Working together to deliver climate-ready restoration for Australia.

CLIMATE-READY RESTORATION

A NATIONAL PARTNERSHIP PROSPECTUS – MAY 2021

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OUR RATIONALE & VISION

Why Climate-Ready Restoration?

To combat the devastating impacts of a changing climate, the environmental sector must urgently find new interventions and deliver new scales of operating.

During the UN Decade of Restoration, Greening Australia and the World Wide Fund for Nature – Australia are partnering to innovate, accelerate and amplify climate-adapted restoration approaches so that biodiversity and ecosystem services - our life support systems - continue to thrive. A core pillar of our program will be bushfire preparedness and recovery.

Our 2030 vision is one where nature is strong enough to withstand climate change so we can all thrive. That means nature-based solutions to climate adaptation are mainstreamed across Australia, improving the resilience of biodiversity, ecosystem services and our rural economies.

This will help us prepare for, and adjust to, both the current effects of climate change and the predicted impacts in the future, ensuring the Australian environment is 'climate-ready'. We will focus on three key action areas:

(a) Targeted recovery of threatened species through habitat 'renovation', with consideration for maximising the probability of persistence of all species at a given location in the decades ahead;

(b) Long-term resilience of landscapes that are vulnerable to a changing climate, and;

(c) Nature-based solutions to mitigate climate-induced risk.

We need support from the government, philanthropists, community and business to lead this shift. Here we present our science-led plan. We call it **Climate-ready Restoration**.

Community Tree Planting at Cook Reserve Ruse, Campelltown, NSW © WWF-Aus / Leonie Sii

WWF-Australia & Greening Australia - A Signature Partnership

Greening Australia and WWF-Australia are two of the country's best known conservation organisations. We're joining forces to take our work to the next level.

Our signature partnership will combine the strengths of both organisations to build on existing science and take leadership on practical, on-ground solutions that will improve the long-term resilience of the Australian environment to help prepare people and nature for a changing climate.

What this partnership brings:

1. Significant experience and capability in impact-focused, science-driven, on-ground implementation at scale;
2. Innovation at the heart of our strategy and culture;
3. A strong track record in building climate resilience for landscapes and species; and,
4. Unparalleled brand recognition, credibility and trust.

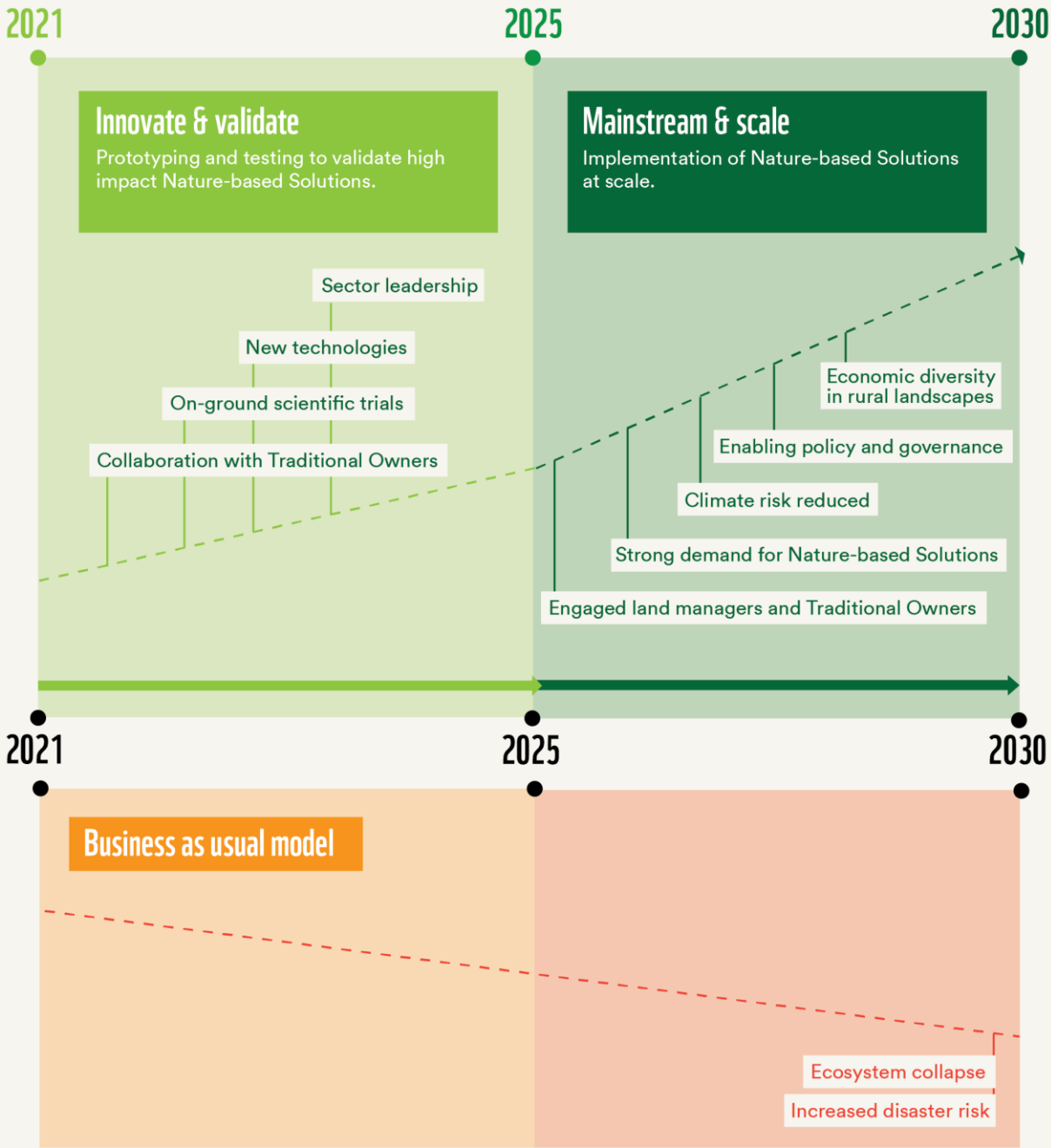
Both organisations have a commitment to bushfire recovery, conserving flora and fauna, building landscape climate resilience and enabling local communities to adapt.

We will take a phased approach to the partnership, focusing on testing, learning, and scaling.

1. July 2021 - Dec. 2022: Phase One – Launch and Validate
2. Jan. 2023 - Dec. 2024: Phase Two – Expand and Leverage
3. Jan. 2025 - June 2026: Phase Three – Consolidate and Future Planning

Co-investment will be provided by Greening Australia and WWF-Australia, and we will build into the program design long-term investment solutions expected to be in the tens of millions of dollars.

CLIMATE-READY RESTORATION MODEL



Science-Driven & Community-Owned

Together with other experts we have developed detailed methodologies to deliver Climate-ready Restoration. We will adopt a scientific methodology that sets and tests hypotheses through data collection, modelling and on ground experimentation, informed by existing scientific and Indigenous ecological knowledge.

