



NSW National Parks and Wildlife Service

Carbon Positive by 2028



Minister's message



There is increasing recognition of the need for integrated solutions to two of the planet's most critical challenges – climate change and the loss of biodiversity.

The NSW Government is already taking responsible action on climate change. We set a goal of net zero emissions by 2050. We released the *Net Zero Plan Stage 1: 2020–2030 Implementation Update* to fast-track emissions reduction to 50% over the next decade.

NSW national parks already play a critical role in the effective conservation of biodiversity and are the centrepiece of our efforts to protect and restore threatened species populations.

National parks, as significant carbon sinks, will also play an important role in helping achieve net zero. With the right management actions and investment decisions we can increase the amount of carbon sequestered by our national parks, while also strengthening the role of national parks in protecting and restoring biodiversity, providing important places for outdoor recreation, and managing bushfire risk to life and property.

NSW National Parks and Wildlife Service (NPWS) is the first national park agency in Australia to commit to becoming carbon positive by 2028. This means that, by 2028, the removal of carbon dioxide from the atmosphere by our national parks will exceed the emissions generated by NPWS in managing those parks.

This plan sets out an ambitious framework for ensuring NPWS is carbon positive by 2028, but we will be trying to get there sooner. Annual reporting and updates to this plan will ensure improvements in our understanding of the sequestration potential of national parks are reflected, where possible, in even more ambitious targets.

To become carbon positive by 2028, NPWS will:

- by 2025: reduce carbon emissions from NPWS operations (scope 1 and 2) by 55%
- by 2028 reach net zero and become carbon positive by reducing the total emissions (including scope 3) and implementing carbon sequestration projects across the national park estate.

I firmly believe that action on climate change must be grounded in science and economics – not ideology. NPWS has committed to reporting annually on rigorous carbon accounting and biennially on climate-related financial risk, in alignment with national and international accounting standards.

NPWS will be a world-leader in supporting the development of premium environmental markets, assisting in developing market tools and piloting premium projects that deliver positive carbon, biodiversity, water and air quality outcomes. This is all part of an exciting agenda designed to position NPWS at the forefront of global efforts on biodiversity conservation, visitor experiences, aboriginal joint management and addressing climate change.

The Hon. Matt Kean, MP

Treasurer and Minister for Energy and Environment



Acknowledgment of Country

The NSW Government acknowledges and respects past, present and future Traditional Owners and Elders, across all lands of NSW. The NSW Government recognises and respects the continuation of cultural, spiritual and educational practices of Aboriginal and Torres Strait Islander peoples.

The development of this plan acknowledges more than 60,000 years of continuous Aboriginal connection to the land that makes up New South Wales.

Aboriginal knowledge and management of the land is based on deep spiritual connections with Country. Country takes in everything within the physical, cultural and spiritual landscape – landforms, waters, air, trees, rocks, plants, animals, foods, medicines, minerals, stories and special places. It includes cultural practice, kinship, knowledge, songs, stories and art, as well as spiritual beings and people.

As part of the world's oldest living culture, Aboriginal and Torres Strait Islander Traditional Owners and Custodians of the Australian continent and adjacent islands share a unique bond to Country – a bond forged through thousands of years of travelling across lands and waterways for ceremony, religion, trading and seasonal migration.



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Introduction

NPWS manages over 9% of New South Wales ranging from the snow-capped peaks of Kosciusko National Park to world heritage listed rainforests, towering wet sclerophyll forests, over 45% of the NSW coast and vast areas of woodlands across central and western NSW.

National parks are the centrepiece in efforts to halt and reverse biodiversity loss – over 85% of all threatened species are represented on national parks; and our parks protect the largest and most intact examples of many threatened ecosystems.

National parks also represent one of the largest carbon stores in New South Wales. NPWS is the custodian of over 40% of all forest carbon in New South Wales – approximately 900 megatonnes. Providing secure, long-term protection for these carbon stocks is a vital contribution to managing climate change risk.

