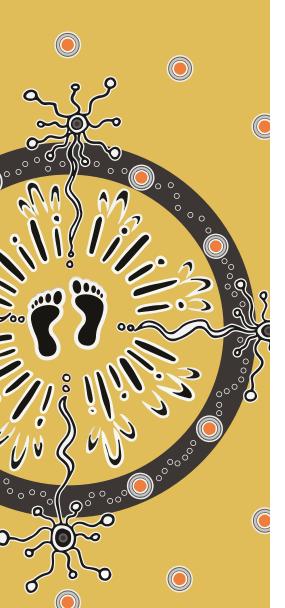# Impact and engagement statement

Department of Planning and Environment
and University of New South Wales
partnership report 2022

Acknowledgement of Country

Department of Planning and Environment acknowledges the traditional custodians of the lands where we work and the places in which we live. We pay respect to Ancestors and Elders, past, present and future.

Our partnership

The Environment and Heritage Group (EHG), within the NSW Department of Planning and Environment (the department, or DPE), and the University of New South Wales (UNSW) have a long history of partnering to deliver high-quality and rigorous scientific research. Our partnership enables us to pool the strengths and expertise of our organisations to tackle complex problems collaboratively and deliver research in priority areas for the NSW Government, with a focus on conservation and landscape management. This important collaborative research extends and strengthens the evidence base through which we support the NSW Government to achieve its environmental goal by:

- delivering a coordinated approach to energy, climate change and sustainability
- supporting resilient ecosystems and biodiversity for improved conservation outcomes
- providing rigorous, transparent and evidence-based advice.

Preface

Dr Georgina Kelly

Executive Director – Science, Economics and Insights Division Environment and Heritage Group Department of Planning and Environment

Professor Sven Rogge

Dean of the Faculty of Science, University of New South Wales, formerly Pro Vice-Chancellor (Research) UNSW

Welcome from the co-chairs of the Partnership Steering Committee: Georgina Kelly and Sven Rogge.

The NSW Department of Planning and Environment and UNSW have a longstanding and highly productive partnership built on a mutual commitment to deliver high-quality science for the NSW community. This partnership was facilitated through a memorandum of understanding between 2009 and 2021 and will continue through a letter of intent from 2022. Since the start of our partnership, the department and UNSW have greatly improved our understanding of wetlands and groundwater-dependent ecosystems, as well as fire behaviour and impacts. Our joint research has made significant contributions to best practice threatened species conservation and restoration science.

This statement celebrates our partnership and highlights a few examples of our collaborative projects and the impact these have had on improving environmental outcomes in NSW.

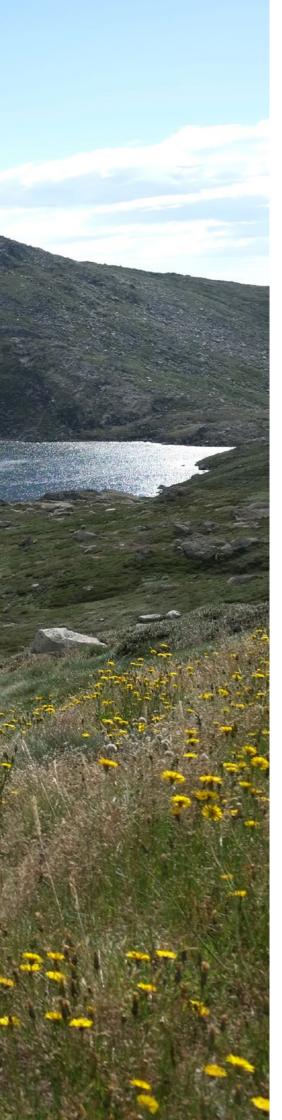We hope you will enjoy reading about what we achieved together.

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Collaborative research highlights

Our success so far

Since entering a formal partnership in 2009, we have achieved the following:

collaboration on **54** projects

co-investment of **$13.86 million** in research projects.

The department and UNSW are committed to measuring, evaluating and communicating outcomes from our joint research through reports and public information sessions. This enables us to understand more about how our collaborative science can be applied to environmental management and conservation actions, improving outcomes, and strengthening our partnership.

Red listing ecosystems – testing the new global standard for conservation

What problem is the research solving?

In 2008, the International Union for Conservation of Nature (IUCN) developed a new global standard for assessing the extinction risk of ecosystems: the Red List of Ecosystems. The IUCN Red List of Ecosystems measures the relative risks of ecosystem collapse for terrestrial, freshwater and marine ecosystems at sub-national, national, regional and global scales. Red List criteria for assessing risks to ecosystems are a major global advance in biodiversity conservation. However, despite a strong theoretical basis, the criteria were untested.

