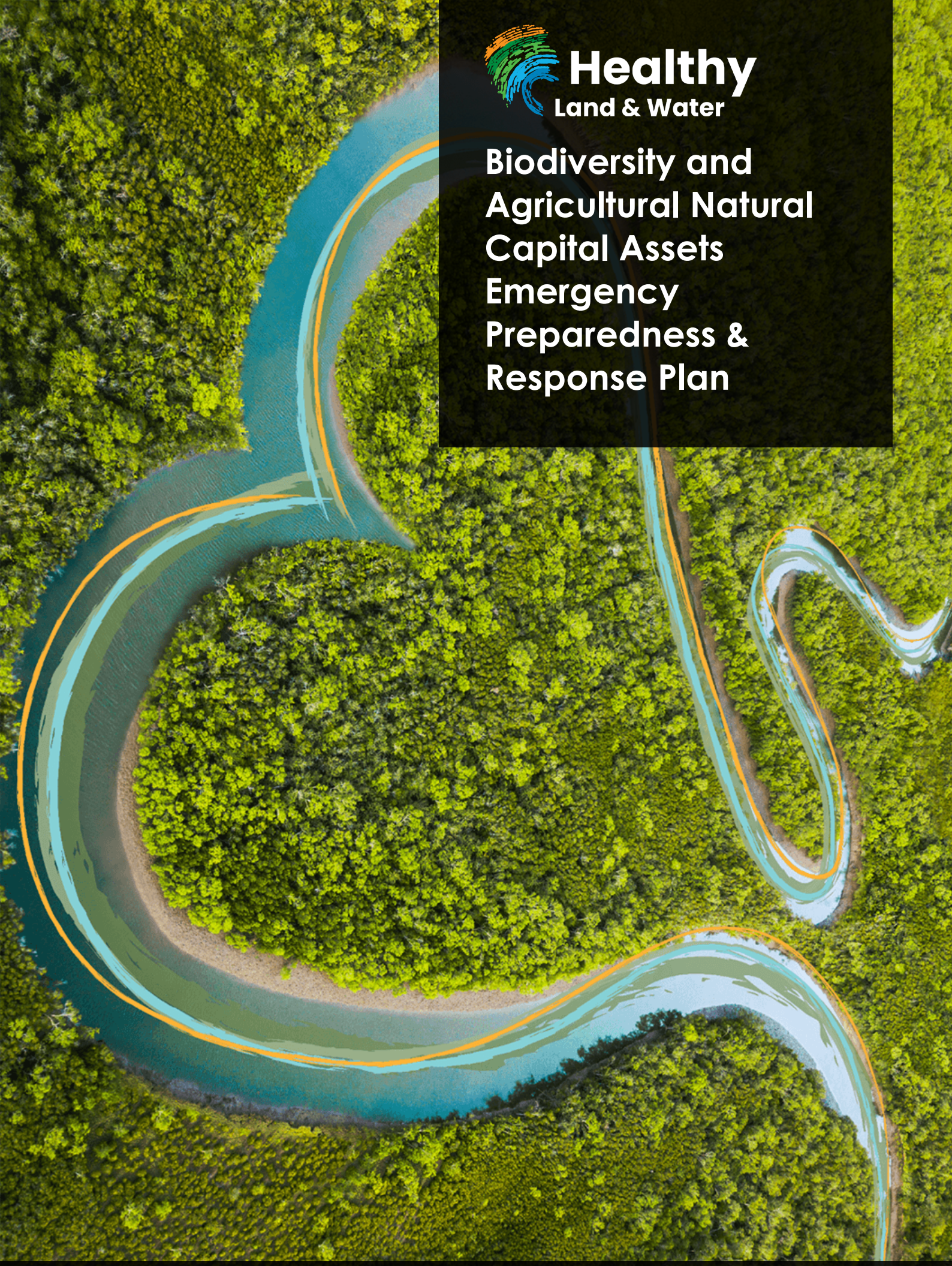

Healthy Land & Water

Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan

Delivering an environment for future generations to thrive

Healthy Land & Water

Authors

Healthy Land & Water

Citation

Healthy Land & Water (2024), Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan, Healthy Land & Water.

About Healthy Land & Water

Healthy Land & Water is the peak environmental group for South East Queensland. For over 24 years it has been dedicated to investing in and leading initiatives to build the prosperity, liveability, and sustainability of our 'future region'. A healthy environment also supports a vibrant economy, strong livelihoods, great lifestyles, and the happiness and well-being of the community. Healthy Land & Water is focused on **delivering an environment for future generations to thrive**.

Healthy Land & Water's success and strength stems from our extensive knowledge, science, and evidence which informs investment in our environment. Healthy Land & Water are experts in research, monitoring, evaluation, and project management. The Healthy Land & Water team has led many thousands of projects to restore waterways and landscapes, improve native habitats, manage weeds, protect native species, inform policy, and educate communities on the best ways to improve and protect the environment.

Working in partnership with Traditional Owners, government, private industry, utilities, and the community, Healthy Land & Water delivers innovative and science-based solutions to challenges affecting the environment. Through a combination of scientific expertise and on-ground management works, Healthy Land & Water **leads and connects through science, big data, and actions that will preserve and enhance our natural assets and support resilient regions long into the future**.

Disclaimer

Traditional Owner acknowledgement

Healthy Land & Water acknowledges that the place we now live in has been nurtured by Australia's First peoples for tens of thousands of years. Healthy Land & Water understands that the spiritual, cultural and physical consciousness gained through this custodianship is vital to maintaining the future of our region.

Contact details

For further information about Healthy Land & Water www.hlw.org.au, please email info@hlw.org.au or telephone (07) 3177 9100.

Australian Government

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Foreword

Queensland is a global biodiversity hotspot and is home to more than half of Australia's native species, including 85% of Australia's native mammals, 72% of native birds, and just over 50% of native reptiles and frogs (*State of Queensland* (Queensland Audit Office, 2023)).

Many of these species are endemic to Queensland and are found nowhere else in the world.

Some of these unique plants and animals are at risk of extinction, with natural events such as cyclones, floods, drought and fire contributing to their decline. We now know that these threats are being exacerbated by climate change.

At the same time, Queensland's agricultural output is expanding and intensifying. More than 88% of Queensland's land is used for primary production and this means how we manage agriculture is closely intertwined with how we manage our environment.

Across mainland Queensland there are 12 regional Natural Resource Management (NRM) organisations (**Figure 1**) working with partners on the ground through some 334 highly qualified staff operating out of 27 rural and regional offices. This network is dedicated to helping communities become more resilient to the effects of climate change and farming more sustainably. Using the best possible science, regional NRM organisations ensure our species and ecosystems – which provide essential environmental services for all of society – can withstand the threats which would otherwise impact their survival.

By supporting communities to be prepared for disasters, we will reduce the impact of these catastrophic events on species, ecosystems, and agricultural natural capital assets.

Strategically, the Queensland regional NRM sector works collegiately with one another as well as across all levels of government and regional stakeholders to align efforts, planning, and resources, to maximise the efficiency and effectiveness of emergency preparedness, response and recovery.

Figure 1: *NRM Regions of Queensland.*

1 Abstract

This ***Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan*** (EPRP) has been developed by Healthy Land & Water for the South East Queensland (SEQ) region.

As the frequency and severity of climate-driven weather events increase, Healthy Land & Water recognises the importance of disaster preparedness to ecosystem resilience and recovery in South East Queensland. This plan aims to better integrate biodiversity and agricultural natural capital assets into emergency planning and response to reduce recovery and restoration costs and promote the integrity and survival of species and natural ecosystems.

This plan builds on lessons from recent environmental disasters, including the 2019/20 Black Summer bushfires and Southern Queensland 2021-22 flood events. It also incorporates insights from the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (*Climate Change 2023: Synthesis Report*).

This plan underscores the critical role of biodiversity and agricultural natural capital in emergency planning and response, for enhancing resilience and recovery in SEQ.

Key gaps:

- **Integration of cultural assets:** Expand leadership opportunities for Traditional Owners which will allow for better incorporation of cultural assets into the EPRP.
- **Resource allocation for plan maintenance:** There is a need for resources to maintain the EPRPs as live tools, allowing regular updates and customisations.
- **Statewide collaboration:** Enhancing statewide collaboration among NRM bodies to help address gaps and build capacity for natural asset emergency management.
- **Stronger partnerships with local government:** Building structured partnerships with local governments and disaster management groups to improve emergency response efficiency.
- **Development and sharing of tools and knowledge:** Creating and sharing tools and resources for disaster preparedness and response through pilot initiatives and collective development.

Recommendations:

- **Include cultural assets in EPRPs:** Expand the inclusion of cultural assets in EPRPs by working with First Nations peoples and Traditional Owners.
- **Develop and maintain live EPRPs:** Allocate resources to develop and maintain EPRPs as dynamic online tools that can be regularly updated and integrated across other emergency management mapping and data collation resources.
- **Explore collective action opportunities:** Enhance the efficiency of NRM bodies through collective action and development of generic tools and resources.
- **Strengthen local government partnerships:** Build stronger partnerships with local governments and integrate with local disaster management structures.
- **Develop and share tools and knowledge:** Develop and share disaster preparedness and response tools and resources and seek opportunities for collaborative funding and project implementation.

By addressing these gaps and implementing these recommendations, this plan aims to enhance the resilience of natural and agricultural systems, protect ecosystem services, support regional economies, and ensure the long-term sustainability of SEQ's natural capital.

2 Background

Environmental risk, specifically extreme weather events, dominate the focus of the critical risk landscape according to the *World Economic Forum Global Risk Report (WEF, 2024)*. As the impact of climate change continues to grow, Natural Resource Management organisations, which act as regional delivery partners, play an increasingly crucial role in climate change mitigation. Healthy Land & Water developed the ***Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan*** (the plan) for South East Queensland (SEQ) in order to support natural ecosystem resilience building, particularly through preparedness and response actions in response to natural disasters.

By investing in disaster preparedness, long-term costs for recovery and restoration post-disaster are reduced.

Ensuring the integrity and survival of species, natural systems and key habitats, helps to preserve key ecosystem services such as clean air, water, and climate regulation, all of which profoundly affect human wellbeing.

Disaster preparedness bolsters the resilience of ecosystems, enabling them to recover and flourish following catastrophic events. Better preparation and response also contribute to stronger regional economies through sectors such as tourism and agriculture. Preserving agricultural natural capital assets ensures longevity of enterprises providing jobs and food for the community.

In the past decade, regions across Australia have experienced drought, significant flooding, and the worst bushfires in living memory. These disaster-scale events are becoming more frequent and intense.

The 2019/20 Black Summer bushfires were shocking and unprecedented. Fires have been a natural part of our landscape for millennia, used by First Nations peoples for tens of thousands of years. However, the Black Summer bushfires were a watershed moment for the Australian community. These bushfires resulted in the loss of the lives of 33 people, killing an estimated 3 billion animals, destroying over 3,000 homes, burning over 18.7 million hectares of land, and releasing hundreds of million tonnes of carbon dioxide equivalent (CO^2e) emissions into the atmosphere.

The Intergovernmental Panel on Climate Change (IPCC)'s *Sixth Assessment (AR6) Synthesis Report* recognises the current state of the climate is causing rapid and widespread changes to our natural systems, the foundation of all life on earth.

Under all climate scenarios, natural disasters are predicted to be more frequent and more severe.

This will have perverse and pervasive impacts on people, the economy, and the environment. Global surface temperatures will continue to increase until at least mid-century. In Australia, our land areas have warmed by around 1.47°C since 1910 when national records began, and average annual temperatures have risen above natural variability in all land regions.

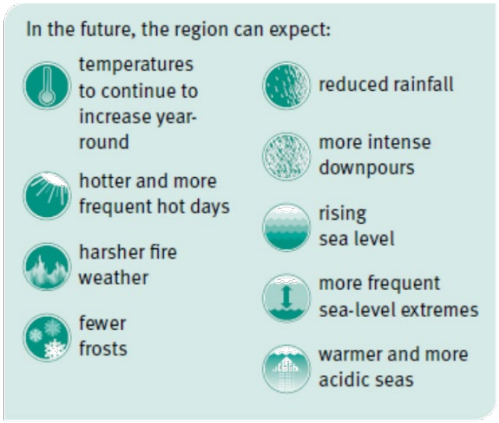
Impacts of this rising temperature will see increased pressures on our food production, water supply, and natural resources. We are already recording escalating declines in our natural resources, including biodiversity loss and disruption to ecosystem services.

There is an urgent need to protect our communities and the integrity of living systems.

This forward-looking plan makes assumptions and predictions of impacts based on forecasted climate change scenarios. The following climate change driven responses, as depicted in **Figure 2**, are predicted for SEQ and inform the identification of future asset impacts. At a finer scale, Healthy Land & Water has applied its climate risk protocol (***APPENDIX 2***: *Healthy Land & Water existing programs and*) for at-risk natural resource management assets, systems and services within the scope of the SEQ NRM Region to further inform the future asset impacts.

The climate change risk drivers within the assessment are drawn from the *IPCC Sixth Assessment Report – Working Group I (The Physical Science) Summary for Policymakers (IPCC, 2021)* list of climate impact drivers adjusted to recognise the climate hazards characterisation already in use in the regional NRM sector (IPCC, 2021; CSIRO, 2015).

Figure 2: *Climate Change in the South East Queensland Region (DESI 2019).*



Whilst not always directly linked to prevailing and future climatic conditions, preparedness for (and responses to) major biosecurity incidents as well as 'accidents', particularly their effect on biodiversity and agricultural natural capital, are included in this plan.

The plan was built on the lessons learned from past natural disaster driven emergencies such as the 2019/20 Black Summer bushfires, other recent environmental disasters and Healthy Land & Water and partners' planning documents (e.g. Natural Resource Management Plans which include Regional Land Partnerships Program – RLP priorities). We also draw down on studies and learnings following disaster-scale flooding and drought.

This plan contributes, in part, to actions under Target 17 of the *Threatened Species Action Plan 2022-2032 (DCCEEW 2022)* and Outcomes 1, 2 and 3 of the Natural Heritage Trust (NHT). It addresses vulnerability to extreme weather events for biodiversity and agricultural natural capital assets identified in the management unit and improves emergency response and planning within jurisdictions. This plan also contributes to Outcomes 1 and 3 of the *Climate-Smart Agriculture Program (DAFF 2023)* by supporting the agriculture sector to build resilience to climate change and conserve natural capital and biodiversity on-farm.

We also keep firmly in mind advice from traditional custodians. We are cognisant that while fires, flood and drought have been a natural part of our landscape for millennia, our First Nations peoples have been managing these and the landscapes for tens of thousands of years.

3 Objectives of this plan

This plan is aimed at improving preparedness for, and response to, emergency events through better integration of biodiversity and agricultural natural capital assets in emergency planning and response.

This includes enhancing the resilience of biodiversity and agricultural assets by identifying the risks and threats posed by natural disasters and undertaking planning to improve outcomes through actions and management before, during (to the extent possible) and after a natural disaster to support recovery.

4 Scope and key terms

The Healthy Land & Water *Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan* (June 2024) concentrates on natural disaster preparedness and response in South East Queensland (SEQ).

The plan focusses on natural disaster mitigation for **biodiversity** and **agricultural natural capital assets**.

It identifies opportunities to build resilience through disaster management based on Healthy Land & Water's existing knowledge, experience and existing preparedness and response mechanisms – both within the organisation and through our strong relationships with stakeholders and community partners.

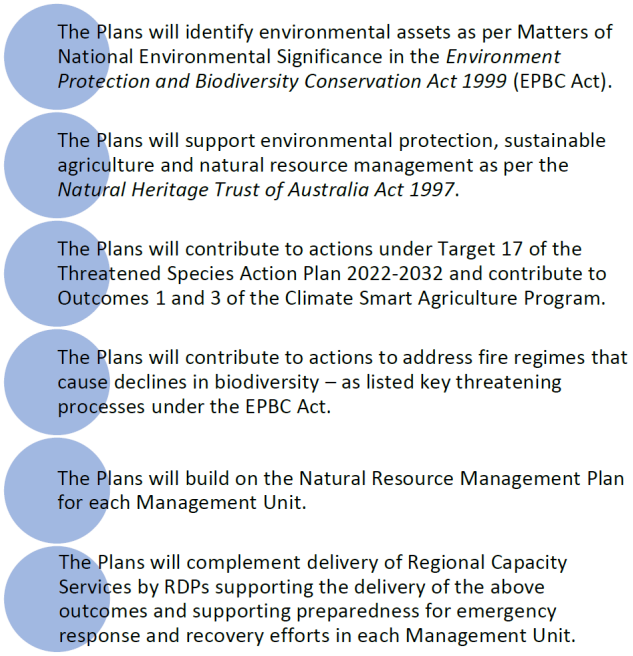
While various projects provide funding for certain elements of natural disaster preparedness and recovery, much of the comprehensive range of measures needed as outlined in this plan remains unfunded. Therefore, this document should be regarded as a proposed plan of action.

This document serves as a guide for informing future policies, strategies, collaboration, and the ranking of management practices and actions aimed at readying for, reinforcing resilience to, and ultimately reducing the impacts of natural disasters on biodiversity and the natural assets of agriculture.

This plan has been developed to guide how Healthy Land & Water can most effectively interact with the emergency preparedness work of other stakeholders, including government, non-government and not-for-profit entities.

At a national level, the Australian Government has set out guidelines which recommend that regional Emergency Preparedness Response Plans align with key Australian Government documents (**Figure 3**).

Figure 3: *Natural Heritage Trust Emergency Preparedness Guidance (Australian Government Department of Climate Change, Energy, the Environment and Water 2023).*

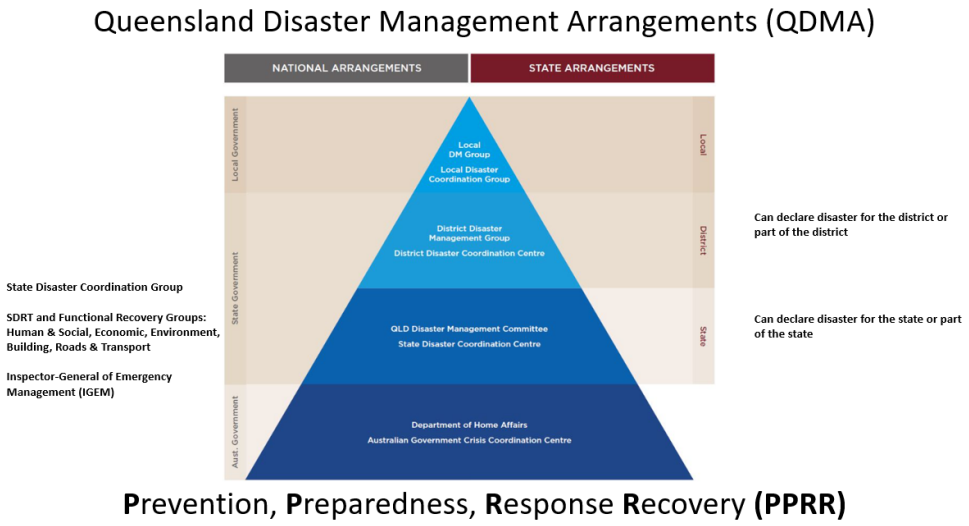


At a State level, State and Territory governments hold primary responsibility for protecting life, property and environment within their borders. They establish plans to respond to and recover from natural (and other) emergencies in this context.

As the most disaster-affected state in Australia, due to the severity and number of disasters and natural emergency events that impact Queensland each year, the Queensland Government proactively developed the *Queensland Government Disaster Management Act (2003)*.

The Act is underpinned by a robust suite of legislation, policies and organisational practices collectively known as the Queensland Disaster Management Arrangements (QDMA). These arrangements comprehensively describe and prescribe the legal framework, governance arrangements, roles and responsibilities of government and non-government stakeholders for emergencies and disasters, often better known as the **Prevent, Prepare, Respond, Recover** approach (**Figure 4**). Healthy Land & Water is committed to working effectively within these disaster management arrangements.

Figure 4: *Queensland Disaster Management Arrangements (QDMA), adapted from Queensland Prevention, Preparedness, Response and Recovery Disaster Management Guideline (2018).*



Other key Queensland Government legislation, policies and strategies include:

- *Environment Protection and Biodiversity Conservation Act (1999)*.
- *Natural Heritage Trust of Australia Act (1997)*.
- *Threatened Species Action Plan (2022-2023)*.
- *South East Queensland Natural Resource Management Plan (2009-2031)*.

Locally, our stakeholder consultations and engagements have led us to simplify this 4-phase model into a 3-phase model for the purposes of this plan.

Our stakeholders identified that the actions for 'prevention' and 'preparedness' are best addressed together in our regionalised plan, leading to development of our 3-phase model of 'Planning & Preparedness', 'Response', and 'Recovery' (**Figure 5**). It is the nature of natural disasters that they can't be prevented, so effort is put into building resilience into the aspects that we can.

This approach integrates well with the 4-phase approach being used by the Queensland Government and other stakeholders.

Figure 5: *Healthy Land & Water's streamlined 3-phase emergency response model represented graphically (Healthy Land & Water 2024).*

The model shows that the approach to emergency management is not strictly linear. It recognises that the phases overlap, and they are not independent of each other. It is also underpinned by an adaptive management cycle, with the 'recovery' phase overlapping with, and providing inputs into, the 'planning and preparedness' phase. All phases include a proactive approach to building future resilience.

With regard to natural assets, there are two types of threats to consider:

- Threats directly caused by the hazard.
- Threats arising from the response and recovery actions.

Threats arising from response and recovery actions represent an opportunity to minimise impacts and risks with effective planning and preparedness activities.

Examples of these threats related to response and recovery actions include:

- Excessive and/or detrimental vegetation and debris clearing before, during or after an emergency such as bushfires or floods.
- The movement of fodder during drought, which can act as a vector for spreading weeds and other pests.
- Chemicals used to clean up oil and other substance spills.
- Collateral damage to the environment from the use of herbicides and insecticides to contain biosecurity outbreaks.
- The impact of using fire retardant chemicals to suppress bushfires.
- 'Building back better' approach to disaster recovery may result in relocating infrastructure (including residences) to areas that aren't prone to flood or other hazards. This could result in the need to remove areas of natural habitat to allow for the relocation of major infrastructure.

Identification of possible threats arising from response and recovery needs to be built into the preparedness and planning phase to enable mitigating actions to be identified and implemented to reduce possible negative impacts.

Actions regarding preparedness and planning are reflected in **Section 8** of the plan and regarding recovery and response **Section 9** of the plan.

4.1 Key terms and definitions used in this plan

A recurring challenge when dealing with the emergency/disaster management sector is the inconsistent use of a variety of key terms in documents, guidelines, policies and legislation. Certain terms, such as 'disaster' and 'emergency', are often used interchangeably, yet different agencies and documentation frequently assign different meanings to these terms. A desktop review of some of our key stakeholders found an array of terminology used in different ways (**Figure 6**).

Figure 6: *Many terms used in different ways.*

To promote clarity of this plan, please refer below for a list of key terms used, together with our definition.

Agricultural natural capital assets: The 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.

Biodiversity assets: Natural assets as identified by jurisdictions, environment management agencies or environmental law as being important to preserve during emergencies or natural disasters (e.g. species, ecological communities, habitat features).

Emergency: An event, actual or imminent, which endangers or threatens to endanger life, property or the environment, and which requires a significant and coordinated response (*Australian Institute of Disaster Resilience 2019*).

Disaster: A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic or environmental losses and impacts (Australian Government Department of Home Affairs, 2018 and UNDRR Sendai Framework for disaster risk reduction (2012-2030)). Note: There is jurisdictional variation in the use of the terms 'emergency' and 'disaster'.

Event: An event may be natural or caused by human acts or omissions. For the purposes of this plan 'an event' relates to climate, biosecurity or human accident or incident that impacts on biodiversity assets and agricultural natural capital assets.

Hazard: A source of potential harm or a situation with a potential to cause loss (*Australian Institute for Disaster Resilience)*.

Crisis: A crisis is a major event that may affect the safety and well-being of a large number of people. (*Australian Government smartraveller.gov.au*).

Risk: The measure of expected harm or loss (human, property, disruption of economic activity) due to a particular hazard.

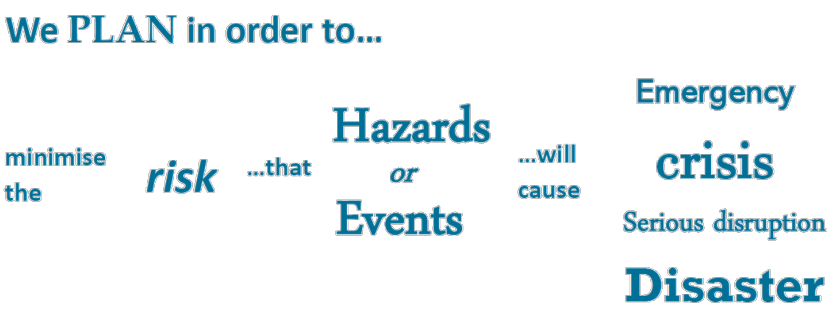
Preparedness: Arrangements to ensure that, should a crisis occur, the required resources, capabilities and services can be efficiently mobilised and deployed.

Response: Actions taken in anticipation of, during, and immediately after an emergency to ensure that its effects are minimised, and that those affected are supported as quickly as possible. (*Australian Government Crisis Management Framework (Commonwealth of Australia, 2023*).

Recovery: Short and medium-term measures to restore or improve the livelihoods, health, economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and 'build back better'[1] to avoid or reduce future disaster risk.

In plain terms, we have based this plan on the following logic (**Figure 7**).

Figure 7: *Planning logic underpinning this plan (Healthy Land & Water 2024).*



Healthy Land & Water has considered the breadth of hazard categories that impact SEQ's biodiversity and agricultural natural capital assets.

For the purposes of this plan, Healthy Land & Water has identified eight hazards (**Table 1**) of which six are climate-driven and two human-induced (biosecurity outbreaks and accident/incident hazards). However, the likelihood of some non-climate hazards occurring can be linked to climate related hazards (e.g. movement of fodder during drought is greater than in non-drought periods with fodder acting as a vector for spreading pests and creating new biosecurity outbreaks).

Table 1: *Healthy Land & Water Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan's Hazard Categories and Descriptions.*

Hazard Category	Description
Bushfire	National Climate Risk Assessment (NCRA) hazard category: Bushfires, grassfires, and air pollution. Includes UN-DRR 'Wildfires', generation of pyrocumulus or pyrocumulonimbus clouds formations, and the contribution of high winds, high temperatures, low humidity.
Floods	NCRA hazard category: Riverine and flash flooding. Includes pluvial (flash) and fluvial (riverine) floods, and antecedent conditions such as soil moisture and river/dam levels.
Storms	NCRA hazard category: Convective storms including hail. Includes typical impacts from thunderstorms, including high winds, downbursts, lightning, heavy rainfall (flash flooding) and large hail.

[1] *'Build back better' is a catch-all phrase commonly used in recent times to describe reconstruction, restoration and future planning efforts that adopt the latest scientific and professional advice, and which incorporate key lessons learned from the crisis in question and/or other similar crises. It enshrines a principle of 'learning from experience' and making necessary modifications to ensure impacts are lessened in the future.*

	Extratropical storms: Includes cut-off low pressure systems, cold fronts, 'East Coast Lows' that bring high winds, storm surge, heavy rainfall and flooding.
Drought	NCRA hazard category: Drought and increasing aridity. Includes broadscale changes in atmospheric circulation resulting in short-term (years) drought becoming long-term (decadal and longer) increases in aridity. May include flash drought associated with high evapotranspiration.
Biosecurity outbreak	Non-climate hazard/climate-amplified hazard: Includes crop, pollinator and herd/flock disease, disease and pest outbreaks causing dieback in natural ecosystems or species populations.
Heatwave	BOM definition: A heatwave is when the maximum and minimum temperatures are unusually hot over 3 days. This is compared to the local climate and past weather.
Sea level rise	NCRA hazard category: Coastal and estuarine flooding. Includes impacts from sea level rise, storm surge, wave action, king and high tides, high winds and low pressures.
Accident/incident	Non-climate hazard/climate-amplified hazard: Including vessel strandings, maritime and land-based spills of oil or other hazardous material, tailings dam failure, wastewater/sewage releases, illegal waste dumping, and other human-induced risk realisation events.

5 The role of Healthy Land & Water in emergency preparedness, response and recovery

Healthy Land & Water has 25+ years of experience in delivering high quality environmental and community engagement management outcomes. It's proven track record of delivering large-scale and integrated environmental projects that deliver lasting and measurable outcomes is well known and evidenced.

Healthier ecosystems, characterised by greater biodiversity, offer numerous benefits, including resilience to large-scale disaster events, improved soil fertility, larger stores of greenhouse gases and ultimately improved livelihood of people and resources depending on them.

The track record of Healthy Land & Water's success in delivering advanced planning, ecological monitoring, and best practice solutions is due to our strong and long-standing partnerships with community groups, First Nations peoples, businesses, and government. Our adept teams are well-prepared to realise the objectives set forth by the National Landcare Program in SEQ.

Healthy Land & Water's work has included the protection and restoration of aquatic ecosystems, catchment management, climate adaptation, resilience planning, community engagement, recovering from natural disasters and capacity building with stakeholders across the region.

Healthy Land & Water has taken a pivotal role in quick response assessment post flood and fire disasters. It has also been heavily involved in flood, fire and drought preparedness and mitigation capacity-building and works.

Healthy Land & Water is widely respected as a thought leader and innovator in the natural resource management sector, with models built in SEQ rolled out for broadscale delivery across Queensland, nationally and internationally.

The combination of scientific expertise and on-ground management works places Healthy Land & Water well to deliver its mission to lead and connect through science and actions that will preserve and enhance our natural assets and support resilient regions.

5.1 Healthy Land & Water's historical and current role in natural resource management

For decades, Healthy Land & Water has been working with partners to build resilience within communities and across landscapes to respond to the changing climate. Healthy Land & Water recognises that responses must span risk reduction and mitigation of impacts, resilience building, and adaption to actively transition towards a positive future.

Healthy Land & Water works with large consortiums of partners to deliver regional landcare activities, providing a significant contribution to environmental conservation efforts in South East Queensland. This partnership has preserved the region's natural assets through innovative, and proactive approaches facilitated by programs such as the National Heritage Trust, National Landcare Program and Regional Landcare Partnerships.

As a trusted independent body, Healthy Land & Water brings together multi-faceted partnerships with Traditional Owners, governments, private industry, utilities, landholders, and communities to co-create and leverage outcomes utilising insights and experiences. These partnerships deliver targeted, innovative and impactful on-ground works that improve the environment. This is exemplified by projects to restore waterways and landscapes, improve native habitats, build resilience to fire and floods, manage weeds, reduce loss of valuable soil from land to waterways, protect native species and improve the sustainability and liveability of built environs and urban areas. Furthermore, capacity building and educational programs are delivered by Healthy Land & Water, either directly or through stakeholder partnerships.

Healthy Land & Water is committed to cultivating relationships with subcontractors who share our ethical values. Our Environmental, Social, and Governance (ESG) Strategy is a reflection of our dedication to responsible and sustainable practices.

Healthy Land & Water is ideally placed with a wealth of knowledge and experience to effectively deliver on disaster preparedness and mitigation, as adequate funding is made available to support this vital work.

5.2 Existing programs and initiatives

Healthy Land & Water has been assisting SEQ communities to adapt to the impacts of climate change.

As trusted advisors to all levels of government, Healthy Land & Water is well placed to guide, act, and facilitate change, providing evidence-based solutions to drive and influence decisions, policy, and actions.

There are many examples of Healthy Land & Water's historical and contemporary activities in the role of disaster planning, preparedness, response and recovery, as outlined in ***APPENDIX 1****: Biodiversity and agricultural assets summary for South East Queensland*.

Table 2 summarises planning/preparedness, response and recovery activities for hazard categories that Healthy Land & Water is or has been involved in leading or supporting the delivery of *(*more detailed information pertaining to some of these activities can be found in ***APPENDIX 1****: Biodiversity and agricultural assets summary for South East Queensland)*.

Table 2: *Planning/preparedness, response and recovery activities Healthy Land & Water have or are delivering in a lead or supporting role.*

Hazard Event	Planning/Preparedness	Response	Recovery
All hazard events	• Integrated the Healthy Land & Water climate risk framework into mainstream climate risk management across the organisation and its scope of activity. • Participated in the development of the 'Climate-ready biodiversity conservation' method to help local governments adapt biodiversity management in response to climate change. • Led the delivery of Property Management Plans for landholders in SEQ, for 20 years.		• Assist with the development of asset recovery plans.
Bushfire	• Led the Queensland Fire & Biodiversity Consortium (QFBC), a state-wide program, to co-develop models and tools such as: • Township Fire Management Strategy (First Nations-led landscape scale and tenure blind approach). • Community Fire Management Plans (landscape scale and tenure blind). • Property Fire Management Plans (private land). • Tailored Fire Management Strategies (public land). • Monitoring programs for fire risk.	• Assist with undertaking rapid assessment post-event to monitor/assess impacts according to how the event occurred/ is occurring.	• Development of Bushfire Recovery Plans and Fire Management Plans. • Community engagement and planning post-disaster for recovery and future preparedness. • Black Summer Bushfire Recovery projects including cross-tenure Community Fire Management Plans, Township Fire Management Strategy and Property level Fire Management Plans to improve landscape and community resilience post-disaster. • Finders Peak ARK - deliverables including: • Revegetation of previously cleared koala habitat. • Targeted weed control areas containing the highest density infestations of weeds that impact koala habitat and koala's ability to utilise habitat.
Flood	• Healthy Land & Water has implemented urban waterway resilience projects through the provision of water sensitive urban design expertise and existing multi-benefit realisation frameworks (Living Waterways, 2020) in conjunction with partnering organisations. • Healthy Land & Water's - Water by Design guideline suite utilised by local governments across the State to inform best practice urban water management including resilience building outcomes for water quality pre-event.	• Participation in various local government disaster response groups and state government disaster response taskforces. • Led programs such as the Riverine Flood Recovery Reconnaissance Project which involves desktop and field assessment of flood damage of riparian areas throughout SEQ and collaborating with a wide range of stakeholders to compile a robust picture of the damage sustained across the region.	• Disaster Recovery Funding Arrangements – Environmental Recovery Program – Riverine Recovery. Healthy Land & Water is undertaking large-scale environmental recovery works to support rehabilitation and restoration of rain and flood-affected environments and environmental assets. • Healthy Land & Water - has implemented urban creek restoration projects by working with partners to design, construct and

	• Mangrove restoration and rehabilitation works to improve the river's long-term resilience to flooding while providing new habitats for local fauna.		demonstrate rehabilitation of waterways. • Extreme floods in 2011 and 2013 mobilised tons of sediment from the upper catchments into Moreton Bay resulting in damage/loss of valuable seagrass beds. Healthy Land & Water played a major role in assessing the damage and rehabilitating these seagrass beds.
Storms	• Developed and implemented programs to protect and improve riparian vegetation and stabilise waterways and gullies to prevent erosion and soil loss, improve land management practices and improve catchment resilience from storm induced local and catchment wide floods.	• Provide rapid assessment of impact.	• Provide support for affected landholders and the impacted asset. • Facilitate restoration works (i.e. of habitat and/or food tree species through revegetation or weed control).
Drought	• Work with industry and government partners to deliver a range of extension and capacity building events to promote drought preparedness. • Assist primary producers with the development of their Farm Business Resilience Plans.	• Provide support/extension services during drought to primary producers through the provision of local events and one-on-one support. • Assist in implementing the response component of producers' Farm Business Resilience Plans. Monitor/assess impacts according to how the event is occurring.	• Implement strategies and practices that improve drought resilience – soils, pastures and water assets.
Biosecurity outbreak	• Provide support to leading agencies as requested in the development of Incident Action Plans.	• Provide support to leading agencies as requested for situation assessment. • Initial implementation of Biosecurity Management Plans and known control measures (i.e. foot cleaning stations to reduce transport of pathogens).	• Facilitate long-term monitoring and assessment of impacted areas and intervention measures undertaken (i.e. spatial database to track progress of outbreak).
Heatwave	• Produced 'heat maps' of Brisbane which identified those areas of the city that are hotter than others and more susceptible to heatwaves. • Establish and promote grazing management regimes to increase ground cover and reduce run-off (mobilisation of sediment).	• Monitor/assess impacts according to how the event is occurring.	• Carry out rapid assessments of impact.
Sea level rise	• Provide long-term monitoring of impacted areas and species. • Trialling artificial roosts in Moreton Bay. • Develop and implement action plans to protect and rehabilitate roosting sites.		• Saltmarsh restoration and erosion control including coir logs, root balls, logs and signs and barriers for behaviour modification.
Accident/incident		• Coordinated overall oil spill cleanup.	• Monitoring shorebirds' health post-spill and coordinated rehabilitation of damaged ecosystems.