We will engage with existing community-based and regional land management practitioners, networks and institutions. We will jointly explore what works and what does not, and ultimately build the capacity of local practitioners to embed climate-ready restoration within local plans and priorities. Our approach to stakeholder collaboration and engagement is shown below.

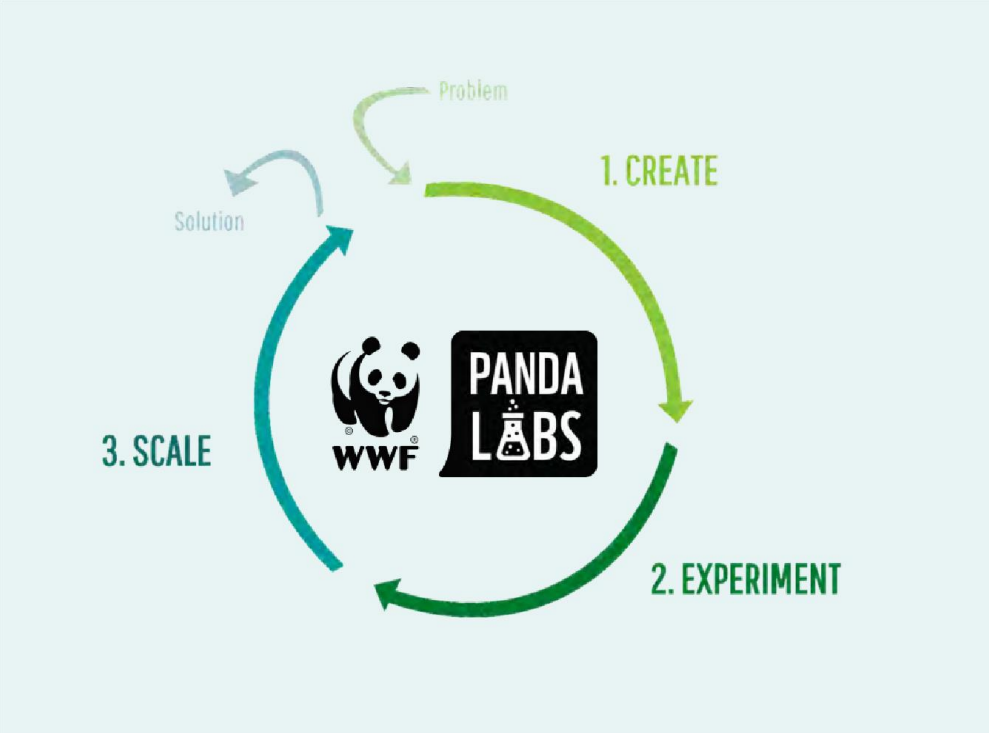
Innovation for Impact – Panda Labs

This is not ‘Business as Usual’. Many of our proposed approaches are experimental in nature, and we need to learn quickly, adapt and scale solutions rapidly.

Panda Labs is WWF-Australia’s award-winning innovation program, focusing on accelerating and amplifying emerging technologies that deliver positive social and environmental impact.

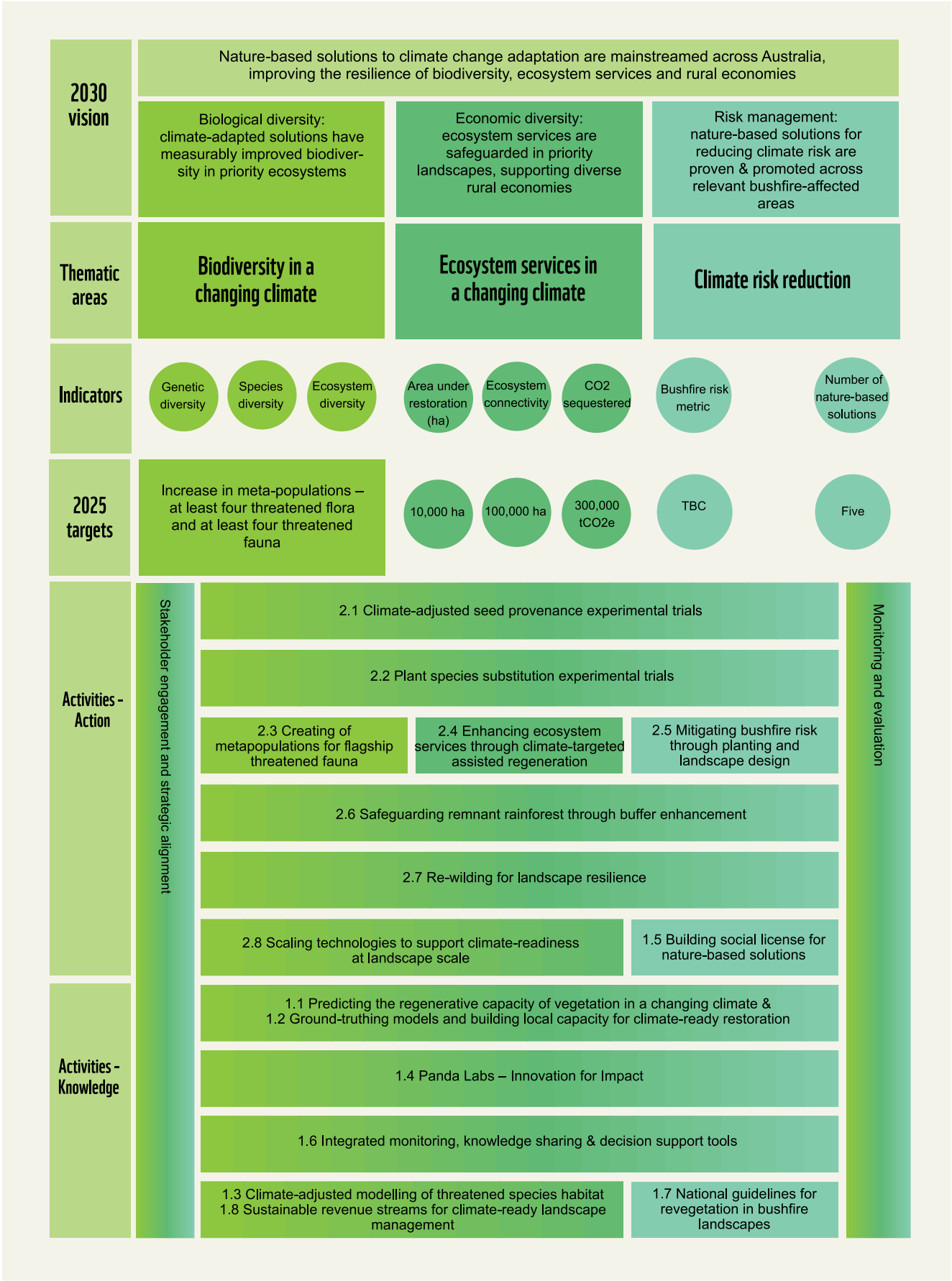
Panda Labs has just completed a Bushfire Regeneration Challenge, using Impactio to uncover innovative nature-based solutions to enhance the recovery, regeneration and resilience of landscapes and threatened species. The Challenge has mobilised $1.3 million to nine projects across Australia, ranging from habitat pods to protect prey from predators in post-fire landscapes to seed enhancement technologies to restore severely burned landscapes to harnessing ecosystem engineers to increase bushfire resilience.

