Protection of koalas in the Murrah Flora Reserves Project evaluation

Advice to the Environmental Trust

Final report

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Natural Resources Commission

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Acknowledgement of Country

The Natural Resources Commission acknowledges and pays respect to traditional owners and Aboriginal peoples. The Commission recognises and acknowledges that traditional owners have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. We value and respect their knowledge in natural resource management and the contributions of many generations, including Elders, to this understanding and connection.

List of acronyms

CAR	Comprehensive Adequate and Representative
CEO	Chief Executive Officer
CSO	Community Service Obligation
DPIE	Department of Planning, Industry and Environment
ESFM	Ecologically sustainable forest management
FCNSW	Forest Corporation New South Wales
FMZ	Forest Management Zoning
ILUA	Indigenous Land Use Agreement Areas
IUCN	International Union for Conservation of Nature
NPWS	National Parks and Wildlife Services
RG-bSAT	Regularised Grid-based Spot Assessment Technique
WSA	Wood Supply Agreement

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Executive summary

In 2015-16, the NSW Environment Trust (the Trust) provided a $2.5 million grant to Forestry Corporation NSW (FCNSW) to deliver the Protection of Koalas in Murrah Koala Reserves (the Reserves) project over four years.

The project aimed to enhance the conservation status of areas within three state forests on the NSW far south coast to further protect the last remaining koala population in the region and important Aboriginal cultural values and heritage sites. The project also funded actions to minimise impacts on the local timber industry and protect jobs.

The grant was made under the Trust's *new government priorities* funding stream. This stream supports new and high priority government issues that address point-in-time environmental issues or complement new policy or legislative frameworks.

The Trust engaged the NSW Natural Resources Commission (the Commission) to evaluate the project. The Commission's review investigated:

- whether the project delivered the expected outcomes
- whether its design and approach were effective
- what can be learnt from it to improve future projects and long-term outcomes.

Key findings

The expected project outcomes were delivered

The Commission found that the project delivered the expected short-term outcomes:

- The Reserves were gazetted in 2016 in the Mumbulla, Bermagui, Murrah and Tanja state forests, thereby changing these areas' management objectives and increasing their conservation status. As a result, timber harvesting ceased in the reserves.
- The (then) Minister for Forestry appointed the National Parks and Wildlife Services (NPWS) as the land manager. The conservation of local koala populations and significant Aboriginal cultural values is now the primary management objective of the reserves.
- The Trust grant facilitated the appointment of NPWS as the land manager of the Reserves under the *Forestry Act 2012* (Forestry Act). This management arrangement was novel at the time, and was the first time NPWS managed part of the state forest estate. Since then, an additional 14 flora reserves totalling nearly 20,000 hectares have been gazetted on state forests with NPWS appointed as the land manager.
- FCNSW met its wood supply obligations to the local timber mills by sourcing timber from other state forests in other regions. Consistent with the objective of the project, it used most of the grant funding to subsidise the additional costs this involved, minimising the economic impact on the mills and protecting local jobs.

Project delivery generated some risks

The Commission found:

- NPWS developed an interim management plan prior to gazettal, with a draft final plan endorsed by the chair of Biamanga Board after consultation and gazettel. Nonetheless, in the view of some Aboriginal interviewees and the Commission, the cultural heritage provisions are vague and high level, and therefore cannot be properly managed or monitored. In addition, the board members were new to their role, and needed time, support and education to build capacity. They told the Commission they didn't understand a lot of the process or the financial management within the timeframes expected.
- Project delivery was at times inefficient due to unforeseen administrative challenges working across tenures and under different legislation. For example, in the early phases of the program, on ground management actions required Ministerial and or Secretary level approval. This delayed delivery and undermined some of the efficiencies sought through transferring management to NPWS. In addition, payments to the NPWS were delayed due to administrative issues that were not resolved until after the conclusion of the grant period.

  These issues were largely expected given the newness of the arrangements at the time. Now the arrangement is more common, with 14 reserves gazetted since the establishment of the Reserves. Accordingly, the regulations for the Forestry Act have been amended to allow the Secretary of Department of Planning, Industry and Environment (DPIE) to authorise NPWS staff working in flora reserves, rather than going to the Minister responsible for the Forestry Act.
- Funding and resourcing arrangements to support the initial management of the Reserves were insufficient. No project funding was allocated from the Trust's grant to cover NPWS's start-up costs and ongoing management actions in the Reserves. The grant provided sufficient resources to mitigate the short-term impacts of the Reserves on the local timber industry, however it was not sufficient to deliver on the management plan. It was expected that NPWS would fund most of the management of these reserves from existing NPWS budgeted funds, however these were already at capacity.

  Funding for new reserves has since been improved with a 4-year funding commitment for new reserves supported by the NSW Waste Levy, including significant start-up funds and ongoing support.

The Commission also found local Aboriginal communities (nor other stakeholders) were not engaged prior to gazettal of the Reserves (and this grant) due to confidentiality arrangements put in place by the Government. This impacted initial buy-in into the project by Aboriginal groups and delayed the delivery of some potential management actions. While this issue was outside of the control of the Trust and project partners, the Commission considers where future projects intersect or impact landscapes with high Aboriginal cultural values, early and genuine engagement is critical to promote two-way learning and incorporate Aboriginal management priorities.

This project was developed under the Trust's *new government priorities* investment stream. These types of projects are typically initiated outside of the Trust's program development process. Often, they are presented to the Trust as partially or fully developed projects for their delivery. In a previous evaluation, the Commission identified this as a risk for the Trust as the projects may not always align with the Trust's legislative objectives. This review found similar risks for this project. However, the Trust have since implemented processes to minimise this risk based on the Commission's former advice

The future is challenging but there are opportunities to secure long-term outcomes

While expected short-term project outcomes were delivered, securing long-term outcomes will be a challenge. The area is a strategic asset as the last stronghold for south coast koalas. Most recent monitoring suggests between 30-60 koalas occupy the area. Recent research also suggests the area may benefit from active interventions to improve koala habitat, such as thinning regrowth and planting preferred koala browse trees. The research was paused after the area was impacted by the 2019/20 wildfires.

On-going and sustainable funding to ensure the persistence of koalas and monitoring to track progress is uncertain. Based on comparative analysis with newly created koala reserves and from interview feedback, the Commission conservatively estimates that at least an additional $1 million per annum for four years is necessary to ensure minimum outcomes are delivered in line with the working management plan.

Recent research on changing fire regimes in coastal NSW forests also suggests the area is at risk of increasing temperatures and variability in rainfall with associated increases in drought and fire. This puts the local koala population at high risk regardless of any improved management gains at the local scale. A plan to exclude wildfire from the reserves for a 10-year period is being prepared to assist with koala population recovery. This plan should be expedited, incorporating local Aboriginal cool burns at scale across the reserve and surrounding national parks as appropriate.

Moreover, it is unclear how Aboriginal people will be effectively and meaningfully engaged and contribute to their own outcomes for this area, which they have significant connection to. The government should consider either expanding existing joint-management arrangements from nearby parks or transferring ownership to the Gulaga and Biamanga boards of management.

Opportunities to improve

For similar projects in the future, the Trust should ensure:

1 funding agreements:

- 1.1 ensure any management plan establish clear cultural outcomes and performance indicators
- 1.2 allocate sufficient funding to build capacity in governance and financial management for Aboriginal board members

2 clarity of process and greater transparency between parties where funding transfers are required between agencies and partners to minimise delays and risks to project outcomes

3 sufficient funds are allocated for the start-up phase of new reserves, or similar types of the grant projects.

While the project delivered its short-term objectives, the real challenges lie ahead for the NPWS to secure long-term outcomes for the Reserves. The Commission has identified further opportunities for other parties to consider:

4 within the plan of management for the Reserves, NPWS should:

- 4.1 expedite and implement the working plan to minimise wildfire from the reserves
- 4.2 allocate sufficient funding to effectively implement the plan that will support Government policy to double koala numbers by 2050.

5 the Government should:

5.1 engage early and genuinely with Aboriginal groups and communities where their interests intersect with new and proposed flora reserves

5.2 consider expanding existing joint-management arrangements from nearby parks or transferring ownership to the Gulaga and Biamanga boards of management.

1 Introduction

In 2015-16, the Trust provided a $2.5 million grant to FCNSW for a project aimed to enhance the conservation status of areas within three state forests. These areas are known to support the last remaining koala population stronghold on the NSW far south coast and include important Aboriginal cultural values and heritage sites. The project also funded actions to minimise impacts on the local timber industry and jobs.

The grant was made under the Trust's *new government priorities* funding stream. This stream supports new and high priority government issues that address point-in-time environmental issues or complement new policy or legislative frameworks.[1] The grant was administered by FCNSW over the four years to 2018-19.

The Trust engaged the NSW Natural Resources Commission (the Commission) to evaluate the project. The sections below outline the project's expected outcomes, the Commission's approach to the evaluation, and other key context.