To manage national parks, NPWS operations emit an estimated 14,500 tonnes of carbon dioxide equivalent (t CO₂-e) per annum (scope 1 and 2 using a 2018/19 baseline). Scope 3 emissions are not yet quantified, but a preliminary estimate suggests they are in the order of 30% of NPWS total emissions, i.e. approximately 6000 t CO₂-e per annum.

Offsetting these emissions, national parks also remove (sequester) carbon dioxide from the atmosphere. This occurs through the regeneration and restoration of vegetation due to feral animal control and other land management practices, as well as through replanting of vegetation. The precise level of sequestration by our national parks is being quantified.

To become carbon positive, NPWS will both reduce its operational footprint and increase the sequestration rate across the national park estate.

This plan is set out in four parts:

- **NPWS emissions profile:** understanding the emissions profile of national parks and ensuring accurate reporting
- **NPWS carbon stores and sequestration:** calculating the value of national parks carbon stores and methods for increasing sequestration
- **Action plan:** NPWS plan for reaching net zero and becoming carbon positive by 2028
- **Mitigating climate risk:** being global leaders in managing and reporting on climate related risks.

NPWS emission profile

NPWS has a carbon footprint that is generated from the emissions of different operational activities of the agency.

NPWS has identified and developed a plan for its scope 1, 2 and 3 emissions (as defined by the Greenhouse Gas Protocol).

These scopes are a way of categorising the different kinds of carbon emissions an organisation creates in its own operations, and in its wider value chain.

Key points

Scope 1 and 2 emissions are direct emissions from the operations of NPWS.

- Estimated scope 1 and 2 emissions for NPWS are 14,543 tonnes of carbon dioxide equivalent (t CO₂-e) using a 2018–19 baseline.
- Major sources of scope 1 and 2 emissions are combustion of natural gas and LPG, transport (fleet fuel, bulk fuel and aviation fuel), fugitive emissions (e.g. refrigeration leaks and on-site wastewater treatment) and purchased electricity.

Scope 3 emissions are indirect emissions that occur in the value chain of NPWS, including both upstream and downstream emissions.

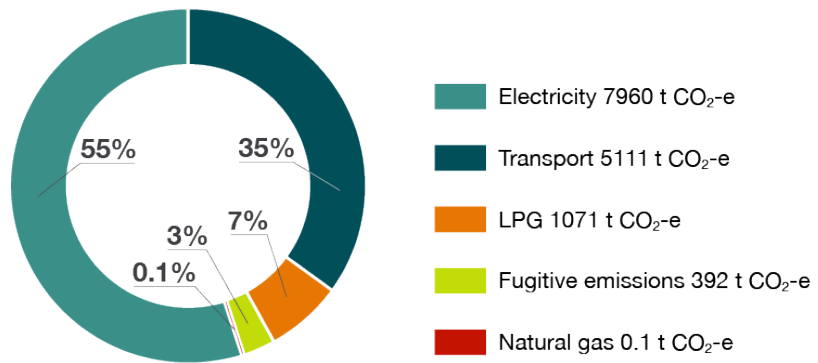
- Scope 3 emissions will be estimated by June 2022.
- The major sources of scope 3 emissions in NPWS include waste, commercial air travel and business travel and accommodation.

NPWS employs around 2000 staff (full time equivalent), operates across 186 office, depot and base locations, runs a fleet of 591 vehicles and 7 aircraft and welcomes around 60 million visits per annum (2018) across 889 visitor precincts. In addition, around 75% of all hazard reduction burning is undertaken on national park by NPWS working in partnership with the Rural Fire Service and other agencies.

Scope 1 and 2 emissions

NPWS has undertaken a Greenhouse Gas (GHG) assessment of scope 1 and scope 2 emission sources to develop a GHG emissions inventory and profile NPWS emissions to 2030.