WWF-Australia and GA will collaborate on innovation for this program of work, supported by the Panda Labs methodology WWF have deployed in the past as represented in the below infographic.



OUR PATHWAY TO SUCCESS

Our Vision, Objectives & Activities



Project Activities & Indicative Costs (2021-2025)

Greening Australia is committed to integrating climate-ready approaches into all restoration projects and sharing knowledge with the broader sector. We have been adopting climate-adapted approaches for threatened species habitat creation and integrating climate-ready seed into our projects. We have worked with scientists across Australia to better understand climate-ready approaches and have run forums to bring together Australia's leading climate scientists with 200+ seed practitioners to encourage the sector to use climate-ready seed. We are also encouraging local communities to take action and support vegetation to adapt with our Climate Future Plots.

WWF has also been progressively integrating climate change considerations across our conservation portfolio, including establishing a dedicated Threatened Species and Climate Adaptation program in 2019. Following the 2019-2020 bushfires, WWF launched an Australian Wildlife and Nature Recovery Fund, which has so far mobilised in the order of $20 million across Australia to support emergency wildlife response, species recovery, landscape restoration, and Indigenous engagement. A unifying focus of WWF's bushfire response is on future-proofing Australia; on building ecological, social and economic resilience in the face of a warming climate.

Greening Australia and WWF have already committed at least $20m to projects and programs between 2020 and 2025 that will directly advance the objectives and vision of this program. The partnership will enhance coordination, leverage cross-sectoral action and investment, and ultimately deliver greater impact. We are seeking an additional $30m to deliver a $50m program of work. The following table outlines a suite of initial, integrated actions that we believe will set the program up for success. As the program gathers momentum, we will periodically review and adapt this suite of priorities to reflect the most impactful, up-to-date and innovative opportunities.

ACTIVITY	FUNDS NEEDED	LEAD
COMPONENT 1: KNOWLEDGE		
1.1 Predicting the regenerative capacity of vegetation in a changing climate	$1.7m	GA
1.2 Ground-truthing models and building local capacity for climate-ready restoration	$1.3m	GA
1.3 Climate-adjusted modelling of threatened species habitat	$1.1m	WWF
1.4 Panda Labs - innovation for climate-ready impact	$1.0m	WWF
1.5 Building social licence for nature-based solutions to bushfire risk	$0.7m	GA
1.6 Integrated monitoring, knowledge sharing & decision support tools	$0.8m	GA/WWF
1.7 National guidelines for revegetation in bushfire landscapes	$0.6m	GA
1.8 Sustainable revenue streams for climate-ready landscape management (scoping)		GA/WWF
Subtotal Knowledge	**$7.2m**	
COMPONENT 2: ACTION		
2.1 Climate-adjusted seed provenance experimental trials	$1.7m	GA
2.2 Plant species substitution experimental trials	$1.8m	GA
2.3 Creating meta-populations for flagship threatened fauna through revegetation	$9.2m	GA
2.4 Enhancing ecosystem services through climate-targeted assisted regeneration	$4.1m	WWF
2.5 Mitigating bushfire risk through planting and landscape design	$0.6m	GA
2.6 Safeguarding remnant rainforest through buffer enhancement	$0.8m	GA
2.7 Rewilding for landscape resilience and species persistence	$1.5m	WWF
2.8 Scaling technologies to support climate-readiness at landscape scales	$3.1m	WWF
Subtotal Action	**$22.8m**	
TOTAL	**$30m**	

Component 1: KNOWLEDGE

1.1 Predicting the regenerative capacity of vegetation in a changing climate (GA)

Question to be addressed

Where do we predict our natural areas will recover after the fire?

Why is this important?

We have already identified and can quickly assemble the key stakeholders and establish the governance model for this project, including an independent Project Steering Committee. We will closely consult with Traditional Owners along this journey. The extent of the burnt area is large, and the habitat types varied. We will build on the current fire severity mapping by combining additional spatial layers (e.g. fire history) with plant traits (e.g. immaturity risk) to develop spatially explicit maps of regeneration potential for four widespread vegetation communities that represent the spectrum of fire tolerance.

What will we deliver?

- Spatially explicit maps of regeneration potential for four widespread vegetation communities in a changing climate (>2 million ha of bushfire affected regions)
- Identification of refugia and vulnerable locations where we need to take climate-adjusted action

What will it cost?

$1.7 million

1.2 Ground-truthing predictive models and building local capacity for climate-ready restoration (GA)

Question to be addressed

Are our predictions correct- where and to what extent can nature recover after fire?

Why is this important?

Soils contain seeds that can typically regenerate after bushfires, but the intense heat of these fires may have rendered some seeds unviable. Other plants resprout after fire from sprouts on the buds and tubers at the base of the plant, but in some locations, the fires may have been so hot that the resprouting ability is likely to have been compromised. Project Phoenix, Greening Australia's project funded by the federal government, has enabled ecologists to predict which ecological communities, and where, are likely to have had their regeneration potential impacted. Underpinned by this predictive framework, we will employ local people to sample the soil seed bank across fire severity and ecological community categories, support local nurseries to grow the seeds and engage local botanists to identify plants. This will enable practitioners to (a) understand the impact of fire severity on the soil seed bank and ability to resprout, (b) strengthen the regeneration potential maps, (c) strategically invest in seed acquisition and (d) develop a decision support tool for future fires.

What will we deliver?

- Support for local nurseries in bushfire-affected regions
- Employment and training for Australia's First Nations people, where they have the interest and capacity
- Maps that demonstrate the impact of fire severity and ecological community on regeneration potential across 2 million ha
- Improved predictive capacity for future fire impacts

- Decision support tool to support future fire recovery efforts and seed collection activities

What will it cost?

$1.3 million

1.3 Climate-adjusted modelling of threatened species habitat (WWF)

Question to be addressed

Where will our threatened species live in a changing climate?

Why is this important?

We will draw on existing climate-projected habitat distribution and the aforementioned landscape regeneration maps (see 1.1 and 1.2), along with recovery plans and expert advice, to identify strategic locations, flagship species and strategic interventions that will increase metapopulations and spread the geographic risk of extinction. We will incorporate knowledge around wildlife dispersal capabilities, habitat needs and genetic integrity. We will target a suite of fauna, including iconic species such as gliders, koala and lyrebirds, that will ultimately benefit hundreds of other species, including narrow range invertebrates.

What will we deliver?

- Identification of 'safer' locations for the climate-ready creation and restoration of threatened species habitat. These will inform the implementation of several on-ground interventions outlined below, including (but not limited to) 2.3, 2.4 and 2.8.

What will it cost?

$1.1 million

Platypus © Lukas - stock.adobe.com / WWF-Aus

1.4 Panda Labs - Innovation for climate-ready impact (WWF)

Question to be addressed

What are the new ideas we have not thought of yet?