5.3 Healthy Land & Water's evolving role in the broader emergency management arrangements

In Queensland, Natural Resource Management (NRM) groups such as Healthy Land & Water, are not currently identified as having a formal role in the Queensland Disaster Management Arrangements (QDMA). While not having a specified role in key documents such as the *Queensland State Disaster Management Plan* (QDMC 2023), *Queensland Strategy for Disaster Resilience 2022-2027* (QRA 2022) and the *Queensland Bushfire Plan* (QFES 2010), Healthy Land & Water is often called on for information and expertise into key guiding documents.

In recent years, Healthy Land & Water has interacted in many ways with key QDMA stakeholders to play a growing role in SEQ emergency/disaster preparedness, recovery and management.

Healthy Land & Water's role across the Queensland Government's PPRR model has so far included:

- **Prevention**: Promoting cool burns on private properties; fire planning on behalf of stakeholders to reduce bushfire risk; education on bushfire risk, sustainable agriculture, water sensitive urban design; particular focus on properties that neighbour national parks and areas of high conservation value; rehabilitation of streambanks and flood impacted areas.
- **Preparedness**: Property, catchment and regional planning through to on-ground works, including bushfire mitigation and installation of mitigating infrastructure (e.g. water tanks, fire trails and breaks), streambank restoration, water sensitive urban design; workshops and training; educational material and decision support tools such as guidelines that are embedded within the *State Planning Policy (Water)* (Queensland Government 2017) and local government planning instruments.
- **Response**: Property, catchment, regional and state planning to enable integrated, informed and actionable response measures across tenure; rapid post-disaster monitoring to address immediate impacts and current risks.
- **Recovery**: Early engagement to promote monitoring, assess and determine impacts and landscape recovery potential; post-disaster community engagement to promote recovery actions and increased resilience; investment to restore landscapes and implement bushfire mitigation infrastructure in impacted areas.

Over the past 25+ years, Healthy Land & Water has been called upon for expertise in fire, flood, drought and other disaster management situations (refer to ***APPENDIX 2**: Healthy Land & Water existing programs and* for examples).

Healthy Land & Water's key role through this program is in **Prevention, Preparedness and Recovery**. While **Response** largely sits with other organisations, Healthy Land & Water does provide information, connection to community networks. Its technical support is also called upon.

CASE STUDY: Queensland Fire & Biodiversity Consortium

This evolving engagement over time can be seen through Healthy Land & Water's Queensland Fire & Biodiversity Consortium (QFBC) program, which is increasingly approached to provide advice and lead the development of regional and State fire management guidelines which is leading to an increasingly 'formalised' role in this space.

The QFBC program is currently formally recognised as a part of the following arrangements:

- Standing member of the *State Bushfire Committee (SBC)*, a function coordinated by the Queensland Fire & Emergency Service (QFES) who's role is to provide strategic leadership to enable a coordinated and effective risk-based approach to the management of bushfire prevention, preparedness, response, and recovery for Queensland.
- Standing member of the Indigenous Land, Fire Management and Natural Disaster Resilience Working Group, that sits under the State Bushfire Committee with the task of exploring the relationship between Indigenous fire management and natural disaster resilience to identify opportunities to integrate insights into the development, planning and execution of public land management activities.
- Standing member of the Darling Downs Area Fire Management Group (AFMG) and presenter at various AFMG meetings across the state.

The QFBC model integrates within the Comprehensive Approach: Prevention, Preparedness, Response and Recovery (PPRR model) as outlined in the *Queensland Prevention Preparedness Response and Recovery Disaster Management Guideline (QFES 2018*).

5.4 An opportunity for a revised role for Healthy Land & Water

This plan is being developed at a time of significant change for the emergency/disaster management sector in Queensland.

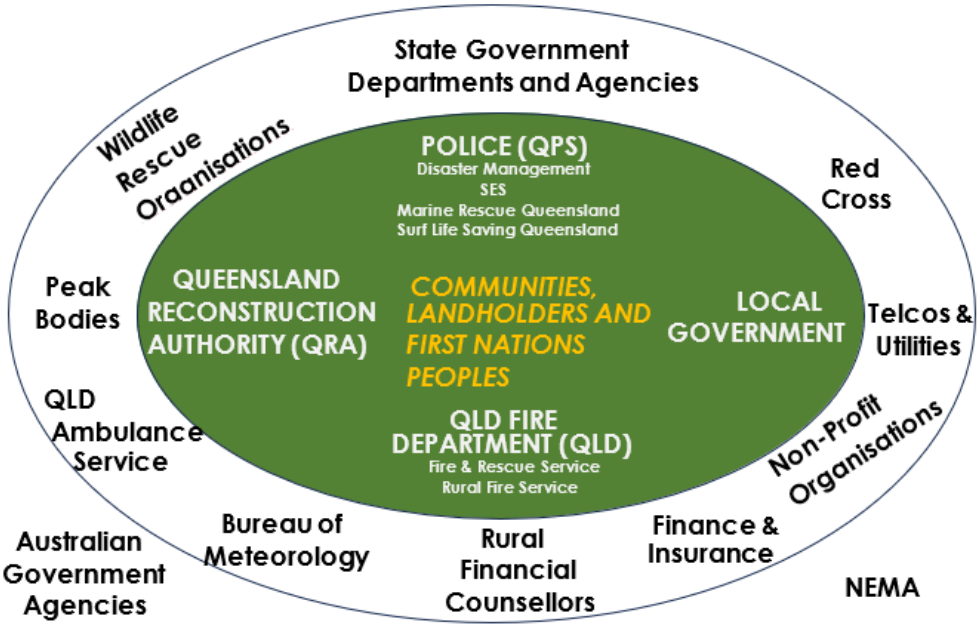
In July 2021, the Queensland Government commissioned an independent review of Queensland Fire & Emergency Services (QFES) and its associated volunteer services. The review report made a number of recommendations that aimed to: "… *modernise service delivery arrangements; simplify organisational structures; and focus resources*" (Queensland Government 2024). The majority of recommendations made by the review have been accepted in principle by Government and are expected to be implemented ahead of the 2024 natural disaster season.

The reforms will result in:

- An uplift of almost 500 full-time emergency services personnel and dedicated budgets to boost resourcing across Queensland.
- Establishment of a new Queensland Fire Department (QFD) and a new entity, Marine Rescue Queensland (MRQ), which will bring together coast guard and marine rescue activities.
- Expansion of the Queensland Police Service (QPS) to incorporate additional disaster management functions, including the State Emergency Service (SES), Surf Life Saving Queensland (SLSQ) and Marine Rescue Queensland (MRQ).
- Boosting capability and capacity for the Queensland Reconstruction Authority to improve resilience.

It is expected (post-July 2024) that a graphical representation of the relationships between key emergency/disaster management stakeholders in SEQ would look like (**Figure 8**):

Figure 8: *Graphical representation of relationships between key emergency/disaster management stakeholders in SEQ.*



Healthy Land & Water sees this time of reform, coinciding with the development of this plan, as an ideal opportunity to evaluate and re-define its role in the revised 'landscape' of emergency/disaster management in Queensland.

5.5 Healthy Land & Water's future and potential role in emergency/disaster management and the QDMA

The understanding of Healthy Land & Water's future and potential role in emergency/disaster management in South East Queensland (and beyond for state-wide programs) has been consolidated and confirmed through the recent stakeholder engagements undertaken to develop this plan.

Key QDMA stakeholders (many of whom have relatively lengthy experience working with Healthy Land & Water) confirmed that:

- Healthy Land & Water has skills, knowledge, experience, resources and networks that are valuable and could be better utilised in emergency/disaster management.
- The potential for Healthy Land & Water to operate within the QDMA at a state level is most likely to be through:
  - Collective arrangements with the other Queensland natural resource management (NRM) organisations represented by NRM Regions Queensland (NRMRQ), and/or
  - Multi-agency 'consortium' arrangements such as QFBC.
- Whilst it is likely that Healthy Land & Water's strongest roles would be in 'Planning & Preparing' for, and 'Recovering' from, emergencies and disasters, it is recognised that there is an emerging role in 'Response' and that this role had already been activated and fulfilled in recent occasions - namely the March 2022 South East Queensland flooding event, the 2019-2020 Black Summer Bushfire events and historical in response to significant flooding events in 2011, 2013 and 2017 and the 2009 South East Queensland oil spill.

Further recommendations for developing Healthy Land & Water's role in emergency/disaster management in SEQ were gathered through engagement at stakeholder workshops, staff discussions and more detailed interviews with key stakeholders. Whilst the specific details of Healthy Land & Water's role in the three phases will be further refined, a clear picture of suggested roles is given in the following table (**Table 3**). Note, some roles at State level would need to be undertaken by collective entities such as NRMRQ.

Table 3: *Potential roles for Healthy Land & Water in emergency/disaster management in South East Queensland.*

Phase	Role for Healthy Land & Water	Partners to be engaged
Planning & preparedness	• Advocacy at a regional scale. • Develop and conduct training, education and awareness programs. • Carry out scenario modelling and scenario training. • Research - provide a 'middle ground' of trusted but practical/timely research. Partner and participate in research projects. • Collect and provide knowledge and data and make it available through accessible/practical products and services. Ability to access knowledge of local partner groups 'on the ground'. • Carry out landscape restoration projects that build resilience and engage communities in disaster preparedness. Prioritise using evidence and data. • Understand what knowledge exists and what First Nations peoples are willing to share and how it should be handled respectfully. • Facilitate, where appropriate, access to funding and resources for First Nations peoples leadership opportunities • Consolidate and curate natural resource knowledge for the region - identify knowledge gaps and pursue ways to 'fill' those gaps. • Develop and maintain critical networks with local groups and key stakeholders. 'Connect the players'. Reach and develop partnerships with other industry groups. • Document knowledge and successful case studies – share through various means. • Contribute to planning and preparedness with local and district disaster groups and share expertise with local governments. Assist other bodies (such as LSFMGs and AFMGs) in developing fire plans. • Sharing of data related to fire preparedness of landholders and community in the form of tenure blind landscape scale fire management plans and property level fire management plans and level of fire literacy within communities through access to QFBC workshops and information sessions. • Provide established and trusted links to First Nations groups – access to partnerships and knowledge. • Join with NRMRQ to contribute to state-level planning. • Utilise existing state programs as a mechanism to consolidate and coordinate community preparedness and resilience through property and landscape scale fire planning. • Actively participate in state-wide consortiums/partnerships (e.g. QFBC) to contribute to state-wide initiatives. • Share knowledge and expertise through partnerships with other NRMs and various organisations.	• Communities and landholders. • First Nations peoples, including Land and Sea Indigenous Rangers and NIAA Rangers. • Industry groups. • Local Governments, Local Government Association of Queensland Ltd (LGAQ). • State Government agencies/organisations (e.g. QPS, QFD, SES, QRA, DESI, DTATSIPCA, QDAF, RDMW, DSDILGP). • Existing district and local area disaster groups - LDMGs and DDMGs. • Australian Government agencies/organisations (e.g. NEMA, DAFF, Defence). • NFPs (e.g. Red Cross, Salvation Army, St. Vincent de Paul, Rural Aid, Blaze Aid, GIVIT, etc). • Landcare and environmental groups (e.g. Plant Health Australia, Animal Health Australia, Australian Conservation Foundation, etc.). • Universities and research groups (inc. NHRA). • Economic development agencies. • Peak bodies (e.g. QFF, Agforce, MLA, Growers Groups). • Schools and educational organisations. • Finance and insurance bodies. • Telcos and utilities. • Rural financial counsellors.

Phase	Role for Healthy Land & Water	Partners to be engaged
	• Assist partner organisations to apply for funding and carry out programs/projects.	
	• Property Management Plans/Farm Business Resilience Plans – e.g. Continue to deliver Property Management Plans for private landholders and work with the Queensland Government Department of Agriculture and Fisheries (DAF) and industry bodies to build capacity of landholders to manage risks through the development of Farm Business Resilience Plans. Need greater recognition of role that NRMs play in Farm Business Resilience planning.	
Response	• Develop and maintain networks with the public and local groups 'on the ground'. Make networks available for communications, education and potential 'personnel'.	• Communities and landholders. • First Nations peoples, including Land and Sea Indigenous Rangers and NIAA Rangers. • Local Governments, LGAQ. • State Government agencies/organisations (e.g. QPS, QFD, SES, QRA, DESI, DTATSIPCA, QDAF, DSDILGP, RDMW). • Existing local area disaster groups - LDMGs and DDMGs. • Australian Government agencies/organisations (e.g. NEMA, DAFF, Defence). • NFPs (e.g. Red Cross, Salvation Army, St. Vincent de Paul, Rural Aid, Blaze Aid, GIVIT, etc). • Finance and Insurance bodies. • Telcos and utilities.
	• Maintain membership relationships with local and district disaster groups – provide knowledge expertise, and resources as relevant and appropriate.	
	• Able to provide rapid assessment of biodiversity/natural capital impacts and most effective response during emergencies/disasters.	
	• Able to provide maps, data and knowledge.	
	• Ability to gather live and direct information from community and landholder networks on the extent and impact of damage (e.g. March 2022 'Live Flood Map' activation).	
	• Able to provide personnel and resources (as appropriate).	
Recovery	• Able to provide rapid assessment of biodiversity/natural capital impacts and most effective recovery actions soon after emergencies/disasters.	• Communities and landholders. • First Nations peoples including Land and Sea Indigenous Rangers and NIAA Rangers. • Industry groups. • Local Governments, LGAQ. • State Government agencies/organisations (e.g. QPS, QFD, SES, QRA, DESI, DTATSIPCA, QDAF, DSDILGP). • Existing local area disaster groups - LDMGs and DDMGs. • Australian Government agencies/organisations (e.g. NEMA, DAFF, Defence). • NFPs (e.g. Red Cross, Salvation Army, St. Vincent de Paul, Rural Aid, Blaze Aid, GIVIT, etc). • Landcare and environmental groups (e.g. Plant Health Australia, Animal Health Australia, Australian Conservation Foundation etc.). • Universities and research groups. • Economic development agencies. • Peak bodies (e.g. QFF, Agforce, MLA, grower groups).
	• Provide appropriate prioritisation of on-ground actions for recovery, rehabilitation and building future resilience.	
	• Draw on accumulated knowledge (experience, expertise and case studies) to suggest most appropriate actions for the region.	
	• Design and delivery reach scale flood recovery and resilience programs.	
	• Provide education (particularly on biodiversity/natural capital rehabilitation and building future resilience) to local groups/farmers and other stakeholders after emergencies/disasters.	
	• Help disseminate critical recovery information through local networks.	
	• Assist with coordinating recovery activities.	
	• Assist with coordinating data collection from local networks and groups.	
	• Provide and report on local monitoring of response and recovery activities.	
	• Partner with other groups/agencies to access funding for recovery and 'resilience' projects – carry out and report.	
	• Collect data and map historical effects of emergency/disaster impacts as well as response and recovery programs.	

6 First Nations participant values for emergency management in South East Queensland

One of the significant gaps in emergency management plans is the need for more effective engagement and inclusion of First Nations peoples and cultural assets. During the development of the current plan, First Nations partners provided feedback regarding assets and disaster management through a number of engagement opportunities. A summary of this feedback is provided here. It is important to recognise, that this feedback is not intended to be reflective of the view of First Nations peoples as a whole, but rather the views of partners with whom Healthy Land & Water have engaged for the purpose of advancing this plan.

Traditional Owner participants described the need for appropriate resourcing and training to support opportunities for leadership in disaster management. This includes opportunities for ranger teams to:

- Manage and deliver First Nations approaches to controlled burns.
- Provide guidance on Country; familiarity from working on Country provides local knowledge.
- Have more autonomy, including, for example, the ability to deliver fines where appropriate when working on Country.
- Traditional Owner groups to lead partnerships with Healthy Land & Water and other partners and key enablers to manage emergency works and programs.
- Traditional Owner groups should run cultural surveys at sites prior to burning.
- Better integration of cultural knowledge into emergency management.

Some of the resources and support described as essential to increase leadership opportunities in emergency management included:

1. Better communication:
    a. In order to reach a larger audience of First Nations peoples, instead of just speaking to established corporations, information should be taken to Indigenous service provider meetings.
    b. All relevant/local First Nations groups should be engaged.
2. Strategic funding investment:
    a. Directed to relevant Traditional Owner groups in order to build capacity, capability, compliance.
    b. For relevant equipment and technology.
    c. To expand and develop Traditional Owner led fire management programs.
3. Cultural Knowledge integration including:
    a. Integration and prioritisation of key biodiversity assets identified by First Nations partners.
    b. Integrating knowledge of Country into management, for example, investment in establishing real time seasonal calendars based on, for example, plants associated with fire ignition/interruption - not necessarily traditional calendars but 'real time' seasonal calendars that also record information about disaster event cycles.

Traditional Owner participants identified specific biodiversity assets that should be included in emergency planning:

- Cultural sites of significance.
- Indigenous Protected Areas (IPA).
- Scar trees.
- Middens.
- Mangroves.
- Oyster habitats.
- Turtle nesting grounds.

- Marine parks.
- Creeks and waterways integrity.
- Toondah Harbour.
- Ancestral Cypress Camp communities which are:
  - Fire intolerant.
  - Require condition assessment and buffer area.
- Salt marsh country.
- Coastal systems - pandanus.
- Open grasslands/native grassland species.
- Aquifers.
- Soaks (standing pools of water that remain even during dry season where rivers and creeks dry out - often the result of a water table below the site; may be an oasis for fish and amphibians during dry periods; soaks can sometimes also represent water just below the surface of the ground that is easily accessible).
- Overall greater focus on habitat protection of land in urban/developed areas.

Specific threats identified by Traditional Owner participants included:

- Erosion.
- Shark nets.
- Boating/fishing.
- Storm runoff.
- Coastal hazards including shifting sand and the need for top dune stabilisation.

7 Identification of South East Queensland assets and susceptibility

This plan recognises biodiversity assets as based on the scope provided by the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW), Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) and Healthy Land & Water's areas of expertise.

7.1 Biodiversity assets

This section identifies and describes natural disaster hazards that impact biodiversity assets in South East Queensland, including, but not limited to Matters of National Environmental Significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC). Matters of State Environmental Significance (MSES) biodiversity assets - flora and fauna listed under Queensland's *Nature Conservation Act 1992* (NCA) have also been captured in this plan, with consideration of the current threatened species assessments undergoing the 'common assessment method' with the Australian Government and state jurisdictions to ensure species listings are comprehensive and current across state and federal legislative frameworks.

Healthy Land & Water recognises the local, state and national significance of SEQ's biodiversity assets. We recognise the objectives set out by the Australian Government and continue to align our activities with the United Nations and Australian Government investment priorities, including:

- MNES under the EPBC, including the management of listed threatening processes, invasive species, and threatened ecological communities.
- The restoration of, and reduction in threatening processes to, the ecological character of Ramsar and UNESCO World Heritage sites.
- Species targeted under the *Threatened Species Strategy (2021–2031)*.
- The management of threatening processes and invasive species.
- International agreements for the Asian - Australian Flyway (the Flyway), including bilateral migratory bird agreements with Japan, China, and the Republic of Korea.
- The United Nations *Declaration on the Rights of Indigenous Peoples (2007)*.

Below is an array of the at-risk biodiversity assets in the SEQ region against the natural disaster emergency risk drivers **Table 4**. Whilst these assets have been identified as likely, or potentially being severely impacted by hazard events, it is recognised that many if not all species and ecological communities in SEQ are likely to be negatively impacted by hazard events. Examples of this are the severe impacts from the recent SEQ severe thunderstorms on Christmas Day 2023 across multiple ecosystems and the susceptibility of Australian lungfish to floods.

Whilst **Table 4** aligns highly impacted MNES and MSES against hazard categories, there are often subsequent and compounding impacts incurred through hazard events which result in biodiversity and ecosystems being affected by the interaction of multiple changes at once. For example, a storm or flood may result in the removal or degrading of natural vegetation (decreasing the health of that vegetation community) but also result in a biosecurity outbreak due to the incursion of weeds, further hindering the recovery of species and ecosystems. **Table 4** below does not specifically identify these linkages/flow on impacts. The table emphasises that one or more species within a group have a reasonable likelihood of being impacted directly or indirectly by the hazard type or event in the future based on current known threats and future climatic predictions.

Table 4: *South East Queensland biodiversity assets and associated hazard events.*

Hazard Category	MNES And MSES Threatened Species	MNES places and threatened ecological communities
Bushfire	• Threatened/migratory and/or marine waders and shorebirds. • Threatened terrestrial birds. • Threatened upland, stream-dwelling amphibians (six species). • Threatened 'acid' frogs (four species). • Threatened arboreal mammals (eleven species). • Threatened ground-dwelling mammals (thirteen species). • Threatened crustaceans (nine species). • Threatened insects (three species). • Threatened freshwater reptiles (two species of turtle). • Threatened terrestrial reptiles (sixteen species). • Threatened/EPBC-listed flora species.	• Gondwana Rainforests of Australia World Heritage Area (WHA). • Glass House Mountains National Landscape National Heritage Area. • Moreton Bay Ramsar Wetland. • Subtropical and Temperate Coastal Saltmarsh. • Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland. • Brigalow (*Acacia harpophylla* dominant and co-dominant). • Littoral Rainforest and Coastal Vine Thickets of Eastern Australia. • Dunn's white gum (*Eucalyptus dunnii*) moist forest in north-east New South Wales and SEQ. • Swamp Tea-tree (*Melaleuca irbyana*) Forest of SEQ. • Lowland Rainforest of Subtropical Australia. • Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and SEQ. • Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and SEQ bioregions. • Poplar Box Grassy Woodland on Alluvial Plains.
Floods	• Threatened/migratory and/or marine waders and shorebirds (75 species). • Threatened upland, stream-dwelling amphibians (six species). • Threatened 'acid' frogs (four species). • Threatened arboreal mammals (eleven species). • Threatened ground-dwelling mammals (twelve species). • Threatened crustaceans (nine freshwater species). • Threatened insects (three species). • Threatened marine mammals (eight species). • Threatened marine fish/shark (twelve species). • Threatened freshwater reptiles (two turtle species). • Threatened terrestrial reptiles (sixteen species). • Threatened NCA and EPBC-listed flora species (generally within riparian or coastal habitats).	• Glass House Mountains National Landscape - National Heritage Area. • Gondwana Rainforests of Australia - World Heritage Area. • Moreton Bay Ramsar Wetland. • Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland. • Swamp Tea-tree (*Melaleuca irbyana*) Forest of SEQ. • Lowland Rainforest of Subtropical Australia. • Poplar Box Grassy Woodland on Alluvial Plains.
Storms	• Storms have the potential to impact coastal, terrestrial and freshwater ecosystems and biodiversity assets. However, this impact is largely unpredictable and is not typically addressed in the conservation listings for threatened species and communities, though it cannot be entirely ruled out as a threat. • Threatened insects (three species). • Threatened upland, stream-dwelling amphibians (six species). • Threatened 'acid' frogs (four species). • Threatened crustaceans (nine freshwater species). • Threatened arboreal mammals (eleven species).	• Gondwana Rainforests of Australia WHA. • Glass House Mountains National Landscape - National Heritage Area. • Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland. • Brigalow (*Acacia harpophylla* dominant and co-dominant). • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. • Weeping Myall Woodlands. • Littoral Rainforest and Coastal Vine Thickets of Eastern Australia.

Hazard Category	MNES And MSES Threatened Species	MNES places and threatened ecological communities
	• Threatened ground-dwelling mammals (thirteen species). • Threatened freshwater reptiles (two turtle species). • Threatened terrestrial reptiles (sixteen species). • Freshwater fish (eight species). • Threatened terrestrial birds (29 species). • Threatened/migratory and/or marine waders and shorebirds (75 species). • Threatened marine reptiles (six turtle species).	• Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland. • Grey box-grey gum wet forest of subtropical eastern Australia. • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions. • Dunn's white gum (*Eucalyptus dunnii*) moist forest in north-east New South Wales and south-east Queensland. • Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland. • Lowland Rainforest of Subtropical Australia. • Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and SEQ ecological community. • Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and SEQ bioregions. • Poplar Box Grassy Woodland on Alluvial Plains. • Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions.
Drought	• Threatened/migratory and/or marine waders and shorebirds. • Threatened terrestrial birds. • Threatened crustaceans (nine species). • Threatened insects (three species). • Threatened marine mammals (seven species). • Threatened freshwater reptiles (two turtle species). • Threatened terrestrial reptiles (sixteen species). • Threatened upland, stream-dwelling amphibians (six species). • Threatened 'acid' frogs (four species). • Threatened arboreal mammals (eleven species). • Threatened ground-dwelling mammals (thirteen species). • Threatened NCA and EPBC-listed flora species.	• Gondwana Rainforests of Australia WHA. • Glass House Mountains National Landscape National Heritage Area. • Moreton Bay Ramsar Wetland. • Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland. • Brigalow (*Acacia harpophylla* dominant and co-dominant). • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. • Weeping Myall Woodlands. • Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland. • Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and SEQ bioregions.
Biosecurity outbreak	Biosecurity outbreaks have the potential to impact any biodiversity asset, with some species currently in decline due to invasive pest fauna and flora. Predicting future biosecurity outbreaks, such as those caused by pathogens, remains reasonably unpredictable. Therefore, we cannot rule out this threat to any biodiversity asset. • Threatened NCA and EPBC listed flora species. • Threatened insects (three species). • Threatened upland, stream-dwelling amphibians (six species). • Threatened 'acid' frogs (four species). • Threatened crustaceans (nine freshwater species). • Threatened arboreal mammals (eleven species). • Threatened ground-dwelling mammals (thirteen species).	• Gondwana Rainforests of Australia - World Heritage Area. • Glass House Mountains National Landscape - National Heritage Area. • Moreton Bay Ramsar Wetland. • Each TEC in SEQ has the potential to be impacted on by biosecurity outbreaks, such as from Myrtle rust. Refer to the extensive list of TECS within SEQ listed in **Table 14**.

Hazard Category	MNES And MSES Threatened Species	MNES places and threatened ecological communities
	• Threatened marine mammals (seven species). • Threatened freshwater reptiles (two turtle species). • Threatened terrestrial reptiles (sixteen species). • Freshwater fish (eight species). • Marine fish/shark (twelve species). • Threatened terrestrial birds (29 species). • Threatened/migratory and/or marine waders and shorebirds (75 species).	
Heatwaves	• Threatened arboreal mammals that do not shelter within hollows (i.e. koalas, grey-headed flying foxes). • Threatened ground-dwelling mammals (thirteen species). • Threatened/migratory and/or marine waders and shorebirds (75 species). • Threatened birds (including their eggs and nestlings). • Threatened freshwater crustaceans (nine species). • Threatened freshwater fish (eight species). • Threatened marine reptiles (seven turtle species). • Threatened terrestrial reptiles (sixteen species).	• Gondwana Rainforests of Australia - World Heritage Area. • Glass House Mountains National Landscape National Heritage Area. • Moreton Bay Ramsar Wetland. • Lowland Rainforest of Subtropical Australia. • Littoral Rainforest and Coastal Vine Thickets of Eastern Australia. • Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland. • Swamp Tea-tree (*Melaleuca irbyana)* Forest of South-east Queensland.
Sea level rise	• Threatened/migratory and/or marine waders and shorebirds (75 species) • Threatened marine reptiles (seven turtle species) • Threatened 'acid' frogs (four species) • Threatened ground-dwelling mammals (i.e. water mouse) • Threatened freshwater fish (eight species) • Threatened NCA and EPBC-listed flora (within coastal, or acidic habitats).	• Moreton Bay Ramsar Wetland. • Glass House Mountains National Landscape National Heritage Area • Subtropical and Temperate Coastal Saltmarsh. • Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland. • Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and SEQ ecological community.

7.2 Agricultural natural capital assets

The following agricultural natural capital assets for SEQ have been identified by Healthy Land & Water based on the scope provided by the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) and the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) and the CSIRO *Natural Capital Handbook* and the Accounting for Nature Program.

- **Agricultural land**: This includes soil, air, water, riparian and native vegetation on agricultural lands used for crops.
- **Grazing land**: This includes soil, air, water, native pastures and native vegetation assets used for livestock.
- **Native forests and plantation forestry**:
  - Plantations classified by the IUCN system of global ecosystems typology as Biome: T7 - established through the translocation of woody perennial plants where these species may be subject to engineered genetic modified or modification through selective breeding to promote particular traits.
  - Native forest may be integrated into agricultural and grazing lands or found on their periphery. These forests are not deliberately genetically modified through engineering. Classified within the

Queensland Regional Ecosystem framework (DSITIA 2014) in the South East Queensland (SEQ) bioregion under a number of broad vegetation groups and under a number of IUCN ecosystem functional groups including T1.1 Tropical-subtropical lowland rainforests, T2.6 Temperate pyric sclerophyll forests and woodlands and T4.4 Temperate woodlands.

- **Fisheries and aquaculture waterways**: This includes all waterways including estuaries, bay and coastal assets used for fishing and aquaculture.

Agricultural production related assets such as livestock, crops and farmed aquaculture are dependent on the health and condition of the natural capital assets. This plan recognises the importance of the production assets but only focusses on the hazard category impacts on the agricultural natural capital.

The following table outlines at-risk agricultural natural capital assets in the SEQ region against the natural disaster emergency risk drivers (**Table 5**).

Table 5: *Emergency Preparedness & Response asset/hazard matrix – Agriculture.*

Hazard category	Agricultural natural capital asset
Bushfire	• Agricultural land (soil, air, water, riparian and native vegetation). • Grazing land (soil, air, water, native pastures, and native vegetation assets). • Native forests and plantation forestry. • Fisheries and aquiculture Waterways, estuary, bay and coastal assets.
Floods	
Storms	
Drought	
Biosecurity outbreak	
Heatwaves	• Agricultural land (soil, air, water, riparian and native vegetation). • Grazing land (soil, air, water, native pastures, and native vegetation assets). • Native forests and plantation forestry. • Fisheries and aquaculture waterways, estuary, bay and coastal assets (Increased water temperatures and acidification).
Sea level rise	• Agricultural land (soil, air, water, riparian and native vegetation). • Fisheries and aquaculture waterways, estuary, bay and coastal assets.

7.3 Biodiversity and agricultural natural capital assets hazard category risks

There is an array of at-risk biodiversity and agricultural natural capital assets across SEQ **(APPENDIX 1**: *Biodiversity and agricultural assets summary for South East Queensland***)**.

Healthy Land & Water has adapted its *Climate Response Protocol* risk framework for this plan. The purpose of the Healthy Land & Water *Climate Response Protocol* risk framework is to mainstream climate risk management across the organisation and its scope of activity. Managing climate risk is contextualised within Healthy Land & Water's corporate risk and environmental, social and governance (ESG) policy framework.

Healthy Land & Water has conducted a first-pass climate risk assessment for its corporate assets, systems, and services, and for those assets, systems, and services within the scope of regional natural resource management in SEQ. The identified risks have been rated (and prioritised) using a built-for-purpose risk rating matrix that characterises identified risks according to the likelihood of those risks disturbing or disrupting the functionality of the asset, system, or service **(Appendix 2)**.

The three risk categories reflecting increasing severity of consequence are:

- *Management risk*: This category of risk anticipates management within business as usual or ecological natural variation.
- *Disturbance risk*: This category of risk anticipates a significant adjustment to established operational responses or ecological function.
- *Disruption risk*: This category of risk anticipates the transformation of established patterns of activity, settlement or ecological function.

Table 6 describes the Risk Rating Matrix. The Assessment's Risk Rating Matrix uses three levels of likelihood of occurrence: 'Unlikely'; 'As likely as not'; or 'Likely'. The table colours are based on a traffic light system with shades of red for 'Likely' shades of yellow for 'As likely as not' and shades of green for 'Unlikely'. The matrix also utilises three categories of consequence: 'Recovery'; 'Adjustment'; and 'Transformation'. This produces a suite of nine risk sub-categories – high, medium and low within each of the three categories.

Table 6: *Risk rating matrix.*

	PROBABILITY or LIKELIHOOD		
	UNLIKELY	AS LIKELY AS NOT	LIKELY
RECOVERY	MANAGEMENT RISK (Low)	MANAGEMENT RISK (Medium)	MANAGEMENT RISK (High)
ADJUSTMENT	DISTURBANCE RISK (Low)	DISTURBANCE RISK (Medium)	DISTURBANCE RISK (High)
TRANSFORMATION	DISRUPTION RISK (Low)	DISRUPTION RISK (Medium)	DISRUPTION RISK (High)

In the initial pass, all risks are assigned a default rating of medium. The default position is that all identified risks are assumed to be as *likely* as they are *unlikely*. It is assumed that recovery from consequential harm/impact can be achieved within established management responses, or within ecological natural variation. The risk rating is adjusted where there is material evidence or supported reasoning that the likelihood or consequence of an identified risk occurring is greater than the default. Management risks that are unlikely to occur in the 10-year risk outlook are not included.

In addition to the risk rating column, a stakeholder impact rating column is included. While workshopping the plan, stakeholders were asked to rate the susceptibility of assets to natural disaster events using a sliding scale from 0=no impact, to 3=high impact. This data provides a point of comparison for the risk rating generated by Healthy Land & Water.