In partnership with the NSW Government, other universities and the IUCN, UNSW designed this Australian Research Council Linkage Project to test the performance of the Red List criteria on a range of ecosystems around the world and develop novel tools to assist in their implementation.

The trial involved 20 ecosystems across 6 continents and 3 oceans – 8 of these ecosystems were in Australia and 5 were in NSW. The project aimed to:

- develop a robust global typological framework for ecosystems based on ecological theory and ecosystem processes and function
- develop a diagnostic global synthesis of risks to ecosystems as a basis for planning protection and restoration actions

- evaluate social-ecological scenarios for provision of ecosystem services (that is, benefits that humans gain from nature) in a thematically related group of ecosystem types
- evaluate climate change adaptation strategies for a suite of climate-sensitive ecosystems.

What has the project achieved?

This project was significant because a **new method** – called Ecosystem Viability Analysis – was developed and applied; and the **first performance test** for ecosystem assessment was undertaken, providing vital support for a global network of users.

The project has delivered several important conservation outcomes, including:

- the **first global-scale framework** for classifying terrestrial, freshwater and marine ecosystems. The Global Ecosystem Typology, adopted by the United Nations (UN) and IUCN, helps identify the ecosystems on Earth that are most critical for conservation, research and management.
- the first thematic global Red List of Ecosystems (mangrove ecosystems)
- identification of priorities for protecting Earth's remaining wild ecosystems and restoring those that have suffered degradation
- strategic policy advances, including new ecosystem goals and targets currently under development for the post-2020 framework of the UN Convention on Biological Diversity
- a framework for ecosystem assets to support the UN System for Environmental Economic Accounting (SEEA) Ecosystem Accounting
- new risk assessments and research and management strategies for alpine ecosystems threatened by climate change, bushfires and other processes in NSW and other Australian jurisdictions.

New information resources – including an interactive IUCN Red List of Ecosystems website, book and scientific data – help to place NSW ecosystems in a global context and enhance cross-jurisdictional alignment of approaches and information.

Project information

Project lead: Prof David Keith

Contributors: Prof Emily Nicholson (Deakin University), Prof Richard Kingsford (UNSW), Dr Jose Ferrer-Paris (UNSW), Dr Jessica Rowland (UNSW), Dr Tony Auld and Mark Tozer (DPE), Dr Tracey Regan (Victorian Department of Environment, Land, Water and Planning), Dr Angela Andrade (IUCN), Dr Hedley Grantham (Wildlife Conservation Society).

More information:

- IUCN Global Ecosystem Typology
- IUCN Red List of Ecosystems
- System of Environmental Economic Accounting (SEEA) Ecosystem Accounting.

Assessment of exposure of threatened plants to adverse fire impacts – frequency and season of burn

What problem is the research solving?

Fire is a key driver determining the persistence of plant species and is one of the main tools used to manage native vegetation. Plant communities are adapted to persist under particular combinations of fire frequency, severity and season – known collectively as the fire regime. However, fire regimes are changing due to climate and land-use change. For example, fire frequency is increasing and the 2019–20 NSW fire season gave an indication of the extent and severity that fires can reach.

To successfully manage vegetation for long-term maintenance of biodiversity, we need to understand the impacts that changes to different elements of the fire regime have on the persistence of species. Building on a strong foundation of collaborative work, researchers set out to gather fundamental information about how plant species respond to different elements of the fire regime.

We need this information to provide us with:

- a clearer understanding of which species groups are potentially at increased risk
- a clearer set of fire management guidelines to inform vegetation management.

What has the project achieved?

The project delivered several key outputs that led to positive environmental outcomes for NSW.

One major achievement was the delivery of multiple submissions to the independent expert NSW Bushfire Inquiry into the 2019–20 bushfire season. The inquiry handed down 76 recommendations designed to improve outcomes and limit damage, including damage to environmental assets, under similar future bushfire events.

Submissions provided to the inquiry by the NSW Bushfire Risk Management Research Hub on environmental impacts were based directly on the work produced by this project. Project Lead, Mark Ooi, was part of the Bushfire Research Hub team that was awarded the 2021 Eureka Prize for Applied Environmental Research in recognition of their efforts informing the inquiry.