1.1 What did the project expect to achieve?

The project's primary objective was the long-term protection of native flora, important koala habitat and Aboriginal cultural heritage. To achieve this, the grant sought to deliver three short-term outcomes:

1 cessation of commercial timber harvesting in four areas within the Murrah, Mumbulla, Tanja and Bermagui state forests through their gazettal as flora reserves under the *Forestry Act 2012* (Forestry Act)[2]

2 appointment of the NPWS as land manager for the reserves to focus their management on protecting and supporting the recovery of the koala population, and to provide synergies with the management of the surrounding national parks

3 maintenance of timber supply to the local timber mills to project jobs in the region by providing an alternative timber supply.[3]

1.2 How did the Commission evaluate the project?

The Commission's evaluation focused on three lines of inquiry:

1 were the project's expected outcomes delivered?

2 was the project design and approach effective?

3 what can we learn from the project to improve for future projects?

For each line of inquiry, we investigated a range of evaluation questions (see **Attachment 1**). To obtain the necessary data, we:

1 reviewed all project documentation

1 Major projects https://www.environment.nsw.gov.au/funding-and-support/nsw-environmental-trust/major-projects

2 Noting Flora Reserves remain part of the Murrah, Mumbull, Tanja and Bermagui state forests

3 Environmental Trust (2015) Major Projects Grant - Business Plan – Protection of koalas in Murrah Mumbulla Tanja.

2 interviewed grantees, mill operators, Trust staff, FCNSW, local Aboriginal representatives and Board members and NPWS staff

3 conducted desktop document and data review.

1.3 Why is the area important?

1.3.1 The area contains a significant local koala population

The Reserves are located on the south coast of NSW and adjoin the Biamanga, Gulaga and Mimosa Rocks National Parks. They provide habitat for the last significant koala population on the NSW south coast, as well as other threatened species such as the long-nosed potoroo (*Potorous tridactylus),* yellow-bellied glider (*Petaurus australis*) and powerful owl (*Ninox strenua*).[4]

Researchers have monitored the koala population over an area of approximately 25,000 hectares that includes the Reserves.[5] The monitoring program is funded through the NSW Government's *Saving our Species* program and has been underway since 2007.

Monitoring prior to the gazettal of the Reserve

A 2007-09 survey undertaken as part of this program found that the southern part of the study area – which includes part of the Reserves – supported the greatest concentration of koalas. Over 580 sites were surveyed throughout the former Bermagui, Murrah and Mumbulla State Forests as well as the Gulaga, Mimosa Rocks and Biamanga National Parks and Bermagui Nature Reserve.[6]

Based on these surveys, the population was considered small, probably less than 50 mature animals across the approximately 12,000-hectare reserve (or 0.004 koalas per hectare). Whilst it is difficult to compare these figures with other known koala habitats due to differences in data collection and sampling methods, some figures are relevant. For example, on the north coast of NSW near Ballina, some studies using scat surveys have estimated a population of 196 koalas across a 2,151 hectare area (or 0.09 koala per hectare).[7] In comparison, recent research predicted NSW north coast forests could support up to 0.25 koalas per hectare.[8]

A scat-based survey in 2012-14 at the Reserves found evidence of koalas at 105 of the 918 survey sites, giving an overall occupancy rate of 11 percent resulting in an estimated population of 30-60 koalas .[9] The occupancy rates overall were similar to those reported in 2007–09 despite the larger survey area and sample size using scat surveys. This occupancy rate is significantly lower

4 Murrah Flora Reserves Draft Final Working Plan. Forestry Corporation of NSW and Office of Environment and Heritage, Sydney NSW.

5 OEH (2016), 2012–14 Koala survey report in coastal forests of south-eastern NSW – Bermagui/Mumbulla area. Accessed at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Native-animals/koala-survey-report-2012-14-bermagui-mumbulla-area-160233.pdf

6 Department of Environment, Climate Change and Water NSW (2010), Koala surveys in the coastal forests of the Bermagui– Mumbulla area: 2007–09 – An interim report

7 Biolink Ecological Consultants (2021), *Koala Population Viability Analysis – Ballina Koala Plan*

8 Natural Resources Commission (2021) Research Program – Koala response to harvesting in NSW north coast state forests – September 2021.

9 Office of Environment and Heritage NSW (2016), 2012-14 Koala survey report in coastal forests of south-eastern NSW Bermagui/Mumbulla area. For the under the 'Corridors and Core Habitat Project' sponsored by the Australian Government's Biodiversity Fund

in comparison to more recent monitoring that detected koalas in over 80 percent of sites sampled in northeast NSW using acoustic song meters.[10]

Monitoring since the gazettal of the Reserve

Scat surveys

Monitoring commenced in 2016 with up to 100 sites sampled per year across five sub-areas. The monitoring program used the same assessment method in the field as that used in previous surveys (scat surveys or RG-bSAT). Community-based contractors, including those from Local Aboriginal Land Councils, with the support of local volunteers, have undertaken almost all the fieldwork for the monitoring program.

The surveys found that the koala population is small, with activity at 14 percent of the sample sites and a preference for Black She-Oak, Mountain Grey Gum, Yellow Stringybark, Woolybut, Silvertop Ash and Ironbark.[11]

Data is held in the south east NSW koala database and has been used to develop a program that can automatically generate reports on koala occupancy rates, and changes in these rates over time, as well as koala distribution, activity levels, and tree species and size-class preferences.

Acoustic surveys

Passive acoustic surveys commenced as part of the monitoring program undertaken by the Department of Planning, Industry and Environment (DPIE) in spring 2016 at 24 of the study area's scat sites. Passive acoustic surveys have subsequently been undertaken in an additional two sub-areas in the spring of 2017, 2018 and 2019.

Survey results identified koala bellows were recorded 522 times at 21 out of the 24 sites, with one site yielding 120 calls.[12] Comparing the passive acoustic survey results with scat surveys at the same sites revealed the acoustic surveys had site detection rates more than three times higher than the scat surveys. This probably reflects the greater area sampled at each site by acoustic recording than localised grid-site surveys.[13] Acoustic surveys appear to be more cost effective than pellet surveys over an equivalent area, and they are particularly effective at detecting low density koala populations.[14]

10 DPI koala research in NSW forests - Monitoring Koalas in Hinterland Forests of Northeast NSW and the effect of 2019 fires on the meta-population. Available at https://www.dpi.nsw.gov.au/forestry/science/koala-research

11 ikoala report: Bernd Gruber & Aaron Adamack - Version 0.77, generated 2019-11-13

12 Law, B., Gonsalves, L., Bilney, R., Peterie, J., Pietsch, R., Roe, P.4 and Truskinger, A. (2019). *Using Passive Acoustic Recording and Automated Call Identification to Survey Koalas in the Southern Forests of New South Wales. Zoologis*t. 2019 Royal Zoological Society of New South Wales. https://publications.rzsnsw.org.au/doi/abs/10.7882/AZ.2019.033

13 ~ 300 m radius Law et al. unpublished data

14 Law, B., Gonsalves, L., Bilney, R., Peterie, J., Pietsch, R., Roe, P.4 and Truskinger, A. (2019). *Using Passive Acoustic Recording and Automated Call Identification to Survey Koalas in the Southern Forests of New South Wales. Zoologis*t. 2019 Royal Zoological Society of New South Wales. https://publications.rzsnsw.org.au/doi/abs/10.7882/AZ.2019.033

1.3.2 The area provides important connection to Country for Aboriginal people

The Reserves lie within the traditional Country of the Djirringanj Yuin People. These lands and the surrounding landscape contain many significant and sacred sites to the Djirringanj Yuin people and other Aboriginal groups. The koala is also a highly culturally significant species for the Aboriginal owners, known as Gumbaawar.

One section of the Reserves – directly south of Gugunyal Road (formally Mumbulla Trig Road) – is declared as part of the Biamanga Aboriginal Place. The Biamanga and Gulaga National Parks adjoin the Reserves. These places contain sites sacred to the Yuin people, such as Mumbulla Mountain and Gulaga Mountain. They are jointly managed by the Aboriginal owners and NPWS.

Following a long campaign by the local Aboriginal community, the Biamanga Aboriginal Place was declared in 1980 over an area of Mumbulla State Forest. Most of the place was included in Biamanga National Park, reserved in 1998 through the Eden Regional Forest Agreement process, although a small area is contained in Mumbulla Flora Reserve.

Biamanga National Park was formally handed back to its traditional owners in May 2006. The Aboriginal community, by way of a majority Aboriginal owner board of management, has full care, control and management of this park, under Part 4A of the *National Parks and Wildlife Act* 1974. Plans of management have been developed for both Biamanga and Gulaga National Parks, and they continue to be jointly managed through a lease agreement with NPWS.