Why is this important?

Once we have combined our starting and future states and we know which plant communities and where they are changing, we need to carefully evaluate our intervention options based on ecological criteria and the cost and ecological feasibility of intervening. Our recommendations will be informed by clear decision-making processes that capture the likelihood of success in a changing climate, the longevity of project outcomes and our return on investment.

We also need to think outside the norm. We are bringing in WWF's award-winning Panda Labs approach to innovation, which focuses on accelerating and amplifying solutions to wicked environmental and social problems. We will bring together experts from diverse fields – fire ecology, artificial intelligence, reforestation, climate forecasting, etc – to establish hypotheses and prioritise potential solutions. We will rapidly test hypotheses to select novel approaches that perhaps were previously deemed too high risk or unnecessary.

What will we deliver?

- Climate targeted goals for priority vegetation communities across bushfire regions (>2 million ha)
- Impactio challenge to unearth high potential, climate-ready solutions from across the country and enhance the clarity and quality of these solutions through collaborative curation.

What will it cost?

$1 million

1.5 Building social licence for nature-based solutions to bushfire risk (GA)

Question to be addressed

How can we bring communities with us?

Why is this important?

Following the devastating fires of last summer, the *perception* of bushfire risk by local communities may not match the *actual* bushfire risk, and it is likely that sensitivity to issues around vegetation and fire will be heightened. This mismatch between actual and perceived bushfire risk may result in anxiety, a loss of social licence for restoration, irreversible delays and poor outcomes for both people and nature. We will coordinate social scientists, disaster psychologists and fire agencies to understand the risk/benefit perception continuum of recovery actions to build a social license for revegetation in bushfire recovery.

What will we deliver?

- Regional focus group workshops to understand bushfire risk perception compared with actual risk
- Communication and outreach techniques developed to address the chasm between perceived and actual bushfire risk
- Communication co-delivered by WWF/GA and fire agencies

What will it cost?

$0.7 million

1.6 Integrated monitoring, knowledge sharing and decision support tools (WWF/GA)

Question to be addressed How do we share what we have learned and maximise impact?
Why is this important? An important part of the value proposition of this program is to provide a national scale and perspective, which encourages the sharing of knowledge and cross-fertilisation of ideas across multiple regions. Therefore, data and findings must be appropriately monitored, aggregated and integrated at multiple scales. Moreover, it is a core objective of the program to share findings and recommendations across the wider restoration and land management sector, to build capacity on climate-ready approaches and enhance the scale and impact of our work.
What will we deliver? ● A knowledge-sharing alliance to aggregate and share findings in a clear and accessible way ● Spatially explicit maps for monitoring progress and prioritising future investment, tied to actions, outputs and outcomes ● Decision support tools to demonstrate which climate adjusted actions are best suited to different regions.
What will it cost? **$0.8 million**

Grey-headed flying fox © Michal - stock.adobe.com / WWF-Aus

1.7 National guidelines for revegetation in bushfire prone landscapes (GA)

Question to be addressed How do we ensure revegetation does not increase fire risk?
Why is this important? There is a risk that at the scale of intervention required, revegetation activities may inadvertently result in increased fire risk, but with careful planting design and national guidelines, we may be able to reduce fire risk under certain weather conditions. Greening Australia & WWF will work with fire ecologists and firefighting agencies to explore the science around planting design and siting for remnant and revegetated areas and develop National Guidelines for Revegetation in Bushfire Prone Landscapes. These guidelines will contribute to 1.5 Building social license for nature-based solutions.
What will we deliver? ● National Guidelines for revegetation in bushfire-prone landscapes
What will it cost? **$0.6 million**

1.8 Sustainable revenue streams for climate-ready landscape management (WWF/GA)

Question to be addressed How can we make it economically viable to restore the land?
Why is this important? If land managers are to be appropriately rewarded and incentivised to invest in landscape restoration, and we are to effectively future-proof Australia to the effects of climate change, this will require an exponential increase in resourcing. This will invariably require a shift away from reliance on grants and philanthropic funding towards sustainable and reliable revenue streams. We will assess a range of options for harnessing and deploying capital towards conservation, sustainable management and restoration, including (but not limited to): carbon markets, biodiversity offsets, payments for ecosystem services (PES), and impact investing, including in the context of global commitments to responsible commodity production, sourcing and finance.
What will we deliver? ● A long-term investment plan for climate-ready landscape management in Australia
What will it cost? **$0.3m**

Component 2: ACTION

2.1 Climate-adjusted seed provenance experimental trials (GA)

Question to be addressed Should we be planting trees using seed collected from different climates anticipating a 2-3 degree increase in global temperatures to improve nature's resilience?
Why is this important? The use of climate adjusted seed is likely to be an important risk-based evolutionary strategy for recovering bushfire affected areas that will be hotter and drier in the future. We will trial climate-adjusted seed across large bushfire-affected areas using aerial seeding techniques along with 'training sites' for drone monitoring of provenance success in the future. We will engage conservation geneticists to employ eco-evolutionary approaches to understand the seed sourcing composition that provides the best adaptive capacity to cope with present and future environmental conditions.
What will we deliver? ● Experimental trials to understand optimal seed sourcing for priority communities in a changing climate ● Drone provenance trials ● Priority communities are 'climate-ready'
What will it cost? **$1.7 million**

AirSeed Technologies demonstrate their seed-dispersing drones at a property at Marulan. © WWF-Aus / Paul Fahy

2.2 Plant species substitution experimental trials (GA)

Question to be addressed Should we be planting different species anticipating a 2-3 degree increase in global temperatures?
Why is this important? Under climate change, some species will be lost at scale across the landscape, so continuing to reseed these sites with the same species in areas with increased fire frequency is not a climate-adjusted strategy. Using the outcomes of the science and planning, we will work with experts to undertake large scale experimental trials of aerial seeding to trial new climate-adjusted species in areas that are projected to be frequently burnt and vulnerable in a changing climate.
What will we deliver? ● Experimental trials of aerial seeding using climate-adjusted species substitution ● Climate ready areas of habitat created for priority ecological communities
What will it cost? **$1.8 million**

2.3 Creating meta-populations of flagship threatened fauna through revegetation (GA)

Question to be addressed How do we spread the risk of climate change to our threatened species by creating new populations?
Why is this important? We will draw on the findings from climate-adjusted modelling of threatened species habitat (see 1.3) to take a risk-based approach to Threatened Species recovery by creating geographically spread ‘insurance populations’. We will build 1000 ha of new habitats in safer locations for future rewilding of priority ‘flagship’ species. We will capture the expected benefits for other species at these locations and identify and advocate for changes to threatened species recovery plans and other strategic priorities as we progressively learn what works (and does not work) in building climate-readiness.
What will we deliver? ● 1000 ha of habitat created for flagship threatened fauna species in ‘safer’ locations for a changing climate
What will it cost? **$9.2 million**

Spotted quoll © Craig - stock.adobe.com / WWF-Aus

2.4 Enhancing ecosystem services through climate targeted assisted regeneration (WWF)

Question to be addressed How can we enable areas most vulnerable climate change to regrow and thrive?
Why is this important? We will partner with public, Indigenous and private landholders to support 'low regrets' climate-targeted interventions to protect natural regrowth aligned with our regeneration potential and climate-ready modelling. We will facilitate assisted regeneration in high conservation value areas that optimise habitat provision, reverse ecosystem simplification and maximise carbon sequestration, including control of invasive fauna and flora across priority landscapes. We will work with Traditional Owners and Indigenous Ranger groups to experiment with cultural burning as a tool for building landscape resilience and reducing fire risk in a changing climate.
What will we deliver? ● 2000-3000 ha of climate-targeted assisted regeneration ● Stewardship payments for farmers and landholders to support assisted regeneration in strategic locations
What will it cost? **$4.1 million**

2.5 Mitigating bushfire risk through planting and landscape design (GA)

Questions to be addressed

Can we change bushfire risk for people and nature by arranging plants differently in the landscape?