In addition to the *NSW Bushfire Inquiry* work, several other notable project achievements included:

- **Extinction risk framework** – A NSW-level framework that assessed and prioritised about 1,500 species based on extinction risk under 11 different threat factors, including high fire frequency. The framework helped to inform the NSW Government on where

to prioritise resources to ensure those species at highest risk of extinction after the 2019–20 bushfires were the initial focus of recovery efforts.

- **Map of 2019–20 bushfire impacts** – A map of impacts in NSW in relation to fire history. The mapping highlighted the extent of native vegetation at risk of high frequency fire, which is a key threatening process listed under the NSW *Biodiversity Conservation Act 2016*. This has informed a more detailed assessment of those threatened species that are at risk from high fire frequency.

Ongoing work is investigating how threatened ecological communities are recovering from the extreme mega-fires of the 2019–20 bushfire season.

Project information

Project leads: Dr Mark Ooi (Senior Research Fellow, UNSW), Dr Tony Auld (Senior Principal Scientist, DPE), Andrew Denham (Senior Scientist, DPE).

Contributors:

From UNSW: Professor David Keith (also DPE), Dr Ryan Tangney (postdoctoral researcher), Tom Le Breton (PhD candidate), Alexandria Thomsen (PhD candidate), Ruby Paroissien (PhD candidate), Dr Chris Gordon (Western Sydney University, formerly at UNSW).

From DPE: Mr Berin Mackenzie (also PhD candidate, UNSW), Jedda Lemmon, Vanessa Allen, Mark Tozer, Dr Allen McIlwee.

From Western Sydney University: Associate Prof Rachael Gallagher (formerly at Macquarie University), Dr Rachael Nolan, Prof Ross Bradstock (formerly University of Wollongong and former Director of the NSW Bushfire Risk Management Research Hub).

From University of Wollongong: Associate Professor Owen Price (also Director of the NSW Bushfire Risk Management Research Hub).

More information:

- NSW Bushfire Inquiry
- NSW Bushfire Risk Management Research Hub
- Nolan et al. (2021) 'Limits to post-fire vegetation recovery under climate change', *Plant, Cell and Environment,* 44(11), doi.org/10.1111/pce.14176.

Sturt National Park feral predator–free area and mammal reintroduction project

What problem is the research solving?

Australia has an unenviable record of mammal extinction and decline, which is particularly apparent in the continent's arid interior. A key driver is predation by foxes and feral cats, and competition with introduced and overabundant native grazers. To help stop this decline, National Parks and Wildlife Service (NPWS) partnered with the Australian Wildlife Conservancy and Wild Deserts (who is in partnership with UNSW with Ecological Horizons) to reintroduce at least 13 native mammal species believed to be extinct in NSW. Scientific research has shown these locally extinct mammals play a significant role in maintaining the health of ecosystems. Reintroducing them to areas in parks where foxes, feral cats and feral herbivores (like rabbits) have been removed will not only reduce their risk of extinction but is expected to deliver significant benefits to many other threatened species.

This innovative and collaborative conservation project involves the reintroduction of locally extinct species to 2 feral predator–free areas established in Sturt National Park. The project provides opportunities to improve our understanding of mammal reintroductions and the associated ecosystem response, predator–prey relationships, innovations in feral predator control and broader ecosystem benefits. This approach also guides land management outcomes in Sturt National Park.

The project is of considerable public interest and its benefits go beyond ecological restoration and research. It also provides opportunities to develop unique visitor experiences and engage with local communities as extinct and iconic mammal species are returned to Sturt's desert ecosystem.

What has the project achieved?

The project is currently in its seventh year of implementation and has already achieved significant on-ground conservation outcomes, guided a strategic adaptive management approach, and established an annual ecological health monitoring program and complementary research strategy.

The partnership between Wild Deserts and NPWS is broader than a research project, and is achieving on-ground conservation, ecological monitoring, wildlife management, research and visitor engagement outcomes.

On-ground conservation outcomes achieved to date include:

- construction of two 2,000-ha **feral predator–free areas**, where feral cats, foxes and feral herbivores have been eradicated
- completion of an additional 10,400-ha '**wild training zone**', which aims to test reintroduced mammals' persistence in areas with low densities of feral species and to trial innovations in feral predator control
- **reintroduction of 4 species** listed as extinct in NSW, including greater bilby, crest-tailed mulgara, golden bandicoot and Shark Bay bandicoot
- application of a **strategic adaptive management** approach to wildlife management.