Table 7 outlines the natural disaster emergency risk drivers for the region's key natural assets utilising the risk rating as described and includes a column that reflects the risk rating, or more specifically an asset susceptibility rating to disaster events, provided by stakeholders through the workshop engagement process. The stakeholder impact rating column therefore refers to the following scoring criteria: 0=no impact, 3=high impact.

Table 7: Risk Assessment: Biodiversity and agricultural natural capital preparedness and emergency response in SEQ.

BUSHFIRE:				
At-risk biodiversity and agricultural natural capital assets	Risk	Risk rating	Stakeholder impact rating 0=no impact, 3=high impact	Preparedness and response status.
Gondwana Rainforests of Australia - World Heritage Area	Damage and/or loss of cultural heritage values. Loss or damage to plant populations. Increased bushfire intensity. Altered species and ecosystem composition. Establishment of weeds & pest animals.	RxL=MR High	2.3	The Gondwana Rainforests Management Committee (GRMC) is investigating adaptation planning for the World Heritage area within their jurisdictions. Fire planning and strategy (TFMS) being co-developed and delivered with the Githabul People and Healthy Land & Water (QFBC) is aiming to better manage and protect cultural, ecological and landscape values in adjacent areas through mitigation, burning and weed/vegetation management.
Glass House Mountains National Landscape - National Heritage Area	Damage and/or loss of cultural heritage values. Loss or damage to plant populations. Increased bushfire intensity. Altered species and ecosystem composition. Establishment of weeds & pest animals.	RxL=MR High	2.8	Plan review has not started. Fire break maintenance and improvement is ongoing.
Moreton Bay Ramsar Wetland	Damage and/or loss of cultural heritage values. Habitat damage from increased hot fires. Loss of threatened flora. Changes in structure of vegetation communities.	RxU=MR Low	1.4	QYAC and Healthy Land & Water have undertaken efforts to protect cultural values within Moreton Bay Ramsar Wetland through creation and implementation of fire management strategies (TFMS).
Other Threatened Ecological Communities as listed in Table 13	Loss or damage to plant populations. Increased bushfire intensity. Altered species and ecosystem composition. Establishment of weeds and pest animals.	RxL=MR High	2.8	Some plans are in place at various scales. There is an opportunity to review these.
Threatened/EPBC-listed frog species	Mortality and habitat damage, loss of food sources, increased predation.	AxL=DR High	2.3	Some species-specific actions occurring. Current research is being undertaken (Griffith University) on impacts of firefighting chemicals on frog populations.

Threatened/EPBC-listed arboreal mammal species	Mortality and habitat damage, loss of food sources, increased predation.	RxL=MR High	2.9	Bushfire Recovery program funded by Australian Government. Hazard reduction burning undertaken by Councils, and QPWS&P.
Threatened/EPBC-listed ground-dwelling mammal species	Mortality and habitat damage, loss of food sources, increased predation.	RxL=MR High	2.6	Bushfire Recovery program funded by Australian Government. Hazard reduction burning undertaken by Councils, and QPWS&P.
Threatened/EPBC-listed reptile species	Mortality and habitat damage, loss of food sources, increased predation.	RxA=MR Medium	2.5	Some species-specific actions occurring. Hazard reduction burning undertaken by Councils, and QPWS&P.
Threatened/EPBC-listed flora	Loss or damage to plant species. Increased bushfire intensity.	AxL=DistR High	3	Some species-specific actions occurring. Hazard reduction burning undertaken by Councils, and QPWS&P.
Agricultural land (soil, air, water, riparian and native vegetation)	Increased soil vulnerability. Loss or damage to native vegetation.	RxL=MR High	2.6	Support for developing Farm Resilience Plans (Australian and Queensland Governments), Healthy Land & Water and industry programs is available.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Loss of ground cover. Increasing erosion and water quality risks. Increased soil vulnerability. Loss or damage to native vegetation.	RxL=MR High	2.3	Healthy Land & Water and Queensland Fire & Biodiversity Consortium Fire Planning occurring.
Native forests and plantation forestry	Loss or damage to tree populations. Increased bushfire intensity.	RxL=MR High	2.9	Preparedness/response activities occurring.
FLOODS:				
At-risk biodiversity and agricultural natural capital assets	Risk	Risk rating	Stakeholder impact rating 0=no impact, 3=high impact	Preparedness and response status
Glass House Mountains National Landscape National Heritage Area	Removal or erosion of habitat. Channel alterations. Create changes to water quality or flows.	RxA=MR Medium	1.5	Activities relating to certain threatened species within this asset is occurring.
Moreton Bay Ramsar Wetland	Increased loads of sediment and nutrients delivered to the bay. Reduction in extent/populations of threatened species.	AxL=DistR High	2.4	Load modelling occurring. EHMP data collection and analysis Upper catchment sediment planning and management occurring. Riparian Restoration

Other Threatened Ecological Communities as listed in Table 14.	For some, alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands.	RxA=MR Medium	2.6	Some ecological community-specific actions occurring.
Threatened/EPBC-listed frog species	Mortality, removal or erosion of habitat. Channel alterations. Create changes to water quality or flows.	RxL=MR High	2.2	Some species-specific activities occurring.
Threatened/EPBC-listed arboreal mammal species	Mortality, loss of habitat.	RxU=MR Low	1.8	Some species-specific actions occurring.
Threatened/EPBC-listed ground-dwelling mammal species	Mortality, displacement, erosion of habitat.	RxA=MR Medium	2.2	More information required.
Threatened/EPBC-listed flora species	Increased erosion. Inundation. Loss of seed bank and disruption of reproductive cycle.	RxA=MR Medium	2.4	Some species-specific actions occurring.
Agricultural land (soil, air, water, riparian and native vegetation)	Increased erosion and soil loss. Soil health/structural decline. Increased risk to water quality, aquatic ecosystem health. Loss of riparian and native vegetation. Increased spread of weeds and pests.	AxL=DistR High	2.9	Support for developing Flood Resilience Plans (Australian and Queensland Governments), Healthy Land & Water and industry programs.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Increased erosion and soil loss. Increased risk to water quality and aquatic ecosystem health. Loss of riparian and native vegetation. Pasture loss. Increased spread of weeds and pests.	AxL=DistR High	2.8	Support for developing Flood Resilience Plans (Australian and Queensland Government), Healthy Land & Water and industry bmp extension programs.
Native forests and plantation forestry	Increased erosion and soil loss.	RxU=MR Low	2.1	Most native forest and plantation forest assets have well buffered riparian zones.
Fisheries and aquaculture - waterways, estuary, bay and coastal assets	Damage or destruction of critical coastal habitats. Negative impact on fisheries.	RxL=MR High	2.6	Healthy Land & Water has projects underway in particular catchments - e.g. RAMSAR wetland, fish habitat, and oyster reef projects.

STORM:				
At-risk biodiversity and agricultural natural capital assets	Risk	Risk rating	Stakeholder impact rating 0=no impact, 3=high impact	Preparedness and response status
Gondwana Rainforests of Australia - World Heritage Area	Alteration of ecological structures. Increased bushfire risk.	RxL=MR High	2.0	Some activities occurring.
Glass House Mountains National Landscape - National Heritage Area	Damage to vegetation communities and displacement of species. Increased invasive pest populations. Increased bushfire risk.	RxA=MR Medium	2.4	Some activities occurring.
Threatened/EPBC-listed frog species	Removal of habitat.	RxU=MR Low	1.9	Some species-specific activities occurring.
Threatened/EPBC-listed arboreal mammal species	Mortality, loss of habitat.	RxA=MR Medium	2.2	Recovery plans for some threatened species exist.
Threatened/EPBC-listed ground-dwelling mammal species	Mortality, displacement, erosion of habitat.	RxA=MR Medium	2.0	More information regarding impact required.
Threatened/EPBC-listed flora species	Erosion. Inundation. Loss of seed bank and disruption of reproductive cycle.	RxA=MR Medium	2.0	Some species-specific activities occurring.
Agricultural land (soil, air, water, riparian and native vegetation.	Increased erosion and soil loss. Increased risk to water quality, aquatic ecosystem health. Damage to native vegetation.	RxL=MR High	2.6	Funding and support for Farm Sustainability Plan development available.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Increased erosion and soil loss. Increased risk to water quality, aquatic ecosystem health. Damage to native vegetation.	RxA=MR Medium	2.3	Funding and support for Farm Sustainability Plan development available.
Native forests and plantation forestry	Reduced cover. Increased erosion and soil loss.	RxA=MR Medium	2.4	Forest management plans developed and address asset risks.
DROUGHT:				
At-risk biodiversity and agricultural natural capital assets	Risk	Risk rating	Stakeholder impact rating 0=no impact, 3=high impact	Preparedness and response status

Moreton Bay Ramsar Wetland	Mobilisation of upstream sediments. Declining aquatic ecosystem health.	RxA=MR Medium	1.7	Promoting responsible land management before and during drought to reduce sediment loads entering streams after storm events. Government funding in place to support this.
Agricultural land (soil, air, water, riparian and native vegetation)	Loss of productivity - crop failure. Decreased water availability (surface and ground) and water quality.	RxL=MR High	2.8	Promoting responsible land management before and during drought to reduce drought impacts. Government funding in place to support this.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Loss of productivity – reduced pasture condition. Increased land degradation. Increased fire weather risks.	RxL=MR High	2.9	Promoting responsible land management before and during drought to reduce drought impacts. Government funding in place to support this.
Native forests and plantation forestry	Tree deaths. Slowing of growth.	RxA=MR Medium	2.6	Using climate and drought information to plan critical forest operations – planting, hazard reduction burns.
Fisheries and aquaculture - waterways, estuary, bay and coastal assets	Increased sedimentation. Reduced dissolved oxygen and fish kills.	RxA=MR Medium	1.9	Promoting responsible land management during drought to reduce sediment loads entering streams after storm events. Government funding in place to support this.
BIOSECURITY OUTBREAK				
At-risk biodiversity and agricultural natural capital assets	Risk	Risk rating	Stakeholder impact rating 0=no impact, 3=high impact	Preparedness and response status
Gondwana Rainforests of Australia - World Heritage Area	Loss of species. Change of species composition. Increase in weeds and invasive pests.	RxU=MR Low	2.3	Biosecurity plan review has not commenced.
Glass House Mountains National Landscape National Heritage Area	Loss of species. Change of species composition. Increase in weeds and invasive pests.	RxU=MR Low	2.2	Biosecurity plan review has not commenced.
Moreton Bay Ramsar Wetland	Loss of species. Change in ecosystem structure and function. Increase in weeds and invasive pests.	RxU=MR Low	2.0	Efforts have been undertaken in collaboration between QYAC, Healthy Land & Water and QPWS&P to target feral pigs on Minjerribah, and foxes and cats on Mulgumpin. Further efforts are required.
Migratory wader and shorebirds	Loss of species. Reduction in species populations.	RxU=MR Low	2.2	Application to re-trial floating roosts in Moreton Bay Ramsar Wetland with funding from Port of Brisbane Pty Ltd. has recently occurred.

Other Threatened Ecological Communities as listed in Table 2.	Loss of species. Change of species composition. Increase in weeds and invasive pests.	RxU=MR Low	2.5	Some species-specific control plans developed and being implemented. Regional (LGA) biosecurity plans developed. Resources (people and financial) are being committed to some control/eradication programs.
Threatened/EPBC-listed frog species	Loss of species. Reduction in species populations. Destruction of habitat.	RxU=MR Low	2.6	Some species-specific control plans developed and being implemented.
Threatened/EPBC-listed arboreal mammal species	Loss of species. Reduction in species populations. Destruction of habitat.	RxU=MR Low TxA=DisrR Medium (for koalas)	2.5	Some species-specific control plans developed and being implemented.
Threatened/EPBC-listed ground-dwelling mammal species	Loss of species. Reduction in species populations. Destruction of habitat.	RxU=MR Low	2.4	Some species-specific control plans developed and being implemented.
Threatened/EPBC-listed reptile species	Loss of species. Reduction in species populations. Destruction of habitat.	RxU=MR Low	N/A	More information regarding impact required.
Threatened/EPBC-listed flora	Loss of species. Change of species composition. Increase in weeds & invasive pests.	RxA=MR Medium	2.5	Some species-specific control plans developed and being implemented.
Agricultural land (soil, air, water, riparian and native vegetation.	Decrease in soil health and function. Loss of native vegetation species. Increase in weeds and invasive pests.	RxA=MR Medium	2.6	Some species-specific control plans developed and being implemented. Regional (LGA) biosecurity plans developed. Resources (people and financial) are being committed to some control/eradication programs.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Decrease in soil health and function. Loss of native vegetation species. Increase in weeds and invasive pests.	RxA=MR Medium	2.7	Some species-specific control plans developed and being implemented. Regional (LGA) biosecurity plans developed. Resources (people and financial) are being committed to some control/eradication programs.
Native forests and plantation forestry	Decrease in production. Loss of trees. Increase in weeds and invasive pests.	RxA=MR Medium	2.5	Forest management plans are in place and being implemented.

HEATWAVES				
At-risk biodiversity and agricultural natural capital assets	Risk	Risk rating	Stakeholder impact rating 0=no impact, 3=high impact	Preparedness and response status
Moreton Bay Ramsar Wetland	Inundation of sediment due to upstream loss of ground cover.	RxA=MR Medium	1.7	Promoting responsible land management before and during drought to reduce sediment loads entering streams after storm events. Government funding in place to support this.
Agricultural land (soil, air, water, riparian and native vegetation	Reduction of native vegetation condition and composition. Increased fire weather risks.	RxA=MR Medium	2.4	Promoting responsible land management before and during summer to reduce heatwave impacts. Government funding in place to support this.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Reduction of pasture condition and composition. Increased fire weather risks.	RxA=MR Medium	2.1	Promoting responsible land management before and during summer to reduce heatwave impacts. Government funding in place to support this.
Native forests and Plantation forestry	Tree deaths. Slowing of growth.	RxA=MR Medium	1.8	Using climate and drought information to plan critical forest operations – planting, hazard reduction burns.
SEA LEVEL RISE				
At-risk biodiversity and agricultural natural capital assets	Risk	Risk rating	Stakeholder impact rating 0=no impact, 3=high impact	Preparedness and response status
Moreton Bay Ramsar Wetland	Loss of cultural heritage (e.g. midden). Loss of ecosystem function. Loss of roosting sites. Damage from fugitive debris.	RxA=MR Medium	2.7	Healthy Land & Water has submitted a recent application to re-trial floating roosts in Moreton Bay Ramsar Wetland with funding from Port of Brisbane Pty Ltd. Healthy Land & Water has developed a concept for coastal hazard strategies, policies and protocols. Healthy Land & Water has some projects underway in particular catchments (e.g. RAMSAR wetland, Fish habitat and oyster reef projects). Coastal Management Planning – development, infrastructure in place.
Migratory wader and shorebirds	Loss of roosting sites. Alteration of species composition within tidal/intertidal zones.	RxA=MR Medium	2.7	
Fisheries and aquaculture - waterways, estuary, bay and coastal assets	Loss of ecosystem function. Loss of fisheries values within estuarine areas.	RxA=MR Medium	3.0	
Agricultural land (soil, air, water, riparian and native vegetation	Impact on coastal flood plains	RxA=MR Medium	Not Rated	

8 Asset planning and preparedness

8.1 Planning and preparedness actions for protecting biodiversity assets

This section outlines the preparedness actions that could be undertaken for biodiversity assets **(Appendix 1)** to reduce the threat of relevant hazards for SEQ. The table below **(Table 8)** summarises information about priority preparedness actions needed, grouped by likely hazard events.

Table 8: *Biodiversity assets emergency planning and preparedness existing and future actions.*

Asset	Actions	Where	Is action currently underway?
Threatened Ecological Communities (TECs)	Review fire management plans/strategies (align with Planned Burn Guidelines) for TECs, for known and at-risk populations. ** Undertake habitat modelling to identify areas likely to contain TECs. Establish risk of fire to TECs. Develop an electronic/GIS ecological overlay (publicly available) which corresponds to TEC's (or the criteria that developed this plan) that can be layered over the QFES and Local Government Bushfire Risk mapping. Verify (field assess) the mapping to confirm presence, extent, condition and distribution of the TECs within SEQ. Map water points for fire fighter access. Identify the level of risk for known TEC populations and use this data for planning and modelling. Carry out a cost-benefit analysis of likely impact. Publish fire management plans. Consider possible impacts from bushfire reduction activities and develop actions to mitigate impact.	Tenure-blind approach to SEQ.	Some plans are in place at various scales (e.g. Minjerribah and Mulgumpin TFMS, Community Fire Management Plans at Rosevale - Tarome, Carneys Creek). There is an opportunity to review these. Gap analysis required to identify priority gaps and develop targeted actions.
	Engagement with Traditional Owners, landholders and land managers to educate on the importance of TECs and how to protect them within the landscape. Improve capacity of organisations to share knowledge.	SEQ.	The SEQ Traditional Owner Alliance is currently being re-formed. TFMS and Community Fire Management Plans with Traditional Owners and Healthy Land & Water (QFBC).
	Re-introduction of appropriate fire regimes and controlled burns.	Targeted areas (e.g. critical areas of TECs and threatened species' habitat).	TFMS projects with QYAC and Githabul People and Healthy Land & Water (QFBC) and other partnership work. Opportunity for a targeted approach for management of TECs – gap analysis and review required.
	Adopt cultural burning knowledge into the plans and practices in the	Targeted areas (e.g.	TFMS projects with QYAC and Githabul People and Healthy Land

	field. Extend these through the use of demonstration sites.	critical areas of TECs and threatened species' habitat).	& Water (QFBC) and other partnership work. Opportunity for a targeted approach – gap analysis and review required.
Gondwana Rainforests of Australia WHA	Establish/review fire management plan/recommendations for the WHA. Re-introduction of appropriate regimes and controlled burns to reduce severe fires on the outer fringes of WHA. Consider possible impacts from bushfire reduction activities and develop actions to mitigate the possible negative impact of these.	Gondwana Rainforests of Australia - World Heritage Area.	The Gondwana Rainforests Management Committee (GRMC) is investigating adaptation planning for the World Heritage area within their jurisdictions. TFMS project with Githabul People and Healthy Land & Water (QFBC).
Glass House Mountains National Landscape - National Heritage Area	Review fire management plan/recommendations for the target area. Re-introduction of appropriate regimes and controlled burns to reduce severe fires. Improved fire breaks and fire lines to increase accessibility for fire management. Consider possible impacts from bushfire reduction activities and develop actions to mitigate the possible negative impact of these.	Glass House Mountains National Landscape - National Heritage Area.	Plan review has not started. Fire break maintenance and improvement is ongoing.
Moreton Bay Ramsar Wetland	Review fire management plan/recommendations for the target area. Re-introduction of appropriate regimes and controlled burns to reduce severe fires on the outer fringes of WHA. Improve fire breaks and fire lines to increase accessibility for fire management. Consider possible impacts from bushfire reduction activities and develop actions to mitigate the possible negative impact of these.	Moreton Bay Ramsar Wetland.	QYAC and Healthy Land & Water has undertaken efforts to protect cultural and ecological within MBRW through creation and implementation of fire management strategies (TFMS). Further work is needed.
Threatened 'acid' frogs (four species)	Develop and implement a suitable fire management strategy (inclusive of cultural burning techniques) for the critical habitat and populations.**	SEQ.	Dependent on species.
Threatened arboreal mammals (eleven species)	Develop or implement suitable fire management strategy for the habitat of key threatened arboreal mammal populations.**	High-risk populations or critical habitat.	Bushfire Recovery program funded by Australian Government (completed) – note this did not target all species. Hazard reduction burning undertaken by Councils, and QPWS&P.
Threatened ground-dwelling mammals (thirteen species)	Develop or implement suitable fire management strategy for the habitat of key threatened ground-dwelling mammal populations.**	High-risk populations or critical habitat.	Bushfire Recovery program funded by Australian Government (completed) – note this did not target all species. Hazard reduction burning undertaken by Councils, and QPWS&P.

Threatened terrestrial reptiles (sixteen species)	Develop or implement suitable fire management strategy for the habitat of key threatened reptile populations.**	High-risk populations or critical habitat.	Some species-specific actions occurring. Bushfire Recovery program funded by Australian Government (completed) – note this did not target all species. Hazard reduction burning undertaken by Councils, and QPWS&P.
Threatened/EPBC-listed flora species	Develop and implement a suitable fire management strategy for species likely to be impacted by wildfires or inappropriate fire regimes.** Consider possible impacts from bushfire reduction activities and develop actions to mitigate the possible negative impact of these.	SEQ.	Dependent on species. Bushfire Recovery program funded by Australian Government (completed) – note this did not target all species. Hazard reduction burning undertaken by Councils, and QPWS&P.
** Establish 'Insurance Populations' for all threatened species assets.			

FLOODS:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Threatened Ecological Communities (TEC)	Utilise landholder networks to develop appropriate vegetation management (restoration projects to enhance resilience of TECs to erosion impacts).**	At risk riverine areas.	Some ecological community-specific actions occurring.
Glass House Mountains National Landscape - National Heritage Area	Carry out modelling of interurban break area (includes Glass House Mountain area).	Glass House Mountains National Landscape - National Heritage Area.	The Gondwana World Heritage Advisory Committee (Qld Section) is currently investigating options for enhanced actions.
Moreton Bay Ramsar Wetland	Provide ongoing monitoring of impacts of flooding 'destroy/recovery' cycle. Establish upper catchment management actions to reduce sediment loads entering wetlands.	Moreton Bay Ramsar Wetland.	Load modelling occurring. Upper catchment sediment planning and management occurring.
Threatened arboreal mammals (eleven species)	Review koala disease rates (e.g. chlamydia) in selected populations after major flood/storm events.** Enhance habitat connectivity in targeted areas throughout the landscape.	SEQ.	Dependent on species. Koala and glider habitat restoration projects completed and/or underway in SEQ.
Threatened/EPBC- listed ground-dwelling mammal species (e.g. water mouse, new Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Undertake flood impact assessments.**	SEQ.	Dependent on species.
Threatened/EPBC-listed flora species	Undertake flood impact assessment. **	SEQ.	Dependent on species.
	** Establish 'Insurance Populations' for all threatened species assets.		

STORMS:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Gondwana Rainforests of Australia WHA	Carry out a cultural natural asset identification, protection and regeneration action program. Enhance areas that are high-risk of erosion (re-vegetation, or assisted regeneration).	Gondwana Rainforests of Australia - World Heritage Area.	Some activities occurring.
Glass House Mountains National Landscape - National Heritage Area	Carry out modelling of interurban break area (includes Glass House Mountain area).	Glass House Mountains National Landscape - National Heritage Area.	Underway.
Threatened/EPBC-listed frog species (e.g. mountain frog, fleay's frog, giant barred frog, stuttering frog, pouched frog, wallum sedge frog)	Undertake storm impact assessment. **	SEQ.	Dependent on species.
	Establish upper catchment management actions to reduce sediment loads entering wetlands.		
Threatened arboreal mammals (eleven species)	Review koala disease rates (e.g. chlamydia) in selected populations after major flood/storm events.**	SEQ.	Dependent on species.
Threatened/EPBC-listed ground-dwelling mammal species (e.g. water mouse, new Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Undertake flood impact assessments.**	SEQ.	Dependent on species.
Threatened/EPBC-listed flora species	Undertake storm impact assessment. **	SEQ.	Dependent on species.
** Establish 'Insurance Populations' for all threatened species assets.			

DROUGHT:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Moreton Bay Ramsar Wetland	Establish/promote grazing management regimes to increase ground cover and reduce run-off (sediment loads).	Moreton Bay Ramsar Wetland.	Promotion of responsible land management before and during drought. Government funding in place to support this.
Gondwana Rainforests of Australia WHA	Identifying critical locations for buffer zones and maintain and restore buffer zones and wildlife corridors; invest in long-term biodiversity conservation.	Gondwana Rainforests of Australia WHA Southeast Queensland Portion	The Gondwana World Heritage Advisory Committee (Qld Section) is currently investigating options for enhanced actions.
Threatened/migratory and/or marine waders and shorebirds	Establish/promote grazing management regimes to increase ground cover and reduce run-off (sediment loads). Resilience building through restoration and erosion control; protect existing roosting and foraging sites.	Moreton Bay Ramsar Wetland	Some existing plans; e.g. Wildlife Conservation plan for Migratory Shorebirds DCCEEW. Restoration and erosion control programs underway

BIOSECURITY OUTBREAK:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Threatened Ecological Communities (TEC)	Address knowledge gaps in implications of pests (e.g. Myrtle rust). Design or (where they exist) implement threat management plans, addressing key threatening processes including possible threatening impacts from hazard response and recovery activities. These plans identify proactive monitoring requirements and localised biosecurity measures.	SEQ.	Some plans are in place at various scales for various TECs.
Gondwana Rainforests of Australia WHA	Update the Gondwana World Heritage Area Biosecurity Strategy to outline threats, preparedness and response actions including possible threatening impacts from hazard response and recovery activities.	Gondwana Rainforests of Australia - World Heritage Area.	The Gondwana World Heritage Advisory Committee (Qld Section) is currently investigating options for enhanced actions.
Glass House Mountains National Landscape - National Heritage Area	Update the National Heritage Area Biosecurity Strategy to outline preparedness and response actions including possible threatening impacts from hazard response and recovery activities.	Glass House Mountains National Landscape - National Heritage Area.	No.
Moreton Bay Ramsar Wetland	Develop and implement a management plan for the control of pigs, foxes, black rats and feral cats in the bay including possible threatening impacts from pest control activities.	Islands of Moreton Bay, Ramsar Wetlands.	Yes, previous efforts have been undertaken in collaboration between QYAC, Healthy Land & Water and QPWS&P to target feral pigs on Minjerribah, and foxes and cats on Mulgumpin. Further efforts are required.
Threatened/EPBC-listed frog species (e.g. mountain frog, fleay's frog, giant barred frog, stuttering frog, pouched frog, wallum sedge frog)	Monitor key amphibian populations for impacts imposed by Chytrid (address knowledge gaps). Develop and/or implement management plans for key populations that address key threats to each species (i.e. cane toad competition, habitat disturbance by feral pigs, feral cats, freshwater yabby and exotic fish predation).	SEQ.	Dependent on species.
Threatened arboreal mammals (eleven species)	Review koala disease rates (e.g. chlamydia) in selected populations after major biosecurity outbreak events.	SEQ.	Vaccination program rolled out by Currumbin Wildlife Sanctuary. Biosecurity controls implemented DESI (General Biosecurity Obligations).
Threatened/EPBC-listed ground-dwelling mammal species (e.g. water mouse, new Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Develop or implement suitable pest management programs that are region wide and site specific where the elimination of the pest is at a site specific scale including possible threatening impacts from pest control activities.	High-risk populations or critical habitat.	Dependent on species.
Threatened/EPBC-listed reptile species (e.g. yakka skink, adorned delma, three-toed snake-tooth, rainforest cool-skink, condamine earless dragon)	Develop or implement suitable pest management programs that are region wide rather than site specific including possible threatening impacts from pest control activities.	High-risk populations or critical habitat.	

Threatened/EPBC-listed flora species	Undertake research and develop trial plots to understand best treatment for threats from Myrtle rust, phytophthora etc.	High-risk populations or critical habitat.	
** Establish 'Insurance Populations' for all threatened species assets.			

HEATWAVES:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Moreton Bay Ramsar Wetland	Establish/promote grazing management regimes to increase ground cover and reduce run-off (sediment loads).	Moreton Bay Ramsar Wetland.	Promotion of responsible land management before and during drought to reduce sediment loads entering streams after drought ending rain events. Government funding in place to support this.
Threatened/EPBC-listed ground-dwelling mammal species (e.g. water and new holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Undertake research to better understand impacts on species, focusing on the importance of refugia such as burrows. Promote sustainable grazing which provides ground and tree cover to reduce exposure to heat.	SEQ.	Knowledge still limited and species-specific. No action currently underway.

SEA LEVEL RISE:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Moreton Bay Ramsar Wetland	Establish impacts and risks from fugitive debris.	Moreton Bay Ramsar Wetland.	Application to re-trial floating roosts in Moreton Bay Ramsar Wetlands with funding from Port of Brisbane. has recently occurred.
	Promote the use of the 'Climate-ready biodiversity conservation' methodology for local governments. This methodology is applicable to all biodiversity assets.		The prototype of the methodology has been trialled and now being implemented across local governments.
	Promote use of CoastAdapt tool.		Action is underway.
	Support the development, review and implementation of Coastal Hazard Adaption Strategies across local governments.		Action is underway.
Threatened/EPBC-listed ground-dwelling mammal species (e.g. water mouse)	Implement rigorous environmental impact assessments to protect habitat. Maintain connectivity of habitat through appropriate positioning of infrastructure.	Coastal areas.	Action is not underway.
Migratory waders and shorebirds	Investigate/trial artificial floating roosts in Moreton Bay. Restore shorebird roosting habitat sites (high tide roosting areas are at higher risk). Review protection methods for high-quality roost sites and where needed, develop and implement action plans. Undertake risk-based approach to direct priority focus areas for intervention.	Moreton Bay Ramsar Wetland and adjoining wetland habitats.	Application to re-trial floating roosts in Moreton Bay Ramsar Wetlands with funding from Port of Brisbane. has recently occurred.
	Promote use of Coast Adapt tool.		
The impact of accidents/incidents will vary according to the type, severity and where the accident/incident occurs. In general, planning and preparedness actions for this hazard include the development of current risk management plans and ensuring there are adequately trained people to call on in the case of an accident/incident.			

8.2 Planning and preparedness actions for protecting agricultural natural capital assets

This section outlines the preparedness actions that could be undertaken for agricultural assets to reduce the threat of relevant hazards for SEQ **(Appendix 1)**. The table below **(Table 9)** summarises information about priority preparedness actions needed, grouped by likely hazard events.

Table 9: *Agricultural natural capital assets emergency planning and preparedness existing and future actions.*

BUSHFIRE:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Agricultural land (soil, air, water, riparian and native vegetation)	Property Fire Management Plans and Integrated Fire Management Plans to include improved data around risk to neighbouring natural assets and from response and recovery activities.	Site specific.	Healthy Land & Water (QFBC) planning and engagement.
	Property Fire Management Plans and implementation of Integrated Fire Management Plans at a local scale including controlled burns and construction and maintenance of fire breaks.	Site specific.	Healthy Land & Water (QFBC) planning and engagement.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Property Fire Management Plans and Integrated Fire Management Plans to include improved data around risk to neighbouring natural assets and from response and recovery activities.	Site specific.	Healthy Land & Water (QFBC) planning and engagement.
	Property Fire Management Plans and implementation of Integrated Fire Management Plans at a local scale including controlled burns and construction and maintenance of fire breaks.	Site specific.	Support for developing Farm Resilience Plans (Australian and Queensland Governments), Healthy Land & Water (QFBC) and industry programs are available.
Native forests and plantation forestry	Property Fire Management Plans and Integrated Fire Management Plans to include improved data around risk to neighbouring natural assets and from response and recovery activities.	All plantations and State Forests.	Healthy Land & Water (QFBC) planning and engagement.
	Property Fire Management Plans and implementation of Integrated Fire Management Plans at a local scale including controlled burns and construction and maintenance of fire breaks.	All plantations and state forests	Healthy Land & Water (QFBC) planning and engagement.

FLOODS:			
Asset	**Actions**	**Where**	**Is action current underway?**
Agricultural land (soil, air, water, riparian and native vegetation)	Develop Flood Resilience Plans. Use pilot projects and establish and promote financial instruments. Develop and implement Flood/ Property Management Plans. Building floodplain resilience through – establishing perennial crops, changing planting times and crop orientation, build cross-floodplain structures, improve farm mapping.	Major floodplain areas – Lockyer, Warrill/Bremer, Logan/Albert, Brisbane, Maroochy.	Support for developing Flood Resilience Plans (QDAF, Australian and Queensland Governments), Healthy Land & Water and industry programs.

	Manage and restore riparian vegetation to increase resilience of riparian areas to flood events.	Rivers and creeks – reach scale.	Healthy Land & Water has some projects underway in particular catchments.
	Streambank stabilisation works to prevent streambank erosion and facilitate riparian vegetation establishment.	High-priority sites/reaches with high return on investment.	Healthy Land & Water has some current projects underway, in particular, focal areas in partnership with various funders NDRA, Queensland Government, utilities, local governments.
	Stream and channel management.	Mainly located in Lockyer, Warill Creeks.	Action is unknown.
	Minimal tillage, stubble retention, perennial and cover crops.	All catchments.	Action is underway.
	Improved erosion and sediment control and soil conservation practices.	All catchments.	Action is underway.
	Use pilot projects to promote best management practices.	All catchments.	Action is underway.
	Establish and promote financial instruments to manage income volatility thus increasing viability and capacity to recover.	All catchments.	Action is underway.
	Urban development/land use to consider impacts on agricultural and natural assets.	Mainly located in the fringe belts around large population areas.	Action is underway. More required.
Grazing land (soil, air, water, native pastures, and native vegetation assets).	Flood/property management plans. Building floodplain resilience – perennial crops and pastures, planting time, crop orientation.	All catchments.	Support for developing Flood Resilience Plans (QDAF, Australian and Queensland Government), Healthy Land & Water and industry BMP extension programs.
	Managing riparian vegetation including the construction of off-stream watering points and riparian fencing.	Rivers and creek – reach scale projects in high-priority catchments.	Healthy Land & Water has some projects underway in particular catchments.
Native forests and plantation forestry	Managing healthy riparian vegetation and natural riparian buffers.	All plantations.	Action is underway.
Fisheries and aquaculture (waterways, estuary, bay and coastal assets)	Managing freshwater, estuarine and coastal vegetation and restoring fish habitats.	Creeks, rivers, estuaries, and coastal wetlands across SEQ.	Healthy Land & Water has some projects underway in particular catchments (e.g. RAMSAR wetland, Fish habitat, oyster reef projects).
	Streambank stabilisation and erosion control works.	Selected sites across region (e.g. Lower Caboolture River).	Healthy Land & Water has some current projects underway in particular focal areas – various funders NDRA, Queensland Government, Utilities, Local Governments.

STORM:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Agricultural land (soil, air, water, riparian and native vegetation)	As per floods.	As per floods.	As per floods.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Maintaining effective groundcover and good pasture condition.	All catchments.	Healthy Land & Water has current bmp extension and adoption projects.
	Improved erosion and sediment control and soil conservation practices.	All catchments.	Healthy Land & Water has some projects.
	Use 'local champions' to demonstrate and promote successful practices.	All catchments.	Healthy Land & Water has current bmp extension and adoption projects.
Native forests and plantation forestry	Maintaining effective erosion and sediment control around plantations and infrastructure.	All plantations.	Action is underway.
	Streambank stabilisation and erosion control works.	Selected sites across region (e.g. Lower Caboolture River).	Healthy Land & Water has some current projects underway in particular focal areas – various funders NDRA, State Government, Utilities, Local Governments.