The Plan of Management for Yuin Bangguri (Mountain) Parks – incorporating Gulaga National Park and Biamanga National Park – states it is a priority to manage the mountains as a single landscape and increase the connectivity and protection of land between them. Given this desire, and the strong cultural connections Aboriginal people have with this area, the Reserves' working management plan supports a close and effective partnership with the Biamanga and Gulaga National Parks' boards that encourages Aboriginal connection to Country. It is a clear and consistent aspiration of the local Aboriginal owners that the Reserves become part of Biamanga National Park and are managed under the Yuin Bangguri (Mountain) Parks Plan of Management.[15]

1.3.3 The area supports local timber industries and towns

Timber harvesting has occurred within and surrounding the Reserves since the 1890s. These areas were declared the Bermagui and Murrah State forests in 1914, and the Mumbulla and Tanja State forests in 1917.[16]

Early harvesting practices were largely selective. Between 1964 and 1973 more intensive harvesting occurred, followed by integrated harvesting. This practice involves taking sawlogs and pulpwood in alternative coupes then returning to harvest the adjoining coupes after a period of regeneration. Integrated harvesting continued into the 1990s, but there were few such operations in the area encompassed by the Reserves after 1996 and the last harvest took place in 2005.[17]

15 OEH (2014), Plan of Management Yuin Bangguri (Mountain) Parks incorporating Gulaga National Park and Biamanga National Park, Office of Environment and Heritage, Sydney.

16 Murrah Flora Reserves Draft Final Working Plan. Forestry Corporation of NSW and Office of Environment and Heritage, Sydney NSW.

17 Data sourced from Forest Corporation of NSW

In terms of overall contribution to employment in these regions, the forestry and wood product manufacturing industries are relatively low. In certain communities and towns such as Eden, however, the flow-on contribution of these industries is more significant.

1.4 How did the 2019/20 wildfires impact the area?

The project finished in June 2019. Wildfires commenced in the south coast from late December 2019 through January 2020. The wildfires were unprecedented in their scale, extent of high and extreme fire severity, and duration, and impacted environmental, economic and social values in the south coast. The 2019/20 wildfires are an indication that fire regimes predicted under climate change, including more frequent and more severe fires, may now be occurring and are likely to increase.[18]

Impacts on the environment

The 2019/20 wildfires burnt 4.8 million hectares of land in NSW, including just over 14 per cent (around 0.7 million hectares) of the native state forest estate.[19] The wildfires significantly impacted forest ecosystems, including native flora and fauna, soil, and water.

Based on fire extent and severity mapping, south coast forests were more heavily impacted than those on the north coast. Up to 34 percent of the total forest extent area in the south coast and Eden subregions were impacted by high to extreme fire severity.[20]

The wildfires impacted the north-western edges of the Reserves. The NSW *Saving our Species* program funded a post-fire survey of koalas and their habitat on the far south coast between March and October 2020. The study found approximately 70 percent of the study area, which included the Reserves and Biamanga National Park, was not impacted by the wildfire.[21] The study found evidence of koala activity, and concluded that the local population was stable, consistent with previous studies. Recent research on the NSW north coast has also found that koalas were recorded in areas that experienced high severity fire from the 2019-20 wildfires, but not in the sampled areas where high severity fires were widespread. The report indicated that where fire severity was moderate-high, koala density was reduced by about 50 per cent within one year, but koalas were widespread throughout the burnt area.[22]

18 Bradstock, R. et al. (2021) Risks to the NSW Coastal Integrated Forestry Operations Approvals Posed by the 2019/2020 Fire Season and Beyond: A Report to the New South Wales Natural Resources Commission, Centre for Environmental Risk Management of Bushfires, University of Wollongong and the NSW Bushfire Risk Management Research Hub.

19 DPIE (2020), *NSW Fire and the Environment 2019–20 Summary,* Biodiversity and landscape data and analyses to understand the effects of the fire events. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Fire/fire-and-the-environment-2019-20-summary-200108.pdf

20 DPIE (2020) Supporting fire management with the Fire Extent and Severity Maps. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Fire/fire-extent-and-severity-mapping-fact-sheet-200068.pdf).

21 DPIE (2020) *NSW Far South Coast post-fire koala survey.* Available at: https://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-far-south-coast-post-fire-koala-survey-2020

22 NSW DPI and FCNSW (2021)*Foundational Monitoring Project: Effects of 2019 Fires on Koala Occupancy Monitoring at the Regional Scale and Koala Density at the Local Landscape Scale*. Available at: https://www.dpi.nsw.gov.au/forestry/science/koala-research.

Other research has found koalas are able to use regenerating forests within months after a fire for forage, and due to their mobility are able to recolonise burnt areas quickly.[23] However, when wildfire impacted most of the Warrumbungle National Park at high to extreme severity, the koala population had not recolonised the fire-affected area six years later.[24]

Impact on people

The wildfires extensively impacted NSW communities, with 26 fatalities, 2,476 homes destroyed, loss of other infrastructure and business assets, ongoing physical and mental health impacts, and financial hardship.[25] Within state forests and national parks, loss of visitor infrastructure, road and bridge damage, and other hazards in fire-affected forests resulted in the temporary closure of forests to the public. This had flow-on impacts for local community groups and commercial operators, particularly in the South Coast and Eden subregions.

Aboriginal people were disproportionately affected, with Aboriginal populations in many wildfire-affected areas in NSW representing greater than 20 percent of total population.[26] Aboriginal peoples' experience of fire crises is vastly different to non-Indigenous peoples. Aboriginal peoples' relationships to Country, culture and community are not only interconnected, they are intrinsically linked to their identity and role as custodians. This means that when any of these foundations are impacted by a fire or other disaster, Aboriginal peoples experience unique trauma[27] such as loss of native food sources, burning of ancient scarred trees and destruction of ancestral and totemic plants and animals.[28]

Impacts on industry

Wildfire impacted a significant area of timber resource on south coast state forests restricting supply to timber mills. In late 2020, FCNSW reported this would have significant impact on the hardwood industry. At the time, FCNSW estimated up to 155 direct jobs were at risk of being lost in the south coast and Eden regions. The impact is expected to be higher when indirect employment is also accounted for.[29]

FCNSW declared *force majeure* on all wood supply agreements and harvesting and haulage contracts on the south coast, impacting employment in forest operations, log haulage, timber

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23 Matthews, A., Lunney, D., Gresser, S. and Maitz, W. (2007) 'Tree use by koalas *Phascolarctos cinereus* after fire in remnant coastal forest'. *Wildlife Research*, 34:84-93.

24 Lunney, D., Sonawane, I., Wheeler, R., Tasker, E., Ellis, M., Predavec, M. and Fleming, M. (2020) 'An Ecological Reading of the History of the Koala Population of Warrumbungle National Park'. *Proceedings of the Linnean Society of New South Wales*, 141, Supplement, S131-S154.

25 NSW Government (2020) Final Report of the NSW Bushfire Inquiry July 2020. Available at: https://www.nsw.gov.au/nsw-government/projects-and-initiatives/nsw-bushfire-inquiry

26 Whittaker, J. and Bedward, M. (2020) Demographic characteristics of populations affected by the 2019/2020 bushfires in NSW. In NSW Bushfire Risk Management Research Hub Reports to the NSW Bushfire Inquiry 2020 – Theme 3A- People and Property Impacts

27 Williamson, B. and Quinn, P. (2021) Unwelcoming and reluctant to help: bushfire recovery hasn't considered Aboriginal culture — but things are finally starting to change. *The Conversation*, February 24. Available at: https://theconversation.com/unwelcoming-and-reluctant-to-help-bushfire-recovery-hasnt-consideredaboriginal-culture-but-things-are-finally-starting-to-change-154954.

28 Williamson, B., Weir, J. and Cavanagh, V. (2020) Strength from perpetual grief: how Aboriginal people experience the bushfire crisis. *The Conversation*, January 10. Available at: https://theconversation.com/strength-from-perpetual-grief-how-aboriginal-people-experience-the-bushfirecrisis-129448.

29 Letter from Regional NSW and FCNSW to the Environment Protection Authority, 7 September 2020. Accessed at https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestry/joint-letter-from-regional-nsw-and-foresg-operations-under-the-coastal-integrated-forestry-operation.pdf?la=en&hash=D3BCFC35DE7CF9BAC15C47282925769E901AA379

processing, and allied services.[30] Some new short-term sales agreements have commenced on the south coast, as their long-term wood supply agreements have recently expired. In March 2021, a stand down of up to 74 harvest and haulage jobs and 6 jobs at a sawmill in the region had been reported.[31]

30 Portfolio Committee No. 7 – Planning and Environment Inquiry into koala populations and habitat in New South Wales SUPPLEMENTARY QUESTIONS – Hearing 26 February 2020. Accessed at: https://www.parliament.nsw.gov.au/lcdocs/other/13254/ASQ%20-%20Mr%20Dean%20Kearney%20-%2026%20March%202020%201.pdf

31 Parliament of NSW (2021) *Budget Estimates 2020-2021 Supplementary Questions, Portfolio Committee No. 4 – Industry*. Available at: https://www.parliament.nsw.gov.au/lcdocs/other/15367/Answers%20to%20supplementary%20questions%20-%20Barilaro.pdf.

2 Murrah Flora Reserves project achieved the expected short-term outcomes

The Commission's evaluation found that the project achieved the expected short-term outcomes as outlined in the project grant:

- the Reserves were established by gazettal
- NPWS was appointed as land manager of the reserves and a management plan was developed
- FCNSW met its wood supply obligations to the local timber mills without imposing additional costs on the mills.