Why is this important?

The configuration of vegetation types, plant densities, plant arrangements and species type is known to influence bushfire risk at local and landscape scales under certain weather conditions. Through careful planting design and landscape management, we may be able to reduce fire risk. We will work with fire ecologists to review the scenarios under which planting designs will mitigate fire risk, formalise planting designs and establish demonstration sites for local communities. The outcomes of this project may contribute to 1.7 *National Guidelines for Restoration.*

What will we deliver?

- Planting designs that mitigate bushfire risk
- Five demonstration sites for local communities

What will it cost?

$0.6 million

Bushfire, Jervis Bay © Bryce Harper / WWF-Aus

2.6 Safeguarding remnant rainforest through buffer protection and enhancement (GA)

Question to be addressed?

How do we most effectively create buffers to help rainforests recover from fire?

Why is this important?

Rainforests are fire intolerant and were burnt across four of the Federal Government's priority regions. In locations where rainforest was not directly impacted by the fire, but the surrounding landscape was burnt, residual rainforests are likely to be exposed to increased evapotranspiration and winds, which may contribute to their further decline and eventual replacement by other species such as Eucalypts. We will undertake experimental planting trials using established shelterbelt designs to reduce wind speed and evapotranspiration to determine whether we can limit the post-fire impacts on rainforests.

What will we deliver?

- Rainforest buffers created in three locations
- One nature-based solution- Effectiveness of rainforest buffers in protecting rainforests understood

What will it cost?

$0.8 million

2.7 Rewilding for landscape resilience and species persistence (WWF)

Question to be addressed

How can reintroduction of key fauna species help plants and soils flourish?

Why is this important?

Re-wilding is likely to be an increasingly important method for assisting the recolonisation of burnt areas as well as for colonising the newly created, climate-ready habitat under #2.3. However, re-wilding is not just important for threatened species recovery, it is fundamentally targeted at restoring ecological function and composition. This is empirically linked to ecological resilience, and in some cases, fire risk reduction.

Ecosystem engineers (potoroos, bettongs and bandicoots) increase soil turnover, soil moisture and nutrient cycling. Diggings increase seedling germination, recruitment and plant growth, ultimately increasing biodiversity and ecosystem functioning (Fleming et al., 2013). Digging also buries leaf litter, creating conditions for cooler burning fires.

We will draw upon our climate modelling and habitat creation to establish strategies for restoring ecosystem engineers to their former landscapes, to enhance biodiversity, ecosystem function and fire risk management.

What will we deliver?

- Spatial prioritisation for areas that will benefit most from re-wilding, with a focus on ecosystem engineers
- Strategic management of the threats
- Reintroductions or population augmentation of at least three priority species

What will it cost?

$1.5 million

2.8 Scaling technologies to support climate-readiness at landscape scale (WWF)

Question to be addressed How do we radically scale up planting and restoration approaches?
Why is this important? We will trial new seeding methods at scale, including drone seeding of burnt landscapes, and develop decision support tools to help practitioners choose the best techniques from the growing range of methods. This is likely to be based on criteria such as ecological attributes, cost, survival rates, safety and accessibility.
What will we deliver? ● 1000-2000 ha under restoration in priority landscapes
What will it cost? **$3.1 million**

OUR GEOGRAPHIC FOCUS

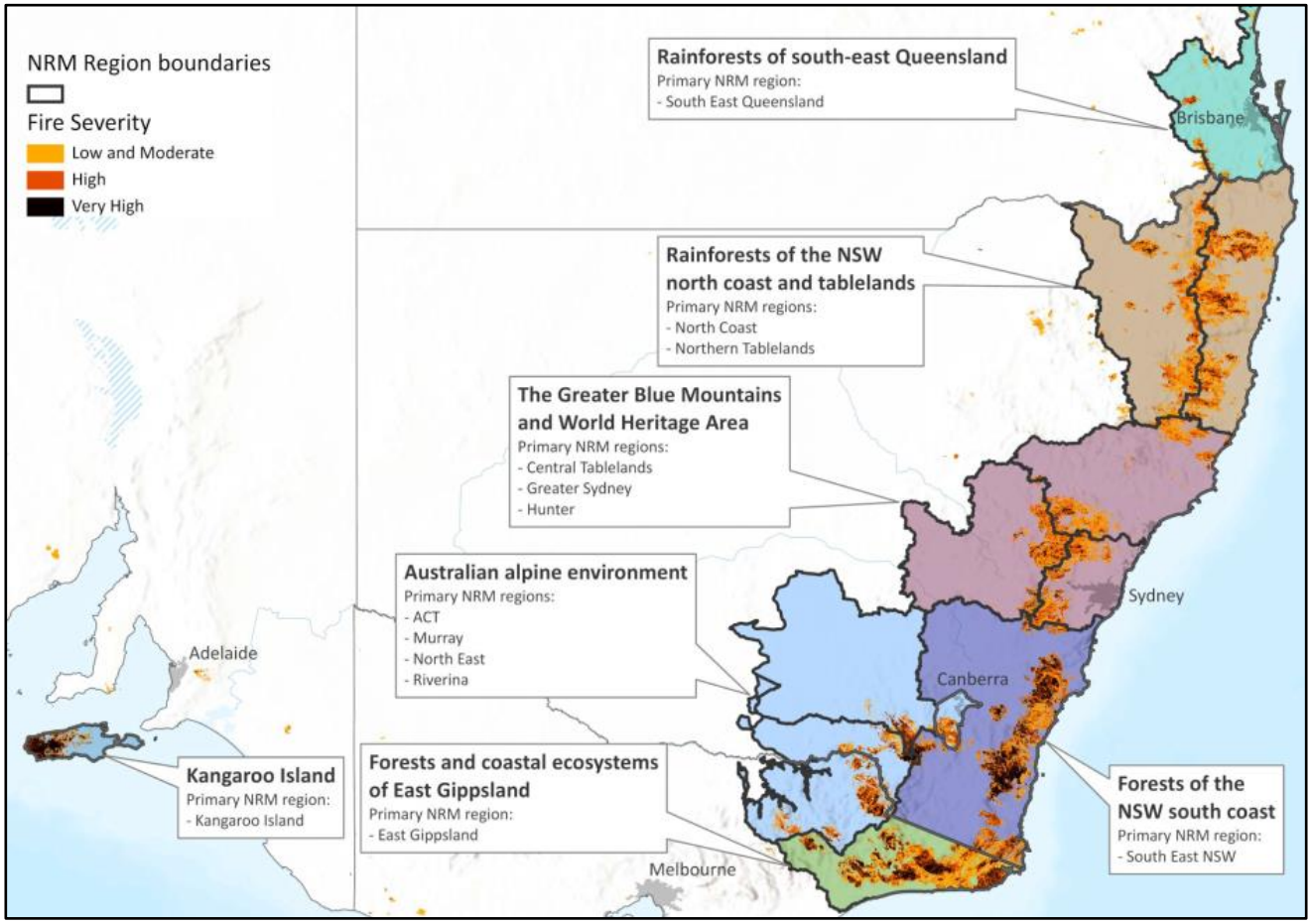
The Commonwealth Government's Regional Bushfire Recovery Target Areas