DROUGHT:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Agricultural land (soil, air, water, riparian & native vegetation.	Proactive Farm Business Resilience Planning to include disaster impact mitigation/reduction activities and possible negative impacts from these activities.	All catchments.	Farm Business Resilience Plan program.
	Improving water security and water use efficiency including access to recycled water.	All catchments.	Drought preparedness loans/ grants (Australian Government and Queensland Government).
	Promote cover crops, stubble retention, perennial pasture and crop rotations.	All catchments.	Action is underway.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Continue to facilitate the development of Farm Business Resilience Plans.	All catchments.	Farm Business Resilience Plan program and Healthy Land & Water extension and adoption programs.
	Improving water security & water use efficiency including access to recycled water.	All catchments.	Drought preparedness loans/ grants (Australian Government and Queensland Government).
	Promote the need to maintain good pasture and land condition.	All catchments.	Healthy Land & Water has current bmp extension & adoption projects.
Native forests and Plantation forestry	Continue using climate and drought information to plan critical forest operations – planting, hazard reduction burns.	All plantations and state forests.	Using climate and drought information to plan critical forest operations – planting, hazard reduction burns.

BIOSECURITY OUTBREAK:

Asset	Actions	Where	Is action currently underway?
Agricultural land (soil, air, water, riparian & native vegetation.	Integrated biosecurity response – containment, treatment, quarantine measures.	Pest/disease specific.	Red fire ant program.
	Increase numbers of locally based biosecurity related support officers.	All catchments	Action is not underway.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Review and implement biosecurity plans (regional/local/pest specific) to include effective response, containment, treatment, and quarantine measures and possible negative impacts that these response activities may generate.	Pest/disease specific.	Red fire ant program.
	Increase producers' awareness of biosecurity zones and requirements associated with the zones.	All catchments.	Initial action is underway.
Native forests and Plantation forestry	Biosecurity response – containment, treatment, quarantine measures	Pest/disease specific.	Forest management plans are in place and being implemented.
Fisheries and Aquaculture - waterways, estuary, bay and coastal assets	Monitoring of biosecurity risks.	All catchments.	Initial action is underway.

HEATWAVES:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Agricultural land (soil, air, water, riparian and native vegetation.	Utilising heatwave advisories for improved decisions for crop management.	Mainly in Lockyer and Fassifern valleys.	Promoting responsible land management before and during summer to reduce heatwave impacts. Government funding in place to support this.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Maintaining good pasture and land condition.	All catchments.	Healthy Land & Water has current bmp extension and adoption projects.
	Maintain native vegetation in good condition.	All catchments.	Healthy Land & Water has current BMP extension and adoption projects.
	Better utilise heatwave advisory information to forewarn producers and community.	All catchments.	Limited action is underway. More targeted action required.
Native forests and Plantation forestry	Utilising heatwave forecasts & climate info to plan forest operations – planting, hazard reduction burns.	All plantations and state forests.	Using climate and drought information to plan critical forest operations – planting, hazard reduction burns.

SEA LEVEL RISE:			
Asset	**Actions**	**Where**	**Is action currently underway?**
Agricultural land (soil, air, water, riparian and native vegetation)	Managing tidal barriers.	Maroochy floodplain.	Action is underway.
Fisheries and Aquaculture (waterways, estuary, bay and coastal assets)	Coastal management planning – development, infrastructure.	All coastal communities.	Action is underway involving all Local Governments and Queensland Government.
The impact of accidents/incidents will vary according to the type, severity and where the accident/incident occurs. In general, planning and preparedness actions for this hazard include the development of current risk management plans and ensuring there are adequately trained people to call on in the case of an accident/incident.			

9 Asset response and recovery

9.1 Response actions for protecting biodiversity assets

This section outlines the response actions that need to be undertaken for the main biodiversity assets to respond to the relevant hazard events in SEQ (**Table 10**).

Table 10: *Biodiversity asset response actions.*

Asset	Actions	Where
Threatened Ecological Communities (TECs) and Threatened species (TS) (i.e. flora and fauna within SEQ) and Migratory birds protected under the EPBC.	Monitor/assess impacts.	Critical areas of TECs and threatened species' habitat where bushfires are impacting.
	During event, provide QFD locality of threatened ecological communities and species habitats for targeted protection.	
	Fire preparedness activities (i.e. controlled burns, prescription burns, hazard reduction burns, cultural burns).	
	Fire suppression activities (i.e. rapid establishment of control lines).	
	Communication and outreach awareness raising within the community.	Community meetings, media.
Gondwana Rainforests of Australia - World Heritage Area (GRA-WHA) and Glass House Mountains National Landscape - National Heritage Area (GHM-HA) and Moreton Bay Ramsar Wetland (MBRW)	During event, provide Emergency responders with the locality of high value areas (cultural & ecological).	Sensitive areas within GRA-WHA, MBRW & GHM-HA that contain cultural heritage, and threatened flora and fauna.
	Fire preparedness activities (i.e. controlled burns, prescription burns, hazard reduction burns, cultural burns).	
	Fire suppression activities (i.e. rapid establishment of control lines).	
Threatened/EPBC-listed ground-dwelling mammal species (e.g. water mouse, new Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Implement appropriate fire regimes within regional ecosystems through prescribed burning.	SEQ
	Ensure landscape-scale pattern of varying fire history to maximise variety of resources available for species.	
	Monitor presence of feral predators (cats, foxes) post-fire and implement eradication program.	

Asset	Actions	Where
Threatened Ecological Communities (TECs) and Threatened species (TS) (i.e. flora and fauna within SEQ) and Migratory birds protected under the EPBC.	Provide Biosecurity Queensland locality of TECs and TS that are susceptible to outbreak for targeted protection.	Susceptible TECs and TS.
	Rapid assessment of impact.	SEQ.
	Establish "insurance" populations of species or TECs.	At-risk TECs and TS.
	Develop Biosecurity Management Plans.	

	Initial implementation of Biosecurity Management Plans and known control measures (i.e. foot cleaning stations to reduce transport of pathogens)	Areas containing susceptible TECs or TS.
	Undertake pest animal control through programs/projects.	SEQ target areas containing susceptible TECs or TS.
	Trial novel biosecurity control measures.	
	Conduct awareness raising programs (i.e. citizen science programs) or incorporate expert presenters into Healthy Land & Water workshops.	Susceptible TECs and TS.
Gondwana Rainforests of Australia - World Heritage Area (GRA-WHA) and Glass House Mountains National Landscape - National Heritage Area (GHM-HA) and Moreton Bay Ramsar Wetland (MBRW)	Monitor/rapid assessment of impact.	Susceptible TECs, habitat or known TS populations.
	Provide Biosecurity Queensland locality of TECs and TS that are susceptible to outbreak for targeted protection.	Susceptible areas- comprising TECs and TS.
	Develop Biosecurity Management Plans for each asset.	Whole of asset area (GRA-WHA, MBRW, &GHM-HA).
	Initial implementation of Biosecurity Management Plans and known control measures (i.e. foot cleaning stations, biocontrols) at a landscape level.	SEQ susceptible habitats within asset area.
	Undertake pest animal control through programs/projects.	SEQ target areas containing susceptible TECs or TS.
	Trial novel biosecurity control measures.	
	Treatment of TECs or threatened flora.	Susceptible/ affected populations within GRA-WHA, MBRW and GHM-HA.
Threatened/EPBC listed ground-dwelling mammal species (e.g. water mouse, new Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Undertake pest animal control through programs/projects.	SEQ target areas with most susceptible populations.
	Implement regulations for domestic cats to be kept indoors.	

Asset	Actions	Where
Threatened Ecological Communities (TECs) and Threatened species (TS) (i.e. flora and fauna within SEQ) and Migratory birds protected under the EPBC.	Monitor/assess impacts according to how the event is occurring.	Susceptible TECs and TS.
Gondwana Rainforests of Australia - World Heritage Area (GRA-WHA) and Glass House Mountains National Landscape - National Heritage Area (GHM-HA) and Moreton Bay Ramsar Wetland (MBRW)	Monitor/assess impacts according to how the event is occurring.	Susceptible TECs and TS within the GRA-WHA, MBRW and GHM-HA.
Threatened/EPBC listed ground-dwelling mammal species (e.g. water mouse, new holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Monitor/assess impacts according to how the event is occurring.	Susceptible species within SEQ.

Asset	Actions	Where
Threatened Ecological Communities (TECs) and Threatened species (TS) (i.e. flora and fauna within SEQ) and Migratory birds protected under the EPBC.	Monitor/assess impacts according to how the event is occurring.	SEQ areas impacted by severe flood or storm damage.
Gondwana Rainforests of Australia - World Heritage Area (GRA-WHA) and Glass House Mountains National Landscape - National Heritage Area (GHM-HA) and Moreton Bay Ramsar Wetland (MBRW)	Monitor/assess impacts according to how the event is occurring.	Cultural heritage places and areas impacted by severe flood or storm damage.
	Facilitate long-term monitoring and assessment of impacted areas and intervention measures undertaken (i.e. spatial database to track progress).	SEQ or within the GRA-WHA, MBRW and GHM-HA.
Threatened/EPBC listed ground-dwelling mammal species (e.g. water mouse, new holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Monitor and assess impact according to how the event is occurring.	SEQ.
The impact of accidents/incidents will vary according to the type, severity and where the accident/incident occurs. In general, accident/incident response and recovery actions include: • Stay safe. • Support frontline responders appropriately. • Provide proactive advice on protection priorities for biodiversity assets. • Assist impacted stakeholders appropriately. Support impact assessment and recovery monitoring and recovery/resilience planning.		

9.2 Recovery actions for protecting biodiversity assets

This section outlines the recovery actions that need to be undertaken for the main biodiversity assets to respond to from the relevant hazard events in SEQ (**Table 11**).

Table 11: *Biodiversity asset recovery actions.*

Asset	Actions	Where
Threatened Ecological Communities (TECs) and Threatened species (TS) (flora and fauna within SEQ) and Migratory birds protected under the EPBC.	Rapid assessment of impact to TECs, habitat or threatened species.	At-risk areas of TECs and threatened species' habitat.
	Implement fire management strategies and actions (i.e. fire protection zones).	
	Plan or facilitate restoration works.	
	Deployment of wildlife rescue and carers.	Known impacted TS habitat (i.e. koala habitat).
	Communication and outreach raising within the community (Fire Info Sessions, Property Fire Management Planning workshops, Backing Onto Bush workshops, etc), printed resources, online resources, media.	Community workshops within SEQ.
	Training for emergency responders or land managers (QFD) - Overall Fuel Hazard	Targeted to areas where bushfire event has occurred.

	Assessment, Fire Weather 1 and 2, Fire Ecology, Crew Member or other fire training.	
Gondwana Rainforests of Australia - World Heritage Area (GRA-WHA) and Glass House Mountains National Landscape - National Heritage Area (GHM-HA) and Moreton Bay Ramsar Wetland (MBRW)	Immediate clean up.	Fire impacted areas with cultural or ecological values within SEQ asset areas (GRA-WHA, MBRW & GHM-HA). Impacted waterways. SEQ region.
	Implement fire management strategies and actions (i.e. fire protection zones).	
	Update out of date fire management strategies or develop them for focus areas.	
	Rapid assessment of impact.	
	Plan or facilitate restoration works.	
	Facilitate long-term monitoring and assessment of impacted areas and intervention measures undertaken (i.e. spatial database to track progress).	
Threatened/EPBC listed ground-dwelling mammal species (e.g. water mouse, New Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Feral predator control.	Targeted to areas where severe bushfire event has occurred.
	Food stations/artificial refuges.	
	Population monitoring/translocations if necessary.	

Asset	Actions	Where
Threatened Ecological Communities (TECs) and Threatened species (TS) (flora and fauna within SEQ) and Migratory birds protected under the EPBC.	Facilitate long-term monitoring and assessment of impacted areas and intervention measures undertaken (i.e. spatial database to track progress of outbreak).	SEQ.
	Implement ongoing management actions where required.	SEQ susceptible TECs or habitat.
	Ongoing treatment of TECs or threatened flora.	Susceptible or affected populations.
	Treatment of impacted wildlife.	Affected TS.
Gondwana Rainforests of Australia - World Heritage Area (GRA-WHA) and Glass House Mountains National Landscape - National Heritage Area (GHM-HA) and Moreton Bay Ramsar Wetland (MBRW)	Facilitate long-term monitoring and assessment of impacted areas and intervention measures undertaken (i.e. spatial database to track progress of outbreak).	SEQ or within the GRA-WHA, MBRW & GHM-HA.
	Implement ongoing management actions highlighted in biosecurity management plans where required.	Within SEQ asset areas (GRA-WHA, MBRW & GHM-HA).
	Ongoing treatment of TECs or threatened flora where required.	Affected species and vegetation communities.
	Ongoing treatment of wildlife where required.	Affected species.
Threatened/EPBC listed ground-dwelling mammal species (e.g. water mouse, New Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Ongoing feral animal control.	Targeted populations.
	Frequent monitoring of populations, particularly in conjunction with ENSO cycles.	

Asset	Actions	Where
Threatened Ecological Communities (TECs) and Threatened species (TS) (flora and fauna within SEQ)	Rapid assessment of impact.	SEQ, vulnerable populations.
	Facilitate the deployment of watering stations or sources for wildlife.	Known vulnerable populations (i.e. koala populations isolated from water).

and Migratory birds protected under the EPBC.		
Gondwana Rainforests of Australia - World Heritage Area (GRA-WHA) and Glass House Mountains National Landscape - National Heritage Area (GHM-HA) and Moreton Bay Ramsar Wetland (MBRW)	Rapid assessment of impact.	Within SEQ asset areas (GRA-WHA, MBRW & GHM-HA).
	Facilitate the deployment of watering stations or sources for wildlife.	Known vulnerable populations (i.e. koala populations isolated from water).
Threatened/EPBC listed ground-dwelling mammal species (e.g. water mouse, New Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Monitoring of populations post-event.	SEQ, vulnerable populations.
	Trialling of artificial refuges e.g. burrows.	

Asset	Actions	Where
Threatened Ecological Communities (TECs) and Threatened species (TS) (flora and fauna within SEQ) and Migratory birds protected under the EPBC.	Immediate clean-up of impacted areas.	Flood impacted habitat, TS populations (i.e. koala, greater glider, flying fox habitat, aquatic lungfish habitat).
	Rapid assessment of impact to TECs, habitat or threatened species.	
	Facilitate restoration works (i.e. of habitat and/or food tree species through revegetation or weed control).	
	Erosion mitigation/ restoration works of degraded/impacted waterways and buffer areas that protect ecological values.	Impacted waterways.
	Waterway health monitoring (long-term) via EHMP.	SEQ.
	Facilitate long-term monitoring and assessment of impacted areas and intervention measures undertaken (i.e. spatial database to track progress).	SEQ.
Gondwana Rainforests of Australia - World Heritage Area (GRA-WHA) and Glass House Mountains National Landscape - National Heritage Area (GHM-HA) and Moreton Bay Ramsar Wetland (MBRW)	Immediate clean up.	Flood impacted areas containing cultural heritage, critical habitat, TS populations & waterways within SEQ asset areas (GRA-WHA, MBRW & GHM-HA).
	Rapid assessment of impact to TECs, habitat or threatened species.	
	Restoration works.	
	Facilitate long-term monitoring of flood impact areas and tracking of management actions being undertaken.	
	Waterway health monitoring (long-term) via EHMP.	SEQ.
Threatened/EPBC listed ground-dwelling mammal species (e.g. water mouse, New Holland mouse, brush-tailed rock-wallaby, long-nosed potoroo)	Clean up of habitat post-event to ensure critical habitat features e.g. logs, hollows, groundcover are still present.	SEQ.
The impact of accidents/incidents will vary according to the type, severity and where the accident/incident occurs. In general, accident/incident response and recovery actions include: • Stay safe. • Support frontline responders appropriately. • Provide proactive advice on protection priorities for biodiversity assets. • Assist impacted stakeholders appropriately. • Support impact assessment and recovery monitoring and recovery/resilience • planning.		

9.3 Response actions for protecting agricultural natural capital assets

This section outlines the response actions that need to be undertaken for the main agricultural natural capital assets to respond to from the relevant hazard events in SEQ (**Table 12**).

***Table 12**: Agricultural natural capital asset response actions.*

BUSHFIRE:		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Fire suppression.	SEQ.
	Monitor/assess impacts according to how the event is occurring.	SEQ.
Native forests and plantation forestry	Fire suppression.	SEQ.
	Monitor/assess impacts according to how the event is occurring.	SEQ.

FLOODS:		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Monitor/assess impacts according to how the event is occurring.	SEQ.

STORMS:		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Monitor/assess impacts according to how the event is occurring.	SEQ.

BIOSECURITY OUTBREAK:		
Asset	**Actions**	**Where**
Agricultural and grazing land, forestry, fisheries and coastal assets	Situation assessment.	SEQ.
	Develop Incident Action Plan.	SEQ.

DROUGHT:		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Monitor/assess impacts according to how the event is occurring.	SEQ.
	Farm Business Resilience Planning.	SEQ.
The impact of accidents/incidents will vary according to the type, severity and where the accident/incident occurs. In general, accident/incident response and recovery actions include: • Stay safe. • Support frontline responders appropriately. • Provide proactive advice on protection priorities for biodiversity assets. • Assist impacted stakeholders appropriately. • Support impact assessment and recovery monitoring and recovery/resilience planning.		

9.4 Recovery actions for protecting agricultural natural capital assets

This section outlines the recovery actions that need to be undertaken for the main agricultural natural capital assets to recover from the relevant hazard events in SEQ (**Table 13**).

Table 13: *Agricultural Natural Capital Asset Recovery Actions.*

BUSHFIRE:		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Develop Bushfire Recovery Plans/Fire Management Plans.	SEQ.
	Implement recovery works – strategic weed control to encourage pasture, forest regen.	SEQ.
Native forests and plantation forestry	Develop Bushfire Recovery Plans/Fire Management Plans.	SEQ.
	Implement recovery works – strategic weed control to encourage pasture, forest regen.	

FLOODS:		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Immediate clean-up.	SEQ.
	Rapid assessment of impact.	SEQ.
	Incorporate resilience building into recovery post immediate response.	SEQ.
	Riparian restoration works – bank stabilisation, riparian weed control and revegetation – monitoring and maintenance.	SEQ.

STORMS		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Provide coordination and support of volunteerism to protect both the volunteers and affected land holders while also supporting the impacted asset.	SEQ.
	Immediate clean-up.	SEQ.
	Rapid assessment of impact.	SEQ.
	Incorporate resilience building into recovery post immediate response.	SEQ.
	Riparian restoration works – bank stabilisation, riparian weed control and revegetation – monitoring and maintenance.	SEQ.

BIOSECURITY OUTBREAK:		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Biosecurity outbreak.	Implement Biosecurity Response Plan in SEQ.

DROUGHT:		
Asset	**Actions**	**Where**
Agricultural and grazing land, fisheries and coastal assets	Implement response component of the Farm Business Resilience Plan.	SEQ.
	Implementing strategies, practices that improve drought resilience – soils, pastures, and water assets.	SEQ.
The impact of accidents/incidents will vary according to the type, severity and where the accident/incident occurs. In general, accident/incident response and recovery actions include: • Stay safe. • Support frontline responders appropriately. • Provide proactive advice on protection priorities for biodiversity assets. • Assist impacted stakeholders appropriately. Support impact assessment and recovery monitoring and recovery/resilience planning.		

10 Community/stakeholder engagement

The overall aim of community/stakeholder engagement in the development and implementation of the Healthy Land & Water *Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan* is to create a shared perspective on how to mitigate disaster and natural hazard risk to biodiversity and natural capital assets. The engagement strategy integrates Traditional Knowledge, contemporary First Nations cultural values, and community feedback and considers how our current and potential emergency preparedness and response activities integrate with other emergency preparedness and response initiatives in SEQ. This will enable all stakeholders to have an evidence base to inform actions and facilitate building a plan with actions and responsibilities.

Healthy Land & Water's community/stakeholder engagement process for the development and implementation of the Emergency Preparedness Plan serves to fulfil multiple roles including education and awareness information, consultation, collaboration, co-design and leadership around emergency response planning and action. Community/stakeholder engagement provides opportunities to:

- Inform communities and stakeholders of the development of the plan.
- Provide opportunities for participation in plan development.
- Consult, collaborate or consider leadership opportunities with stakeholders including First Nations partners on plan development and contents (within the boundary of time constraints for delivery).
- Educate communities and stakeholders on preparedness and recovery actions identified in the plan.
- Support preparedness and recovery actions described in this plan (based on available funding opportunities).

This section outlines Healthy Land & Water's approach to developing and communicating this plan to stakeholders.

10.1 Engagement with Aboriginal and Torres Strait Islander peoples

South East Queensland has the largest Aboriginal and Torres Strait Islander population of any region in Australia (Australian Bureau of Statistics 2017), and 40% of Queensland's Aboriginal and Torres Strait Islander population (Department of Infrastructure, Local Government and Planning 2017b). Accordingly, there are a wide range of organisations and representative bodies, many of which are involved in natural resource management.

Healthy Land & Water has many effective working relationships with First Nations within the SEQ region and will work with the respective custodians and appropriate peoples on Country, to plan, promote, and participate in Regional Capacity Services program.

Healthy Land & Water, like all NRM groups in Queensland, is committed to the following priorities that include:

- Integrating Aboriginal and Torres Strait Islander engagement and participation in the planning, governance, implementation and review of our programs and projects.
- Engaging with Aboriginal and Torres Strait Islander communities to build meaningful partnerships.
- Providing meaningful opportunities for Aboriginal and Torres Strait Islander people to contribute and lead planning, strategies and initiatives.
- Working transparently and respectfully with Aboriginal and Torres Strait Islander people and establishing clear roles and expectations for our involvement.

Healthy Land & Water recognises that it is important for Traditional Owners to be actively involved in natural resource management planning, decision making and implementation. As such, Healthy Land &

Water commits to stand beside the Traditional Owners of SEQ in environmental and natural resource management.

Healthy Land & Water acknowledges and embraces Aboriginal and Torres Strait Islander peoples' history, custodianship, cultures, and relationships. We aspire to support this through achieving mutual respect and understanding, striving to deliver the promise of reconciliation.

Throughout this *Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan* development, Healthy Land & Water has endeavoured to engage with our First Nations partners at all stages of the development process. From its inception to its development, through multiple types of engagement including:

- Face-to-face.
- Phone.
- Online meetings.
- Workshop and small group meetings.

10.2 General community engagement, collaboration and coordination activities in the development of the plan

Engagement activities have been undertaken using multiple approaches which included:

- Desktop review of stakeholder documents and resources.
- Workshops and small group meetings.
- In-person meetings (face-to-face, phone or online).
- Online meetings.
- Emails.

These engagements occurred with a broad range of key stakeholders, including:

- Internal workshops/meetings with Healthy Land & Water executive, technical and operational personnel.
- Statewide meetings such as NRM Regions Queensland and Queensland Fire Department.
- Targeted meetings with bordering NRM bodies and other relevant NRMs.
- South East Queensland-wide committee meetings (e.g. SEQ Catchment Management Association meetings) with catchment/sub-catchment groups.
- QFBC Steering Committee meetings, State Committee meetings and SEQ Partner forums.
- State Bushfire Committee (QFD) meetings.
- Meetings with specific Emergency/Disaster Management agencies (State and Commonwealth).
- Participation of LGAQ and local governments.
- Local meetings with First Nations groups and individuals.
- Meetings with peak agriculture/industry groups including QFF, AgForce, Growcom, Lockyer Valley Growers, HQ Plantations.
- Participation of Queensland State Government agencies.
- Participation of not-for-profits such as Red Cross.
- Participation of the private sector and Government-owned Corporations such as Powerlink.

A detailed list of participants is available from Healthy Land & Water.

10.3 Raising public/stakeholder awareness of the plan

Healthy Land & Water's communication is guided by our communications and engagement strategy and based on the *International Association of Public Participation (IAP2) framework*. We communicate with intention. The techniques we use are fit-for-purpose and tailored to the broad range of audiences we communicate with to get the best result. As an organisation based on collaboration and partnerships, information flow is two ways through ongoing and regular consultation and participatory decision-making. As an organisation, we will effectively communicate with external stakeholders and members to:

- Understand our stakeholders to actively contribute to their success.
- Maintain our position as a trusted, relevant, and independent leader.
- Understand community needs and values of our natural assets.
- Enable respectful and appropriate inclusion and collaboration with First Nations peoples.
- Remove wasted and non-value-added steps and time in processes where feasible.
- Strive to ensure stakeholder, member and customer satisfaction is always achieved.

Based on stakeholder engagement and extension activities undertaken in the development of this plan, Healthy Land & Water recommends the following key activities to be undertaken to further develop and integrate the plan across existing emergency preparedness and response structures:

- Development of an emergency management framework for mitigating the impacts of natural disasters on natural assets - needs to be developed and operationalised, yet no organisation is currently driving this process.
- State and/or regional framework developed to inform the descriptor and identification of natural assets (biodiversity, ecosystem services, cultural and agricultural).
- Development of a state Natural Asset Code of Practice or framework for developing regional natural asset Codes of Practice and associated mapping.
- Code of Practice is to inform the Preparedness and Response phases of disaster management.
- Development of process for district and local Disaster Management Groups to apply Codes of Practice and mapping to their LGA.
- Development of process to include consultation with First Nations, stakeholders and community.
- Development of process to build cultural capacity within Healthy Land & Water.
- Development of regional natural asset risk and mitigation measure register/database.
- Standard operating procedures to inform stakeholders and other Local Disaster Management Groups (LDMG) on how to respond and recover from natural disasters.
- Creation of a Regional Natural Asset Technical Advisory Group to support and align with existing regional and local disaster management groups.
- Development of framework for prioritising natural assets for impact assessments.

Following the release of the *Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan* additional communication activities will be conducted. These may include:

- Media campaigns including – press releases, social media, radio and TV opportunities.
- Distribution to relevant agencies/ Ministers in the Queensland Government and Australian Government.
- Distribution of a brief summary document to all our existing networks (local, state, national and international) – and sharing of the plan on request and with key partners.
- Making the plan available for download on the Healthy Land & Water website and examining the possibility of converting the plan document to a 'live' document with a unique online presence.

A list of stakeholders that should be engaged before, during and after an emergency event and in an associated engagement strategy is identified in tables 8-13 in sections 8 and 9.

10.4 Education and training

The plan identifies training needs relating to specific assets, specific risks/hazards as well as emergency preparedness in general. Education and training opportunities exist throughout Healthy Land & Water and current publications and engagement activities have the capability of being applied in educational settings to better inform environmental practitioners and/or emergency responders on bushfire preparedness and management.

Existing and potential future activities in the education and training space include (but are not limited to):

- Training workshops – topic-specific and modules for inclusion in appropriate 'related' training programs.
- Information packs and factsheets.
- Property management planning manual and workbook.
- Content for use by high schools and tertiary institutions.
- Online resources and e-learning products.
- Informational articles in peak body professional journals, local and state government publications and (possibly) academic journals.
- Cooperation with training designers/providers for Queensland State Government agencies, not-for-profits and private sector organisations.
- Presentations at relevant conferences.
- Knowledge sharing with First Nations peoples.

10.4.1 Education and training opportunity examples from Healthy Land & Water

Healthy Land & Water has a variety of resources promoting strategies, practices and activities to manage the impacts of climate and other risks to the region's natural assets including the following topics:

- Preparing for and managing drought.
- Implementing sustainable land management practices.
- Improving pasture and land condition fact sheets.
- Pasture management in SEQ.
- Managing erosion fact sheet series.
- Property management planning.
- Protecting and enhancing threatened ecological communities – lowland subtropical rainforest, swamp tea tree, brigalow, saltmarsh, dry rainforest and SEVT.
- Regional ecosystem fact sheet series.
- Water by Design – water sensitive urban design resources.
- Land for Wildlife fact sheets.
- Water by Design Guidelines suite.

Healthy Land & Water delivers numerous education and training opportunities.

Learning Resources and guidance publications have been developed by Healthy Land & Water, co-designed with partners and have the capability of being applied in educational settings and/or in the field to better inform environmental practitioners and/or emergency responders on bushfire preparedness and management.

CASE STUDY: Queensland Fire & Biodiversity Consortium

The state-wide Queensland Fire & Biodiversity Consortium (QFBC) program is used here to provide examples of some of these initiatives. QFBC produces a number of signature guidelines and resources, including:

- Regional Planned Burn Guidelines - SEQ Bioregion.
- Regional Dashboard Fire Management Guidelines (six regions across Queensland).
- Detailed Regional Ecosystem descriptions and their associated fire management requirements.

The QFBC team within Healthy Land & Water currently delivers capacity building workshops, educational information sessions and training opportunities that are tailored to meet stakeholder and land manager's needs. The QFBC program is highly capable of adapting the current approach and formatting of workshops to align with the aims of this and other regional *EPRPs*. Currently, the QFBC program delivers the following events in relation to bushfire preparedness:

- Fire Information Sessions – Targeted at landholders and the public, these sessions provide overviews of bushfire and fire preparedness. Participants gain practical advice and guidance and hear from local experts on reducing bushfire risk in their specific landscape. These are delivered collaboratively with Councils, Rural Fire Services and other key land managers.
- Property Fire Management Planning Workshops – Assisting landholders and land managers to reduce the threat of bushfires/wildfires to life and assets on their property, whilst protecting and enhancing the diversity and abundance of native plants and animals, with considerations for primary production. Landholders develop a fire management map and action plan tailored to individual properties, priorities and circumstances.
- Backing Onto Bush bushfire awareness workshops – Recently developed initiative targeted at peri-urban and rural residential landholders to inform individuals of the importance of fire ecology and how fires keep natural environments healthy. This workshop comprises a field component that enables landholders to better understand fuel loads and risk, to observe the health of the local environment and to recognise fuel history.
- Overall Fuel Hazard Training – These sessions are led by guideline author and expert Francis Hines and facilitated by QFBC, aimed at equipping Traditional Owners, Rural Fire Brigades, and land managers (i.e. representatives from local government, Powerlink, Seqwater) with the skills required to assess the landscape condition and landscape fire risk on their land.
- Fire Weather 1 and 2 – Delivered by QFD and the Bureau of Meteorology, the QFBC coordinates sessions for stakeholders to learn about the practicalities and planning burns around fire weather scenarios.
- Bespoke training – We design customised capacity building programs. Recent customised offerings tailored to land manager needs have included fire ecology for land managers and fire planning workshops.

11 Legal and policy framework

Healthy Land & Water is committed to conducting its operations in accordance with its legislative obligations, acknowledging that effective management of, and compliance with these obligations are necessary and desirable. Our compliance register is reviewed regularly for currency and any legislative changes.

Healthy Land & Water will take all steps to integrate its goals and actions contained in this plan within the existing Legal and Policy framework for Emergency/Disaster Management in Queensland – especially the QDMA.

Healthy Land & Water complies with all relevant State and Commonwealth legislation relating to its role as an NRM, especially the *Environment Protection and Biodiversity Conservation Act (1999)* (Cth) (EPBC Act), *Biosecurity Act 2014* (Qld) and *Environmental Protection Act 1994* (Cth). Regarding the Biosecurity Act 2014 (Qld), NRM groups (including Healthy Land & Water) play a role in the monitoring and reporting on the implementation of various biosecurity plans/strategies through the Queensland Invasive Plants and Animals Committee.

In addition, Healthy Land & Water has roles and responsibilities under many of the State and Commonwealth 'business' laws, 'privacy and information' laws and those that govern its role as a workplace and an employer.

Hence, this *Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan* is developed (and will be implemented) within this context of **three overlapping bodies of laws and policies –** those that govern Healthy Land & Water's **role as a public organisation and workplace**, those that relate to its **role as a Natural Resource Management organisation** and those that pertain to **Emergency/Disaster Management (particularly in South East Queensland).**

A list of the key laws, regulations, policies and documents that were referred to during the development of this EPRP and/or would be relevant to the implementation of this plan, and the actions contained within, are contained in **Appendix 3**.

12 Key gaps in the plan

This Emergency Preparedness & Response Planning project has highlighted several key gaps in the integration of an evidence-based approach to understanding, mitigating risk and protecting biodiversity and natural capital agricultural assets across our regions.

Healthy Land & Water has identified gaps and subsequent opportunities in emergency response and preparedness for biodiversity and agricultural natural capital assets and set these out below for future consideration.

This plan has been developed as a live document in recognition of the work that remains to be developed and delivered with regard to the integration of biodiversity and agricultural natural capital assets and other recognised assets, such as cultural heritage, within an emergency management framework.

For both Healthy Land & Water and the broader NRM sector in Queensland, along with our local, regional and state partners, it is recognised that this work will be ongoing.

What **we have already learned** in developing this plan:

- **It is timely.** Whilst the Queensland Disaster Management Arrangements (QDMA) are considered by many to be robust and practical, the effects and ongoing impacts of the recent Queensland emergency management reforms will need time to 'settle in' – key organisations are reviewing their roles and how they interact most effectively with other stakeholders. Healthy Land & Water sees this as an opportunity to promote a structured role for NRMs in the state arrangements and therefore the development of this EPRP is timely.
- **Place-based emergency management**. Many of the 'emergencies' covered by this plan, typically will be 'place-based' (i.e. they will impact most acutely on a 'place' or a 'region'). Healthy Land & Water is place-based and maintains a holistic perspective on the interrelated ecosystems and assets within its region. This can present ongoing challenges when partnering with events-based organisations and government agencies (e.g. the Queensland Fire Department) and also when dealing with 'cross-boundary' issues. The integration of NRM bodies within district and local disaster management networks enables these challenges to be broadly acknowledged, accepted and subsequently addressed.
- **Complex and multi-faceted knowledge**. Effective planning and decision-making for emergencies requires understanding and use of a wide array of different but reliable knowledge. Such knowledge comes from many sources and should be enabled to be utilised as fit-for-purpose to generate effective solutions. In some cases, knowledge is collected and documented by individual organisations, in others it is created through experience, tradition or culture. Finding the most appropriate ways to protect and manage this complex body of collective knowledge and making it available to as wide a range of users as possible.
- **Collective actions**. NRMs responsibilities are bounded within their regions. However, there are opportunities to maximise their efficiency through collective action. This is most likely through their state-wide organisation NRM Regions Queensland and/or through 'issue-based' consortiums or state-wide initiatives such as Healthy Land & Water's Queensland Fire & Biodiversity Consortium (QFBC) and Water by Design programs. The development of the EPRPs throughout Queensland has already proven to be a catalyst for exploring more opportunities for collective action.
- **Rapidly changing risks, impacts and responses**. Environmental events on their own do not create emergencies – it is the complex combination of events/risks/impacts that create emergencies and disasters. In addition, the knowledge, development and experience of appropriate responses is exponentially growing. The combination of these elements is constantly changing and will expose

gaps and opportunities in our planning and preparedness, response and recovery efforts. Hence the EPRP will need to be a live and dynamic tool that is adjusted and modified regularly.