However, the extent to which the project will lead to improved longer-term outcomes for the local koala population and Aboriginal cultural heritage is not clear.

2.1 Murrah Flora Reserves were established by gazettal

The Reserves were gazetted in the NSW Parliament under section of 25A of the *Forestry Act 2012* in March 2016.[32] As a result, the area remains in a state forest but:

- has legislative status and is recognised as a formal reserve under the National Comprehensive, Adequate and Representative (CAR) reserve system[33], and is recognised as part of Australia's reporting to the International Union for Conservation of Nature (IUCN)[34]
- is permanently reserved to conserve native plants, forest ecosystems, threatened species and habitats, and Aboriginal cultural and archaeological values – with no forestry activities permitted[35]
- is recognised under FCSNW's Forest Management Zoning system (**Box 1**)
- in this instance the reserves are managed by NPWS as appointed by the Minister for Forestry[36], rather than managed by FCNSW.

The gazettal has increased the conservation status of the area as it cannot be revoked without an Act of Parliament.[37]

32 Government Gazette of the State of NSW, Number 22, 29 March 2016. Accessed at: https://legislation.nsw.gov.au/gazette
33 Strategy for Australia's National Reserve System 2009-2030
34 Accessed at: https://www.iucn.org/
35 Forestry Act 2012 No 96, Part 3 State Forests and Flora Reserves
36 Noting now the Secretary of Department of Planning, Industry and Environment to authorise NPWS staff working in flora reserves rather than going to Minister responsible for the Forestry Act.
37 C.16 (4) *Forestry Act 2021*

Box 1: Forest Management Zoning[38,39]

Forest Management Zoning (FMZ) is a land classification system which establishes spatially explicit management objectives in state forests. The primary purpose of the FMZ system is to clearly separate those areas of State forests for conservation and those that are for timber harvesting. FMZ is a two-tiered system. The first tier classifies parts of state forests into one of eight zones. Each zone has prescribed forest management attached to it. The second tier is used to classify special values including natural or cultural features or specific forests uses.

FMZ 1 – or Flora Reserves – provides for special protections to maximise protections of very high natural and cultural conservation values. Flora Reserves are established under Section 25A of the *Forestry Act*. An Act of parliament is required to revoke Flora Reserve zoning. Section 25A of the *Forestry Act* requires a management plan for Flora Reserves to be approved by the Minister for Forestry.

FMZ 1 areas are designed to meet the requirements of JANIS reserves (or Comprehensive Adequate and Representative (CAR) reserve system) in the National Forestry Policy Statement and, as such, are the equivalent to International Union for Conservation of Nature (IUCN) Protected Area Categories I, II, III or IV.

2.2 NPWS was appointed the land manager

The Trust grant facilitated the appointment of NPWS as the land manager of the Reserves under the *Forestry Act 2012*. Previously, FCNSW would have continued to manage the land as a flora reserve. The appointment of NPWS as the land manager was a novel arrangement, being the first of its kind in NSW.

Since then, an additional 14 flora reserves totalling nearly 20,000 hectares have been gazetted on state forests with NPWS appointed as the land manager.[40] Nearly all new gazettals have occurred since November 2020, some four years after the Reserves were gazetted.

In 2016, the (then) Minister for Primary industries appointed the Chief Executive of the (then) Office of Environment and Heritage as the land manager for the reserves in accordance with section 57(3) of the Forestry Act. Under the same Act, the Reserves must be managed in accordance with a working plan adopted by the Minister responsible for the Forestry Act after public consultation.

A working management plan was jointly prepared by members of the project steering committee, the Gulaga and Biamanga boards of management, and staff from the NPWS, FCNSW and the NSW Department of Primary Industries (DPI). Public consultation finished in January 2018.

38 FCNSW, *Managing our Forests Sustainably: Forest Management Zoning in NSW State Forests.* Available at: https://www.forestrycorporation.com.au/__data/assets/pdf_file/0003/438402/managing-our-forests-sustainably-forest-mgt-zoning-in-nsw-state-forests.pdf

39 ANZECC (1997) *Nationally Agreed Criteria for the Establishment of a CAR Reserve System for Forests in Australia.* Available at: https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/rfa/publications/nat_nac.pdf

40 See https://www.nationalparks.nsw.gov.au/conservation-and-heritage/flora-reserves

A management plan is now in place that was formally signed-off by the Minister on 14 July 2021, some 7 years after the Reserves were gazetted.

The plan's objectives include:

- implement the koala monitoring program and contribute to the enhancement of koala habitat
- provide for Aboriginal community participation in the conservation of natural and cultural values and practices
- integrate reserve management with adjoining land management programs
- increase knowledge of the reserves and their natural and cultural values
- improve biodiversity.

Table 1 compares the management actions under the NPWS's management plan with FCNSW's management objectives and actions prior to the creation of the reserves.

Table 1: Management objectives and actions before and after establishment of the Reserves

	Pre-gazettal	After gazettal
Land Manager	Managed by FCNSW in accordance to harvesting plan and Coastal IFOA including Ecologically Sustainable Forest Management (ESFM)	Managed by NPWS in accordance with Management Plan and objectives under the *National Parks and Wildlife Act 1974*
Primary management objectives	Timber production while protecting environmental and cultural values Other multiple uses such as recreation and tourism and apiary	Conservation of key koala habitat Aboriginal community participation in the conservation of natural and cultural values and practices
Primary management actions	Silviculture including timber harvesting Koala monitoring program Fire and access trail maintenance Fuel load reduction Pest animal management	Active management trial such as thinning to improve quantity of koala feed trees Fuel load management incorporating Aboriginal cultural burning Koala monitoring program Visitor access and community and Aboriginal engagement Pest animal management

NPWS did not receive any of the $2.5 million grant provided by the Trust. However, NPWS did receive $510,000 in Community Service Obligation (CSO)[41] payments from FCNSW over the grant period to manage the flora reserves in line with the management plan. The Commission learned that NPWS provided additional funds from its internal budget and one-off grants, including from the *Saving our Species* program.

Since establishing the Reserves, the NSW state government has gazetted 14 new flora reserves across the state, with more proposed for gazettal. These new reserves have been funded out of the NSW Waste Levy[42], with a focus on koala conservation.

The Commission understands the new reserves have received significant start-up funding compared to the Reserves when they were established. Funds allocated for the most recent Flora Reserves on a per hectare basis over a 4-year period were 11 times more than those allocated to the Reserves. These newly created flora reserves received an average of around $120 per hectare per annum over four years, while the Reserves received an average of $11 per hectare per annum over four years.[43]

FCNSW and NPWS staff told the Commission they support the new management approach while recognising some early 'teething' problems. NPWS noted that structural changes within their agency during the establishment of the Reserves, and a lack of adequate upfront funding to manage the Reserves, compromised the delivery of the management plan. In addition, the NPWS restructure impacted the transfer of important corporate knowledge between management staff.

Ongoing funding to manage the Reserves was expected to come from existing NPWS budgets. However, the Commission was told this proved challenging given the budget was already stretched managing the existing estate. This highlights a flaw in the design of the project, whereby funding was not commensurate with the objectives sought. Whilst funds were sufficient to offset the impacts of the Reserves on the local timber industry, they were not sufficient to carry out the management actions as outlined in the management plan (discussed further in **Section 3.2**).

2.3 FCNSW met its wood supply obligations

In line with the grant agreement, FCNSW allocated the bulk of the grant funding ($1.94 million, or 78 percent of the total) to subsidise additional harvesting and haulage costs and ensure it could meet its legal contractual obligations under the Eden Management Area Wood Supply Agreement (WSA).

This agreement required FCNSW to supply 25,000 cubic metres of combined high and low quality sawlogs from Eden Management Area to Blue Ridge Hardwoods from 1999 to 2018. Prior to the establishment of the Reserves, the entire volume was sourced from the Eden Management Area, some of which was sourced from the areas now covered by the Reserves.

41 The NSW Government provides FCNSW with an annual Community Services Obligation grant, which is a fee-for-service that covers some of the cost of providing community facilities such as free visitor areas, community roads, management of conservation and other services that a private commercial forest manager would not otherwise deliver.

42 The Protection of the Environment Operations Act 1997 (POEO Act) requires certain licensed waste facilities in NSW to pay a contribution for each tonne of waste received at the facility, referred to as the 'waste levy'. The levy is used by the NSW State Government for various initiatives including waste and environmental programs.

43 Interview notes: Rob McKinnon, Senior Project Officer, Reserve Establishment at NSW NPWS

The establishment of the Reserves (located within the Eden WSA Management Area) required FCNSW to source timber from other regions to meet its supply obligations, including from the Narooma, Queanbeyan and Badja which sit within the South Coast sub-region. This resulted in higher harvesting and haulage costs as the alternative regions were typically up to 200 kilometres from the customers' mills, and in some cases was in terrain that made harvesting and haulage more difficult.