The Commonwealth government has identified seven regions most impacted by the 2019-2020 bushfires, targeting for investment into bushfire recovery actions.

Greening Australia and WWF-Australia will coordinate our strategies and interventions with those of the Commonwealth, state governments and other key stakeholders to help ensure that investments are complementary.

In doing so, we will adopt a national perspective, which emphasises climate-ready experimentation and cross-regional knowledge exchange, as well as preparing for a changing future.

We will seek to establish a footprint in each of the seven regions, focusing on specific vegetation communities across the fire tolerance spectrum (see section below), which will enable us to compare and contrast the post-fire recovery of these communities across the relevant regions.



A Fire Tolerance Spectrum

Many of Australia's plants and animals have evolved to cope with fires and floods, droughts and high temperatures. For many species, these disturbances mechanisms are tied closely to their life cycle or give them a competitive edge over other species. However, the intensity and frequency of disturbances we are now witnessing are outside their tolerance zone for many species.

Our work will focus on four priority vegetation communities that represent a fire 'tolerance' spectrum based on plant traits and the species contained within those areas. Focusing on these vegetation communities will involve experimenting with site-specific interventions and assessing landscape-scale impacts for replication and scaling across other similar vegetation types.

Vegetation Community	Fire response and plant traits	Priority fauna	Priority flora
Rainforests	Fire intolerant	Lyrebirds, Eastern Bristlebird, Rufous Scrub-bird, Koontoo, Clarence River Cod, Bristle snails, golden bowerbird, lemuroid ringtail possum	World Heritage Gondwana Rainforest, Lowland Subtropical Rainforest, Myrtle beech, Southern sassafras
Eucalypt forests	Obligate seeders	Leadbeaters possum, Alpine skink, Mountain pygmy possum, Galaxids	Alpine Ash, Snow Gum, Mountain tea tree, Mountain hickory wattle, Silver wattle
Eucalypt forests and woodlands	Fire tolerant, resprouters	Koala, Greater Glider, forest owls, Spotted-tailed Quoll, platypus, south, Southern brown bandicoot, long footed & long nosed potoroo, Peppered Tree Frog, Hastings River Mouse, Giant Burrowing Frog, Grey-headed flying fox	Grey Box-Grey Gum Wet Sclerophyll Forest in the NSW North Coast Bioregion, Banyabba Shiny-barked Gum, Manna gum, heath, woodland and open dry sclerophyll forest
Allocasuarina and Banksia woodlands	Fire tolerant	Glossy Black Cockatoos, Little Pygmy Possum, Rosenberg's Goanna, Tammar wallaby	Sugar gum, drooping sheoak

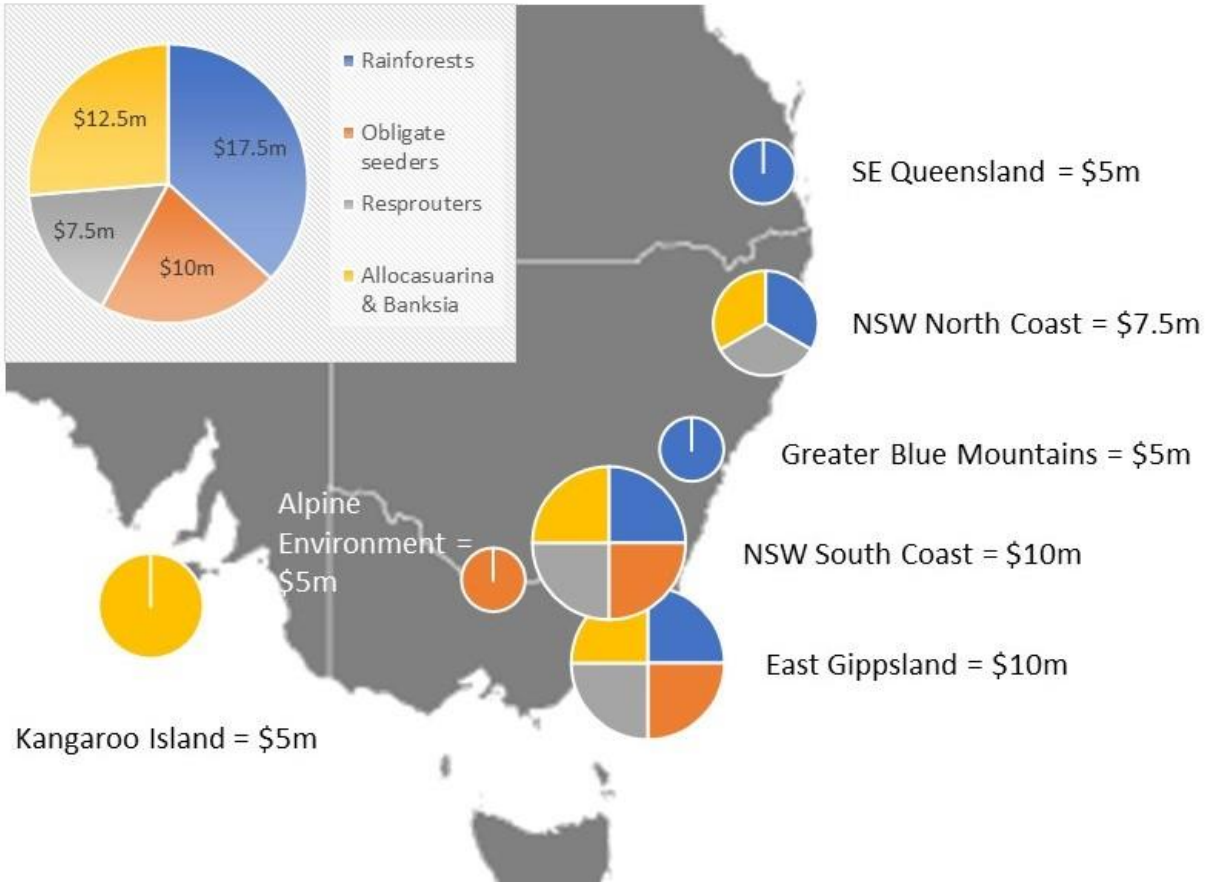
If we map these vegetation communities against the Commonwealth Government's priority bushfire-affected regions, we can see that they are represented unevenly across these regions. Therefore, in the first instance, we plan to weigh our resource allocation towards those areas with multiple vegetation communities. This will enable us to more rapidly activate a broader range of interventions across the fire tolerance spectrum, and to adopt integrated, landscape approaches involving multiple communities within a single area.