Figure 1 shows the percentage of the overall scope 1 and 2 emissions that is contributed by each major source.



Total emissions 14,543 tCO₂-e

Figure 1 NPWS Scope 1 and 2 emissions

Over 50% of all scope 1 and 2 emissions come from purchased electricity. Transport fuel consumption accounts for 34% of emissions and is a considerable part of the operations of NPWS.

Even though NPWS has a relatively small footprint, there are significant challenges in transitioning some of the major emissions sources into low carbon alternatives. For example, most fuel is consumed by operational vehicles, heavy vehicles (such as tractors, diggers and toppers), plant and aircraft, which are owned and operated by NPWS. Many of these vehicles have particular operational requirements, e.g. firefighting in remote areas for extended periods of time. For many of these applications, there are no zero emission vehicles available or likely to be available in the next three to five years. However, options will be identified and evaluated at the earliest opportunity.

Hazard reduction burns are currently not included in the scope 1 and 2 emissions inventories. Further analysis is required to determine how best to quantify and account for fire management, including hazard reduction burns and wildfires (including avoidance or suppression of wildfires).

Scope 3 emissions

NPWS Scope 3 emissions include:

- disposal of waste
- water usage and wastewater treatment
- air travel – commercial
- paper usage
- business travel
- business accommodation
- staff commuting to and from work
- postage and couriers
- electricity, natural gas, LPGs and fuels used for outsourced activities (i.e. by contractors)

The major sources of scope 3 emissions in NPWS include:

- waste – estimated to account for approximately 50% of scope 3 emissions
- commercial air travel – estimated to account for approximately 10–20%
- business travel and accommodation – estimated to account for approximately 5–10%.

These emission sources can be difficult to measure. In addition, many of these items are managed as part of a larger entity (the Department of Planning, Industry and Environment) and separate data for NPWS is not currently available. This limits the capacity to measure emissions from waste management, commercial air travel and business accommodation. As a result, NPWS scope 3 emissions were excluded from this assessment. However, reliable data will be available within 12 months to inform an assessment of scope 3 emissions. For example: new waste management contracts are being put in place, and commercial and business travel data for NPWS is being segregated.

A very preliminary estimate suggests scope 3 emissions are in the order of 30% of NPWS total emissions, i.e. approximately 6000 t CO₂-e.



NPWS carbon storage and sequestration profile

NSW national parks are the centrepiece in efforts to halt and reverse biodiversity loss and protect ecosystems, and they also protect carbon stocks and create opportunities for carbon sequestration.

Key points

- National parks are major carbon stores with an estimated 900 megatonnes of forest carbon stored in the NSW Park Estate, 41% of the total forest carbon in New South Wales.
- NPWS is undertaking an analysis to quantify the total carbon stocks in national parks and the sequestration rates. This work will allow NPWS to measure whether the carbon stores of NPWS are stable, increasing or decreasing and how land management influences this over time.
- Additional sequestration of carbon occurs on park through a range of activities, including regeneration and restoration of vegetation as a result of feral animal control and other land management practices, as well as through replanting of vegetation and, potentially, improvements in soil carbon.
- NPWS is piloting projects to demonstrate how national park management can sequester carbon in a manner consistent with the effective conservation of biodiversity. The level of sequestration will be verified and used to:
 - offset any NPWS emissions that cannot be eliminated/avoided
 - generate revenue for park management through the sale of premium carbon credits.
- The Koonaburra Human Induced Regeneration and Carbon Planting pilots are registered with the Commonwealth Environmental Regulator (CER). Additional carbon sequestration projects will be developed by NPWS as a priority.
- The *National Parks and Wildlife Act 1974* will be amended to ensure NPWS can take advantage of existing and emerging carbon sequestration options.

Approximately 85% of all threatened species in New South Wales are represented on national parks; and national parks protect the largest and most intact examples of many threatened ecosystems. The role of the NSW national park estate in also protecting carbon stocks and creating opportunities for carbon sequestration has been recognised in the NSW Government’s *Net Zero Plan Stage 1: 2020–2030 Implementation Update* (DPIE 2020).