At the expiry of the Eden WSA in December 2018, FCNSW had met its supply obligations to its Eden customers. FCNSW sourced around 75 percent of the required volume of timber from the South Coast sub-region with the remainder coming from the Eden Management Area following the gazettal of the Reserves (which was the final three years of the 20 year WSA).

Blue Ridge Hardwoods told the Commission that while FCNSW delivered the required volume of logs, the quality of the logs was variable. In their view, this impacted the overall profitability of the business.

Despite this, the Trust grant ensured timber supply continued at the time, the mill continued to operate and local jobs were maintained. As **Section 1.4** notes, other factors, including the 2019/20 wildfires, have significantly impacted the extent of standing timber resources in south coast state forests since this project finished, which in turn has significantly impacted timber supply to local timber mills.

3 Project design and approach could have been more effective

Although the project delivered its stated outcomes, the Commission identified issues which could be used to improve the design and approach of similar future projects to enhance their likely long-term outcomes.

We found that:

- local Aboriginal communities were not engaged early and genuinely in the project, which is an issue given the high cultural values of the area, the Yuin people's recognised cultural rights, and their knowledge and experience as joint managers of the surrounding areas
- challenges associated with cross-tenure land management were not foreseen and addressed early in the project, which reduced the project's administrative efficiency
- start-up funding was not commensurate with the management objectives sought for the Reserves.

3.1 Aboriginal cultural provisions could be improved

The Yuin People have significant connection to the areas encompassed by the Reserves (**Section 1.3.2**). They are also the joint managers of the Biamanga and Gulaga National Parks adjoining the Reserves.

Aboriginal stakeholders view the establishment of the Reserves as a starting point for improving their management with the involvement of Aboriginal owners. As one interviewee commented:

> *'… at its most basic level it's a start, a way of lassoing an important cultural and ecological area and protecting it, a start for Aboriginal people to be involved in its management … you have to start somewhere … any opportunity for Aboriginal people to be at the table in land management is a good thing that can be built on. It can be a model for future actions but need to reflect on a lot of learnings and improvements including to the financial management.* [44]

NPWS developed an interim management plan prior to gazettal. We were told that NPWS shared the interim plan with Aboriginal members of the National Parks' boards of management when the Reserves were announced. However, it was the view of some Aboriginal members that NPWS did not genuinely engage them in further shaping the plan. However, the final plan was workshopped by a community group including representatives from the Boards of Management and the plan was endorsed by the chair of Biamanga Board before it was submitted to the Ministers for approval.

Nonetheless, in the view of the interviewees and the Commission, the cultural heritage provisions are vague and high level, and therefore cannot be properly managed or monitored. No cultural heritage assessment, protection or management has been undertaken in the Reserves to date, nor any monitoring and reporting on cultural heritage outcomes.

Interviewees also told the Commission that NPWS did not transparently share financial reporting and management processes with them. The board members were new to their role, and needed time, support and education to build capacity. They didn't understand a lot of the process or the financial management within the timeframes expected.

44 Interview notes: Graham Moore, Yuin man, Monday 12 April 2021.

For projects that involve the development of management plans to protect and enhance these cultural values, the Trust should ensure that funding agreements require that the resulting plan clearly identifies the intended outcomes for cultural values, includes cultural indicators, and better incorporates cultural practices, including but not limited to cultural burning. In addition, the Trust could consider sufficient grant funding is allocated to build capacity in governance and financial management for Aboriginal board members.

It is important to note, confidential arrangements prevented agencies from consulting and engaging communities and stakeholders prior to the formal announcement of the gazettal. This Government decision impeded relationships with the local Aboriginal communities who became aware of the project when the Reserves gazettal was formally announced in the media.

NPWS staff told the Commission they still feel constrained by the confidential processes by which new Flora Reserves continue to be developed. Feedback has indicated that since the creation of the Reserves, a number of proposed reserves have been in Indigenous Land Use Agreement Areas (ILUA). However, the ILUA partners have again only found out about proposals when they were officially announced. NPWS recognise that this is not in the spirit of the agreements and creates tensions from the beginning. Feedback indicates that the development of working management plans with Aboriginal communities has worked well with some ILUA partners, but is difficult if tension exists from the lack of consultation from the start.[45]

Where future projects intersect or impact landscapes with high Aboriginal cultural values, early and genuine engagement is critical to promote two-way learning and incorporate Aboriginal management priorities.

3.2 Challenges associated with cross-tenure land management were not addressed early in the project

Our review found several administrative and process issues hampered NPWS's ability to execute its management plan for the Reserves during the initial phase of the grant period. Some of these issues stemmed from working across land tenures. For example:

- the need for certain Ministerial powers to be delegated to the Chief Executive of (the then) Office of Environment and Heritage hindered timely decision making
- the need for NPWS staff to be authorised officers under the Forestry Act made it difficult to get approval of management actions in a timely manner
- the different tenure-based legislative requirements made some activities difficult to conduct across tenures (for example, cultural burning).[46]

These issues were largely expected given the newness of the arrangements at the time. Now that the arrangement is more common, the Commission understands these issues have been resolved. For example, the regulations for the Forestry Act have been amended to allow the Secretary of DPIE, to authorise NPWS staff working in the Reserves rather than requiring authority from the Minister responsible for the Forestry Act.

[45] Interview notes: Rob McKinnon, Senior Project Officer, Reserve Establishment at NSW NPWS

[46] Cultural burning is allowed but only within the parameters of NPWS burning prescriptions.

Other administrative issues relating to the transfer of funds were also identified. FCNSW provided some funds, in the form of CSO payments, to NPWS. These payments were, however, delayed due to administrative issues that were not resolved until after the conclusion of the grant period. The Trust had limited visibility of this process as CSO payments sat outside of the grant process. However, these payments were important for delivering improved koala habitat and cultural heritage outcomes.

NPWS also faced challenges in hiring and retaining suitably qualified staff and suffered staff losses due to internal NPWS restructures. For example, the Commission was told NPWS initially planned to hire an Aboriginal person as a ranger, but the position's qualifications and experience requirements made it difficult for Aboriginal people to be competitive for the role.[47]

In addition, there have been challenges in developing appropriate protocols and procedures to incorporate cultural burning into the fire management plans due to cultural burning practices not fitting within the mainstream fire management regimes and practices. There are potentially significant co-benefits for the Reserves and the local community, particularly Aboriginal youth, if administrative hurdles to cultural burning operations can be overcome. Some of these initial challenges have been addressed, with cultural burning now incorporated into a draft landscape wide fire management plan.

With any new and novel arrangement there will be some challenges in the early stages. As such, for future projects it is worth spending some time planning the implementation of the program as well as the program design. Project design should fully examine potential legislative constraints and relevant decision-making delegations to ensure the smooth and timely delivery of programs.

3.3 Insufficient funds hampered effective start-up

Funding and resourcing arrangements for the start-up phase of the Reserves was insufficient. As noted previously, no project funding was allocated from the Trust's grant to cover NPWS's start-up costs and ongoing management actions in the Reserves. The grant provided sufficient resources to mitigate the short-term impacts of the Reserves on the local timber industry, however it was not sufficient to deliver on the management plan. It was expected that NPWS would fund the vast majority of the management of the Reserves from NPWS internal resources.

As highlighted in **Section 2.2**, funding for the Reserves was up to 11 times less per hectare than the average funds per hectare allocated to 14 recently established flora reserves.[48] CSO contributions from FCNSW, whilst welcome, were not commensurate to the management actions required as outlined in the management plan. NPWS relied on other one-off competitive grants to supplement funding, however this was well short of similar funding for more recently created reserves.

CSO payments for the Reserves equated to around $127,500 per annum over four years, enough to employ one full-time staff member with responsibility to manage almost 12,000 hectares. In comparison, if the Reserves had received the same per hectare funding as these newer flora reserves it would have equated to approximately $5.7 million over four years, or an average of $1.4 million per annum.

47 Interview notes: Dan Morgan, Regional Coordinator-Southern NSW, Firesticks Alliance Indigenous Corporation.

48 https://www.nationalparks.nsw.gov.au/conservation-and-heritage/flora-reserves

4 There are opportunities for Government to improve long-term outcomes

The project effectively achieved short-term project outcomes and met an immediate Government priority. However, without continued and appropriate funding it is not clear that the Trust's investment in the project will result in better longer-term outcomes than would otherwise be the case.

The project's design focused on gazetting the Reserves, transferring management to NPWS and subsiding timber harvesting and haulage to establish improved environmental and cultural heritage outcomes in the long-term. However, this is contingent on future funding and management of the Reserves, including the effective mitigation of threats and facilitating greater involvement of Aboriginal owners.

4.1 Additional funding is needed to achieve outcomes

Just over $500,000 was provided to NPWS to manage the Reserves as agreed over the four-year grant period (or nearly $130,000 per annum representing around $11 per hectare per year). Based on comparative analysis with newly created Reserves and from interview feedback[49], the Commission estimates at least an additional $1 million per annum over four years is required to ensure minimum outcomes are delivered in line with the Reserves' management plan. As discussed in **sections 2.2** and **3.3**, newer established reserves received significantly more funding than the Murrah Flora Reserves.