- Tier One (20% each): Forests of the NSW South Coast, Forests and Coastal Ecosystems of East Gippsland
- Tier Two (15% each): NSW North Coast and Tablelands
- Tier three (10% each): Greater Blue Mountains, Alpine Environment, Rainforests of South East Queensland, Kangaroo Island

Vegetation community	KI	EG	NSW SC	Alpine	GBM	NSW NC	SEQ
Rainforests (RF)							
Eucalypt - obligate seeders (OBS)							
Eucalypt forest and woodlands - resprouters (RES)							
Allocasuarina and Banksia woodlands (AB)							

Regional Budget Breakdown[1]

PER GEOGRAPHY	Total		Per Vegetation Community			
NSW	**%**	**$**	**RF**	**OBS**	**RES**	**AB**
Forests of the NSW South Coast	20%	$10m	$2.5m	$2.5m	$2.5m	$2.5m
NSW North Coast and Tablelands	15%	$7.5m	$2.5m		$2.5m	$2.5m
Greater Blue Mountains	10%	$5m	$5m			
Alpine Environment[2]	5%	$2.5m		$2.5m		
Forests and Coastal Ecosystems of East Gippsland[3]	10%	$5m	$1.25m	$1.25m	$1.25m	$1.25m
VICTORIA						
Forests and Coastal Ecosystems of East Gippsland	10%	$5m	$1.25m	$1.25m	$1.25m	$1.25m
Alpine Environment	5%	$2.5m		$2.5m		
QUEENSLAND						
Rainforests of South East Queensland	10%	$5m	$5m			
SOUTH AUSTRALIA						
Kangaroo Island	10%	$5m				$5m
	95%[4]	**$47.5m**	**$17.5m**	**$10m**	**$7.5m**	**$12.5m**



[1] This is a preliminary and indicative breakdown only, which will need to be more thoroughly costed through detailed analysis and consultation. Moreover, some of the Knowledge components of the program will be carried out at national level, not local.
[2] Cuts across NSW and Victoria, so have split the 10% resource allocation evenly across both states.
[3] Cuts across NSW and Victoria, so have split the 20% resource allocation evenly across both states.
[4] Enables us to work with round numbers, as well as to allow for some flexibility in the regional allocation.

Emergency Spatial Prioritisation

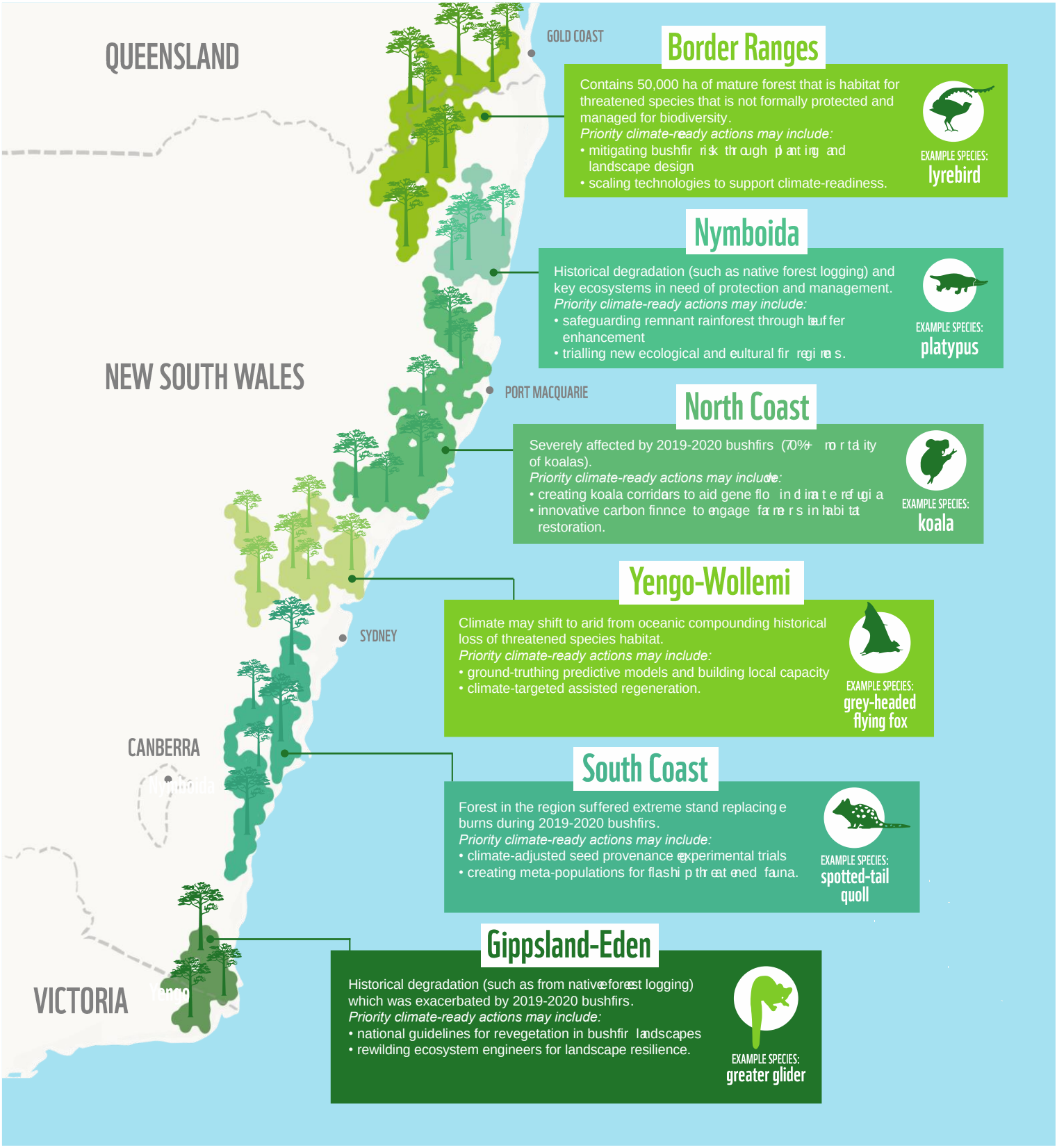
Within these broad geographic regions, there are multiple pieces of interrelated analysis we are using to inform our spatial (and other) priorities for post-fire landscape and species recovery, including through the lens of climate readiness.