- **Need to support far greater collaboration.** Through engagement with regional partners, including emergency management agencies and sector representatives, and through NRM Regions Queensland there has been a collective learning and determination of the need to support greater local, regional and statewide collaboration to address gaps and build capacity for natural asset emergency management in the NRM sector.
- **Disasters can have compounding and cumulative effects on biodiversity and agricultural natural capital assets.** In a fluid landscape, multiple disasters often impact landscapes consecutively, leading to exacerbated effects such as drought followed by bushfires (i.e. 2019-2020 Black Summer bushfires), bushfires followed by floods that cause significant issues for runoff/erosion, storms and floods, etc. that can then increase material on the ground (i.e. organic debris and increased growth), open canopies, and cause increased bushfire risk and greater threats to biodiversity or agricultural assets. In order to improve landscape resilience, the region and emergency impacts should be considered holistically. These cumulative effects are not currently holistically reflected within the asset and impact tables. However, future work should consider and target these impacts, including through further monitoring.

These key lessons, along with the best available data and knowledge, have informed many of the detailed actions contained in this EPRP. However, the process of ongoing key gap identification and response is a core element of the adaptive management approach employed by Healthy Land & Water across the organisation.

12.1 Recommended key steps for future plan development

Based on the works developed by Healthy Land & Water and the actions recommended throughout the plan, the following key actions are recommended as the next steps to be delivered across the next five years to enable identified gaps and subsequent opportunities to be addressed and realised:

- Ongoing work needs to be undertaken to **integrate Traditional Owners' knowledge and cultural assets in the EPRP**. First Nations leadership and engagement opportunities must be further developed. Our current engagement with First Nations peoples serves to highlight the need for additional planning, recognition, integration and protection of cultural assets in the EPRPs. These engagements with First Nations partners provide the opportunity to ensure that appropriate actions are developed in response to emergency events that will serve not only to protect the cultural heritage of this region but also the natural ecosystems of which they are a part. Whilst this current iteration of Healthy Land & Water's EPRP has mentioned some cultural assets within the biodiversity and agricultural assets through input and advice gained during consultation sessions, future work should be undertaken to expand the inclusion of cultural assets more widely and make identification of cultural assets in EPRPs more explicit. Resourcing should be allocated to further First Nations leadership and collaboration in order to better capture the cultural assets and the context of First Nations perspectives in the development of the plan.
- Resources should be allocated to **develop and maintain the EPRPs as a 'live' tool** – ideally through an online format. This would allow the EPRP to be regularly and quickly modified and updated to facilitate a degree of 'customisation' for users and maximise the currency of the data and information used in the plan.
- Undertake a detailed **data and knowledge gap analysis.** Whilst Healthy Land & Water endeavoured to compile information and available data on biodiversity and agricultural natural capital assets through searches, existing knowledge, and consultation, various knowledge and data gaps currently

exist. A detailed gap analysis will enable Healthy Land & Water and this plan to consolidate key priority gap areas and where best to focus resources.

- **Research** is required to eliminate data gaps. This includes data collection to generate finer-scale threatened species information at a regional level. Research is also needed to better understand the compounding impacts incurred through hazard events which result in biodiversity and ecosystems being affected by the interaction of multiple changes at once.
- Following on from a detailed gap analysis, resources should be allocated to developing further **monitoring programs** to capture relevant, holistic landscape data to inform key impacts, risks and priorities for mitigation actions. Currently, **Section 14** details the existing data and monitoring that was used to inform this plan. Further monitoring programs that target key species, ecosystems and/or threats will add value and ensure a data-driven, evidence-based approach to emergency management. For example, landscape monitoring of fire risk attributes aligned to ecosystem health and/or key species. Additionally, monitoring related to multi-disaster impacts would support a holistic approach, such as post-storm monitoring for vegetation condition and fuel structure to refine fire regimes and improve landscape resilience.
- Utilise, adapt and apply **existing functional planning models** across localities in order to holistically manage landscapes cross-tenure. For example, the **Township Fire Management Strategy** (TFMS) model developed by the Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC). This planning process is a First Nations-led, tenure-blind approach to land management (specifically fire), that integrates the protection of cultural and ecological values alongside community and asset protection to reduce landscape bushfire risk. This model aligns all land managers and stakeholders on the same page with a cohesive strategy and plan of action that meets legislative and regulatory frameworks, whilst ensuring Traditional Owner knowledge and aspirations are captured, protected and promoted. The work was awarded the Resilient Queensland Community award in 2018 and was commended in the Inspector General's *The 2018 Queensland Bushfires Review Report 2: 2018-2019* as a prime example of a cooperative, locally led and state-facilitated approach; and is used during emergency situations, being recognised as assisting to protect houses from burning in later bushfires. This work has been applied across Minjerribah (North Stradbroke Island) and Mulgumpin (Moreton Island) with QYAC and is currently underway with the Githabul People. Further application of this model would greatly benefit collaborative disaster management across landscapes, achieving holistic outcomes cross-tenure, and ensuring better protection and resilience of communities.
- NRMs should continue to explore ways of **working collectively** to maximise their effectiveness. This should be done to use collective resources most efficiently (such as through development of generic tools and resources where appropriate) as well as seeking opportunities to provide a collective 'voice' to structured national and state planning and policy mechanisms (such as membership of the QLD Functional Recovery Groups). Guidance and leadership are already being driven by NRM Regions Queensland.
- NRMs should further consider the role of community organisations in natural disaster management. Community network organisations have already partnered with local government/councils to collaborate in natural disaster management planning.
- The development of this plan provides an opportunity to ensure better alignment and integration with the NRM Plan – including ongoing community and stakeholder engagement, data and gap analysis, maintaining partnerships for collaborative planning and delivery, and monitoring.
- Healthy Land & Water needs to build **stronger and more structured partnerships with local governments** in their region – through agreed and supported relationships with the Local Disaster Management Groups (LDMGs), the District Disaster Management Groups (DDMGs) and through peak bodies such as the Local Government Association of Queensland (LGAQ), the Council of Mayors-South East Queensland (COMSEQ) and the local Government Managers Associations.

- Healthy Land & Water should explore **opportunities to develop and share tools, resources and knowledge** – this could be through pilot initiatives with individual LDMGs/DDMGs or within their region, and/or through collectively developing tools and resources (such as state-wide assessment frameworks, databases, Codes of Practice or agreed management guidelines).
- **Maintain ongoing planning partnerships**. The EPRP has been an opportunity to undertake valuable cooperative planning with a variety of stakeholders outside Healthy Land & Water. All opportunities should be sought to maintain these relationships and continue cooperative planning through ongoing processes.
- **Seek future resources through key partnerships**. Work with key partners to jointly seek resources from national and state governments as well as from not-for-profit and private sector organisations, to carry out projects cooperatively, update the plan, conduct the actions in the plan or both. This will require resourcing considerations.

Healthy Land & Water employs an adaptive management approach. A fundamental premise of this approach is the ongoing process of key gap identification and response. Therefore, it is anticipated that as emergency preparedness and response management plans continue to evolve, so too will additional gaps come to light and require resolution.

13 Risk management including mitigation strategies

This section outlines key overarching risks associated with the implementation of the asset preparedness/response/recovery actions and how they can be mitigated.

13.1 Risks of attending site post-bushfire

Risks of attending the site after a bushfire include:

- Small remnant fires and hot ground.
- Presence of bushfire smoke.
- Presence of ashes and fine dusts, especially from copper chrome arsenate-treated timber.
- Live electrical hazards such as damaged power lines.
- Unstable structures and rubble.
- Unstable trees and branches, especially if there were significant crown fires.
- Sharps from glass, metals, and splintered wood.
- Exposed hidden chemicals such as asbestos, lead paint, fertilisers, and farm chemicals.
- Damaged underground infrastructure such as septic tanks and rainwater storage.
- Presence of injured animals.
- Contaminated water from ash and deceased animals.

During and after a bushfire there is expected to be the presence of bushfire smoke. Bushfire smoke is a mixture of different-sized particles, water vapour, and gases, including carbon monoxide, carbon dioxide, and nitrogen oxides.

The larger particles contribute to visible haze when a fire is burning. They are generally too large to breathe deeply into the lungs but can irritate the nose and throat.

Finer microscopic particles and gases are small enough to breathe deep into the lungs and can cause adverse health effects.

Refer to the Queensland Government Department of Environment, Science and Innovation for live air quality data.

13.2 Risks of attending site post-flood/storm/cyclone

Risks of attending the site after a flood include:

- Presence of flood water and mud with contamination from bacteria, increasing the likelihood of infection.
- Hidden hazards underneath debris, foliage, and mud.
- Washed up materials, equipment, and sediment from upstream.
- Presence of dangerous and poisonous animals uprooted from flooding.
- Presences of injured, deceased, or decomposing animals.
- Proliferation of potentially toxic and extremely toxic plants.
- Live electrical hazards such as damaged power lines.
- Unstable structures.
- Fallen trees and objects hanging from trees.
- Sharps from glass, rusted metals, and splintered wood.
- Exposed chemicals such as washed-up oil, and fuel asbestos-containing material.
- Damaged infrastructure such as septic tanks and sewage lines.

During and after flood events, the water is often contaminated, and the ground is often muddy. This creates an optimal breeding ground for bacteria and infections in persons not wearing adequate personal protective equipment (PPE). Those re-entering flooded areas may be exposed to gastrointestinal illnesses, skin infections, mosquito-borne diseases, leptospirosis, melioidosis, and tetanus. Consumption of food and drink while in an immediate post-flood area should be kept to a minimum.

13.3 Risks of attending site during severe or extreme heatwave

Risks of attending the site during a severe or extreme heatwave include:

- Exposure to a culmination of hot surfaces, radiant heat, direct sun, high humidity and inability to regulate internal body heat.
- Limited access to cool drinking water.
- Increased risk of dehydration especially related to consumption of caffeine.
- Increased likelihood of fire from dried foliage and grasses.
- Presence of injured or decomposing animals.
- Increased presence of mosquitos and other pathogen-carrying animals.
- Increase presence of snakes and other venomous animals.
- Increase proliferation of toxic algae and plants.

During and after a severe or extreme heatwave event there is a high fire danger and risk of exposure to biological hazards. Low humidity during a heatwave dries out foliage and dead plants, providing an abundant source of available fuel in the event of a spot fire. High humidity during a heatwave promotes the life cycle of mosquitos and toxic algal blooms.

13.4 Risks of attending site during disease outbreak

Risks of attending the site after a flood include:

- Presence of sick or decomposing animals.
- Possibility of zoonotic pathogens from host animal or carrier animal/insect.
- Possibility of exposure to aggravated or aggressive animals.
- Proliferation of fungi and other potentially toxic plants.

During an environmental disease outbreak, there may be mass death of animals and plants. This presents a higher risk of infection and proliferation of potentially harmful organisms that take advantage of the available food source. Those exposed to the disease or animals and plants suffering from it must exercise caution, especially if the disease is new or not well documented.

14 Monitoring and data

This section outlines the nature of data collected or utilised as part of this plan and how it will be handled. We currently collect data through the Ecosystem Health Monitoring Program (EHMP), on-ground projects, open data sources such as Qspatial, council and community.

The Ecosystem Health Monitoring Program (EHMP) is a waterway monitoring program which has been running since 2000. Currently, 143 estuarine sites are sampled annually/eight months of the year. A full 129 freshwater sites are sampled every three years, which presently includes 48 sites monitored annually and 81 sites sampled on rotation.

Project data is collected with ESRI GIS products including ArcGIS field maps, Survey123, ArcGIS pro and ArcGIS online. This data includes project location and landholder infrastructure/assets (e.g. Water tanks, homes, fences, sheds, etc.). This data is collected by Healthy Land & Water staff in the field, or from landholder engagement events.

State and federal spatial data is utilised for monitoring. QSpatial data such as MSES, MNES, floodplain and fire scar data has been utilised in the past for other projects and would be utilised again for post-event monitoring. Satellite data, particularly Sentinel 2, has and would be collected as part of any post-event monitoring.

Land and vegetation condition is being measured and monitored at selected project sites using tools developed through the Queensland Statewide Indicators Framework, as well as utilising a variety of standard field monitoring and remote sensing to monitor changes in other key indicators including soil health and groundcover, respectively.

All data will be stored on Healthy Land & Water's server. The analysis performed on the data would depend on the emergency event. Post-flood, for example, included LiDAR change analysis to assess where losses of soil occurred.

Depending on the purpose, funding source and privacy and intellectual property (IP) agreements, data could be shared with the Australian Government as geodatabases, shapefiles, maps or in Excel spreadsheets. Maps could be made available via live data layers to allow for adaptation to interests and needs based on *Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan* requirements.

The sites for mapping biodiversity and agricultural natural capital assets are included in Appendix 2**.** These maps provide an outline of the general SEQ management unit, but layers describing some types of disaster threats and biodiversity and agricultural assets have been added. Multiple maps are included in this outline to clearly demonstrate some of the available data.

14.1 Key learnings

Where possible, current gaps in emergency response and preparedness for biodiversity and agricultural natural capital assets have been determined, evaluated and (if possible) addressed in the development of this plan – although it is clearly recognised that this work will be ongoing.

What **we have already learned** in developing this plan:

- **It is timely.** Whilst the Queensland Disaster Management Arrangements (QDMA) are considered by many to be robust and practical, the effects and ongoing impacts of the recent Queensland emergency management reforms will need time to 'settle in' – key organisations are reviewing their roles and how they interact most effectively with other stakeholders. Healthy Land & Water see this as

an opportunity to promote a structured role for NRMs in the state arrangements and therefore the development of this EPRP is timely.

- **Place-based emergency management**. Many of the 'emergencies' covered by this plan, typically will be 'place-based' – i.e. they will impact most acutely on a 'place' or a 'region'. NRM's such as Healthy Land &Water are also place-based and their role requires that they maintain a holistic perspective on the interrelated ecosystems and assets within their region. This can present ongoing challenges when partnering with events-based organisations and government agencies (e.g. the QFS) and also when dealing with 'cross-boundary' issues. These challenges will continue to be addressed.
- **Complex and multi-faceted knowledge**. Effective planning and decision-making for emergencies requires understanding and use of a wide array of different but reliable knowledge. Such knowledge comes from many sources and we should be able to use it in different ways to generate effective solutions. In some cases, knowledge is collected and documented by individual organisations, in others it is created through experience, tradition or culture. Finding the most appropriate ways to protect and manage this complex body of collective knowledge and make it available to as wide a range of users as possible, is an ongoing challenge
- **Collective actions**. NRM's responsibilities are bounded within their regions. However, there are clearly opportunities to maximise their efficiency through collective action. This is most likely through their state-wide organisation NRM Regions Queensland and/or through 'issue-based' consortiums such as the Queensland Fire and Biodiversity Consortium. The development of the EPRPs throughout Queensland has already proven to be a catalyst for exploring more opportunities for collective action.
- **Rapidly changing risks, impacts and responses**. Environmental events on their own do not create emergencies – it is the complex combination of events/risks/impacts that creates 'emergencies' and disasters'. In addition, the knowledge, development and experience of appropriate responses is growing all the time. The combination of all these elements is constantly changing and will expose 'gaps' in our planning and preparedness, response and recovery efforts. Hence the EPRP will need to be a 'live' and dynamic tool that is adjusted and modified regularly.

These key lessons, along with the best available data and knowledge, have informed many of the detailed actions contained in this EPRP.

15 Key contact

In December 2024, Healthy Land & Water was contracted as the South East Queensland (SEQ) Regional Delivery Partner to deliver the Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan.

For further enquiries regarding the Biodiversity and Agricultural Natural Capital Assets Emergency Preparedness & Response Plan, please contact Healthy Land & Water by email: info@hlw.org.au.

APPENDIX 1: Biodiversity and agricultural assets summary for South East Queensland

The following tables comprise lists of biodiversity assets in the form of threatened species and ecological communities within South East Queensland. The desktop assessment returned previously recorded species presence from the Queensland Government's WildNet species search and WetlandInfo flora and fauna species lists, as well as the Australian Government's Protected Matters Search Tool's known and likely threatened species and threatened ecological communities listed under the EPBC Act.

Table 14: *Healthy Land & Water biodiversity assets - Threatened ecological communities within South East Queensland.*

Threatened Ecological Communities (TEC) and link to Species Profile and Threats Database (SPRAT)	EPBC Listing Status	TEC Likelihood of occurrence within SEQ
Subtropical and Temperate Coastal Saltmarsh. Species Profile and Threat Database (SPRAT)	Vulnerable	Community likely to occur within SEQ
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland. Species Profile and Threat Database (SPRAT)	Endangered	Community likely to occur within SEQ
Brigalow (*Acacia harpophylla* dominant and co-dominant). Species Profile and Threat Database (SPRAT)	Endangered	Community known to occur within SEQ
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Species Profile and Threat Database (SPRAT)	Critically Endangered	Community likely to occur within SEQ
Weeping Myall Woodlands. Species Profile and Threat Database (SPRAT)	Endangered	Community may occur within SEQ
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia. Species Profile and Threat Database (SPRAT)	Critically Endangered	Community likely to occur within SEQ
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland. Species Profile and Threat Database (SPRAT)	Critically Endangered	Community likely to occur within SEQ
Grey box-grey gum wet forest of subtropical eastern Australia. Species Profile and Threat Database (SPRAT)	Endangered	Community likely to occur within SEQ
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions. Species Profile and Threat Database (SPRAT)	Endangered	Community may occur within SEQ
Dunn's white gum (*Eucalyptus dunnii*) moist forest in north-east New South Wales and south-east Queensland. Species Profile and Threat Database (SPRAT)	Endangered	Community likely to occur within SEQ
Swamp Tea-tree (*Melaleuca irbyana)* Forest of South-east Queensland. Species Profile and Threat Database (SPRAT)	Critically Endangered	Community likely to occur within SEQ
Lowland Rainforest of Subtropical Australia. Species Profile and Threat Database (SPRAT)	Critically Endangered	Community likely to occur within SEQ
Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and SEQ ecological community. Species Profile and Threat Database (SPRAT)	Endangered	Community likely to occur within SEQ

Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and SEQ bioregions. Species Profile and Threat Database (SPRAT)	Endangered	Community likely to occur within SEQ
Poplar Box Grassy Woodland on Alluvial Plains. Species Profile and Threat Database (SPRAT)	Endangered	Community likely to occur within area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions. Species Profile and Threat Database (SPRAT)	Endangered	Community likely to occur within area

Table 15: *Healthy Land & Water biodiversity assets- Threatened fauna within South East Queensland*[2].

Number	Scientific Name	Common Name	Listing under the NCA	Listing under the EPBC Act
Montane, rainforest and stream-dwelling amphibians (six species)				
1	*Adelotus brevis*	Tusked frog	V	
2	*Assa darlingtoni*	Pouched frog	V	V
3	*Litoria pearsoniana*	Cascade treefrog	V	
4	*Mixophyes fleayi*	FLEAY'S barred frog	E	E
5	*Mixophyes iteratus*	Giant barred frog	V	V
6	*Philoria kundagungan*	Red-and-yellow mountain frog	E	E
'Acid' amphibians (four species)				
1	*Litoria freycineti*	Wallum rocket frog	V	
2	*Litoria olongburensis*	Wallum sedge frog	V	V
3	*Crinia tinnula*	Wallum froglet	V	
4	*Litoria cooloolensis*	Cooloola sedge frog	NT	
Threatened Terrestrial Birds (29 species)				
1	*Anthochaera phrygia*	Regent honeyeater	CR	CE
2	*Aphelocephala leucopsis*	Southern whiteface		V
3	*Atrichornis rufescens*	Rufous scrub-bird	V	E
4	*Botaurus poiciloptilus*	Australasian bittern	E	E
5	*Calidris tenuirostris*	Great knot	CR	CE
6	*Calyptorhynchus lathami*	Glossy black-cockatoo	V	V
7	*Calyptorhynchus lathami lathami*	Glossy black-cockatoo (eastern)	V	V
8	*Charadrius leschenaultii*	Greater sand plover	V	V

[2] *NCA Status under *Nature Conservation Act 1992*: CR: Critically endangered, E: Endangered, V: Vulnerable, NT: Near threatened

*EPBC Status under the *Environment Protection and Biodiversity Conservation Act 1999*: CE: Critically endangered, E: Endangered, V: Vulnerable, CD: Conservation dependent

Number	Scientific Name	Common Name	Listing under the NCA	Listing under the EPBC Act
9	*Charadrius mongolus*	Lesser sand plover	E	E
10	*Climacteris picumnus victoriae*	Brown wreecreeper (south-eastern)		V
11	*Cuculus optatus*	Oriental cuckoo	SL	Migratory, terrestrial
12	*Cyclopsitta diophthalma coxeni*	Coxen's fig-parrot	CR	CE
13	*Dasyornis brachypterus*	Eastern bristlebird	E	E
14	*Epthianura crocea macgregori*	Yellow chat (Dawson)	E	CE
15	*Erythrotriorchis radiatus*	Red goshawk	E	E
16	*Falco hypoleucos*	Grey falcon	V	V
17	*Fregetta grallaria grallaria*	White-bellied storm-petrel		V
18	*Geophaps scripta scripta*	Squatter pigeon (southern subsp.)	V	V
19	*Grantiella picta*	Painted honeyeater	V	V
20	*Hirundapus caudacutus*	White-throated needletail	V	V
21	*Lathamus discolor*	Swift parrot	E	CE, Migratory, terrestrial
22	*Melanodryas cucullata cucullata*	South-eastern hooded robin		E
23	*Neochmia ruficauda ruficauda*	Star finch (eastern subspecies)	E	E
24	*Neophema chrysostoma*	Blue-winged parrot		V
25	*Pachyptila turtur subantarctica*	Fairy prion (southern)		V
26	*Poephila cincta cincta*	Black-throated finch (white-rumped subspecies)	E	E
27	*Rostratula australis*	Australian painted-snipe	E	E
28	*Stagonopleura guttata*	Diamond firetail	V	V
29	*Turnix melanogaster*	Black-breasted button-quail	V	V
Threatened, Migratory and/or Marine Birds (74 species)				
1	*Arenaria interpres*	Ruddy turnstone	SL	Migratory, marine
2	*Calidris acuminata*	Sharp-tailed sandpiper	SL	Migratory, marine
3	*Calidris alba*	Sanderling	SL	Migratory
4	*Calidris canutus*	Red knot	E	E, Migratory, Marine
5	*Calidris ferruginea*	Curlew sandpiper	CR	CE, Migratory, marine
6	*Calidris melanotos*	Pectoral sandpiper	SL	Migratory, marine
7	*Calidris pugnax*	Ruff	SL	Marine, marine
8	*Calidris ruficollis*	Red-necked stint	SL	Migratory, marine
9	*Calidris subminuta*	Long-toed stint	SL	Migratory, marine
10	*Calonectris leucomelas*	Streaked shearwater	SL	Migratory, marine

Number	Scientific Name	Common Name	Listing under the NCA	Listing under the EPBC Act
11	*Charadrius bicinctus*	Double-banded plover	SL	Migratory, marine
12	*Charadrius veredus*	Oriental plover	SL	Migratory, marine
13	*Chlidonias leucopterus*	White-winged black tern	SL	Migratory, marine
14	*Cuculus optatus*	Oriental cuckoo	SL	Migratory, terrestrial
15	*Diomedea antipodensis*	Antipodean Albatross		V, Migratory, marine
16	*Diomedea antipodensis antipodensis*	Antipodean albatross	V	V, Migratory, marine
17	*Diomedea antipodensis gibsoni*	Gibson's Albatross		V, Migratory, marine
18	*Diomedea epomophora*	Southern royal albatross		V, Migratory, marine
19	*Diomedea exulans*	Wandering albatross	V	V, Migratory, marine
20	*Esacus magnirostris*	Beach stone-curlew	V	Migratory, marine
21	*Fregata ariel*	Lesser frigatebird	SL	Migratory, marine
22	*Fregata minor*	Great frigatebird	SL	Migratory, marine
23	*Gallinago hardwickii*	Latham's snipe	SL	Migratory, wetlands
24	*Gallinago megala*	Swinhoe's Snipe	SL	Migratory, wetlands
25	*Gallinago stenura*	Pin-tailed snipe	SL	Migratory, wetlands
26	*Gelochelidon nilotica*	Gull-billed tern	SL	Migratory, marine
27	*Glareola maldivarum*	Oriental pratincole	SL	Migratory, marine
28	*Limnodromus semipalmatus*	Asian dowitcher	SL	Migratory, marine
29	*Limosa lapponica baueri*	Western Alaskan bar-tailed godwit	V	V, Migratory, wetland
30	*Limosa limosa*	Black-tailed godwit	SL	Migratory, marine
31	*Lophochroa leadbeateri*	Pink cockatoo	E	E, Migratory, marine
32	*Macronectes giganteus*	Southern giant-petrel	E	E, Migratory, marine
33	*Macronectes halli*	Northern giant-petrel	V	V, Migratory, marine
34	*Numenius madagascariensis*	Eastern curlew	E	CE, Migratory, wetlands
35	*Numenius minutus*	Little curlew	SL	Migratory, wetlands
36	*Numenius phaeopus*	Whimbrel	SL	Migratory, wetlands
37	*Oceanites oceanicus*	Wilson's storm-petrel	SL	Migratory, marine
38	*Onychoprion anaethetus*	Bridled tern	SL	Migratory, marine
39	*Phoebetria fusca*	Sooty albatross	V	V, Migratory, marine
40	*Phoebetria palpebrata*	Light-mantled sooty albatross	SL	Migratory, marine
41	*Pluvialis fulva*	PACIFIC golden plover	SL	Migratory, wetlands
42	*Pluvialis squatarola*	Grey plover	SL	Migratory, wetlands

Number	Scientific Name	Common Name	Listing under the NCA	Listing under the EPBC Act
43	*Procellaria aequinoctialis*	White-chinned petrel	SL	Migratory, marine
44	*Procellaria parkinsoni*	Black petrel	SL	Migratory, marine
45	*Procellaria westlandica*	Westland petrel	SL	Migratory, marine
46	*Pterodroma heraldica*	Herald petrel	CR	CE, Migratory, marine
47	*Pterodroma leucoptera leucoptera*	Gould's Petrel		E, Migratory, marine
48	*Pterodroma neglecta neglecta*	Kermadec petrel (western)		V, Migratory, marine
49	*Spatula querquedula*	Garganey	SL	Migratory, marine
50	*Stercorarius longicaudus*	Long-tailed jaeger	SL	Migratory, marine
51	*Stercorarius maccormicki*	South Polar skua	SL	Migratory, marine
52	*Stercorarius parasiticus*	Arctic jaeger	SL	Migratory, marine
53	*Stercorarius pomarinus*	Pomarine jaeger	SL	Migratory, marine
54	*Sterna dougallii*	Roseate tern	SL	Migratory, marine
55	*Sterna hirundo*	Common tern	SL	Migratory, marine
56	*Sterna sumatrana*	Black-naped tern	SL	Migratory, marine
57	*Sternula albifrons*	Little tern	SL	Migratory, marine
58	*Sternula nereis exsul*	New Caledonian fairy tern	E	Migratory, marine
59	*Sternula nereis nereis*	Australian fairy tern		V, Migratory, marine
60	*Thalassarche bulleri*	Buller's albatross	V	V, Migratory, marine
61	*Thalassarche carteri*	Indian yellow-nosed albatross	V	V, Migratory, marine
62	*Thalassarche cauta*	Shy albatross	E	V, Migratory, marine
63	*Thalassarche chrysostoma*	Grey-headed albatross	E	E, Migratory, marine
64	*Thalassarche impavida*	Campbell albatross		V, Migratory, marine
65	*Thalassarche melanophris*	Black-browed albatross	SL	V, Migratory, marine
66	*Thalassarche salvini*	Salvin's albatross		V, Migratory, marine
67	*Thalassarche steadi*	White-capped albatross		V, Migratory, marine
68	*Thalasseus bergii*	Crested tern	SL	Migratory, wetlands
69	*Tringa brevipes*	Grey-tailed tattler	SL	Migratory, wetlands
70	*Tringa glareola*	Wood sandpiper	SL	Migratory, wetlands
71	*Tringa incana*	Wandering tattler	SL	Migratory, wetlands
72	*Tringa nebularia*	Common greenshank	SL	Migratory, wetlands
73	*Tringa stagnatilis*	Marsh sandpiper	SL	Migratory, wetlands
74	*Tringa totanus*	Common redshank	SL	Migratory, wetlands
75	*Xenus cinereus*	Terek sandpiper	SL	Migratory, wetlands
Threatened Crustaceans (nine species)				

Number	Scientific Name	Common Name	Listing under the NCA	Listing under the EPBC Act
1	*Euastacus gumar*	Bloodclaw crayfish		E
2	*Euastacus jagabar*	Blue-black crayfish		CR
3	*Cherax robustus*	Sand yabby	V	V
4	*Euastacus binzayedi*	Embezee's crayfish	CR	CE
5	*Euastacus dalagarbe*	Mud gully crayfish	CR	CE
6	*Euastacus hystricosus*	Condondale spiny crayfish	E	
7	*Euastacus jagara*	Jagara hairy crayfish	CR	CE
8	*Euastacus maidae*	Hinterland spiny crayfish	CR	CE
9	*Tenuibranchiurus glypticus*	Swamp crayfish	E	
Marine Fish/shark (twelve species)				
1	*Pristis zijsron*	Green sawfish		V
2	*Carcharias taurus*	Grey nurse shark	E	CE
3	*Carcharodon carcharias*	White shark		V
4	*Epinephelus daemelii*	Black rockcod		V
5	*Galeorhinus galeus*	School shark		CD
6	*Hemitrygon fluviorum*	Estuary stingray	NT	
7	*Hippocampus whitei*	White's seahorse	E	E
8	*Rexea solandri (eastern Australian)*	Eastern gemfish		CD
9	*Rhincodon typus*	Whale shark		V
10	*Seriolella brama*	Blue warehou		CD
11	*Sphyrna lewini*	Scalloped hammerhead		CD
12	*Thunnus maccoyii*	Southern bluefin tuna		CD
Freshwater Fish (eight species)				
1	*Bidyanus bidyanus*	Silver perch		CE
2	*Maccullochella ikei*	Clarence River cod		E
3	*Maccullochella mariensis*	Mary River cod		E
4	*Maccullochella peelii*	Murray cod		V
5	*Mordacia praecox*	Non-parasitic lamprey		E
6	*Nannoperca oxleyana*	Oxleyan pygmy perch	E	E
7	*Neoceratodus forsteri*	Australian lungfish		V
8	*Pseudomugil mellis*	Honey blue eye	E	E
Insects (three species)				
1	*Argynnis hyperbius inconstans*	Australian fritillary	E	CE
2	*Ornithoptera richmondia*	Richmond birdwing	V	

Number	Scientific Name	Common Name	Listing under the NCA	Listing under the EPBC Act
3	*Phyllodes imperialis smithersi*	Pink underwing moth		E
Arboreal Mammals (eleven species)				
1	*Chalinolobus dwyeri*	Large-eared pied bat	E	V
2	*Hipposideros semoni*	Semon's leaf-nosed bat	E	V
3	*Macroderma gigas*	Ghost bat		V
4	*Nyctophilus corbeni*	Eastern long-eared bat	V	V
5	*Petauroides armillatus*	Central greater glider	E	E
6	*Petauroides volans*	Greater glider (southern & central)		E
7	*Petauroides volans sensu lato*	Greater glider	V	V
8	*Petaurus australis australis*	Yellow-bellied glider	V	V
9	*Phascolarctos cinereus*	Koala	E	E
10	*Pteropus poliocephalus*	Grey-headed flying-fox		V
11	*Taphozous australis*	Coastal sheathtail bat	NT	
Ground-dwelling Mammals (twelve species)				
1	*Antechinus argentus*	Silver-headed antechinus	E	E
2	*Antechinus arktos*	Black-tailed antechinus	E	E
3	*Dasyurus hallucatus*	Northern quoll		E
4	*Dasyurus maculatus maculatus*	Spotted-tailed quoll	E	E
5	*Notamacropus parma*	Parma wallaby		V
6	*Ornithorhynchus anatinus*	Platypus	SL	
7	*Petrogale penicillata*	Brush-tailed rock-wallaby	V	V
8	*Potorous tridactylus tridactylus*	Long-nosed potoroo	V	V
9	*Pseudomys novaehollandiae*	New Holland mouse	V	V
10	*Pseudomys oralis*	Hastings River mouse	E	E
11	*Tachyglossus aculeatus*	Short-beaked echidna	SL	
12	*Xeromys myoides*	Water mouse	V	V
Marine Mammals (eight species)				
1	*Arctocephalus tropicalis*	Subantarctic fur seal	V	E
2	*Balaenoptera borealis*	Sei whale		V
3	*Balaenoptera musculus*	Blue whale		E
4	*Balaenoptera physalus*	Fin whale		V
5	*Dugong dugon*	Dugong	V	
6	*Eubalaena australis*	Southern right whale		E
7	*Orcaella heinsohni*	Australian snubfin dolphin	V	

Number	Scientific Name	Common Name	Listing under the NCA	Listing under the EPBC Act
8	*Sousa sahulensis*	Australian humpback dolphin	V	
Snail (one species)				
1	*Thersites mitchellae*	Mitchell's Rainforest Snail		CR
Terrestrial Reptiles (sixteen species)				
1	*Anilios insperatus*	Fassifern blind snake	CR	CE
2	*Anilios silvia*	Striped blind snake	NT	
3	*Anomalopus mackayi*	Five-clawed worm-skink		V
4	*Coeranoscincus reticulatus*	Three-toed snake-tooth skink		V
5	*Delma torquata*	Collared delma	V	V
6	*Egernia rugosa*	Yakka skink	V	V
7	*Furina dunmalli*	Dunmall's snake	V	V
8	*Harrisoniascincus zia*	Rainforest cool-skink	V	V
9	*Hemiaspis damelii*	Grey snake	E	E
10	*Karma tryoni*	Tryon's skink	E	
11	*Lampropholis colossus*	Bunya sunskink	NT	
12	*Nangura spinosa*	Nangur skink	CR	CE
13	*Phyllurus caudiannulatus*	Ringed thin-tailed gecko	V	
14	*Phyllurus kabikabi*	Oakview leaf-tailed gecko	CR	CE
15	*Strophurus taenicauda*	Golden-tailed gecko	NT	
16	*Tympanocryptis condaminensis*	Condamine earless dragon		E
Freshwater Reptiles (two species)				
1	*Elseya albagula*	White-throated snapping turtle	CR	CE
2	*Elusor macrurus*	Mary River turtle	E	E
Marine Reptiles (seven species)				
1	*Caretta caretta*	Loggerhead turtle	E	E
2	*Chelonia mydas*	Green turtle	V	V
3	*Crocodylus porosus*	Estuarine crocodile	V	
4	*Dermochelys coriacea*	Leatherback turtle	E	E
5	*Eretmochelys imbricata*	Hawksbill turtle	E	V
6	*Lepidochelys olivacea*	Olive ridley turtle	E	E
7	*Natator depressus*	Flatback turtle	V	V