The NSW Government's recent announcement of $193 million funding for koala conservation outcomes strongly aligns with the objectives of the Reserves.[50] It is not clear, however, if the Reserves will receive the additional funding necessary to achieve long-term outcomes based on feedback from land managers during this review.

Additional funding is needed to continue to support novel management approaches to increase the viability of the local koala populations.[51] For example, NPWS are undertaking a research trial using treatments to shift the current vegetation composition towards species that are preferred koala browse trees. Treatments include fire, vegetation thinning, ground litter manipulation and direct seeding. These active intervention trials are ongoing, however treatment areas were impacted by the 2019/20 wildfires.

Section 1.4 notes the area is at risk of increasing temperatures and variability in rainfall with associated increases in drought and fire. This puts the local koala population at high risk regardless of any improved gains at the local scale. A draft plan to exclude wildfire from the Reserves for a 10-year period is being prepared to assist with koala population recovery. This plan should be expedited and implemented, incorporating local Aboriginal cool burns at scale across the reserve and surrounding national parks as appropriate.

49 Interview notes: Rob McKinnon, Senior Project Officer, Reserve Establishment at NSW NPWS

50 NSW Koala Strategy. Accessed at: https://www.environment.nsw.gov.au/topics/animals-and-/threatened-species/programs-legislation-and-framework/nsw-koala-strategy

51 Murrah Flora Reserve Draft Final Working Plan, State of New South Wales, Forestry Corporation of NSW and Office of Environment and Heritage 2017.

4.2 Consider including the reserves in the Biamanga joint management area

Local Aboriginal groups have indicated that they would like to see the Reserves included as part of the Biamanga Aboriginal Place and Biamanga National Park, which are jointly managed by the Aboriginal owners with NPWS. Evidence from interviews indicates there is strong community support for this outcome due to the:

- proximity of the Reserves to the broader area, which has a fully functional and effective Board of Management with good existing relationships with NPWS
- recognition of the high Aboriginal cultural values of the area (including the koala), as well as the Aboriginal owners' cultural rights in the area
- importance of access to the Reserves, and connectivity between the Reserves and the broader area to critical cultural pathways and storylines (and to koala movements).

As one Board member told us, *'We have the right to speak for Country here under the protection and joint management agreement. We are best placed to do this work.'*[52]

Benefits include the continued improvement of management and increased Aboriginal engagement and management of culturally significant areas. The Commission suggests that NPWS, FCNSW and the local Aboriginal boards undertake a formal process to identify the next steps to facilitate this change, and identify key legislative or other administrative hurdles that need to be navigated to facilitate a potential inclusion within the Biamanga joint management area.

[52] Interview: Bunja Smith, Chair Biamanga Board of Management.

Attachment 1: Evaluation framework

Key evaluation questions/sub-questions
1. Did the project deliver expected outcomes?
a. **Were outcomes achieved in line with expectations?**
b. **How might project outcomes differ to what might have happened in its absence?**
2. Was the project design and approach effective?
a. **Was the project well planned and designed to deliver desired outcomes and objectives?**
b. **How cost effective was the project in achieving outcomes, and how does it compare to other similar projects?**
3. What can we learn and improve?
a. **What are the opportunities to improve the long-term outcomes for the flora reserve? Are there any risk and what lessons can be learned?**

Lines of inquiry, data sources and methods

KEQ	Indicative lines of inquiry	Data sources and methods
1. Did the project deliver expected outcomes?		
a. **Were outcomes achieved in line with expectations?**	• Assess alignment of outcomes identified in project framework • Compare objectives to evidence in project reports/documents • Compare objectives to on-ground monitoring data from sites, considering items such as: changes in koala abundance and density, ongoing management of the reserve, connectivity • Assess change in cultural heritage outcomes as compared to expectations • Assess alignment or change of social and economic outcomes with expectations • Document and assess perceptions of NPWS, FCNSW, Local Aboriginal management groups, timber mills and harvest and haulers	**Review of project documents** (project plans, progress and final reports, reviewer reports. Murrah Flora Reserves draft final working plan **Review of monitoring data and reports –** koala surveys, Wood supply volumes and quality, harvest and haulage costs to supply mills/local industry (both before and during project). Local timber industry direct and indirect employment figures **Interviews with grantee** (possibly with site inspections) **Interviews** with harvest and haulage operators, NPWS, Aboriginal groups specifically as they relate to stakeholders in project delivery

KEQ	Indicative lines of inquiry	Data sources and methods
b. **How might project outcomes differ to what might have happened in its absence?**	• Compare any changes in management pre and post project • Assess current management activities and obligations as compared to pre-project • Assess extent to which site-level management has been supplemented (added to) versus substituted (i.e. are resources going elsewhere) • Assess any change in koala abundance and/or occupancy • Compare any change in mill log volume and quality pre and post project • Review any change in employment and mill viability over the life of the grant • Assess changes in cultural heritage outcomes pre and post grant.	**Review project documents** (applications, agreements with land managers, monitoring data, management records) **Interview**/survey project stakeholders **Review koala research** and mapping on occupancy and likelihood of occurrence Murrah Flora Reserves draft final management plan
2. How cost effective has the project been in achieving specified outcomes?		
a. **Was the project well planned and designed to deliver desired outcomes and objectives?**	• Assess extent of alignment with objectives and Environmental Trust's Major Funding Principles • Consider adequacy of KPIs, monitoring and reporting as they relate to assessing outcomes and program impacts • Assess extent to which objectives were based on and logically relate to a clear need • Review evidence of consultation with appropriate stakeholders • Assess whether the management plan supports enduring outcomes for cultural heritage and koala habitat	**Review project documents** (applications, assessments, maps, monitoring data,) **Review** of Environmental Trust's Major Projects Funding Principles **Interview** project stakeholders Historical state forest harvestable area and harvest exclusion maps Murrah Flora Reserves draft final working plan
b. **How cost effective was the project in achieving specified outcomes and how does it compare to other similar projects?**	• Assess total cost of site management • Compare with other similar reserve costs and measures • Assess whether the contracted wood supply was delivered • Compare the actual cost to transport the timber to allocated ET grant funds • Assess alternative management options and costs (e.g. FCNSW	**Review of project documents** (applications, assessments, maps, monitoring data,) **GIS analysis** **Review** of similar programs **Assessment** of harvest and haulage costs **Interview** project stakeholders

KEQ	Indicative lines of inquiry	Data sources and methods
	management, Aboriginal community management etc)	
a. What are the opportunities to improve the long-term outcomes for the flora reserve? Are there any risks and what lessons can be learned?	• Assess feedback from grantees • Assess perceptions of relevant Trust staff and other state agency partners • Identify factors that might indicate likelihood of project success/challenges • Synthesis of findings above	**Review project documents** (monitoring data, site maps, engagement with Aboriginal group) **Interview** project stakeholders **Murrah Flora Reserves draft final management plan**

Attachment 2: Koala Monitoring in the Reserves

Scat surveys

In 2016, an analysis of monitoring data was undertaken to identify the sampling intensity required to detect changes in occupancy rates if sites were reassessed in a monitoring program, using the grid-based (RGb-SAT) survey method. [53] As recommended by the analysis, the area was subdivided into five sub-areas (see **Figure 1**) and the program commenced in 2016, with 65-100 grid-sites sampled per annum. The method and survey intensity was based on on the assumption that if approximately 500 grid-sites were reassessed per koala generation (6 years), there is 90-95 percent confidence that a 30 percent change in occupancy rates would be detected.

All five sub-areas were monitored according to the methods in the previous survey periods. Community-based contractors including those from Local Aboriginal Land Councils, with the support of local volunteers, have undertaken almost all the fieldwork for the monitoring program. The monitoring program included surveys in:

- Sub-areas 2 & 3 in 2016
- Sub-area 4 was assessed in 2017
- Sub-area 5 in 2018
- Sub-area 1 in 2019/2020 (**Figure 1**).

The monitoring program used the same assessment method in the field as that used in the previous surveys (scat surveys or RG-bSAT). Data is held in the south east NSW koala database and has been used to develop a program (*ikoala)* that can automatically generate reports on koala occupancy rates, and changes in these rates over time, as well as koala distribution, activity levels, and tree species and size-class preferences.

Acoustic surveys

Passive acoustic surveys commenced as part of the monitoring program undertaken by DPIE in spring 2016 at 24 of the study area's scat grid-sites.[54] Passive acoustic surveys have subsequently been undertaken in an additional two sub-areas in the spring of 2017, 2018 and 2019.