For example, an initial piece of analysis that WWF-Australia has carried out identifies six landscapes across the fire footprints of New South Wales, Victoria and Queensland that represent the most important post-fire refuge areas for biodiversity and threatened species. These areas will be increasingly important in the face of climate change. This is informing a considerable body of work to promote enhanced legal (and other) protection of these areas and is an important input to our restoration priorities.

A complementary piece of analysis is ongoing, which will prioritise areas for restoration based on climate-projected species distribution, and overlay costs of relevant restoration actions in order to optimise return on investment.

Superb Lyrebird (Menura novaehollandiae) © Andrew - stock.adobe.com / WWF-Aus

Illustrative examples of potential climate-ready interventions



A Landscape Approach: NSW North Coast – Koalas Forever

The NSW North Coast region has significant remnant mature forests, including relictual globally recognised Gondwana rainforest, one of four world heritage areas within NSW. The area is also an important stronghold for koalas, containing four large distinct metapopulations and is identified as a climate refugia due to its higher rainfall, fertile soils and relative protection from high-intensity fires. The area contains substantial Areas of Koala Significance (ARKS), many identified as having moderate to high resilience in the face of climate change. Climate projections suggest that koalas are more likely to survive the coming centuries of global heating than koala populations west of the Dividing Range.

Bushfires have had a devastating impact along with the southern and northwest areas of the North Coast. Post-bushfire koala surveys found 70%+ mortality from bushfires in NSW, with an estimated 6,382 koalas dying during the fires in NSW, with most in the northern region.

To increase the resilience of these World Heritage rainforests and priority koala habitats the recovery actions on the North Coast are focused on the following recovery actions:

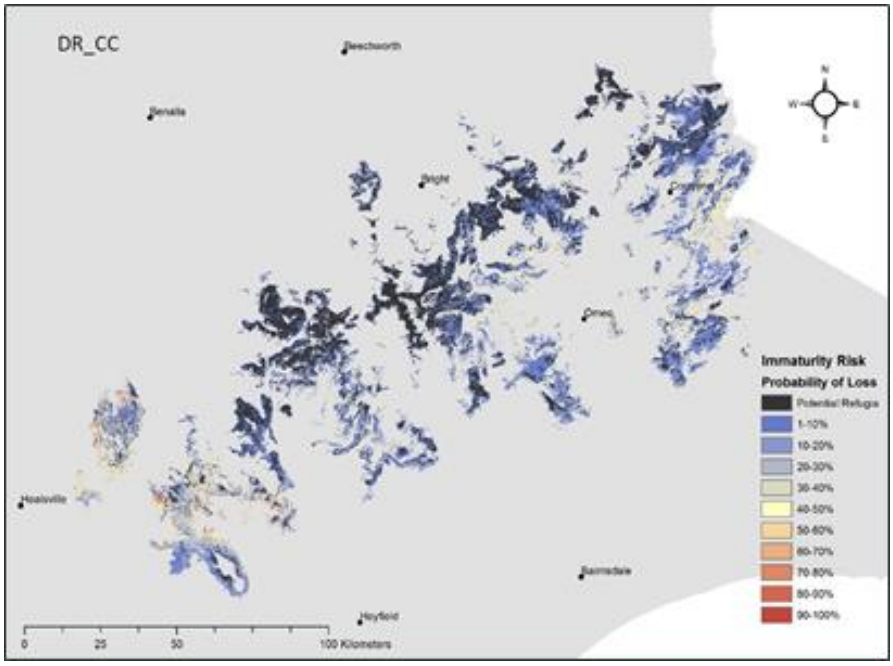
- Richmond and Clarence River Catchment Koala Corridor Restoration to aid the movement of koalas and improve gene flow in climate refugia (including revegetation of climate adapted koala food trees);
- Reducing the impact of intense wildlife fires through increased ecological and cultural burning;
- Drone seeding trial in degraded and fire affected habitats;
- Protecting and improving the integrity of core habitat areas through targeted removal of weeds impeding koala movement; and,
- Koala Carbon - trialling aggregated carbon projects in Areas of Regional Koala Significance to engage small scale farmers in restoration of rainforest and koala habitat.

To mitigate against extreme heat events planting design includes dense shade tree species, for example, Acacia species, turpentine (Syncarpia glomulifera), and kurrajong (Brachychiton populneus). Priorities include block plantings as these are cooler than narrow corridor plantings and revegetating south-facing slopes and gullies, which remain cooler on hot days. Spatial modelling has identified priority climate refugia areas to be targeted within our landscape projects. These target areas include the East Lismore/West Ballina Koala Stronghold and koala corridors identified through State and Local Government and community koalas surveys.

Koala and joey in tree © Dominik Rueß - stock.adobe.com / WWF-Australia

A Vegetation Community Approach: Alpine Ash

Over the past 20 years, Victorian Alpine Ash forests have experienced an unprecedented frequency of bushfires, a situation that is predicted to occur across more of Australia under future climate scenarios. This presents us with a valuable opportunity to build on existing Alpine Ash research and deliver on-ground interventions to establish ecosystems that are more resilient to hotter and drier weather and novel fire regimes.



Over the last two years, Greening Australia has been working with Parks Victoria, DELWP and University of Melbourne researchers to better predict the potential loss of these forests when exposed to increased fire frequency and climatic change and to explore what we could do differently in response. Some of the key stakeholders already have working partnerships and have developed regeneration hypotheses based on plant traits and fire frequency and severity. Predictions of the future state of Alpine Ash Communities have already been developed based on years of research into the response of the Alpine Ash community to a changing climate, including short interval fires, and modelling the key plant traits that contribute to this response.

Modelling predicts that on average, 20,000 ha of Alpine Ash communities could be lost every 20 years under a changing climate and increased fire frequency. This modelling has helped identify where in the landscape Alpine Ash communities are likely to persist ('potential refugia') versus areas where we have a high probability of Alpine Ash loss in the future. We have also identified areas where Alpine Ash communities currently occur sporadically, but climate change may result in climatic conditions that support their establishment and colonisation (e.g. higher elevations).

Now that we are empowered with this knowledge of where Alpine Ash is likely to persist and where it may be lost, there are many on-ground actions we can consider. We can let 'nature take its course' and monitor how transitions occur through time (i.e. 'autonomous adaptation' *sensu* Doherty *et al.* 2017). We can continue as usual by aerially reseeding the larger, accessible and most vulnerable areas with available Alpine Ash seed and accept the inevitable future losses (i.e. 'planned mitigation'). Or we can innovate our response, taking an eco-evolutionary approach to seed sourcing and species composition, to provide regenerating forests with the best adaptive capacity to cope with present and future environmental conditions (i.e. 'planned adaptation').
Deciding where and when to enact a particular response requires shared goal setting by decision-makers such as land managers, local communities, the conservation sector and importantly, the indigenous community. Climate adjusted goal setting by decision-makers will also be improved when the uncertainty regarding the ecological and cost-effectiveness of the activities is reduced. Using the habitat renovation framework described by Prober *et al.* (2019), we propose to experimentally trial new eco-evolutionary methods to mitigate key threats to Alpine Ash communities, reduce the uncertainty of outcomes, and provide a framework for scaling up process delivery as required.

For more information

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