Table 16: *Healthy Land & Water biodiversity assets; Threatened flora within South East Queensland.*[3]

No.	Scientific Name	Common Name	Listing under the NCA	Listing under the EPBC Act
1	*Acacia attenuata*	Whipstick wattle	V	V
2	*Acacia baueri subsp. baueri*	Tiny wattle	V	
3	*Acacia eremophiloides*		V	V
4	*Acacia forsteri*	Forster's wattle	CR	
5	*Acacia grandifolia*	Null		V
6	*Acacia pedleyi*		V	
7	*Acacia saxicola*	Mt. Maroon wattle	E	
8	*Acacia sp. (Castletower N.Gibson TOI345)*		V	
9	*Acacia tingoorensis*		V	
10	*Acianthus saxatilis*		E	
11	*Acronychia littoralis*	Scented acronychia	E	E
12	*Actephila bella*		V	
13	*Aggreflorum luehmannii*		V	
14	*Alectryon ramiflorus*		E	E
15	*Allocasuarina emuina*	Mt. Emu she-oak	E	E
16	*Allocasuarina filidens*	Mt. Beerwah she-oak	V	
17	*Allocasuarina rigida subsp. exsul*		V	
18	*Allocasuarina thalassoscopica*	Mt. Coolum she-oak	E	E
19	*Antrophyum austroqueenslandicum*	Border Ranges Lined Fern		CE
20	*Apatophyllum olsenii*		E	V
21	*Aponogeton elongatus subsp. fluitans*		V	
22	*Archidendron lovelliae*	Bacon wood	V	V
23	*Arthraxon hispidus*		V	V
24	*Arthraxon hispidus var. hispidus*		V	
25	*Arundinella grevillensis*		V	
26	*Astonia australiensis*		E	
27	*Atalaya collina*		E	E

[3] *NCA Status under *Nature Conservation Act 1992*: CR: Critically endangered, E: Endangered, V: Vulnerable, NT: Near threatened

*EPBC Status under the *Environment Protection and Biodiversity Conservation Act 1999*: CE: Critically endangered, E: Endangered, V: Vulnerable, CD: Conservation dependent

28	*Backhousia oligantha*		CR	
29	*Baloghia marmorata*	Jointed baloghia	V	V
30	*Banksia conferta*		V	
31	*Bertya ernestiana*		V	V
32	*Bertya glandulosa*		V	
33	*Bertya opponens*	null		V
34	*Bertya pinifolia*		V	V
35	*Blandfordia grandiflora*	Christmas bells	E	
36	*Boronia grimshawii*	Grimshaw's boronia	CR	
37	*Boronia keysii*	Key's boronia	V	V
38	*Bosistoa transversa*	Three-leaved Bosistoa		V
39	*Bothriochloa bunyensis*	Bunya Mountains bluegrass	V	V
40	*Brachychiton sp. (Ormeau L.H.Bird AQ435851)*	Ormeau bottle tree	CR	CE
41	*Brachychiton sp. Ormeau*	Ormeau Bottle Tree		CE
42	*Brachyscome ascendens*	Binna Burra daisy	V	
43	*Bulbophyllum argyropus*		V	
44	*Bulbophyllum globuliforme*	Miniature Moss-orchid, Hoop Pine Orchid		V
45	*Bulbophyllum weinthalii*	Blotched bulbophyllum	V	
46	*Bulbophyllum weinthalii subsp. striatum*		V	
47	*Bulbophyllum weinthalii subsp. weinthalii*		V	
48	*Cadellia pentastylis*	Ooline		V
49	*Callistemon pungens*	null		V
50	*Calyptochloa gracillima subsp. ipsviciensis*		CR	
51	*Carex breviscapa*		V	
52	*Cassia marksiana*		V	
53	*Cassinia collina*		V	
54	*Caustis blakei subsp. macrantha*		V	
55	*Chiloglottis sphyrnoides*		V	
56	*Clematis fawcettii*		V	V
57	*Coleus acariformis*	Mt Emu mint bush	E	
58	*Coleus habrophyllus*		E	E
59	*Coleus leiperi*		V	V
60	*Coleus nitidus*		E	E

61	*Coleus omissus*		E	E
62	*Coleus torrenticola*		E	E
63	*Commersonia leiperi*	Leiper's commersonia	E	
64	*Coopernookia scabridiuscula*	Coopernookia	V	V
65	*Corchorus cunninghamii*		E	E
66	*Corokia whiteana*	Null		E
67	*Corunastylis cranei*		V	
68	*Corybas montanus*	Small helmet orchid	V	V
69	*Corynocarpus rupestris subsp. arborescens*	Southern corynocarpus	V	
70	*Cossinia australiana*		E	E
71	*Croton lucens*		CR	
72	*Croton mamillatus*	Bahrs scrub croton	CR	
73	*Cryptocarya foetida*	Stinking cryptocarya	V	V
74	*Cryptostylis hunteriana*	Leafless Tongue-orchid		V
75	*Cupaniopsis shirleyana*	Wedge-leaf tuckeroo	V	V
76	*Cupaniopsis tomentella*	Boonah tuckeroo	V	V
77	*Cycas megacarpa*		E	E
78	*Cynanchum elegans*	White-flowered Wax Plant		E
79	*Cyperus clarus*		V	
80	*Cyperus rupicola*		V	
81	*Cyperus semifertilis*		V	V
82	*Davidsonia jerseyana*	Davidson's Plum		E
83	*Davidsonia johnsonii*	Smooth davidsonia	E	E
84	*Daviesia discolor*		V	V
85	*Denhamia parvifolia*		V	V
86	*Dichanthium queenslandicum*	King Blue-grass		E
87	*Dichanthium setosum*	Bluegrass		V
88	*Diospyros mabacea*	Red-fruited Ebony, Silky Persimmon, Ebony		E
89	*Diploglottis campbellii*	Small-leaved tamarind	E	E
90	*Diuris curta*		E	
91	*Diuris parvipetala*		V	
92	*Dodonaea rupicola*		V	V
93	*Drynaria x dumicola*		V	
94	*Elaeocarpus williamsianus*	Hairy Quandong		E

95	*Eleocharis difformis*		E	
96	*Endiandra floydii*	Floyd's Walnut, Crystal Creek Walnut		E
97	*Endiandra hayesii*	Rusty rose walnut	V	V
98	*Endiandra wongawallanensis*		E	
99	*Eucalyptus argophloia*	Queensland western white gum	CR	V
100	*Eucalyptus conglomerata*	Swamp stringybark	E	E
101	*Eucalyptus dunnii*	Dunn's white gum	V	
102	*Eucalyptus glaucina*	Slaty Red Gum		V
103	*Eucalyptus hallii*	Goodwood gum	V	V
104	*Eucalyptus kabiana*	Mt. Beerwah mallee	V	V
105	*Eucalyptus taurina*	Helidon ironbark	E	
106	*Eucalyptus virens*	Shiny-leaved ironbark	V	V
107	*Eucryphia jinksii*	Springbrook leatherwood	CR	
108	*Euphrasia bella*	Lamington eyebright	E	V
109	*Fawcettia tinosporoides*		V	
110	*Fimbristylis vagans*		E	
111	*Floydia praealta*	Ball nut	V	V
112	*Fontainea australis*	Southern fontainea	V	V
113	*Fontainea rostrata*		V	V
114	*Fontainea venosa*		V	V
115	*Gaultheria viridicarpa*	Green waxberry	E	E
116	*Germainia capitata*		V	V
117	*Gonocarpus effusus*		V	
118	*Gonocarpus hirtus*		V	
119	*Gossia fragrantissima*		E	E
120	*Gossia gonoclada*		CR	E
121	*Gossia inophloia*		CR	
122	*Graptophyllum ilicifolium*	Holly-leaved graptophyllum	V	V
123	*Graptophyllum reticulatum*	Reticulated holly	E	E
124	*Grevillea glossadenia*		V	V
125	*Grevillea hodgei*	Coochin Hills grevillea	CR	CE
126	*Grevillea linsmithii*		E	
127	*Grevillea quadricauda*		V	V
128	*Grevillea venusta*	Grevillea	V	
129	*Gyrostemon osmus*		CR	

130	*Habenaria harroldii*		E	
131	*Haloragis exalata subsp. velutina*		V	V
132	*Helicia ferruginea*	Rusty oak	V	
133	*Hicksbeachia pinnatifolia*	Red bopple nut	V	V
134	*Jasminum jenniae*		E	
135	*Lagenophora fimbriata*		V	
136	*Lasiopetalum sp. (Proston J.A.Baker 17)*	Proston velvet bush	E	CE
137	*Lastreopsis silvestris*		V	
138	*Leichhardtia coronata*		V	
139	*Leichhardtia longiloba*		V	V
140	*Leionema beckleri*		E	
141	*Leionema gracile*		V	
142	*Leionema obtusifolium*		V	V
143	*Lenwebbia sp. (Blackall Range P.R.Sharpe 5387)*		E	
144	*Lenwebbia sp. (Main Range P.R.Sharpe+ 4877)*	Main Range lenwebbia	CR	CE
145	*Lenwebbia sp. Main Range*	Null		CE
146	*Lepiderema pulchella*	Fine-leaved tuckeroo	V	
147	*Lepidium peregrinum*	Wandering Pepper-cress		E
148	*Leptospermum barneyense*		V	
149	*Leptospermum oreophilum*		V	
150	*Leuzea australis*		V	V
151	*Lilaeopsis brisbanica*		E	
152	*Lychnothamnus barbatus*		V	E
153	*Macadamia integrifolia*	Macadamia nut	V	V
154	*Macadamia jansenii*		CR	E
155	*Macadamia ternifolia*	Bopple nut	V	V
156	*Macadamia tetraphylla*		V	V
157	*Macrozamia cardiacensis*		V	
158	*Macrozamia lomandroides*		E	E
159	*Macrozamia parcifolia*		V	V
160	*Macrozamia pauli-guilielmi*		E	E
161	*Mallotus megadontus*		V	
162	*Maundia triglochinoides*		V	
163	*Medicosma elliptica*		V	V

164	*Melaleuca irbyana*		E	
165	*Melaleuca williamsii subsp. fletcheri*		V	V
166	*Micromyrtus vernicosa*		V	
167	*Myrsine serpenticola*		E	
168	*Niemeyera whitei*		V	
169	*Notelaea ipsviciensis*	Cooneana olive	CR	CE
170	*Notelaea lloydii*	Lloyd's native olive	V	V
171	*Notelaea x ipsviciensis*	Cooneana Olive		CE
172	*Ochrosia moorei*	Southern ochrosia	E	E
173	*Olearia hygrophila*	Swamp daisy	E	E
174	*Owenia cepiodora*	Onion cedar	V	V
175	*Ozothamnus vagans*		V	V
176	*Pakau pennigera*		E	
177	*Parsonsia kroombitensis*		V	
178	*Parsonsia larcomensis*		V	V
179	*Parsonsia largiflorens*		E	
180	*Parsonsia sankowskyana*		E	
181	*Parsonsia tenuis*	Slender silkpod	V	
182	*Paspalidium grandispiculatum*		V	V
183	*Persicaria elatior*		V	V
184	*Phaius australis*		E	E
185	*Phaius bernaysii*	Yellow swamp orchid	E	E
186	*Phebalium distans*	Mt Berryman phebalium	E	E
187	*Philotheca obovatifolia*		V	
188	*Phlegmariurus varius*		V	
189	*Phyllanthus sp. (Bulburin P.I.Forster+ PIF16034)*		V	
190	*Picris conyzoides*		V	
191	*Picris evae*		V	V
192	*Planchonella eerwah*		E	E
193	*Podolepis monticola*	Mountain podolepis	V	
194	*Polianthion minutiflorum*		V	V
195	*Pomaderris clivicola*		E	V
196	*Pomaderris coomingalensis*		E	
197	*Pomaderris crassifolia*		V	
198	*Pomaderris notata*		V	

199	*Prasophyllum wallum*	Wallum leek orchid	V	V
200	*Prostanthera spathulata*		V	V
201	*Pterostylis bicornis*	Horned greenhood	V	V
202	*Pterostylis chaetophora*		E	
203	*Pterostylis scoliosa*		E	
204	*Pultenaea whiteana*	Mt. Barney bush pea	V	
205	*Randia moorei*	Spiny gardenia	E	E
206	*Rhaponticum australe*	Austral Cornflower, Native Thistle		V
207	*Rhizanthella omissa*		E	
208	*Rhodamnia angustifolia*	Narrow-leaved malletwood	CR	CE
209	*Rhodamnia dumicola*	Rib-fruited malletwood	E	
210	*Rhodamnia maideniana*	Smooth scrub turpentine	CR	CE
211	*Rhodamnia rubescens*	Scrub turpentine	CR	CE
212	*Rhodamnia whiteana*	White malletwood	E	
213	*Rhodomyrtus psidioides*	Native guava	CR	CE
214	*Ricinocarpos speciosus*		V	
215	*Romnalda strobilacea*		V	V
216	*Samadera bidwillii*	Quassia	V	V
217	*Sarcochilus fitzgeraldii*	Ravine orchid	E	V
218	*Sarcochilus hartmannii*		V	V
219	*Sarcochilus weinthalii*	Blotched sarcochilus	E	V
220	*Scleromitrion gibsonii*		E	
221	*Selaginella andrewsii*	Tallebudgera spikemoss		V
222	*Solanum callium*	Brush nightshade	V	
223	*Solanum mentiens*		E	
224	*Sophora fraseri*	Brush sophora	V	V
225	*Sowerbaea subtilis*		V	
226	*Styphelia recurvisepala*		E	
227	*Styphelia sp. (Coolmunda D.Halford Q1635)*		E	E
228	*Symplocos baeuerlenii*	Small-leaved hazelwood	V	V
229	*Syzygium hodgkinsoniae*	Red lilly pilly	V	V
230	*Syzygium moorei*	Durobby	V	V
231	*Tetramolopium vagans*		V	
232	*Thelypteris confluens*		V	
233	*Thesium australe*	Toadflax	V	V

234	*Triunia robusta*		E	E
235	*Uromyrtus lamingtonensis*		V	
236	*Vincetoxicum woollsii*		E	E
237	*Wahlenbergia scopulicola*		V	
238	*Westringia grandifolia*		E	
239	*Westringia rupicola*		V	V
240	*Westringia sericea*	Native rosemary	V	
241	*Xanthostemon oppositifolius*	Southern penda	V	V
242	*Zieria bifida*		E	E
243	*Zieria boolbunda*	Boolbunda stink bush	CR	
244	*Zieria collina*		V	V
245	*Zieria exsul*	Banished stink bush	CR	CE
246	*Zieria gymnocarpa*		CR	
247	*Zieria inexpectata*		E	
248	*Zieria montana*	Mt Barney stink bush	CR	
249	*Zieria scopulus*	Flinders Peak stink bush	CR	
250	*Zieria verrucosa*		V	V

This table (***Table 17***) provides an abbreviated summary of biodiversity assets-threatened communities and species and the descriptions of the types of threats posed by hazard category.

Table 17: *Healthy Land & Water biodiversity asset summary and threats posed by hazards or events.*

Asset	Hazard category	Why it poses a threat
Gondwana Rainforests of Australia - World Heritage Area	Bushfire (and/or inappropriate fire regimes)	Climate change, through increased severity fires and disturbance to ecotones and fringing habitats, has been identified as a threat to the integrity of the Gondwana Rainforests WHA. Severe fires to ecotones and fringing habitats alter species and ecosystem composition, increase chances of biosecurity risk and establishment of weeds and pest animals.
	Increased temperatures	Changes in temperature, rainfall and relative humidity on both the high-elevation forests in the Gondwana Rainforests are projected to impact the WHA. One of the implications of these changes includes the shift of cloud base height anticipated within the WHA which is believed to supply the ecosystems ~40% of their annual moisture content (Narsey et al. 2020).
	Drought	Even small climatic changes, including those induced by drought, could change the distribution patterns of many endemic species and vegetation communities, particularly high-altitude species and vegetation communities with particular thermal and moisture tolerances (QLD Govt, 2020).
	Floods	Gondwana Rainforest of SEQ was not impacted as severely as NSW during the 2022 floods. Indirect impacts are generally incurred through heavy rainfall rather than flooding/inundation.

Asset	Hazard category	Why it poses a threat
	Severe storm events	Increasing damages to old-growth vegetation can shift the ecological structure of the WHA during recovery (increases recruitment of weed species and invasive pests). Treefall also poses a threat to impact assessors post-event. Create physical impacts on the structure and composition of vegetation and subsequently fauna habitat and species composition.
	Biosecurity outbreak	Introduced pathogens can result in broader ecological impacts within the rainforest ecosystem. Pathogens currently threaten the values of the property (flora, fauna and ecological communities). Including: • Phytophthora species (a soil-borne water mould which infects the roots of plants). • *Batrachochytrium dendrobatidis* (fungus which causes chytridiomycosis in frogs). • *Psittacine circoviral* (beak and feather) disease infecting parrots. • *Australianropuccinia psidii* (fungal disease, myrtle rust) poses a significant long-term threat to the Gondwana Rainforests through changing species composition, reducing biodiversity and can result in extinction of some native species (i.e. *Rhodamnia* sp.). Changes in competition from weed species and impacts from pest animal species to associated wildlife also pose a threat. • Emerging threats from fire ants have the potential to displace or eliminate ground dwelling animals associated with Gondwana Rainforest including insects, spiders, lizards, frogs, birds and mammals. This species is spread during floods.
Glass House Mountains National Landscape - National Heritage Area	Bushfire (and/or inappropriate fire regimes)	This area is prone to bushfires due to the nature of the vegetation. Threatened flora species occupy the montane habitats within the Glass House Mountains. Inappropriate fire regimes have already impacted this landscape, and further threaten the persistence of threatened species reliant on it. Weed species are present and influence fire behaviour (i.e. red natal grass and molasses grass).
	Floods	Floods may incur removal or erosion of habitat, channel alterations, and create changes to water quality or flows and catchment changes. Threatened species that reside within GHM NHA (i.e. frog species) are susceptible to these changes.
	Severe storm events	Increased damages to vegetation communities and displacement of species. Treefall also poses a threat to impact assessors post-event. Damage may shift the ecological structure of the NHA and increase weed species and invasive pest presence and competition with native and threatened species.
	Biosecurity	Several introduced pest animals and pathogens threaten the values of the property (threatened flora, fauna, ecological communities and potentially cultural heritage). Changes in competition from weed species and impacts from pest animal species to associated wildlife also pose a threat.
Moreton Bay Ramsar Wetland (MBRW)	Bushfire (and/or inappropriate fire regimes)	Localities within the Ramsar site have a higher susceptibility to bushfire impacts, such as Minjerribah. Displacement and impacts on threatened wildlife, loss of threatened flora, changes in the structure of vegetation communities. Damage and/or loss of cultural heritage values (Ramsar criteria).
	Floods	Extreme weather events (such as the major floods of 1974, 2011 and 2022) can lead to increased loads of sediment and nutrients delivered to the bay, impacting on seagrasses, ecosystems (i.e. seagrass) and threatened species in the Bay (i.e. dugongs).
	Heatwaves/ droughts	Changes in weather patterns and rainfall may increase the frequency and intensity of fires. Prolonged heat can create changes to water quality or flows and

Asset	Hazard category	Why it poses a threat
		catchment changes. Threatened species (i.e. acid frogs), and migratory bird species will show varying levels of impacts incurred through these events.
	Sea level rise	Due to the coastal nature of the Moreton Bay Ramsar Wetland, it will be subject to sea level rises. Modelling based on higher sea level rise scenarios is estimated to potentially lead to a 4% to 31% loss of the current area of protected wetlands in southern Moreton Bay due to inundation (ibid). Current and projected rises in temperature and sea level from climate change can cause severe threats to coastal ecosystems via seawater intrusion into the freshwater aquifer, changes to the distribution and extent of wetlands, and contribution towards landward retreat, transgression by mangroves, fragmentation and loss of habitat or function for threatened, or migratory species.
	Biosecurity	Several introduced pest animals and pathogens threaten the values of the property (flora, fauna and ecological communities). The current presence of pest species (feral cats, pigs and foxes) within Moreton Bay Ramsar Wetland currently impacts wildlife and coastal habitats. Further intrusion or lack of action will result in broader ecological impacts within the structure of the ecosystems.
Subtropical and Temperate Coastal Saltmarsh Threatened Ecological Community (TEC)	Bushfire (and/or inappropriate fire regimes)	Coastal saltmarsh vegetation is not well fire-adapted and fire. Invasive problem species (e.g. *Juncus acutus* and *Baumea juncea*) may have highly flammable fuel loads, putting Coastal Saltmarsh at risk.
	Climate change – sea level rise	Sea level rise will contribute to landward retreat, transgression by mangroves, fragmentation and loss of habitat or function. Current and projected rises in temperature and sea level and increased storm events from climate change are considered severe threats to coastal saltmarsh.
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland Threatened Ecological Community (TEC)	Bushfire (and/or inappropriate fire regimes)	Inappropriate fire regimes (i.e. higher intensity, more frequent intervals) threaten the functionality and resilience of this TEC. TEC the ecological community more vulnerable to damage during periods of stress, such as droughts or wildfires.
	Floods / severe storms and heavy rainfall	Increased storm surges and sea level rise threaten low lying coastal communities. Low lying communities are impacted by inundation during storm surges and higher tides are increasing the potential for dieback from increased salinity.
	Biosecurity	Myrtle rust may pose threats to *Myrtaceae* species within TEC. Myrtle rust (*Austalianropuccinia psidii*) is known to infect several canopy species, notably the dominant paperbark species. Infections are more acute after prior disturbance from clearing or fire (Pegg et al. 2017; Pegg et al. 2018; Makinson et al. 2020; Pegg et al. 2020);
	Heatwaves/ droughts	Climate change is likely to intensify drought events (Dai 2012; Mitchell et al. 2016), which increases the potential for water being diverted away from the ecological community for consumptive use in response to water sharing arrangements.
Brigalow (*Acacia harpophylla* dominant and co-dominant) Threatened Ecological Community (TEC)	Bushfire (and/or inappropriate fire regimes)	Fire is the second highest threat to Brigalow. Fire becomes a serious threat to this TEC where fuel characteristics have been changed (i.e. presence of high biomass grasses). If climate change results in increasing temperatures and lower and more erratic rainfall it is probable that unplanned, high-intensity fires will become a greater threat throughout the Brigalow Belt.

Asset	Hazard category	Why it poses a threat
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Threatened Ecological Community (TEC)	Bushfire (and/or inappropriate fire regimes)	Fire can open up forests to weeds and cause structural and species change. Increased ignition sources from nearby urban areas, and climate change resulting in dryer conditions increase the likelihood of high-intensity fire.
Dunn's white gum (*Eucalyptus dunnii*) moist forest in north-east New South Wales and SEQ Threatened Ecological Community (TEC)	Bushfire (and/or inappropriate fire regimes)	If Dunn's white gum moist forest undergoes frequent and/or severe fires, stands of the ecological community may be lost, undergoing a transition to an open, grassy or woody sclerophyll dominated understorey.
Swamp Tea-tree (*Melaleuca irbyana)* Forest of SEQ Threatened Ecological Community (TEC)	Bushfire (and/or inappropriate fire regimes)	This ecosystem requires fire. However, it is hypothesised that high-intensity fire could lead to localised extinction (Vickers 2004).
	Floods/severe storms and heavy rainfall	This ecosystem benefits from flooding, however, it is hypothesised that extreme flooding could lead to localised extinction (Vickers 2004).
Lowland Rainforest of Subtropical Australia	Floods/severe storms and heavy rainfall	No information is listed in the conservation advice.
	Bushfire (and/or inappropriate fire regimes)	Climate change, through increased severity fires and disturbance to ecotones and fringing habitats. Severe fires to ecotones and fringing habitats alter species and ecosystem composition, increase chances of biosecurity risk and establishment of weeds and pest animals. 2019-20 Bushfires impacted this ecosystem causing major structural changes in fringing habitats.
	Biosecurity	EPBC Act listed Key Threatening Processes that are considered relevant to this TEC include predation by European red fox, loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants and the biological effects, including lethal toxic ingestion, caused by cane toads (*Rhinella marina*) (DCCEEW, 2024).
Coastal Swamp Oak *(Casuarina glauca)* Forest of New South Wales and SEQ ecological community	Bushfire (and/or inappropriate fire regimes)	High-intensity or frequent fires may slow or prevent regeneration and lead to lower species richness. High-intensity fires may kill trees and fauna and lead to whipstick regeneration (Queensland Herbarium, 2016). Endangered plants within the ecological community that are most likely to be affected by fire include the endangered southern swamp orchid (*Phaius australis*) (Office of Environment and Heritage, 2017d).
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Major biosecurity incidents (e.g. pests, disease)	The following have been listed as key threats to this TEC: • Canopy dieback resulting from Armillaria spp. (honey fungus). • Myrtle rust (*Austalianropuccinia psidii*). • Dieback caused by Phytophthora cinnamomic. • Psittacine beak and feather disease (*Psittacine circoviral* disease).
	Bushfire (and/or inappropriate fire regimes)	In some areas, high-intensity or too frequent fires may slow or prevent regeneration of some species in the ecological community and lead to lower species richness. Sustained high frequency fire will lead to a loss of eucalypts and other plant species, a reduction in vegetation structure and a corresponding loss of animal species in the ecological community (NSW OEH 2017c). Mega-fires, such as those experienced in the 2019–2020 fire season, can burn a significant proportion of an ecological community and the surrounding vegetation in a single event, which compounds these detrimental impacts. Almost 15% of the

Asset	Hazard category	Why it poses a threat
		ecological community was burnt in 2019–20, based on the Australian Google Earth Engine Burnt Area Map (DAWE 2020b).
Poplar Box Grassy Woodland on Alluvial Plains	Flood	Causes alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands. Situated on alluvial plains, subject to clearing, erosion, and poor land practices.
	Bushfire (and/or inappropriate fire regimes)	More intense and frequent fires, as a result of introduced grasses for grazing, can substantially reduce the understorey diversity within the Poplar Box Grassy Woodland and further their spread into the ecological community.
	Biosecurity	Dieback is caused by the root-rot fungus (*Phytophthora cinnamomi*). More information and research required as per the conservation advice.
Threatened birds listed under the EPBC (25 species)	Biosecurity outbreak	Bird flu - HPAI can cause mass mortalities in many species of wild birds as well as other non-avian wildlife species and may represent a population level threat to some wildlife hosts, impacting biodiversity (Wildlife Health Australia, 2024). More information is required to understand the full potential impact of this virus now that it has been detected in Australia.
	Bushfire (and/or inappropriate fire regimes)	Fires can have devastating consequences on bird species distribution, modifying the structure and composition of natural assemblages, and decreasing nesting success (Cahill and Walker 2000). Fires can cause direct mortality, degradation or loss of habitat, disruption of life cycles, increased exposure to predators, extremes of temperature and dehydration and exacerbate impacts of other threats.
	Drought	Climate change, involving drier conditions, particularly prolonged sequences of drought has been linked to influenced breeding seasons, and potential impairment of reproductive capacity (TSSC, 2014). Drier conditions may also cause a contraction in range to core areas of wetter high-altitude habitat (TSSC, 2024).
	Heatwaves/ increased temperatures	Heatwaves linked to climate change have already led to mass deaths of birds around the world. Studies conducted by CSIRO found that birds within study sites died at rates three times greater during a very hot summer compared to a mild summer, with eggs and nestlings more susceptible to heat (CSIRO, 2022).
	Floods/severe storms and heavy rainfall	Temporary inundation and/or storm surges of habitat during events. Floods can have both beneficial and detrimental effects on aquatic bird reproduction and survival, through depositing of sediment and nutrients within the intertidal zones and alteration of benthic systems. Birds in the Clarence Valley and Northern Rivers area in Northern NSW had been found suffering from malnutrition while baby birds washed out of nests after floods (Wires 2011).
Threatened/ migratory and/or marine waders and shorebirds (75 species)	Climate change – sea level rise	Increased sea levels are projected to inundate and impact on crucial foraging and high-tide roosting areas for the migratory shorebirds and wading birds within the Bay. Foraging and high-tide roosting areas are also incurring pressure through coastal squeeze and limited areas to restore this habitat.
	Biosecurity outbreak	Introduced predatory animals; foxes and cats, directly impact on species populations that are not historically adapted to defending themselves. Pests such as pigs degrade habitat. Introduced weed species modify ecosystems. Collective impacts and increased predation have been shown to further drive species closer to extinction. Bird flu - HPAI can cause mass mortalities in many species of wild birds as well as other non-avian wildlife species and may represent a population level threat to some wildlife hosts, impacting biodiversity.

Asset	Hazard category	Why it poses a threat
Threatened insects (three species)	Biosecurity outbreak	Impacts on host plants for these insects occur from weed invasion, and on occasion, trampling by livestock. The survival of insects is dependent on host plants and can be threatened through the introduction of 'look alike' invasive species, such as the Dutchman's pipe vine which looks similar to the host plant of Richmond birdwing butterfly. However, is lethal to the species (DAF, 2016).
	Drought/ heatwaves	May have resulted in the reduction of abundance in larval plant foods (i.e. arrowhead violet depended upon by the Australasian fritillary).
	Floods / Storms	May incur impacts to host plants through degradation or erosion of host plants.
Threatened, or migratory marine mammals (seven species)	Floods	Increased sediment and nutrient loads into the Bay may impact marine species composition and food sources, such as that dependent on seagrass (UQ, 2011). Marine mammals in the Moreton Bay waters are likely to be exposed to pollution and high nutrient loads during their time in these waters. However, the implication of this is largely unknown (Townsend et al. 2019).
	Warmer temperatures and ocean acidification	Significant changes in the Southern Ocean may alter ecosystem trophic interactions and reduce prey availability. Ocean acidification anticipated to affect the calcium carbonate structure of animals at the base of the food web.
Threatened upland, stream-dwelling amphibians (six species)	Biosecurity outbreak	*Batrachochytrium dendrobatidis* — a fungus that causes chytridiomycosis (chytrid) in frogs is fatal to certain frog species. Chytrid is believed to be responsible for the recent decline and extinction of several rainforest frogs (Daszak et al. 2003). It is listed as a key threatening process under the EPBC Act. Habitat is often degraded by feral species (pigs and cattle) and the presence of weed species.
	Drought/ heatwaves	During drought conditions, smaller streams typically used by the species for breeding are no longer suitable, due to reduced flow rates (Mahony 1993). Can cause extremes of temperature and dehydration and exacerbate impacts of other threats (Hunter et al. 2011).
	Bushfire	Localised extirpation of frogs has been observed through wildfire events, particularly to species restricted to the upper topsoil and leaf litter which provides little protection during fires. Chronic ash and sediment can also cause low aquatic oxygen levels (NESP TSRH 2021).
	Floods/severe storms and heavy rainfall	Floods can erode streams, impact local hydrology, increase pH and impact stream-frogs.
Threatened 'Acid' amphibians (four species)	Drought/ heatwaves	Risk may arise from longer periods of heat and drought, which, if impact on moist refuge they depend on will reduce their ability to recover following fires (Meyer et al. 2006).
	Bushfires	Acid frogs are generally adapted well to bushfire prone habitats and studies have shown resilience following moderate intensity fires. An increase in the frequency or intensity of fires could however impact significantly on frog numbers through direct mortality or loss of vegetation, the loss of cover exposing frogs to predators, extremes of temperature and dehydration (Meyer et al. 2006).
	Floods/severe storms and heavy rainfall	Floods can erode streams, impact local hydrology, increase pH and nutrients and introduce exotic fish which cause disturbance. Increased permanence of water can lead to the establishment of predatory fish in otherwise fish-free ephemeral swamps (Meyer et al. 2006). Pollutants from runoff into ephemeral habitats have been linked to the mortality of acid frogs (Filer et al. 2019).
	Sea level rise	In the longer term, predicted rises in sea levels with global warming could also bring about habitat loss on both the mainland and offshore sand islands, including the loss of habitat in conservation reserves (Meyer et al. 2006).

Asset	Hazard category	Why it poses a threat
	Biosecurity outbreak	Predation of eggs and larvae by introduced fish (i.e. mosquito fish, *Gambusia holbrooki)* impacts acid frogs in SEQ (Meyer et al. 2006). *Batrachochytrium dendrobatidis* which causes chytridiomycosis in frogs is fatal to certain frog species. However, this is a knowledge gap that needs to be addressed for acid frogs.
Threatened crustaceans (nine species)	Drought/ heatwave	In the context of increased severity and frequency of extreme weather events, drought is considered a potential severe impact on freshwater crayfish. Severe drought is potentially impactful for a species that relies on groundwater-fed wetlands (TSSC, 2023). Severe drought is a potential driver of habitat and population loss for coastal species (i.e. *C. robustus)* and species dependent on wallum habitat which is connected to groundwater.
	Increased temperatures	Long-term irreversible temperatures are expected to push higher-altitude crayfish to their upper limits within streams. Projected increase in temperatures may also lower local water tables and increase seasonality of streams that the species occupy (DCCEEW, 2023).
	Storms/floods	High rainfall events leading to flash floods can scour high-altitude streams and this can be fatal to any *Euastacus* that seek refuge under leaves/fallen palm fronds (DCCEEW, 2023).
	Bushfires	Crayfish species from cooler climates or high-altitude populations are at greater risk from bushfire-induced changes to aquatic thermal and oxygen levels than are more broadly distributed and/or lowland species (NESP TSRH, 2021).
Threatened freshwater fish (12 species)	Floods, storms	Floods can lead to breaking of creek banks as well as lead to decline in extent and quality of suitable habitat for freshwater or wetland-dependent species (i.e. honey blue eye) (DCCEEW, 2023).
	Bushfires	The processes by which fire impacts freshwater habitats are complex and depend on the characteristics of the fire event. However, risks to freshwater fish include siltation and deoxygenation of habitat following fires and siltation events (DCCEEW, 2023).
	Drought	Prolonged drought conditions prior to fire can exacerbate the effect of fire on freshwater species by facilitating more severe fires and allowing them to become more widespread (Climate Council, 2019).
	Sea level rise	Freshwater fish dependent on coastal freshwater wetlands (i.e. honey blue eye) may be impacted by sea level rise and influenced groundwater recharge in the future (DCCEEW, 2023).
	Invasive species impacts	Introduced species can compete for habitat and food, predate on native fish, behave aggressively and disturb plant beds, impacting native fish populations (DAF, 2024).
	Temperature extremes	Temperature extremes have the potential to influence or prohibit spawning cycles of freshwater fish and are recognised as a threat to species such as the honey blue eye (DCCEEW, 2023).
Threatened arboreal mammals (11 species)	Bushfires/ inappropriate fire regimes	Can cause direct mortality, degradation or loss of habitat, disruption of life cycles, increased exposure to predators, extremes of temperature and dehydration and exacerbate impacts of other threats.
	Increased temperatures/ heatwaves	Increased frequency, intensity and duration of heatwaves are predicted in Australia, and have the potential to increase the chances of mass mortality associated with extreme heat (JCU, 2024), including koalas and species of flying fox, as seen in SEQ in 2014.
	Drought	Drought poses significant risk to mammals that are susceptible to heat stress and dehydration, such as koalas (DES, 2020).