National parks represent one of the largest carbon stores in New South Wales. By providing secure, long-term protection for these carbon stocks, and implementing natural climate solutions such as revegetation, NPWS will contribute to global efforts to reduce the impacts of climate change. Such sequestration will be delivered in a manner that is integrated with, and supports, the conservation of biodiversity.

Understanding carbon stocks

A preliminary assessment of the forest carbon stores in NSW national parks has estimated a storage of more than 900 megatonnes. National park estate forest carbon makes up approximately 41% of the total forest carbon in New South Wales (Figure 2). A recent UNESCO study (2021) has found that the World Heritage Gondwana Rainforests in NSW are a large carbon sink with an estimated annual net carbon sequestration rate of more than 1 t CO₂-e/ha each year.

Other types of environmental carbon stores include soils, grasslands and rangelands, peatlands and oceans. NPWS is commissioning additional analysis to quantify the total carbon stocks in national parks to identify the factors influencing changes in carbon stocks over time and to highlight the opportunities for increasing sequestration rates. This work will also help NPWS understand the carbon sequestration potential of new acquisitions.

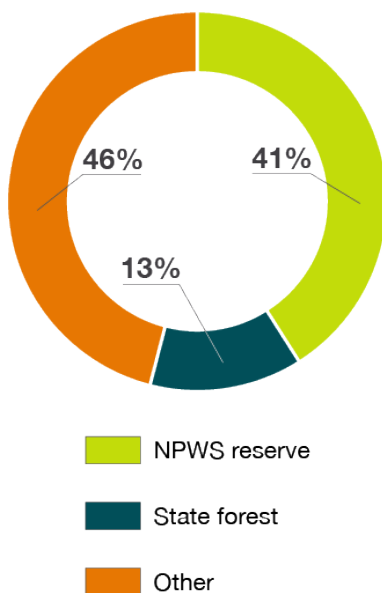


Figure 2 Preliminary results of examination of 2018 NSW forest and harvested wood products carbon stock by management.

Fire management and carbon stocks

Fire plays an important role in the natural carbon cycle. Carbon stock losses from biomass burning do not increase the accumulated atmospheric CO₂ concentrations under historical fire regimes. However, carbon stock dynamics may alter if fire regimes are impacted by climate change. For example due to the large-scale drought and fires over the past 20 years, the Greater Blue Mountains National Park may have reversed from a carbon sink to an emissions source (UNESCO 2021). The role of hazard reduction burns in the total carbon cycle of forests is also complex, particularly with regards to preventing emissions from large wildfires. Therefore, fire management, including management of changes caused by climate change, is essential to protect carbon stores. For this reason, the investment in fire management by NPWS should be regarded as critical to the management and reduction of climate risk.

Existing carbon sequestration projects on national parks



The current national park estate provides an opportunity for testing innovative natural climate solutions and carbon sequestration projects.

NPWS has pilot projects underway that will demonstrate how national park management can sequester carbon in a manner consistent with the effective conservation of biodiversity. These pilot projects are the first of their kind for NPWS and signal a new opportunity for NPWS to generate and trade carbon credits.

- **Koonaburra Human Induced Regeneration:** Koonaburra will use the human induced regeneration (HIR) method, which is designed to achieve forest cover by carrying out eligible activities that encourage regeneration of Australian native tree species that are indigenous to a project's local area. At Koonaburra, this will involve feral goat *exclusion*. Feral goats have had a major impact on the ability of plants to grow and store carbon on Koonaburra. The increased vegetation resulting from feral goat control will store additional carbon and generate carbon credits.
- **Environmental Planting pilots:** NPWS has 'Environmental Planting' trials underway, involving the planting of native trees for the purpose of sequestering carbon. NPWS will continue to seek opportunities to identify appropriate sites to expand the carbon sequestration potential via tree planting and other maintenance work such as fencing and weed and feral animal control



Koonaburra and the Environmental Planting pilots are registered with the Clean Energy Regulator.