53 ikoala report: Bernd Gruber & Aaron Adamack - Version 0.77, generated 2019-11-13

54 DPI koala research in NSW forests - Monitoring Koalas in Hinterland Forests of Northeast NSW and the effect of 2019 fires on the meta-population. Available at https://www.dpi.nsw.gov.au/forestry/science/koala-re

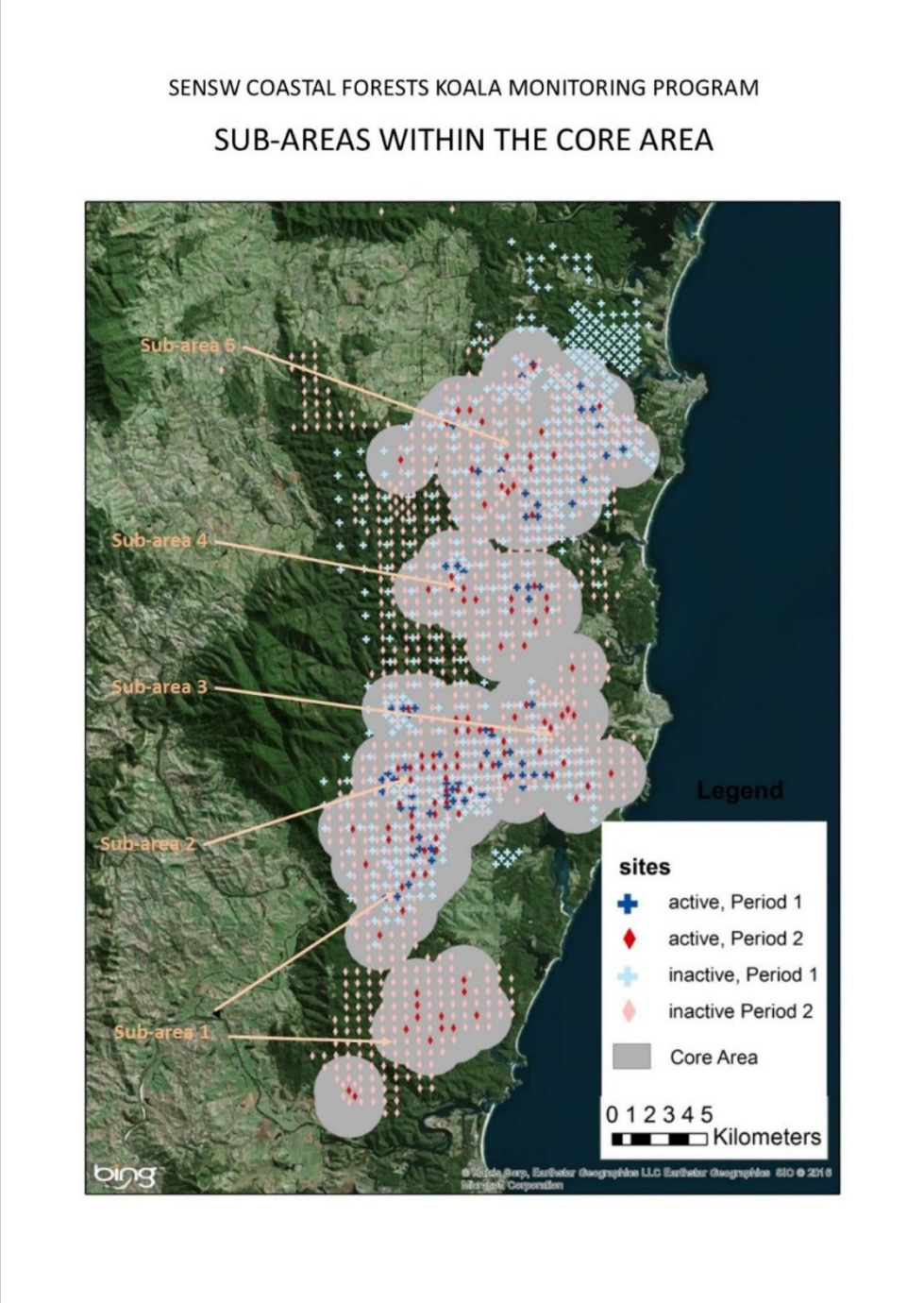

Figure 1: Map of the sampled locations and their activity for the two initial sampling periods. The derived core area and 5 sub-areas are also shown. In total 979 sites of the 500 x 500 m grid are located within the core area.

Scat surveys may be underestimating the occupancy of koalas. The use of scat surveys in north east NSW has led to the assumption that there is a low likelihood of occurrence of koalas in the region. For example, spot-lighting and scat searches targeting forestry areas recorded koalas on less than 15 percent of sites[55], while a recent study targeting modelled koala habitat using passive acoustics recorded naive occupancy of 62 percent[56]. This is because false absences or

55 Smith AP, Andrews SP, and Moore DM (1994) Terrestrial Fauna of the Grafton and Casino State Forest Management Areas: Description and assessment of impacts. EIS Report to State Forests NSW, Sydney Australia,1994.

56 Law BS, Brassil T, Gonsalves L, Roe P, Truskinger A and McConville A ((2018) Passive acoustics and sound recognition provide new insights on status and resilience of an iconic endangered marsupial (koala Phascolarctos cinereus) to timber harvesting. PLoS ONE 13(10): e0205075. https://doi.org/10.1371/journal.pone.0205075

imperfect detection are common in low density koala populations, particularly where forests are not easily accessible.

Future monitoring

It is uncertain if passive acoustics will be adopted going forward for the south east NSW koala monitoring program. It is likely that the previous survey method (scat surveys or RG-bSAT) and passive acoustic surveys will be completed, so that results and trends over time are comparable (using scat surveys) and because the former (scat surveys) actively involves the local community through volunteer initiatives.

The NSW Koala Strategy commits to monitoring and reporting by the responsible land manager at key sites. This requires ongoing monitoring of the Murrah Reserve and surrounding areas as part of the south east NSW koala population including:

- the distribution, size, demography, genetic diversity and trends of the koala population
- the extent and quality of habitat
- the distribution, intensity and impact of threats to koalas
- the health of koalas
- the impact of management actions.

Koala Occupancy modelling

Occupancy data collected by the scat monitoring program for the south east NSW koala population is being modelled by the University of Canberra.[57]

The occupancy analysis is being completed for 3 periods:

- Period 1 (2007-2010)
- Period 2 (2011-2015)
- Period 3 (2016-2019) (post-reservation of the Murrah Flora Reserve).

The occupancy rates by tenure and overall were similar to those reported from 2007–09 despite the larger survey area and sample size. Similar to 2007–09, the highest concentration of activity was in the Mumbulla State Forest. However, in 2012–14 this activity extended further eastwards and into Mimosa Rocks National Park (northern section). A smaller cluster of activity was identified further south in Mimosa Rocks National Park (southern section) as well as a small, isolated cell of activity in Tanja State Forest.

The pattern of activity to the north of the Murrah River was similar to 2007–09 with a cluster of activity in the northern section of Murrah State Forest and then scattered koala activity, with generally smaller activity cells in the northern section of Biamanga National Park, other Aboriginal-owned land, small areas of Bermagui Nature Reserve and parts of the south western section of Bermagui State Forest (**Figure 2**).

57 Bernd Gruber, Anthony Davidson; and Richard Duncan 09-07-2021
Trends in Koala (*Phascolarctos cinereus*) occupancy on the South Coast of NSW

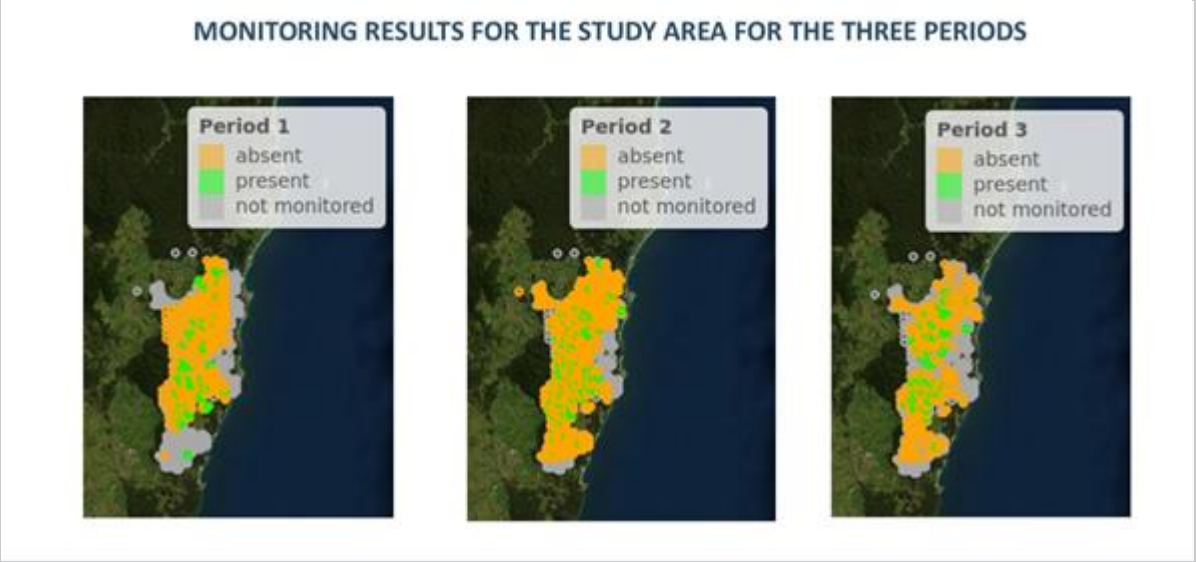

Figure 2: The location of presence and absent records from the three monitoring periods.