Asset	Hazard category	Why it poses a threat
		Arboreal folivores are particularly vulnerable to the impacts of extreme climate change-driven heatwaves and droughts as they rely on leaf moisture content for survival (NIV, 2019). Mammals that predate on insects (such as microbats) have the potential to be impacted through drought conditions disrupting abiotic conditions and subsequent insect reproductive cycles (DCCEEW, 2023).
	Storms	Severe storms can greatly modify habitat of arboreal folivores through destruction of forest canopy, up-rooting of mature and habitat trees, and through reducing the structural integrity of vegetation.
	Floods	Flood water can inundate and destroy habitat, physically displacing animals and increasing competition for dry ground. Flood events at the scale seen in 2022 floods resulted in 'waterlogged' and unwell mammals (including koalas) coming into care for treatment.
Threatened ground-dwelling mammals (13 species)	Biosecurity outbreak	Introduced predatory animals; foxes and cats, directly impact species populations that are not historically adapted to defending themselves. Pests such as pigs degrade habitat. Introduced weed species modify ecosystems and compete with native plants which provide food resources for native species. Collective impacts and increased predation have been shown to further drive species closer to extinction,
	Bushfires/ inappropriate fire regimes	Bushfires can cause mortality of medium-sized marsupials directly via high temperatures, toxic effects of smoke and oxygen depletion (Whelan et al. 2002), or indirectly via starvation and predation (McGregor et al. 2014; Hradsky 2020). Intense fires can also cause degradation or loss of habitat, disruption of life cycles, increased exposure to predators, extremes of temperature and dehydration and exacerbate impacts of other threats.
	Floods/severe storms and heavy rainfall	Displacement, erosion of habitat. Prolonged, frequent and/or extreme inundation of habitat (such as in water mouse habitat) is likely to result in high rates of mortality and localised declines and extirpations.
	Sea level rise	Species such as water mouse are at high risk of significant and ongoing declines due to rapid inundation of mangroves and other coastal habitats as sea levels rise with the progression of climate change (DCCEEW, 2022).
Threatened terrestrial reptiles (16 species)	Bushfires/ inappropriate fire regimes	Can cause direct mortality, degradation, or loss of habitat or refugia, disruption of life cycles, increased exposure to predators and exacerbate impacts of other threats (i.e. predation by feral cats and foxes). Inappropriate fire regimes are identified as threatening processes to many of these species as per their conservation advice.
	Floods/severe storms and heavy rainfall	Many of these species currently reside within niche habitats or microclimates and are highly susceptible to further disturbance.
	Biosecurity outbreak	Introduced predatory animals; foxes and cats, directly impact species populations.
Threatened marine reptiles (six species of marine turtles)	Floods	Marine turtles have temperature dependent sex determination, and flooding (and flooding-caused erosion) may impact temperature thresholds for successful incubation.
	Sea level rise	Sea level rise in Australia may reduce sea turtle nesting sites and incur further reduced availability of nesting sites which are already squeezed between human infrastructure and shorelines.
	Storms	Storm surges associated with high cyclonic activity in the region are considered a potential impact on embryonic development.

Asset	Hazard category	Why it poses a threat
	Biosecurity outbreak	Predation by foxes has impacted species nesting success on mainland beaches, although management by government agencies and community groups has largely controlled foxes at key sites.
	Heatwaves	Increased heat and duration of heat have been shown to impact temperature thresholds for successful incubation and lead to embryo mortality (Valverde et al. 2010). Heat exhaustion has also been apparent in nesting turtles and hatchlings.
Freshwater Reptiles (two species of freshwater turtles)	Drought/ heatwaves	Extended dry periods can result in the near total removal of extensive and dense macrophyte beds (Hamann et al. 2007).
	Floods	Floods can scour the river substrate, removing aquatic vegetation and invertebrate fauna (Limpus et al. 2002). Floods also carry increased pollutant and sediment loads during events.
	Biosecurity outbreak	Principal threats to both two species include impacts associated with predation by feral (fox, dog, pig and cat) species and habitat trampling by cattle (TSSC).
	Drought	Has the potential to deplete sufficient water sources in riverine habitat.
Threatened NCA & EPBC listed flora (250 species)	Bushfires/ inappropriate fire regimes	Can cause direct mortality, degradation or loss of habitat, disruption of life cycles (depletion of seed banks) and exacerbate impacts of other threats including weed intrusion and impacts by pathogens.
	Floods/severe storms and heavy rainfall	Erosion, inundation, loss of seed bank and disruption of reproductive cycle.
	Biosecurity outbreak	Several introduced pathogens threaten flora in SEQ. Including Phytophthora species (a soil-borne water mould that infects the roots of plants), and *Australianropuccinia psidii* (fungal disease, myrtle rust). In only a few years, myrtle rust has changed ecosystems by destroying trees and their canopies, led to species decline/extinction in areas, and taken an economic toll on industries that grow trees such as lemon-scented myrtle and tea tree. Phytophthora has shown drastic impacts on Bunya pines, and mortality in canopy trees.

Healthy Land & Water agricultural assets summary for South East Queensland. This table (**Table 18**) contains summary information about key assets and susceptibility. The susceptibility rating has been informed by a workshop of Healthy Land & Water staff and SEQ stakeholders who rated the impact of hazard category on the asset. Scores were allocated based on 1-3 with <1 low impact, 1-2 moderate impact and >2 high impact.

Table 18: *Healthy Land & Water agricultural natural capital assets summary for South East Queensland.*

Asset	Emergency scenario	Why it poses a threat	Susceptibility	Why
Agricultural land (soil, air, water, riparian & native vegetation)	Floods	Flooding results in increased erosion and soil loss, and impacts negatively on soil structure and health, riparian vegetation, aquatic ecosystems, and water quality, in addition to significant impacts on crops and infrastructure.	High	With much of the regions high value agriculture (horticulture, fodder and cropping) located on floodplains, the natural assets, crops and farm infrastructure, supply chains and local and regional economy is highly impacted by flooding. Main impacts on natural assets include loss of agricultural land and riparian vegetation due to streambank erosion, soil loss from floodplains, soil health decline through leaching,

				compaction, waterlogging and impacts on aquatic ecosystems and water quality.
	Storms	Extreme weather events including wind and hailstorms, and intense rainfall result in increased erosion and soil loss, damage to native vegetation, and water quality in addition to significant impacts on crops and infrastructure.	High	Due to climate and topography, the SEQ region is susceptible to intense storms which lead to increased erosion (landslip, hillslope, gully and streambank) and soil loss with impacts on aquatic ecosystems and water quality, as well as damage to native vegetation.
	Heatwaves, and higher temperatures	Predicted increasing number of hot days, heatwaves, and higher temperatures result in depleted soil moisture levels, as well as having potential to significantly damage crops and increase health risks for farm workers.	Extreme	Whilst heatwaves pose significant threat to crops, supply chains and people, as well as to the region's agricultural soils, water assets and native vegetation are less susceptible and reasonably resilient to shorter duration intense events.
	Drought	Predicted increasing drought intensity and frequency has potential to deplete soil moisture, waterways and groundwater systems, impacting riparian vegetation, aquatic ecosystems and water quality and resulting in increasing salinity, as well as impacts on crops, supply chains and local communities.	High	The region's agricultural soils, surface and groundwater assets, aquatic ecosystems, and water quality, are impacted by drought with more frequent and longer droughts experienced in the western half of the region, which typically receives significantly less rainfall and where most of the region's high value agricultural production is concentrated.
	Biosecurity outbreak	New pests, pathogens and disease have potential to impact soils native vegetation, plants and animals as well as damage or destroy crops, significantly disrupting supply chains, agriculture-dependent communities and lifestyles.	High	Depending on the particular biosecurity threat, new pests, pathogens, or diseases have significant potential to impact soil health and function, riparian areas, waterways, ecological communities and native flora and fauna.
	Bushfire	Bushfires have the potential to damage soils, riparian and other native vegetation as well as damage/destroy crops and farm infrastructure.	High	Agricultural soils on floodplains are less susceptible because of their location however riparian vegetation along waterways, and other native vegetation is highly susceptible to unplanned fires, which can lead to increased erosion and negative impact on aquatic ecosystems, water quality and increased spread and establishment of transformer weeds.
	Sea level rise	Sea level rise and increasing saltwater incursion onto coastal floodplains will impact soil health and function, existing riparian vegetation, freshwater communities and plants and animals and crops and infrastructure they support.	Moderate	Whilst the area of the region impacted is very small, the impacts on those natural assets- soils, water resources supporting mainly sugarcane and other crops on Maroochy floodplain and around Jacobs Well, and freshwater ecosystems will be heavily impacted.
Grazing land (soil, air, water, native pastures, and native vegetation assets)	Floods	Flooding results in increased erosion and soil loss, and impacts negatively on soil structure and health, pasture condition, riparian vegetation, aquatic ecosystems, and water quality, in addition to significant impacts on pastures and property infrastructure on floodplains.	High	While impacts on soil health and structure, pastures, riparian vegetation, and adjacent waterways can be significant along waterways and on floodplains, the majority of grazing land is not directly impacted. Flood events do result in the spread of invasive exotic weeds which not only degrade riparian areas but also native pastures and ecosystems.
	Storms	Rainfall intensity and more severe storms are likely to increase runoff and	High	Due to climate and topography, the SEQ region is susceptible to intense

		reduce infiltration, increase erosion (hillslope, gully and streambank) and soil loss, which impact aquatic ecosystems and water quality.		storms which lead to increased erosion (landslip, hillslope, gully and streambank) and soil loss with impacts on aquatic ecosystems and water quality, as well as damage to pastures and native vegetation.
	Heatwaves and higher temperatures	Predicted increasing number of hot days, heatwaves and higher temperatures result in increased plant stress, curing and overall reduced pasture condition, as well as increased heat stress on livestock and people.	High	Whilst heatwaves pose significant threat to livestock and agricultural workers, the region's soils, native pastures, water assets and native vegetation are less susceptible and reasonably resilient to these shorter duration intense events.
	Drought	Longer and more frequent droughts have the potential to deplete soil moisture, groundwater and surface water supplies, negatively impact groundcover levels, pasture biomass, quality and condition and native vegetation communities and plants and animals, resulting in increased land degradation from pasture decline, invasive weeds, increased erosion and soil loss, and increasing fire bushfire risks, as well as impacts on grazing enterprises, supply chains and local communities.	Extreme	The regions grazed native and sown pastures, native vegetation communities, plants and animals and waterways and wetlands are significantly impacted by drought with more frequent and longer droughts experienced in the western half of the region, which typically receives significantly less rainfall and where most of the region's grazing land is located.
	Bushfire	Increased fire weather and more severe bushfires pose a significant threat to native pastures and ecosystems and the plants and animals they support.	High	While native pastures and most forest, woodland ecosystems are adapted to fire, soil health, pasture condition and native vegetation is highly susceptible to intense unplanned wildfires which result in significant changes in pasture composition, increasing weed invasion, loss of cover and resulting increased erosion risk, soil loss and impacts on water quality as well as damage or loss of native vegetation communities, habitat and native flora and fauna.
	Biosecurity outbreak	New pests, pathogens and diseases have the potential to damage native pastures, vegetation communities and native flora and fauna as well as significantly impact on livestock, disrupt supply chains and agriculture-dependent communities.	High	Depending on the particular biosecurity threat, new pests, pathogens, or diseases have significant potential to impact on soil health and function, native and sown pastures, native vegetation and ecological communities and flora and fauna.
Native forests and plantation forestry	Flood	Flooding results in increased erosion and soil loss, and impacts negatively on riparian vegetation, aquatic ecosystems, and water quality.	Moderate	Most native forest and plantation forest assets have well buffered riparian zones.
	Storms	Rainfall intensity and more severe storms are likely to increase runoff and reduce infiltration, increase erosion (hillslope, gully and streambank) and soil loss, which impacts on aquatic ecosystems and water quality, as well as directly impact on forest condition.	Moderate	Whilst impacts from storms are generally not significant in extent, they can cause significant local damage to existing native forests and plantations. However, during the harvesting, preparation and planting phase, storms and intense rainfall events can have a significant local and catchment impact due to reduced cover, increased erosion and soil loss impacting on waterways, downstream aquatic ecosystems and water quality.

	Heatwave	Predicted increasing number of hot days, heatwaves and higher temperatures result in increased stress, particularly in seedlings and young plants at establishment, with heatwaves impacting on forest workers.	Moderate	Whilst heatwaves pose a significant threat to forestry workers the region's native forests and plantations are less susceptible and reasonably resilient to these shorter duration intense events.
	Drought	Longer and more frequent droughts have the potential to deplete soil moisture, and particularly impact on plant establishment and growth, as well as affect forest condition and the plants and animals in and around these communities, with increasing threats from invasive weeds, increased erosion and soil loss between harvesting and re-planting, and increasing fire bushfire risks.	Moderate	Drought conditions can have a significant impact in the planting and establishment phase due to limited soil moisture and nutrient availability and droughts can also lead to increased risk of bushfires however given long-term nature of forest production and the resilience of the main native species, not a major risk.
	Bushfire	Increased fire weather and more severe bushfires pose a major threat to the region's significant native forests and plantations and the ecosystems and the plants and animals they support.	High	While native hardwood forest ecosystems are adapted to fire, they can be heavily impacted by intense unplanned wildfires which can result in significant damage or losses to forest products, loss of cover resulting in increased erosion risk, soil loss and impacts on water quality as well as damage or loss of native vegetation communities, habitat and native flora and fauna. Native and exotic pine plantations are particularly susceptible to damage and destruction from severe bushfires.
	Biosecurity outbreak	New pests, pathogens and diseases have the potential to significantly damage or destroy native and plantation forests.	High	Depending on the particular biosecurity threat, new pests, pathogens or diseases have significant potential to impact native forests and plantations, along with the adjacent native vegetation and ecological communities and flora and fauna they support.
Fisheries and aquaculture Waterways, estuary, bay and coastal assets	Floods	Increased flooding and intense runoff events can damage or destroy critical coastal habitats including mangroves, sea-grass beds and coastal vegetation, and impact fisheries.	High	More frequent and intense flooding presents an increasing risk to coastal habitats, which are essential breeding, and nursery grounds for a range of species and the marine ecosystem.
	Sea level rise	Sea level rise and inundation will impact estuarine and river fish species and potentially impact on native vegetation and coastal habitats.	Extreme	Sea level rise and inundation will damage native vegetation which stabilises waterways and estuaries and provides critical habitat, for prawns, bugs, crabs, and fish.
	Increased water temperatures and acidification	Increased water temperatures and acidification may lead to degradation of local reef habitats and impact on a range of fish species, as well as changed distribution, tolerances reproduction and behaviour of native species, affecting the environment and fishery.	Extreme	Increased water temperatures and acidification may lead to changed distribution, tolerances, reproduction, and behaviour of both freshwater and marine species.
	Drought	Drought and decreased rainfall lead to reduced flows and nutrient supplies affecting freshwater, estuarine and coastal environments, and the fishery.	Moderate	Drought and decreased rainfall and flow patterns can impact fishery recruitment, growth rates and potential increases in the number of natural fish deaths. However, the system is adapted to variable climate and run off patterns.

APPENDIX 2: Healthy Land & Water existing programs and initiatives

15.1 Climate Risk Protocol

Over the past two years, Healthy Land & Water has been developing a climate risk framework (the Healthy Land & Water Climate Risk Protocol) to mainstream climate risk management across the organisation and its scope of activity. Managing climate risk is contextualised within Healthy Land & Water's corporate risk and environmental, social and governance (ESG) policy framework.

Healthy Land & Water has conducted a first-pass climate risk assessment for its corporate assets, systems, and services, and for those assets, systems, and services within the scope of regional natural resource management in SEQ. The identified risks have been rated (and prioritised) using a built-for-purpose risk rating matrix that characterises identified risks according to the likelihood of those risks disturbing or disrupting the functionality of the asset, system, or service.

The climate change risk drivers have been drawn from the *IPCC Sixth Assessment Report – Working Group I: The Physical Science, (Summary for Policymakers* list of climate impact drivers p.34), adjusted to recognise the climate hazards characterisation already in use in the regional natural resource management sector (*Climate Change in Australia, Projections for Australia's NRM Regions* (CSIRO 2015).

An adapted value chain analysis tool has additionally been developed and utilised to interrogate identified Healthy Land & Water climate risk impacts and management responses at a program/project level. Feedback from this process, together with validation input from experts and practitioners, supports an iterative currency and refinement process for the risk identification and rating foundation of the framework, focusing on a rolling 10-year risk horizon.

15.2 Queensland Fire & Biodiversity Consortium program (delivery across the state)

The Queensland Fire & Biodiversity Consortium (QFBC), a program of Healthy Land & Water, delivers bushfire management preparedness and response projects and capacity building.

Established in 1998, the QFBC is recognised as one of the longest established and enduring fire engagement programs in Australia.

The QFBC is a unique partnership that brings together diverse stakeholders to improve fire management and biodiversity conservation outcomes in Queensland. The QFBC approach, defined by its independence, collaboration, science-based foundation, and community engagement focus, sets it apart from conventional approaches. The structure and partnership approach allows the QFBC to address the complex and interconnected challenges of integrated fire management and biodiversity protection across Queensland.

Examples of the models delivered include:

- **Township Fire Management Strategy** (Minjerribah, Mulgumpin and Emuvale): A model developed by the Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC) that balances contemporary fire management practices with Traditional Knowledge. It is a First Nations-led approach and developed in collaboration with key stakeholders at a local, regional, state, and federal level (regulatory or non-regulatory).

- **Community fire management plans** (Rosevale-Tarome, Noosa River Catchment and Carneys Creek, currently delivering these in Yeppoon, Gladstone, Southern Downs and Millmerran): A landscape scale and tenure blind approach to target high-risk areas. The plans include the construction of new and/or improved fire lines and breaks, fuel load reduction works, installation of fire control infrastructure, asset protection zones, and defined prescribed burn areas. This information is shared with emergency responders who can utilise the assets while responding to wildfires.
- **Property fire management planning:** Property level plans undertaken in conjunction with local governments or through grant-funded programs. These workshops facilitate interactive sessions with landholders and land managers to create a fire management plan for their land, provide a hard copy map of their land and assets, and outline actions to mitigate risks associated with bushfires.

Following the devastating Black Summer Bushfires of 2019-2020, which significantly affected extensive areas throughout Queensland, there was a collective acknowledgment from the Queensland Fire & Bushfire Consortium and its partners of the necessity to expand QFBC services across the state. The expansion is aimed at meeting the increased demand for bushfire management expertise, knowledge, and preparedness. It is formalising what has been decades of *ad hoc* requests to roll out service delivery into additional regions.

15.3 Water by Design initiative (delivery across the state)

Since 2005, Healthy Land & Water's Water by Design initiative has been working with individuals and organisations to identify and fill knowledge gaps and facilitate the uptake of improved practice in sustainable water management. The initiative fosters innovative practice and strives to build regionally consistent approaches. By facilitating information exchange, networking, and constructive debate, practitioners are motivated to deliver high quality urban environments.

Examples of projects delivered:

- **Urban flood mitigation** (Redbank Plains Recreational Reserve): This location was plagued with flooding downstream of the reserve. To solve the issue, a combined stormwater detention (90,000 m^3) and stormwater harvesting wetland (5300 m^2) was constructed within the recreational reserve. The project included a number of vegetated swales as well as a heavily vegetated section of the harvesting pond which helps to filter stormwater runoff before it is discharged to the creek. This infrastructure converted the flooding threat into an alternative irrigation supply (up to 44 ML/year) for the local sports fields, which potentially saves ratepayer funds. The wetland has become a feature within the recreational reserve with dog walkers stopping to take pictures of birdlife from a nearby path.
- **Urban creek restoration** (Restore Biodiversity Values – Davidson Street, Newmarket): The Davidson Street Creek Restoration project is an inspiring example of community, government and industry working together to improve and protect our waterways and the communities who rely on them. Thanks to the funding impetus provided by the Federal Government, this project presented an opportunity for Healthy Land & Water to practically implement and apply its Living Waterways framework. Living Waterways was developed through a collaboration by local and state governments from across Queensland with input from the stormwater industry. Living Waterways is a framework that incentivises collaboration and integrated planning and design of urban water systems. These outcomes are achieved through simple and measurable targets, against which designs can be easily assessed whilst ensuring ongoing operation and maintenance costs are reduced.
  Community insight was key to informing a bespoke, naturally integrated site that consisted of a student led and designed interpretation trail, a viewing platform integrated into the landscape, nest boxes and bee hives and a dry creek bed installed to provide an example of historical ecological

components of the site. The project treated site runoff via a soakage basin fulfilling the spirit of the Queensland State Planning Policy legislation i.e. to protect and enhance waterway values. Additionally, over 3,500 species of the original regional ecosystem, a littoral vine forest, were restored on the site, significantly boosting local biodiversity values.

- **Urban waterway flood recovery** (Kedron Brook Flood Recovery project): This project is aimed at improving waterway health and flood resilience by reducing streambank erosion, restoring riparian vegetation and supporting healthy biodiversity and ecosystems. The focus is on investigating opportunities to improve the environmental values of a heavily urbanised section of the waterway.

15.4 Marine, estuarine and terrestrial ecosystems restoration

Healthy Land & Water has been working closely in the recovery of marine, estuarine and terrestrial ecosystems 25+ years. It has also been monitoring and reporting on the health of waterways and associated ecosystems for over two decades and provides this information to key decision-makers and policymakers. In terms of on-ground delivery, Healthy Land & Water has led many thousands of successful projects over its lifetime.

Examples of projects include:

- **Shellfish reef restoration:** Building and deploying shellfish reefs made up of oysters and mussels, which offer a whole suite of ecosystem services. Each restored hectare of native oyster reef can filter 2.7 billion litres of seawater removing 225 kg of nitrogen and phosphate, produce an additional 2.5 tonnes of harvestable fish every year, and divert tonnes of used shells from landfill. The reef improves water quality and provides habitat for marine ecosystems such as seagrass beds.
- **Erosion control:** Reducing loss of soil and flood resilience through revegetation, coir logs, root balls, logs, signs and barriers for behaviour modification, and other nature-based solutions.
- **Saltmarsh restoration:** Protecting saltmarsh brings numerous benefits including blue carbon sequestration, flood resilience, re-established and enhanced habitats, and cultural value to name a few.
- **Mangrove restoration and rehabilitation:** A current program is restoring around 2.4 km of the Caboolture riverbank with revegetation and stabilisation works. Bank stabilisation works will improve the river's long-term resilience to flooding while providing new habitats for local fauna. Works include reprofiling eroded banks to create stable areas for new mangrove forests and riparian revegetation and active interventions to promote mangrove establishment and reduce erosion impacts on local ecosystems.
- **Lungfish habitat restoration:** Restoring lungfish breeding habitats in the Brisbane River, not only protects one of the oldest fish species but also improves river health and water quality. This project is a partnership with Seqwater which is focussed on reestablishing the aquatic plants vital for the lungfish survival.
- **Koala conservation in Areas of Regional Koala Significance (ARKS):** The devastating 2019 wildfires across the east coast of Australia had a devastating impact on the already declining koala population. The initial site at Flinders Peak was selected based on the potential to deliver project activities and the willingness of the landholders to support koala conservation activities. Throughout the project, the landholders have continued to support and expand on the works being conducted by Healthy Land & Water and a range of partners. With strong support from the Australian Government, the successful program has started to be expanded to other koala ARKS, ensuring that broader benefits to koalas and other native species are realised. Project deliverables include:
  - Revegetation of previously cleared koala habitat.
  - Targeted weed control areas containing the highest density infestations of weeds that impact koala habitat and koala's ability to utilise habitat.
  - Community engagement and capacity building.

- **Wild macadamia hunt program:** An engaging citizen science project that helped locate and register wild native macadamia trees, which were then genetically analysed for conservation of this important native species which is under threat. Brisbane City Council funded the initial hunt around Brisbane and surrounds. It was so well-received that the now Queensland Government Department of Environment, Science and Innovation (DESI) funded the program to be extended Queensland-wide. It added to Healthy Land & Water's broader efforts since 2006 to find and conserve wild native macadamias and their habitats. Outcomes included:
  - Habitat restoration.
  - Surveys and long-term monitoring.
  - Habitat mapping.
  - Propagation workshop.
  - Supporting genetic research.
  - Community education and awareness.

15.5 Sustainable agriculture and land restoration

Agriculture provides us with the food, fibre and a range of products we use every day.

Healthy Land & Water strives to support the appropriate management of our agricultural lands. Sustainable management leads to greater profitability and environmental benefits and supports viable local rural communities.

Rural areas in South East Queensland make up about 1.9 million hectares or 85% of the region, much of which is managed by farmers.

Grazing is the dominant rural land use, accounting for 51% of the land area in SEQ, whilst other more intensive agricultural activities, such as horticulture and intensive animal production, make up a further 8%.

The protection and sustainable management of agricultural land in SEQ is important to safeguard the capacity of the region to produce food, fibre and other materials for communities.

Healthy Land & Water is active in a vast array of sustainable agriculture projects, some of which include:

- **Flood response and building catchment resilience:** Following significant regional flooding events in 2011, 2013, 2017, 2021 and 2022, Healthy Land & Water led regional flood impact assessments, participated in various Local Government Disaster Response groups and the State Government Disaster Response Taskforce and planned and implemented riparian restoration and rehabilitation projects through joint Natural Disaster Recovery and Relief Agreements, after each of these major events.
- **Riverine flood recovery reconnaissance projects:** Assessing the flood environmental impacts and scoping of recovery and resilience solutions. Healthy Land & Water conducted desktop and field assessments of flood damage of riparian areas throughout SEQ and collaborated with a wide range of stakeholders to compile a robust picture of the damage sustained across the region. While not all areas with flood damage assessed were able to be put forward for funding, we identified those areas with high potential to build long-term environmental resilience at a reach scale of 5 km or more.
- **Disaster recovery funding arrangements** (Environmental Recovery Program – Riverine Recovery): Healthy Land & Water is undertaking large scale environmental recovery works to support rehabilitation and restoration of rain and flood-affected environments and environmental assets in order to maintain healthy ecosystems and other environmental values and improve resilience for future disaster events. This is being delivered on more than five sites across the region in partnership

with Ipswich City Council, Resilient Rivers Initiative, Port of Brisbane, City of Moreton Bay, Brisbane City Council and Lockyer Valley Regional Council.

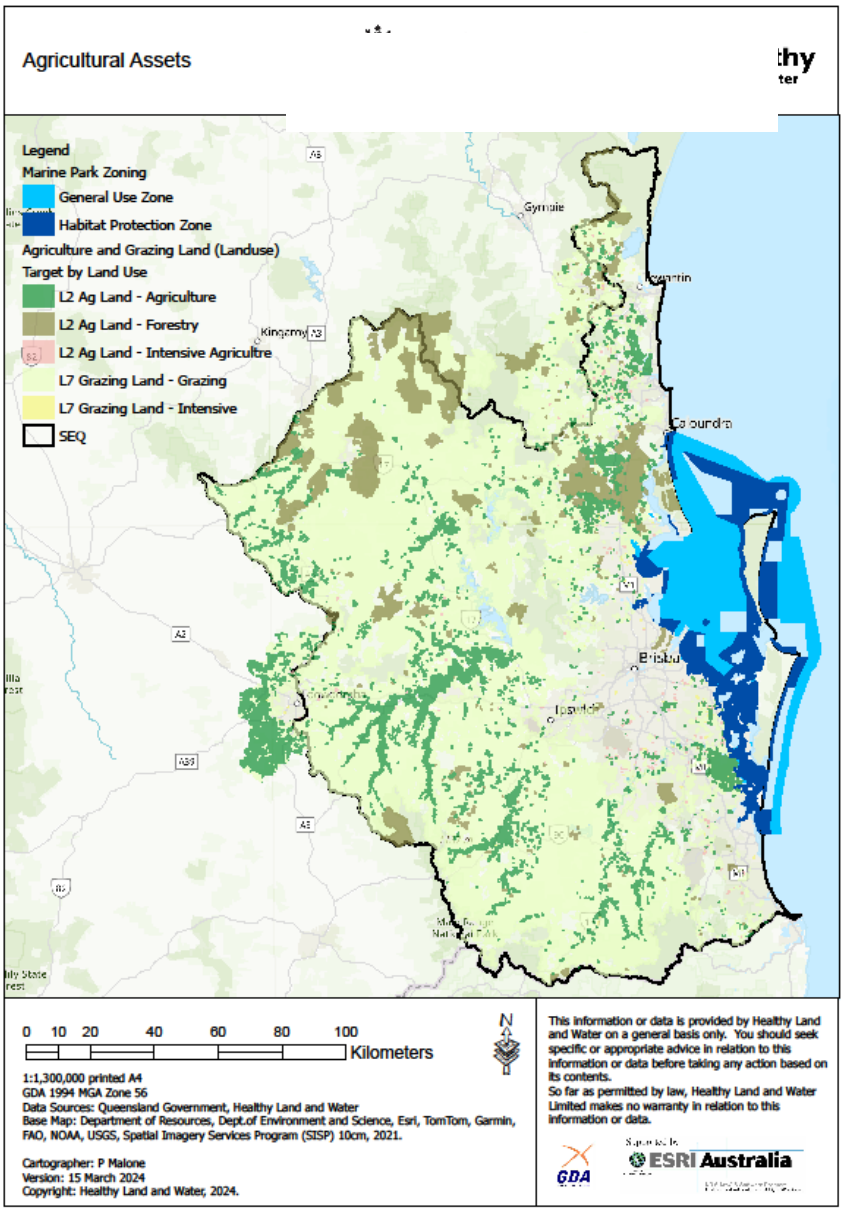
- **Source water protection programs:** Healthy Land & Water developed and implemented sustainable catchment scale on-ground management programs to deliver water source protection outcomes. Programs protect and improve riparian vegetation and stabilise waterways and gullies to prevent erosion and soil loss, improve land management practices and improve catchment resilience. Programs include Seqwater's Multi Catchment Source Water Protection Program (all of SEQ), North Pine River Water Source Protection and Regional Riparian Weed Control program funded by Seqwater.
- **Flood resilience and source water quality programs:** Healthy Land & Water delivers an array of programs that aim to restore and protect water quality and build resilience throughout all target catchment areas. The programs work closely with landholders delivering a range of projects that involve revegetating riverbanks, installing fencing, removing weeds, and stabilising gullies. These projects ensure gullies and riverbanks are more resilient to high flow events, reducing erosion and the flow of sediment into the Mid Brisbane River and eventually Moreton Bay. Programs include the Queensland Government Department of Environment, Science and Innovation partnership – the Healthy Catchments Program and the Mid Brisbane Partnerships program.
- **Drought and climate adaptation program:** Through the Future Drought Fund projects and involvement in the Southern Queensland & Northern New South Wales Drought Resilience Adoption and Innovation Hub, Healthy Land & Water worked and is working with industry and government partners to deliver a range of extension and capacity building events to promote drought preparedness, climate adaptation and farm business resilience planning. This includes supporting a series of on-farm demonstration sites which showcase farming and grazing management strategies and practices that improve soil health, land condition, water security and drought resilience.
- **Sustainable agriculture program:** Healthy Land & Water leads regional engagement and capacity building programs to support landholders and promote implementation of land and water management practices which enhance natural capital, maintain sustainable production, and build resilience, in agricultural enterprises and landscapes. Examples include the recently completed 5-year Australian Government-funded Regional Land Partnerships Agriculture project and successive Natural Resources Recovery Programs funded by the Queensland Government.

APPENDIX 3: South East Queensland biodiversity and agricultural natural capital assets

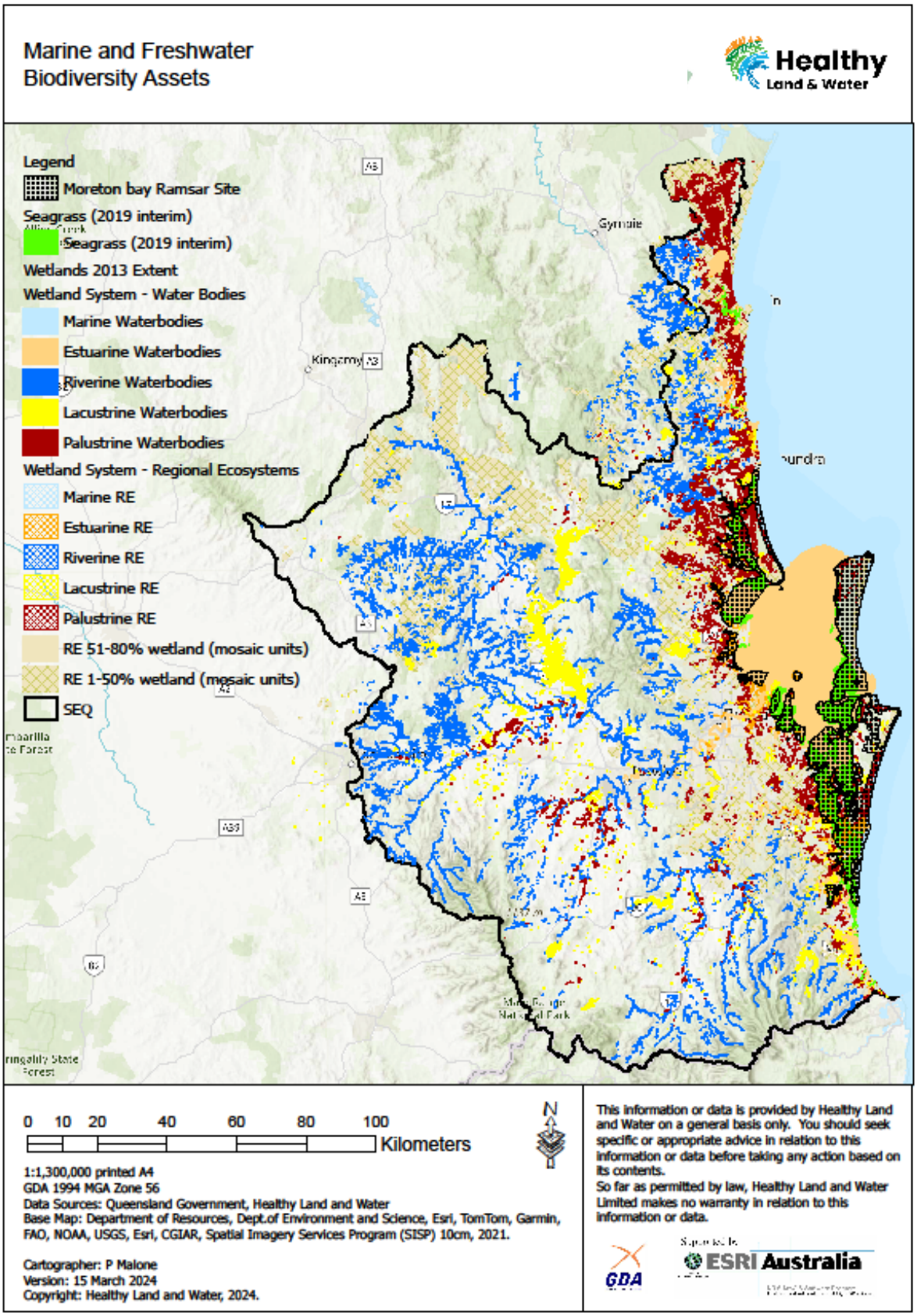
The proposed sites for mapping biodiversity and agricultural natural capital assets are included in Appendix 2. These maps provide an outline of the general SEQ management unit, but layers describing some biodiversity and agricultural assets and some types of threats have been added.