Table 1 details the potential carbon sequestration from the projects to 2030. It takes time to grow plants and store carbon; depending on available resources and rigorous assessment of sites, these projects could start producing credits from vegetation growth as early as 2028, which can be used to offset NPWS emissions or be sold. Case studies for each approach are set out below.

Table 1 Carbon sequestration potential from registered NPWS projects.
Note: the environmental plantings figures do not include credits that have already been sold and are indicative dependent on implementation of future projects.

Year of sequestration	Koonaburra HIR potential carbon sequestration (t CO ₂ e-)	Environmental Planting Pilots potential carbon sequestration (t CO ₂ e-)
2022–23 to 2026-27	0	0
2027–28	36000	3000
2028–29	36000	3000
2029–30	36000	3000
Estimated CO ₂ e- remaining for project lifetime	700,000	200,000



Case study 1: Koonaburra Human-Induced Regeneration

In October 2021 NPWS registered Koonaburra Station as a HIR Carbon Project. This is the first of its kind in NSW on national park estate.

HIR of degraded native vegetation on Koonaburra provides an opportunity to store a significant amount of carbon and improve biodiversity. The property is also home to a range of threatened species, including an estimated 20 threatened animal species, such as the Major Mitchell’s cockatoo, malleefowl, fat-tailed dunnart and kultarr.

The abatement is estimated at 900,000 t CO₂-e over a 25-year crediting period, which equates to about 36,000 t CO₂-e per annum.

This is the first large scale commercial carbon offset project on national parks in New South Wales. This project will boost investment in carbon and conservation works on Koonaburra, enabling a comprehensive enhanced feral animal management program across the park, including upgraded, fit-for-purpose fencing infrastructure.



Case study 2: Carbon planting on degraded land

Land that had been previously used for forestry, mining or agricultural purposes is being targeted for carbon planting. Many of these cleared or modified sites now contain compromised habitat for native wildlife. The program is an excellent opportunity to address these issues by providing the foundation for natural ecological processes to re-commence.

The ability of maturing trees to trap and absorb greenhouse gases highlights the potential to achieve carbon sequestration and biodiversity outcomes. As indicated in Table 1 above, the pilot projects have the potential to deliver net sequestration of 200,000 t CO₂-e.

Local Aboriginal communities and private, external providers are helping to deliver the pilots.

Updating legislation

The NSW Government's *Net Zero Plan Stage 1: 2020–2030 Implementation Update* commits to amending the *National Parks and Wildlife Act 1974* to enable the creation and trade of carbon credit rights to protect and enhance carbon sinks. NPWS is currently developing amendments to support participation in future carbon trading schemes and to recognise the broad range of management activities that generate carbon benefits on NPWS land. Any revenue generated by offsetting emissions in national parks will be reinvested in the National Parks and Wildlife Fund (special deposit account) to help improve and sustain the conservation of national parks. For Part 4A (joint management) national parks, sequestration activities will occur only in accordance with joint management arrangements and any revenue generated will be reinvested in those parks.

Net zero to carbon positive action plan

2025 target: reducing carbon emissions (scope 1 and 2) by 55%

By 2025, NPWS will reduce its scope 1 and 2 emissions by 55% (from 14,543 t CO₂e- to 6583 t CO₂e-) from 2018/19.