While monitoring results are still preliminary, the project has achieved significant success, including:

- demonstrating that reintroduced species are establishing in the feral predator–free areas
- detecting native species, other than those reintroduced, which have not been previously recorded in Sturt National Park
- measuring ecosystem response to recent drought-breaking rains which triggered a 'boom' event following years of extreme drought
- initial indications of improved ecosystem health inside the feral predator–free areas.

Five journal articles have been published by the Wild Deserts team, communicating learnings ranging from conservation project planning to innovative trials into minimising the 'barrier effect' of conservation fencing.

Project information

Project leads: From Wild Deserts, UNSW: Prof Richard Kingsford, Dr Reece Pedler, Dr Rebecca West, Sharon Ryall, Prof. David Keith, Dr Keith Leggett, Dr Mike Letnic, Assoc. Prof. Katherine Moseby and from Ecological Horizons, Dr John Read From NPWS, DPE: Dan Hough, Danielle Dendrinos, David Rudder, Dave Kelly, Gareth Telfer, Jaymie Norris and Richard Kingswood.

Funding: DPE has committed more than $8.4 million over 10 years (2016–2026) under a contract with Wild Deserts to deliver the project in Sturt National Park. The Wild Deserts project team works closely with NPWS to implement project outcomes in Sturt National Park. This project is funded by the NSW Government, in collaboration with NPWS.

A significant benefit of this collaboration has been the additional investment UNSW has leveraged from the NSW Government's investment. Wild Deserts estimates it has leveraged an additional $3.2 million in funding towards providing improved research facilities (for example, accommodation facilities), innovative visitor experiences and extending project learnings by establishing a 'wild training zone'.

Through additional cash and in-kind investment provided by UNSW, new research accommodation has been established in Sturt National Park to maximise the learning opportunities presented by postgraduate student projects. UNSW also obtained philanthropic funding to establish the wing fencing for the wild training zone and to support PhD students, as well as further significant funding from other external sources. In total, UNSW has obtained and contributed over $2million in cash and in kind investments to the project.

More information:

- Wild Deserts

- Reintroduction of locally extinct mammals

Thirlmere Lakes Research Program – developing an integrated water balance budget to understand hydrological dynamics

What problem is the research solving?

Thirlmere Lakes is a group of waterways in the Greater Blue Mountains World Heritage Area that includes Lake Gandangarra, Lake Werri Berri, Lake Couridjah, Lake Baraba and Lake Nerrigorang. The lakes are thought to be about 15 million years old and have significant hydrological, ecological and community values. Water levels in Thirlmere Lakes have fluctuated over time. A decline in water levels over the last decade caused significant local community concern and provided the impetus for various inquiries and reviews.

The Thirlmere Lakes Research Program phase 3 (TLRP3) is the latest phase in a long-running research program. The overarching aim of the TLRP3 was to establish a water balance budget for Thirlmere Lakes that accurately integrated the surface water dynamics, hydrological and environmental parameters, and relevant groundwater systems using highquality field data. Through an interdisciplinary approach, this research aimed to understand which factors influence lake water levels, and why the lakes dried out during recent droughts.

What has the project achieved?

The project has developed **robust science findings** that the community trusts to understand Thirlmere Lakes National Park. This science has been integrated within a hydrologic model that allowed us to analyse how the lakes respond to climate and sub-surface influences. For the first time, this has provided a detailed picture into the lakes' history and helped to understand their potential future.

Field and modelling results suggest that the recent water level declines are primarily associated with climate variability rather than the nearby longwall mining. However, this conclusion does not preclude the influence of the ongoing longwall mining and bore extraction in the future, and ongoing monitoring is recommended.

The project has **improved our understanding** of the lakes and allowed us to draw 3 main conclusions:

- The lakes are controlled by the climate, especially rainfall and evaporation.
- The recent drought is not unprecedented and that in recent times, the dry periods have been shortlived and the lakes have eventually refilled.
- The lakes are a vulnerable ecosystem, and the water levels and volumes are reliant on catchment rainfall.

Project information

Project leads: Prof William Glamore (UNSW), Martin Krogh (DPE).

Contributors: Associate Prof Fiona Johnson (UNSW) and Dr Shenyang (Chris) Chen (UNSW).

Funding: This project is made possible by a co-investment of $0.5 million by the department, the NSW Government's Climate Change Fund (administered by the department at the time of project) and UNSW.

More information:

- Thirlmere Lakes research

More information

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Read:
UNSW 2025 Strategic initiatives webpage
Environment and Heritage Group Research partnerships webpage