The map layers include *Springs and Potential Aquifers* in response to feedback from Traditional Owners to include aquifers in the mapping. Multiple maps are included in this outline to clearly demonstrate some of the available data. A live link, which includes all these map layers, plus additional layers can be accessed here.

Agricultural Assets SEQ



Marine and Freshwater Biodiversity Assets SEQ


Marine and Freshwater Biodiversity Assets
Healthy Land & Water
Legend
Moreton bay Ramsar Site
Seagrass (2019 interim)
Seagrass (2019 interim)
Wetlands 2013 Extent
Wetland System - Water Bodies
Marine Waterbodies
Estuarine Waterbodies
Riverine Waterbodies
Lacustrine Waterbodies
Palustrine Waterbodies
Wetland System - Regional Ecosystems
Marine RE
Estuarine RE
Riverine RE
Lacustrine RE
Palustrine RE
RE 51-80% wetland (mosaic units)
RE 1-50% wetland (mosaic units)
SEQ
Gympie
Kingaroy
0 10 20 40 60 80 100
Kilometers
N
1:1,300,000 printed A4
GDA 1994 MGA Zone 56
Data Sources: Queensland Government, Healthy Land and Water
Base Map: Department of Resources, Dept.of Environment and Science, Esri, TomTom, Garmin, FAO, NOAA, USGS, Esri, CGIAR, Spatial Imagery Services Program (SISP) 10cm, 2021.
Cartographer: P Malone
Version: 15 March 2024
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GDA
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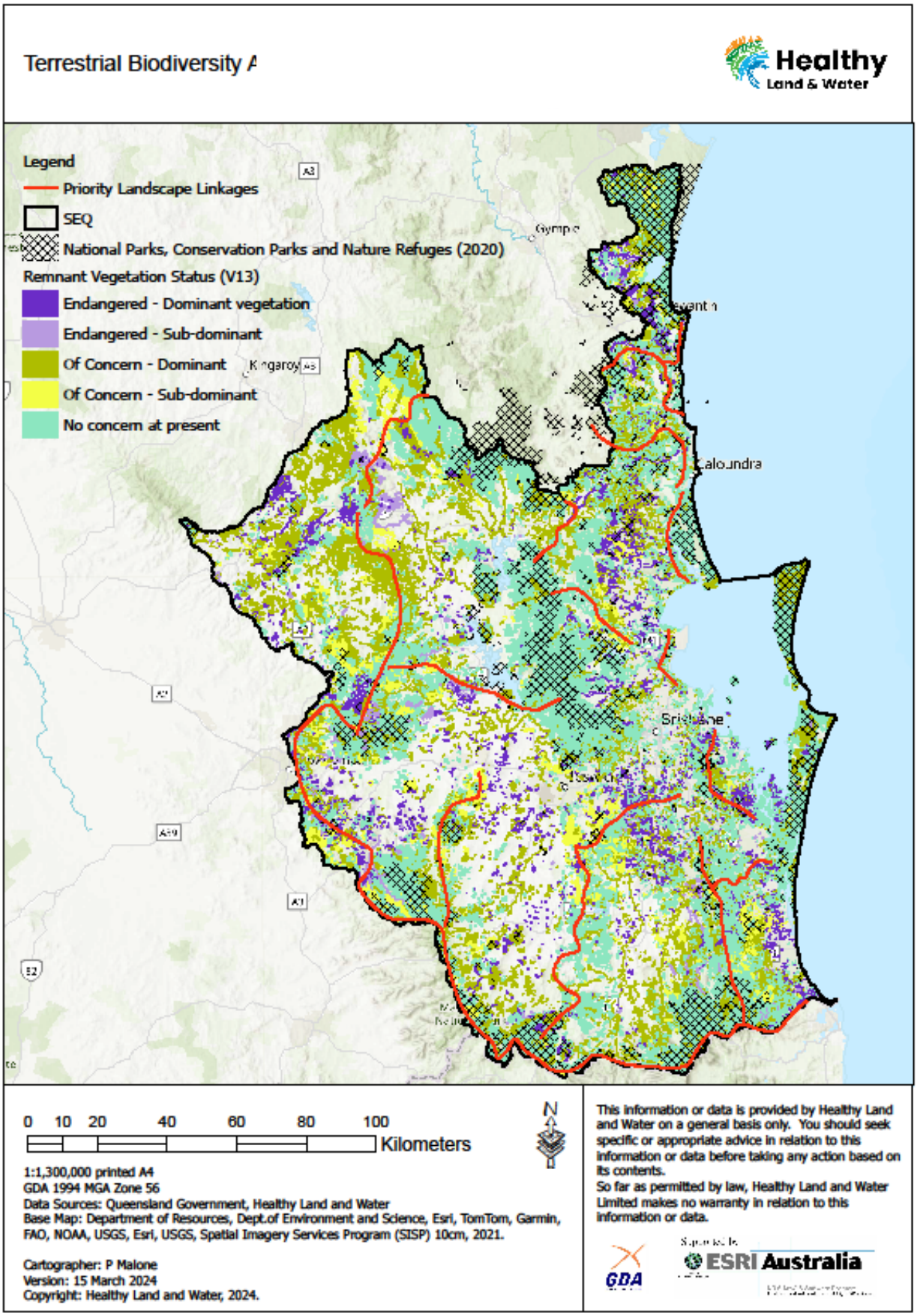
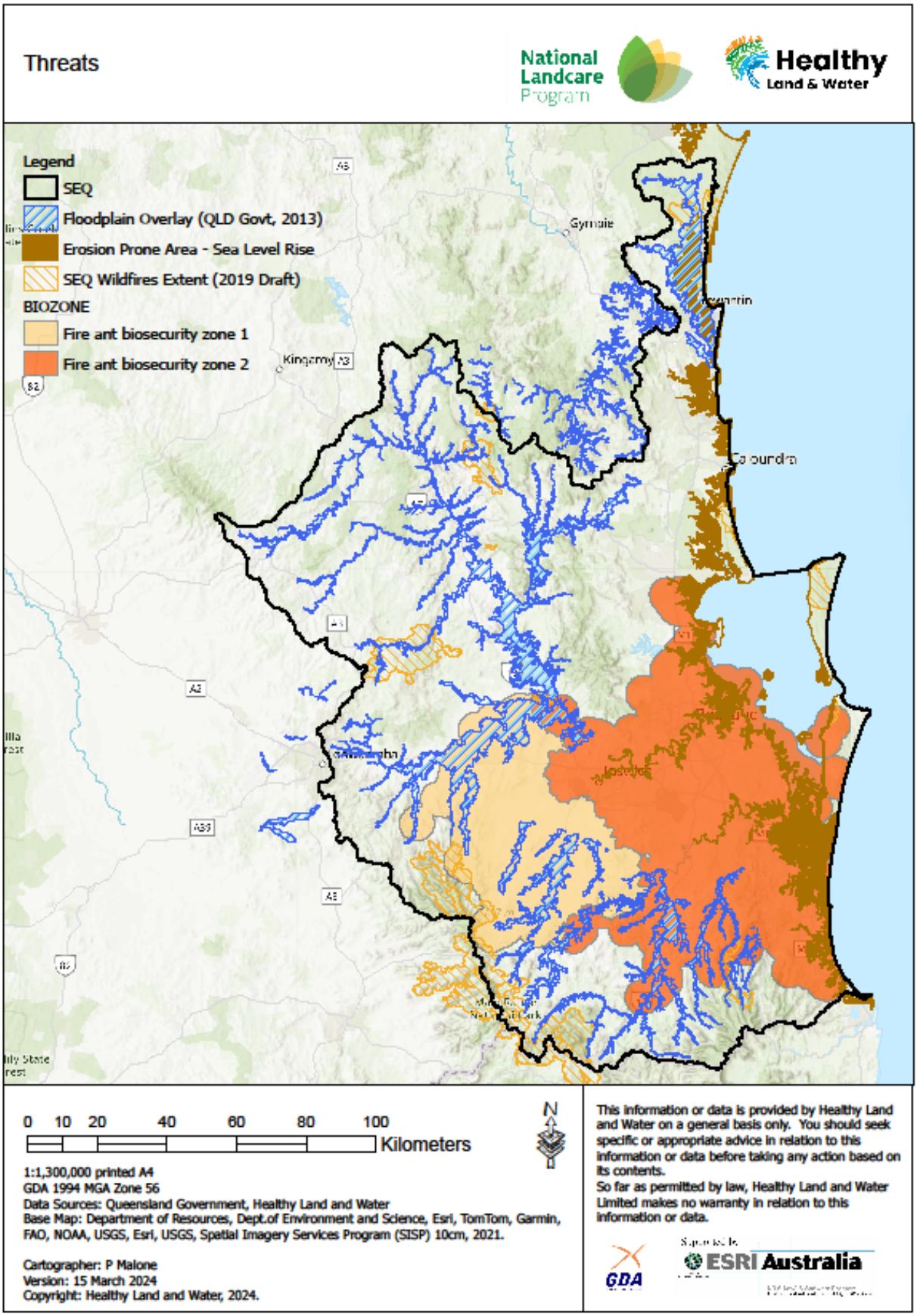
Terrestrial Biodiversity Assets SEQ



Threats SEQ


Threats
National Landcare Program
Healthy Land & Water
Legend
SEQ
Floodplain Overlay (QLD Govt, 2013)
Erosion Prone Area - Sea Level Rise
SEQ Wildfires Extent (2019 Draft)
BIOZONE
Fire ant biosecurity zone 1
Fire ant biosecurity zone 2
Gympie
Kingaroy
Coolangatta
0 10 20 40 60 80 100
Kilometers
N
1:1,300,000 printed A4
GDA 1994 MGA Zone 56
Data Sources: Queensland Government, Healthy Land and Water
Base Map: Department of Resources, Dept.of Environment and Science, Esri, TomTom, Garmin, FAO, NOAA, USGS, Esri, USGS, Spatial Imagery Services Program (SISP) 10cm, 2021.
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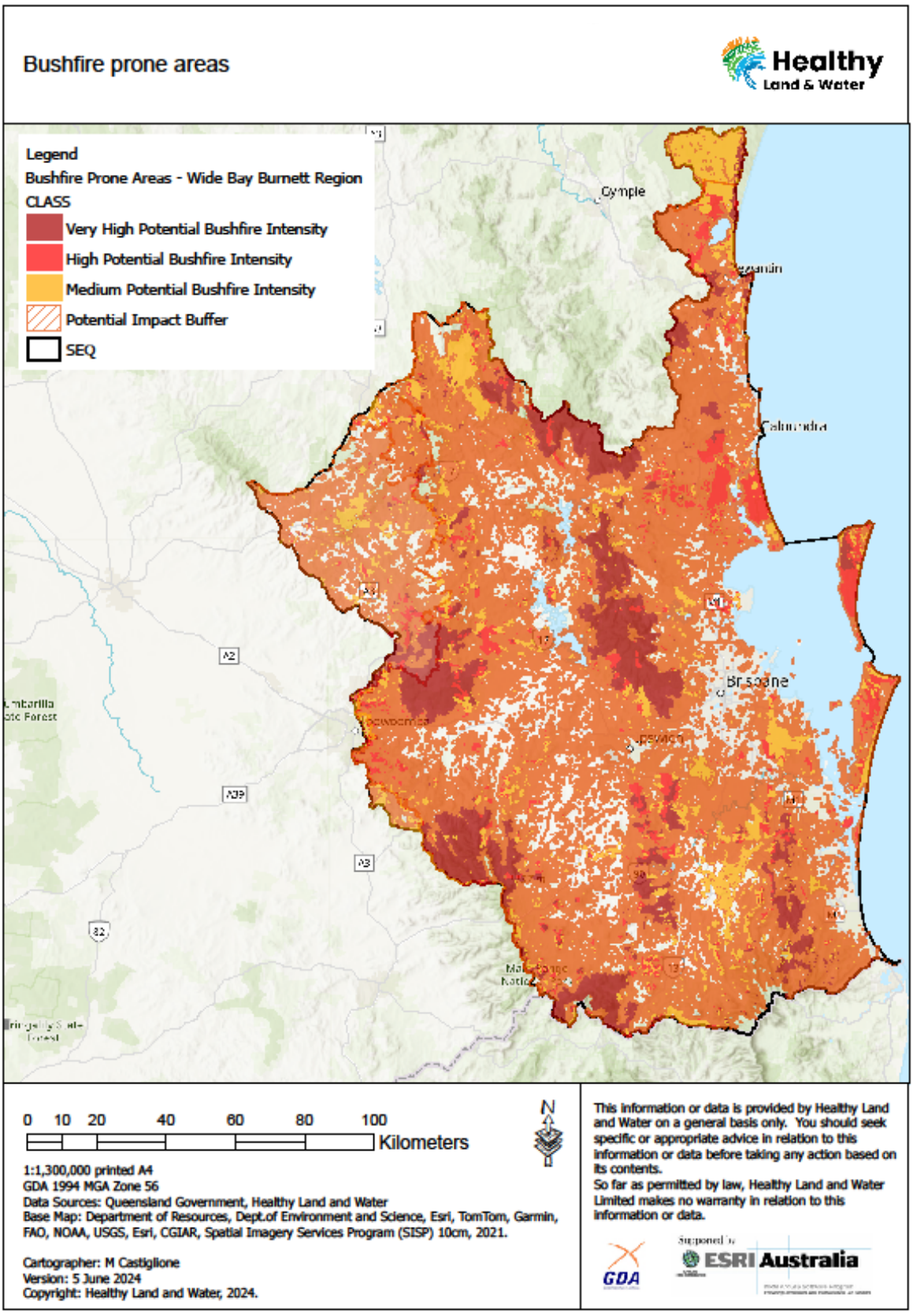
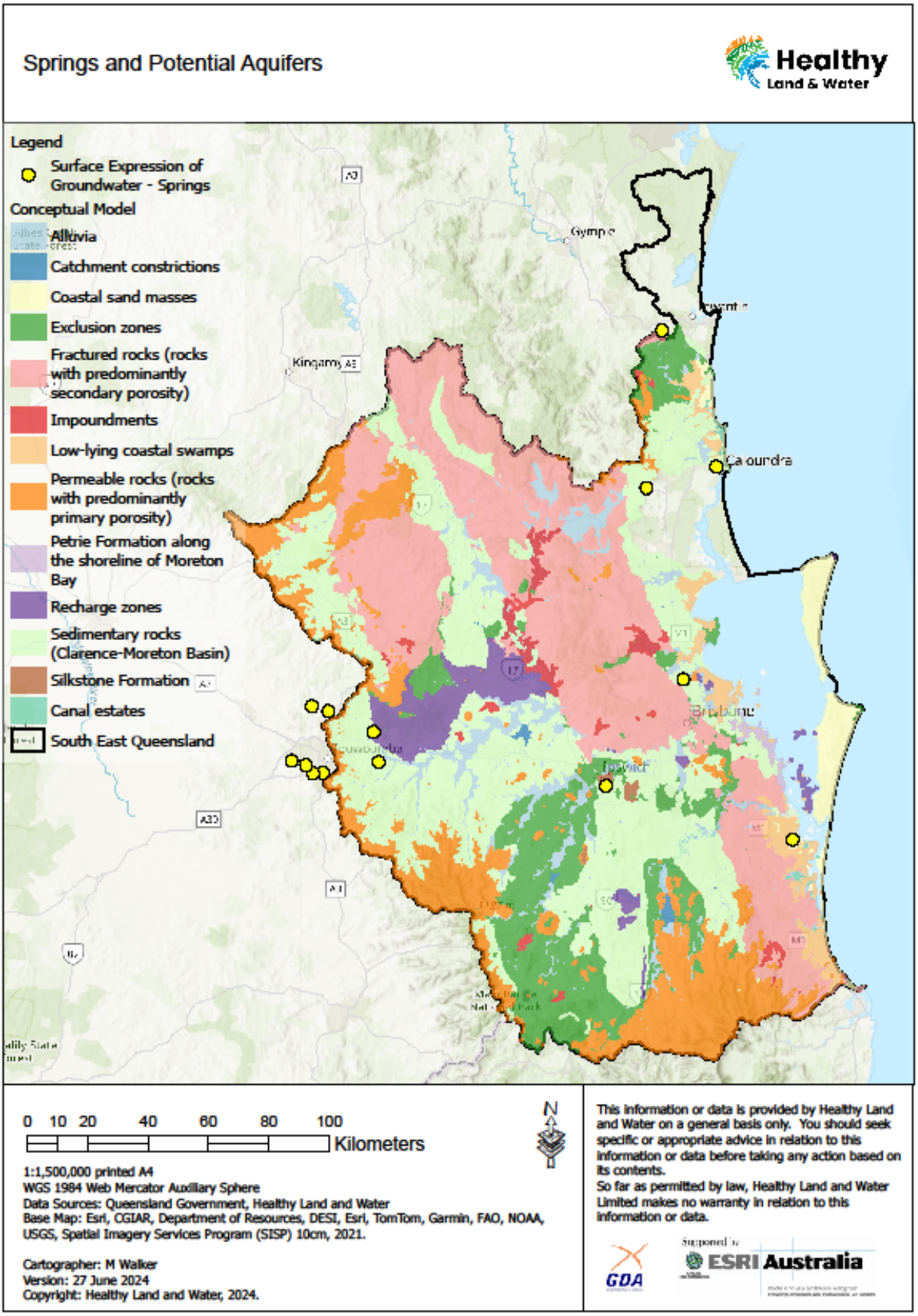
Bushfire Prone Areas Map Layer



Springs and Potential Aquifers



APPENDIX 4: Key documents and laws, regulations and policies

There is a huge number of key laws, regulations policies and documents,some which have been referred to and/or would be relevant to the implementation of this plan (and the actions contained within). **This list is not comprehensive.**

Emergency/disaster management

Key laws, regulations, policies:

- Sendai Framework for Disaster Risk Reduction 2015 – 2030.
- Ulaanbaatar Declaration 2018.
- Australia's National Midterm Review of the Sendai Framework 2022.
- The National Disaster Risk Reduction Framework 2019.
- National Strategy for Disaster Resilience 2019.
- Australian Disaster Preparedness Framework 2018.
- Critical Infrastructure Resilience Strategy: Plan, 2015.
- Australian Government Crisis Management Framework, 202.
- Australian Disaster Recovery Framework 2022.
- National Drought Agreement 2018.
- Commonwealth Government Disaster Response Plan (COMDISPLAN).
- Australian Government Disaster Recovery Funding Arrangements (DRFA).
- The Second National Action Plan to Implement the National Disaster Risk Reduction Framework.
- National Disaster Management Act 2003 (Qld).
- Standard for Disaster Management in Queensland (2021).
- Queensland Disaster Management Arrangements 2023 Review.
- Queensland State Disaster Management Plan 2023.
- Queensland Disaster Management Regulation 2014.
- IGEM Stakeholder Engagement Framework 2022.
- Fuel Load Verification Research Project.
- Queensland Bushfire Plan 2020.
- Queensland Prevention, Preparedness Response and Recovery Disaster Management Guidelines 2018.
- Queensland Strategy for Disaster Resilience 2022–2027.
- Resilient Queensland - Delivering the Queensland Strategy for Disaster Resilience 2018.
- Queensland Department of Environment and Heritage Protection, Queensland Climate Adaptation Strategy 2017–2030.
- Overall Fuel Hazard Assessment guide 4th edition July 2010: Fire and Adaptive Management report no. 82.
- Fire Safety Management Plan Guidelines (Queensland Fire and Emergency Services) 2018.
- Local Disaster Management Group Responsibilities: Manual – M.1.030 (Queensland Fire and Emergency Services) 2018.
- District Disaster Management Group Members Responsibilities Manual – M.1.040, (Queensland Fire and Emergency Services) 2018.

Key documents and references:

- Bureau of Meteorology Australia, What is Drought, http://media.bom.gov.au/social/blog/2179/explainer-what-is-drought/

- Burke C & Wade R, Drought Program Review (Queensland) Report by: Independent Panel, January 2019.
- Major-General Stephen Day (Drought Coordinator-General), 2019, suggestions for a Strategy for Drought Preparedness and Resilience.
- Commonwealth of Australia, Drought in Australia: -Coordinator-General for Drought's advice on a Strategy for Drought Preparedness and Resilience, April 2019.
- Australian Red Cross Emergency Services: Psychosocial Framework, 2016.
- Australian Red Cross, Drought Resilience Program, 2021.
- Local Government Association of Queensland (LGAQ), Queensland Local Government Drought Action Plan, October 2019.
- International Federation of the Red Cross and Red Crescent Societies (2019), 'The Cost of Doing Nothing - The Humanitarian Price of Climate Change and how it can be avoided'.
- The Australian Institute for Disaster Resilience, Australian Emergency Management Arrangements 2023
- Australian Government Drought Response, Resilience and Preparedness Plan (DRRP).
- National Emergency Management Agency: About Us, https://nema.gov.au/about-us
- Royal Commission into National Natural Disaster Arrangements Implementation of Recommendations 2021.
- Australian Institute for Disaster Resilience, Australian Disaster Resilience Handbook Collection, https://knowledge.aidr.org.au/collections/handbook-collection/
- Australian Institute for Disaster Resilience, Australian Disaster Resilience Knowledge Hub, www.knowledge.aidr.org.au/
- Australian Red Cross, Register. Find. Reunite. https://www.redcross.org.au/emergencies/about-register-find-reunite/
- Australian Institute for Disaster Resilience, Australian Disaster Resilience Glossary, www.knowledge.aidr.org.au/glossary/
- Emergency Alert www.emergencyalert.gov.au/
- Royal Commission into National Natural Disaster Arrangements (2020), https://naturaldisaster.royalcommission.gov.au/
- Queensland Department of Environment, Science and Innovation (DESI) (2024), Local government disaster recovery information sheet, DESI.
- Queensland Disaster Management Lexicon, State of Queensland (Inspector-General of Emergency Management) 2021.
- Climate Change in SE Queensland, DESI 2019.
- Red Cross Queensland/ Mellor R, 'Not if…but when – Supporting Queensland Communities Plan for the Challenges of Drought 2021.
- World Bank/Mellor R, 2013, National Disaster Public Awareness Strategy for Vietnam.

'BUSINESS' and WORKPLACE REQUIREMENTS

Key laws, regulations, policies

- Competition and Consumer Act 2010 (CCA).
- Privacy Act 1988.
- Fair Work Act 2009.
- Work Health and Safety Act 2011.
- Corporations Act 2001.
- Superannuation Guarantee law.
- Income Tax Assessment Act 1997 (ITAA 1997).
- Fringe Benefits Tax Assessment Act 1986.
- A New Tax System (Goods and Services Tax) Act 1999 (the GST Act).

- Work Health and Safety Regulations of 2011.
- Hazardous manual tasks - Code of Practice 2021.
- How to manage work health and safety risks – Code of Practice 2021.
- Managing the risk of psychosocial hazards at work Code of Practice 2022.
- Work health and safety consultation, cooperation and coordination – Code of Practice 2021.
- Confined spaces – Code of Practice 2021.
- Electrical safety - Code of Practice 2020.
- Excavation work - Code of Practice 2021.
- First aid in the workplace - Code of Practice 2021.
- Hazardous manual tasks - Code of Practice 2021.
- How to manage and control asbestos in the workplace – Code of Practice 2021.
- How to safely remove asbestos - Code of Practice 2021.
- Managing electrical risks in the workplace - Code of Practice 2021.
- Managing noise and preventing hearing loss at work - Code of Practice 2021.
- Managing risks of hazardous chemicals in the workplace - Code of Practice 2021.
- Managing the risks of falls at workplaces - Code of Practice 2021.
- Managing the risk of psychosocial hazards at work - Code of Practice 2022.
- Managing the risks of plant in the workplace - Code of Practice 2021.
- Managing the work environment and facilities - Code of Practice 2021.
- Mobile crane - Code of Practice 2006.
- Traffic management for construction or maintenance work - Code of Practice 2008.
- Work near overhead and underground electric lines – Electrical safety - Code of Practice 2020.

The following Australian Standards advise on the type of PPE possibly required by responders:

- AS/NZS 1800:1998 Occupational Protective Helmets – Selection Care and Use.
- AS/NZS 1336:2014 Eye and Face Protection – Guidelines.
- AS/NZS 1337.1:2010 Personal Eye Protection Eye and Face Protectors for Occupational Applications.
- AS/NZS 1337.6:2012 Personal Eye Protection Prescriptive Eye Protectors Against Low and Medium Impact.
- AS/NZS 1067.1:2016 Eye and Face Protection – Sunglasses and Fashion Spectacles Requirements.
- AS/NZS 1269.3:2005 Occupational Noise Management Hearing Protector Program.
- AS/NZS 1715:2009 Selection, Use and Maintenance of Respiratory Protective Equipment.
- AS/NZS 1716:2012 Respiratory Protective Devices.
- AS/NZS 2161.1:2016 Occupational Protective Gloves Selection, Use and Maintenance.
- AS/NZS 2161.10.1:2005 Occupational Protective Gloves Protective Gloves Against Chemicals and Micro-organisms.
- AS/NZS 2161.3:2020 Occupational Protective Gloves Protection Against Mechanical Risks.
- AS 60903:2022 Live Working – Electrical Insulating Gloves.
- AS/NZS 1906.4:2023 Retroreflective materials and devices for road traffic control purposes, Part 4: High-visibility materials for safety garments.
- AS 4399:2020 Sun Protective Clothing - Evaluation and Classification.
- AS/NZS 4602.1:2011 High Visibility Safety Garments for High-Risk Applications.
- AS/NZS 2210.3:2019 Personal protective equipment, Part 3: Safety footwear.
- AS/NZS 2210.5:2009 Personal protective equipment, Part 5: Occupational footwear.

Where Australian guidance is unavailable, the following International Standards advise on the type of PPE possibly required by responders:

- EN 13034:2005+A1:2009 Protective Clothing Against Liquid Chemicals - Performance Requirements for Chemical Protective Clothing Offering Limited Protective Performance Against Liquid Chemicals (Type 6 and Type Pb [6] Equipment).

- EN ISO 13982.1:2004 Protective Clothing for Use Against Solid Particulates – Part 1: Performance Requirements for Chemical Protective Clothing Providing Protection to the Full Body Against Airborne Solid Particulates (Type 5 Clothing).
- EN 14116:2015 Protective Clothing - Protection Against Flame - Limited Flame Spread Materials, Material Assemblies and Clothing.
- EN 14126:2003+AC:2004 Protective Clothing - Performance Requirements and Tests Methods for Protective Clothing Against Infective Agents.
- EN 14605:2005+A1:2009 Protective Clothing Against Liquid Chemicals - Performance Requirements for Clothing with Liquid-Tight (Type 3) Or Spray-Tight (Type 4) Connections, Including Items Providing Protection to Parts of the Body Only (Types Pb [3] and Pb [4]).
- ISO 15025:2016 Protective Clothing - Protection Against Flame - Method of Test for Limited Flame Spread.

NATURAL RESOURCE MANAGEMENT

Key laws, regulations, policies

- Environment Protection and Biodiversity Conservation Act 1999 (Cth).
- Conserving Nature—a Biodiversity Conservation Strategy for Queensland, State of Queensland, 2022.
- Natural Heritage Trust of Australia Act 1997 (Cth).
- Environment Protection (Impact of Proposals) Act 1974 (Cth).
- National Parks and Wildlife Conservation Act 1975 (Cth).
- Australian Heritage Commission Act 1975 (Cth).
- World Heritage Properties Conservation Act 1983 (Cth).
- Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth).
- Native Title Act 1993 (Cth).
- *Queensland* Planning Act 2016.
- *Queensland* Environmental Protection Act 1994.
- *Queensland* Nature Conservation Act 1992.
- *Queensland* Fisheries Act 1994.
- *Queensland* D Fauna Conservation Act 1974.

Key Documents and References

- Queensland Audit Office, Conserving Threatened Species (Report 7: 2018–19).
- Northern Territories Resources Pty Ltd (NTR), Environmental Emergency Response Management Plan 2023.

APPENDIX 5: Glossary

ADF	Australian Defence Force.
AMFG	Area Fire Management Group.
AIDR	Australian Institute of Disaster Resilience.
ARKS	Areas of Regional Koala Significance.
BoM	Bureau of Meteorology.
DAFF	Department of Agriculture Fisheries and Forestry (Australian Government).
DAF	Queensland Department of Agriculture and Fisheries.
DCAP	The Drought and Climate Adaptation Program.
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Australian Government).
DDMG	District Disaster Management Group.
DESI	Department of Environment, Science and Innovation (Queensland Government).
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning.
DTATSIPCA	Department of Treaty, Aboriginal and Torres Islanders Partnerships, Communities of the Arts.
EHMP	Ecosystem Health Monitoring Program.
EPRP	Emergency Preparedness Response Plan.
ESG	Environmental, Social and Governance.
FDF	Future Drought Fund.
GRMC	Gondwana Rainforests Management Committee.
IPCC	Intergovernmental Panel on Climate Change.
IRRO	Industry Recovery and Resilience Officer.
LDMG	Local Disaster Management Groups.
LGA	Local Government Area.
MBRW	Moreton Bay Ramsar Wetland.
MLA	Meat & Livestock Australia.
MNES	Matters of National Environmental Significance.
MRQ	Marine Rescue Queensland.
MSES	Matters of State Environmental Significance.
NBEPEG	National Biosecurity Emergency Preparedness Expert Group.
NDRA	Natural Disaster Relief and Recovery Arrangements.
NEMA	National Emergency Management Agency of Australia.
NFP	Not-for-profit.
NHA	Natural Hazards Australia.
NRM	Natural Resource Management.
NRMRQ	NRM Regions Queensland.
OFH	Overall Fuel Hazard.

PPRR	Prevention, Preparedness, Response Recovery.
QDAF	Queensland Department of Agriculture and Fisheries.
QDMA	Queensland Disaster Management Arrangements.
QDMC	Queensland Disaster Management Committee.
QFD	Queensland Fire Department.
QFES	Queensland Fire and Emergency Services.
QFF	Queensland Farmer's Federation.
QYAC	Quandamooka Yoolooburrabee Aboriginal Corporation.
QFBC	Queensland Fire & Biodiversity Consortium.
QPS	Queensland Police Service.
QPWS&P	Queensland Parks & Wildlife Service & Partnerships (Queensland Government).
QRA	Queensland Reconstruction Authority.
RFES	Rural Fire Services.
SBC	State Bushfire Committee.
SEQ	South East Queensland.
SES	State Emergency Service.
SLSQ	Surf Life Saving Queensland.
SEQ NRM Plan	South East Queensland Natural Resource Management Plan.
TEC	Threatened Ecological Communities.
WHA	World Heritage Area.

APPENDIX 6: References

- Australian Government Department of Agriculture, Fisheries and Forestry, *Climate- Smart Agriculture Program 2024-2028* https://www.agriculture.gov.au/agriculture-land/farm-food-drought/natural-resources/landcare/climate-smart.
- Australian Government Department of Agriculture, Water and the Environment (2021), *Threatened Species Strategy (2021–2031),* Australian Government.
- Australian Government Department of Climate Change, Energy, the Environment and Water (2022), *Threatened Species Action Plan 2022-2032*
- Australian Government Department of Climate Change, Energy, the Environment and Water (2023), *Natural Heritage Trust Emergency Preparedness Guidance,* Australian Government.
- Australian Government Department of Climate Change, Energy, the Environment and Water (2022), *Threatened Species Action Plan 2022-2032,* Australian Government.
- Australian Government Department of Climate Change, Energy, the Environment and Water (2023), National Climate Risk Assessment: Methodology, Department of Climate Change, Energy, the Environment and Water, Canberra, July. CC BY 4.0.
- Australian Government Department of Climate Change, Energy, the Environment and Water (2024), National Climate Risk Assessment – first pass assessment report, Department of Climate Change, Energy, the Environment and Water, Canberra, March. CC BY 4.0.
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- Australian Government Department of Home Affairs, 2018.
- Australian Government smartraveller.gov.au.
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- Australian Institute of Disaster Resilience 2019 *https://www.aidr.org.au/*.
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- Commonwealth of Australia (2023), Department of the Prime Minister and Cabinet, *Australian Government Crisis Management Framework,* Commonwealth of Australia.
- CSIRO (2015), *Climate Change in Australia, Projections for Australia's NRM Regions*, CSIRO.
- Healthy Land & Water (March) 2022 '*Live Flood Map*': https://seqcatchments.maps.arcgis.com/apps/dashboards/598e87302b594b788c4f268881c387d1.
- Inspector General's *The 2018 Queensland Bushfires Review Report 2: 2018-2019* https://cabinet.qld.gov.au/documents/2019/Jul/bfires/Attachments/Report.PDF.
- Intergovernmental Panel on Climate Change (IPCC, 2021) *Sixth Assessment Report – Working Group* I (The Physical Science) Summary for Policymakers, IPCC.
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- International Association of Public Participation (IAP2) framework https://iap2.org.au/.

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- Queensland Fire and Emergency Services (2018), *Queensland Prevention Preparedness Response and Recovery Disaster Management Guideline*, Queensland Fire and Emergency Services.
- Queensland Government (2009), *South East Queensland Natural Resource Management Plan* 2009–2031, Healthy Land & Water.
- Queensland Government Department of Agriculture and Fisheries, *Biosecurity Act (2014)*.
- Queensland Government Department of Environment, Science and Innovation live air quality data https://apps.des.qld.gov.au/air-quality/.
- Queensland Government, *Disaster Management Act* (2003).
- Queensland Government, *Environmental Protection Act* (1994).
- Queensland Government, *Nature Conservation Act* (1992).
- Queensland Government, *Public Health Act (2005)*.
- Queensland Government, *State Planning Policy* (Water) 2017.
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- Ramsar National Report to COP14 COP14 National Report Background information. (n.d.). https://www.dcceew.gov.au/sites/default/files/documents/national-report-cop14.pdf
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- *South East Queensland Natural Resource Management Plan* (2019-2023)
- *State of Queensland* (Queensland Audit Office, 2023)
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- World Economic Forum (2024), *Global Risk Report*, WEF.

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