Actions – emission reduction

- 1. Greening electricity:** electricity accounts for 55% of NPWS emissions. By purchasing 100% renewable energy, NPWS will reduce emissions by 55% by 2025 to **6583 t CO₂e-**
- 2. Improving energy efficiency:** NPWS will improve its energy efficiency by upgrading and installing LED lighting across the entire NPWS asset portfolio as funding permits. Energy efficiency will not add to the total emissions reduced, as lighting electricity will be derived from renewable energy. However, energy efficiency reduces the total energy consumption of NPWS, the cost of renewable electricity and overall demand.
- 3. Installing solar PV:** NPWS will install solar PV on sites that have a consumption greater than 10 MWh, as funding permits. Onsite renewable energy will not add to the total emissions reduced. However, installing solar PV will reduce energy consumption of NPWS electricity from the grid and the cost of purchased renewable electricity.
- 4. Greenhouse Gas Emissions Inventory** and annual reporting:
 - a. A full inventory of scope 3 emissions will be completed by June 2022 and incorporated into 2021–2022 Annual Reporting. By June 2023, a detailed Scope 3 Emissions Reduction Plan will be included into the NPWS net zero actions.
 - b. NPWS will assess, where possible, the NPWS historical emissions and carbon sequestration rates. By 2025 a roadmap will be completed to ensure that NPWS becomes carbon positive considering all historical emissions and sequestration.

Actions – sequestration

- 5. Update legislation:** the *National Parks and Wildlife Act 1974* will be updated to enable the creation and trade of carbon credit rights to protect and enhance carbon sinks.
- 6. Implement Koonaburra HIR Project:** final carbon assessment and project establishment of the Koonaburra carbon project will be completed by 2023 and incorporated into annual reporting.

7. **Tree planting project:** the Environmental Planting pilot projects may be completed by June 2023 and incorporated into annual reporting.
8. **Carbon sequestration opportunities:** NPWS will identify new carbon projects. This will include increasing the opportunity and participation of Aboriginal people in managing landscapes for environmental and carbon credits/markets.

2028 target: NPWS is net zero and carbon positive

By 2028 NPWS will be carbon positive, i.e. sequestration rates will exceed emissions.

Actions – emissions reduction

9. **Reducing emissions from waste:** NPWS will implement the waste and scope 3 emissions reduction actions identified in the inventory assessment (2024). Priority actions which have the greatest emissions reduction benefit will be implemented first and included in annual reporting.
10. **Reducing transport emissions:** NPWS will introduce electric vehicles into the NPWS fleet, starting with a charging station pilot project for NPWS staff and visitors, by 2023. NPWS will continue to explore technological advancement in transport alternatives. Transport emissions that cannot be avoided will be offset by NPWS carbon sequestration projects.
11. **Hot water and HVAC** (heating, ventilation and air conditioning): NPWS will upgrade these systems with high efficiency models and heat pump alternatives upon attrition. These systems contribute a small proportion to the overall NPSW carbon footprint, and often have long lifespans therefore NPWS will commit to upgrading as the systems reach end of life.

Actions – sequestration

12. **Carbon offsetting to reach net zero:** a minimum of 10,000 credits will be held by NPWS from the registered carbon sequestration projects (Planting and Koonaburra) to ensure NPWS can offset any remaining emissions to reach net zero.
13. **Expand carbon sequestration action:** NPWS will continue to assess and expand carbon sequestration rates through additional carbon projects that support and enhance biodiversity conservation.

Emissions reduction: summary 2021-25

Emissions source	Target	Date	Actions	Estimated Cost	CO ₂ e reduction	% of NPWS emissions (2018 baseline)	Remaining carbon emissions
Electricity	100% renewable	2025	Purchase large-scale generated certificate (LGC) renewable energy to offset our electricity which makes up to 55% of all scope 1 and scope 2 emissions.	\$194,000 ¹ /pa	-7,960 t (55%)		
Electricity	Upgrade lighting to reduce consumption	2025	Systematic upgrade of lighting to LED alternatives, across the entire asset portfolio, as funding is available	\$1.5 million/total	Included in renewable electricity	55% reduced by 2025	+6583 tCO ₂ -e
Electricity	Install solar PV to reduce consumption	2025	Install solar PV systems on sites with electricity consumption greater than 10 MWh p.a. (average system size of 11 kW per NMI), as funding is available	\$2 million ² /total	Included in renewable electricity		

¹ Approximate cost of \$194,000 p.a. at \$20/MWh (current average rate between now and 2030). If LED and PV lighting are installed, the number of LGCs required will be reduced

² Estimated capex assuming a system cost of \$1.50/Watt plus installation including remote locations.