The percent of occupied sites was generally low within the individual state forest areas surveyed, with naïve occupancy of 15.31 percent in 2007-2009 to 15.33 percent in 2012-2014. However, these rates were higher than the surrounding national parks and nature reserves, which had a combined naïve occupancy of 7.10 percent in 2007-2009 and 7.29 percent in 2012-2014.

Koalas were estimated to have a naïve occupancy probability using scats of 17 percent over the south east NSW study area in the 2016-2019 monitoring period[58] which is post reservation of the Reserves. So naïve occupancy has fluctuated only slightly over the three monitoring periods (**Table 2**).

Table 2: Occupancy results over the 3 survey periods[59]

	Period 1 (2007-2010)	**Period 2 (2011-2015)**	**Period 3 (2016-2019)[60]**
Naiive occupancy	14%	13%	17%
Modelled occupancy	16%	16.5%	17.5%
Number of occupied sites	250	257	273

Occupancy modelling (accounting for imperfect detection) shows a stable population with a slight growth in the latest monitoring period, however this trend would need to be validated by the next period of monitoring. This trend does not represent a statistically significant (i.e. greater than 30 percent) increase or decrease in koala occupancy rates in the region when compared with previous periods**.** Despite this, the extinction probability has increased from 35 percent to 50 percent from Period 1-2 and 2-3. This may be a result of increased uncertainty due

58 Gruber, B., Davidson, A. and Duncan, R. (2021) Trends in Koala (Phascolarctos cinereus) occupancy on the South Coast of NSW

59 Ikoala report: Bernd Gruber & Aaron Adamack - Version 0.77, generated 2019-11-13

60 Note: this figure does not include the sub-area 1 data.

to sampling rather than the full survey being analysed for Period 3, but will be explored further in the University of Canberra report.

Koala tree use and habitat

As part of the occupancy analysis, linear regressions were performed on the strike rate for the use of different tree species (that is, what trees the scats were found beneath) and also the size of the trees, based on the presence of faecal pellets during the monitoring surveys. The regression analysis found that the species with the highest strike rate included woollybutt (*Eucalyptus longifolia),* narrow-leaved peppermint (*Eucalyptus radiata),* mountain gum (*Eucalyptus cypellocarpa),* blue-leaved stringybark (*Eucalyptus agglomerate)* and yertchuck *(Eucalyptus consideniana)*.

A recent study[61] found that observations of koala scat decreased as the proportion of silvertop ash *(Eucalyptus sieberi)* in an area increased beyond zero. Silvertop ash responds well to disturbance and can increasingly dominate forests after logging and/or fire. The research may help guide management of some areas where this species predominates and where it may become predominant[62].

The reserve has a modified floristic composition and structure from a history of harvesting and fire. The areas are now dominated by dense Black She-oak (*Allocasuarina littoralis),* silvertop ash *(Eucalyptus sieberi)* and/or stringybark regrowth[63]. It is possible that this dense growth supresses the regeneration of koala browse species, particularly woollybutt (*Eucalyptus longifolia)*[64].

Between 2011 and 2017, the *Corridors and Core Habitat for Koalas* project aiming to enhance and connect habitat sustaining the last known koala population in NSW Far South Coast forests was completed. It was a NSW inter-agency project funded by the Commonwealth's Biodiversity fund.

The NSW *Saving our Species Iconic Koala Project* allocated $40,500 in the financial year 2016-7 to the *Corridors and Core Habitat for Koalas* project. The project aimed to trial combinations of silvicultural and regeneration techniques at designated treatment plots and evaluate their effectiveness in enabling the regeneration of eucalypt species preferred by koalas.

A small pilot study of regeneration treatments was undertaken at five private properties cleared for farming or intensively logged, where koala browse species were present as older trees but where younger trees of these species have not regenerated[65] (**Figure 3**). Initial data from November 2017 showed that all proposed treatments have been applied to the sites, with the exception of proposed burning at one of the sites. Data from the monitoring of the plots has not yet been analysed for evaluation of the rehabilitation work.

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61 Au J, Clark RJ, Allen CD, Marsh KD, Foley W (2019) A nutritional mechanism underpinning folivore occurrence in disturbed forests. Forest Ecology and Management 453

62 Allen C (2021) Koala Monitoring in SENSW Coastal Forests 2007-19 Summary Report to NSW Natural Resources Commission, unpublished.

63 Office of Environment and Heritage (2016b). Murrah Flora Reserves Numbers 187, 188, 189, 190 Interim Working Plan Mumbulla, Tanja, Murrah and Bermagui State Forests. NSW Office of Environment and Heritage PO Box 656 Merimbula NSW 2548.

64 Saving our Species (2017) Iconic koala project koala habitat rehabilitation SENSW coastal forests. Interim Report (Draft) November 2017.

65 Office of Environment and Heritage (2015). Rehabilitating Koala Habitat in Degraded Forest: Proposal for a Pilot Project in the Coastal Forests Koala Study Area. NSW Office of Environment and Heritage PO Box 656 Merimbula NSW 2548.s

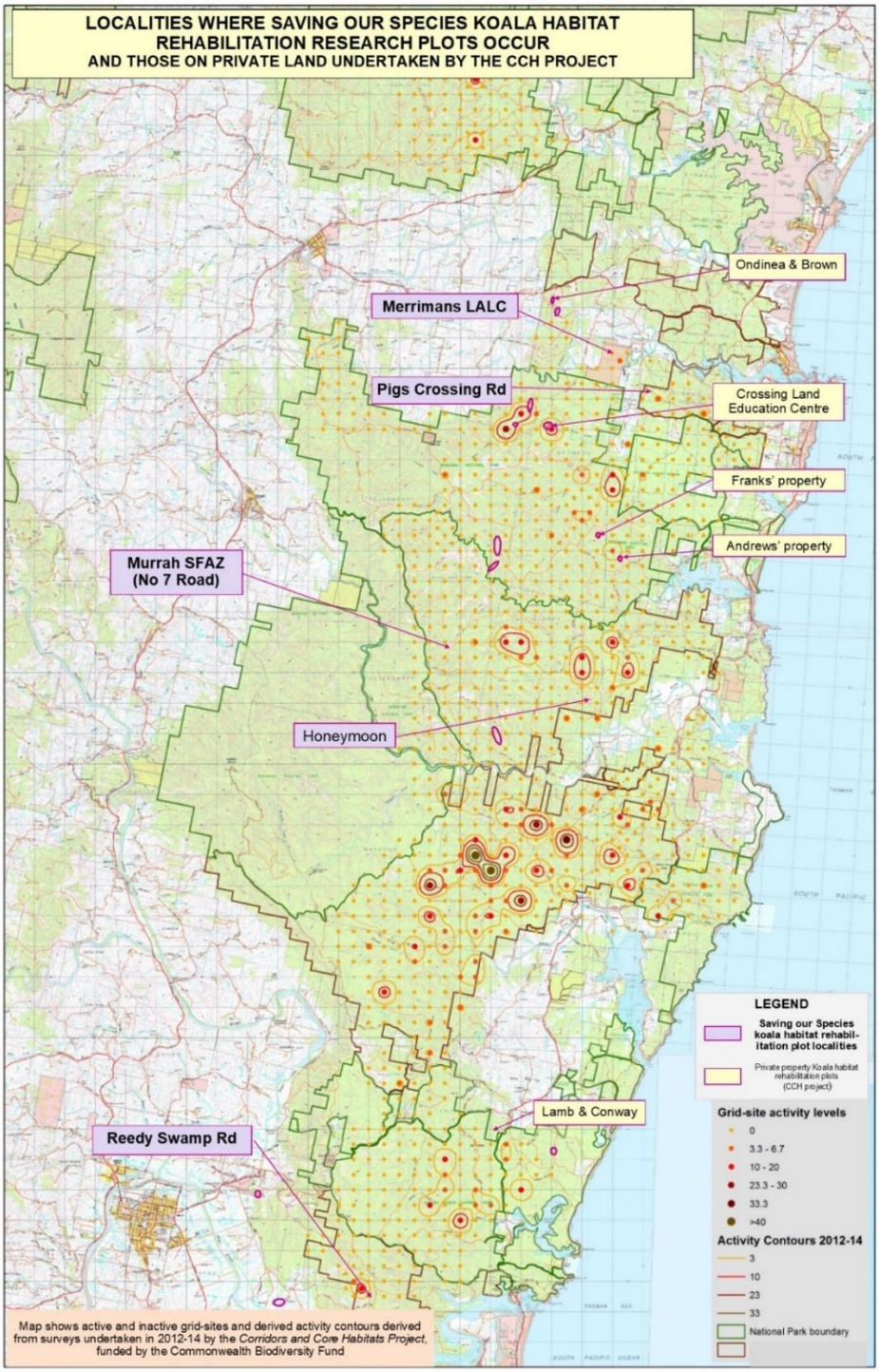

Figure 3: SOS Koala habitat rehabilitation research plot locations