Emissions reduction: summary 2025–28

Emissions source	Target	Date	Actions	Estimated Cost	CO ₂ e-reduction	Percentage of 2018 emissions	Remaining carbon emissions
Transport	Passenger fleet converted to EV	2028	Passenger vehicle transition to Electric Alternatives	TBD	-44 t	0.3%	+6539 t CO ₂ -e
Fugitive emissions + electricity	Hot water + HVAC at end of life	Attrition	HVAC & fridge upgrade at end of life to latest high efficiency model (procurement project) Replace electric resistive & gas hot water units with heat pump alternatives upon attrition	TBD	-933 t	6.5%	+ 5606 t CO ₂ -e
Scope 3	Waste and other emissions	2025-2028	Implementation of scope 3 emissions reductions action plan developed for 2025–28	TBD	NA	TBD	TBD

Managing climate related risks

The NSW Government has committed to develop and publish a biennial climate change impacts, risks and adaptation statement which will set out the economic, financial and physical impacts, risks and opportunities of climate change on the State across various climate scenarios. The statement will be consistent with the framework established by the Task Force on Climate-Related Financial Disclosures (TCFD) and other relevant international guidance or standards, which will be peer reviewed by an appropriately qualified person, such as an auditor. NPWS will be amongst the first agencies to deliver on this promise by undertaking a comprehensive climate change risk assessment and delivering the first Biennial Report by end of 2021–22.

NPWS is developing and implementing strategies to increase the resilience and adaptation of ecosystems and biodiversity to climate change (see Case Study 3). These actions will be incorporated into the TCFD reporting.

Case Study 3: Protecting carbon store: Gondwana World Heritage Rainforests

The Gondwana World Heritage rainforests contain some of NSW's most significant biodiversity and the largest carbon stores. Climate change poses a significant risk to these ecosystems through increased fire frequency, changes to seasonality, drought and storms. In response, NPWS has delivered the first ever holistic adaptation plan for protecting the Outstanding Universal Values of Gondwana Rainforest from climate change.

The project has used the world leading research from the NSW Biodiversity Adaptation Research hub to identify ways to protect climate refugia, genetically rescue populations at risk and support the climate transition of habitats to maximise the protection of Gondwana biodiversity. The actions include climate refugia fire management strategies and translocating native species to lower risk locations for insurance. For areas around climate refugia, the Macquarie University Climate-ready Revegetation guide has been applied to identify seeds and species for revegetation of buffers, which will build resilience against fires and maintain habitat structure while protecting the refugia.

This is the first on-ground application of holistic climate change adaptation measures undertaken in New South Wales, reflecting the importance the State places on these treasured World Heritage values and the carbon stored within them.

References

Department of Planning, Industry and Environment 2020, *NSW Net Zero Plan Stage 1: 2020-2030*, DPIE, Sydney, viewed 3 November 2021, environment.nsw.gov.au/topics/climate-change/net-zero-plan.

UNESCO, WRI, IUCN 2021, *World Heritage forests: Carbon sinks under pressure*, UNESCO, Paris, viewed 3 November 2021, unesdoc.unesco.org/ark:/48223/pf0000379527.locale=en.

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Published by:

Environment, Energy and Science

Department of Planning, Industry and Environment

Locked Bag 5022, Parramatta NSW 2124

Phone: +61 2 9995 5000 (switchboard)

Phone: 1300 361 967 (Environment, Energy and Science enquiries)

TTY users: phone 133 677, then ask for 1300 361 967

Speak and listen users: phone 1300 555 727, then ask for 1300 361 967

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