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Northern Hairy-Nosed Wombat Recovery Action Plan 2022



Prepared by: Threatened Species Program, Wildlife and Threatened Species Operations, Department of Environment and Science

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Introduction

A recovery action plan (RAP) is developed as part of the Queensland Department of Environment and Science Threatened Species Program 2020–2040 framework. It outlines the recovery actions that are needed to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities in Queensland and facilitate the recovery process. The attainment of objectives and the provision of funds necessary to implement actions are subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities.

This RAP was approved by the Queensland Department of Environment and Science (department) and is subject to modification as dictated by new findings, changes in status of the taxon or ecological community, and the completion of recovery actions. Information in this RAP was accurate as of July 2022.

For further information on this or other RAPs please contact Threatened.Species@des.qld.gov.au.

Engagement with First Nations people

The department is committed to progressing self-determination by recognising the rights and interests of First Nations people across Queensland. The [Gurra Gurra Framework 2020–2026](#) accelerates this commitment by reframing our relationship with First Nations peoples to work in genuine partnership to safeguard ecological and cultural values across Queensland.

The department acknowledges and respects First Nations peoples' lived experiences, knowledge, skills and expertise, and seeks to incorporate their perspectives into the policies, programs and systems that guide land and sea management. We commit to work genuine partnership with First Nations people across Queensland to ensure their vision and knowledge of Country is appropriately reflected in the Threatened Species Program.

Summary

Species

- Northern hairy-nosed wombat *Lasiorhinus krefftii*

Family

- Vombatidae (wombats)

Current distribution

- Epping Forest National Park (Scientific) (EFNP) in central Queensland: last remaining natural population
- Richard Underwood Nature Refuge (RUNR) in southwest Queensland: translocated population

Conservation status

- Queensland *Nature Conservation Act 1992*: Critically Endangered
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC): Critically Endangered
- Taxon status under the International Union for Conservation of Nature (IUCN) Red List of Threatened Species: Critically Endangered

Threatening processes on current populations

- Predation
- Fire
- Drought
- Competition for resources
- Reduced genetic diversity

Vision statement

- By 2041, there are multiple (>4), viable wild sub-populations of NHW that are protected, effectively managed, and geographically spread.

Goals

1. Ensure established sub-populations are maintained at sustainable levels and genetic diversity is maximised
2. Establish additional wild NHW sub-populations at sites that can carry at least 250 individuals
3. Research informs management decisions and fills knowledge gaps
4. Secure support and long-term resourcing for NHW conservation and recovery program

Overview

The recovery program for the northern hairy-nosed wombat *Lasiorhinus krefftii* (NHW) has been led by the department, with extensive support of key stakeholders. The program's success has primarily come from increasing understanding of the species biology and resource needs and ensuring established populations meet their full potential through effective management of habitat and threats at the sites. Threats including fire, drought, competition, weeds, and predation specifically need to be managed.

The purpose of this 10-year plan is to identify the priority actions necessary to continue to recover the species and significantly reduce the risk of extinction. This can only be achieved through a coordinated program that:

- protects established populations
- increases the number and size of populations
- improves our understanding of the species, its resource needs and effective management
- is widely supported by key stakeholders including government, the conservation and research community, investors and the broader community.

Background

Description and taxonomy

The NHW is the largest herbivorous burrowing mammal in the world. It is the largest member of the family Vombatidae, which contains two other extant species; the bare-nosed wombat *Vombatus ursinus*, and the southern hairy-nosed wombat *L. latifrons*. Adult NHWs attain an average weight of 32kg, with females slightly heavier than males (Johnson and Crossman 1991).

The two hairy-nosed wombat species are morphologically similar, however, the northern hairy-nosed wombat has nasal bones that are shorter than the frontal bones, whereas this is reversed in the southern hairy-nosed wombat (Dawson 1983). The species also differ by 3.4% of DNA sequence at a mitochondrial gene commonly used to construct DNA phylogenies (Taylor *et al* 1994). Both hairy-nosed species differ morphologically from the bare-nosed wombat in having broader, hairy noses, silkier fur and longer ears.

Biology and ecology

Behaviour

There is a deficit of knowledge about much of NHW behaviour as they are a cryptic, skittish, fossorial, nocturnal species. Home ranges are believed to be around 6 ha in winter and 3 ha in summer, and females have a higher rate of dispersal than males to different burrow groups during their lives. Time spent out of the burrows ranges from two to six hours per night, feeding in 88% of the time being observed during one study. They are least active after summer rain and most active during the dry season.

Burrows

NHWs have strong claws to dig large burrows that average 3 to 3.5m in depth with a diameter of less than half a metre, just enough for a wombat to pass. Burrows can have multiple entrances. Burrows are often located close to trees whose roots may provide support for the burrows and canopy that provides shade. Temperatures within the burrows remain relatively stable despite the large variability with arid zone temperatures in summer and winter. Although mainly nocturnal, sleeping most daylight hours in the burrows, NHWs will sun themselves and graze during the cooler winter days.

Burrows are generally occupied by a single wombat, although burrow sharing may occur in the larger, multi-entrance burrows. Adjacent burrows are connected by well-worn paths and active burrows are regularly "sign-posted" with dung and urine.

Diet

NHWs are grazers, with more than 90% of their diet comprised of grass. NHW body condition is consistently maintained year-round, and wombats conservative foraging behaviours and burrowing lifestyle allow them to subsist on low-quality food (Casey *et al* 2020). NHWs have extremely low water requirements (amongst the lowest known for any mammal) (Evans 2000), with the higher humidity in the burrow helping to conserve moisture.

Reproduction

NHWs give birth to single young after a short gestation period, believed to be similar to their southern counterparts at 21 days. Joeys remain in the pouch for around eight to nine months, followed by a short period where the mother leaves the joey in the burrow while she leaves to feed, then the joey remains with the mother until weaning at around 12 months of age. Sexual maturity is not known for NHWs, but is likely to be similar to the southern hairy-nosed wombats at two to three years for males and three years for females.

Distribution and habitat requirements

Fossil records indicate NHWs were once widespread, living in Victoria, New South Wales and Queensland (Figure 1). However, since European settlement, NHW has only been found in three locations being the Deniliquin area in southern New South Wales, the Moonie River area in southern Queensland, and the Epping Forest area in central Queensland. By 1982, the species had retracted to the Epping Forest population. Decline was likely due to competition for food from introduced grazing animals such as sheep, cattle and rabbits, particularly during periods of drought.

The site of the last remaining population of NHW was a 2,750-ha area of open eucalypt woodland and brigalow communities over several properties. It was purchased in 1971 by the Queensland Government and gazetted as Epping Forest National Park (Scientific).

A second colony of northern hairy-nosed wombats was established in 2009 at Richard Underwood Nature Refuge at Yarran Downs near St George in southern Queensland. The nature refuge was gazetted in 2008 and protects about 130 hectares of eucalypt woodland on old riverbanks.

The primary habitat requirements of the NHW are:

- flood-free soils suitable for burrowing (sands, loamy sands, sandy loams, sandy clay loams with massive to weak structure and weak to firm consistence to a depth of at least 3m; Forster 2007)
- year-round, diverse grass cover (native and introduced) to provide food supply, in an open woodland or woodland community
- located within the NHW's assumed pre-European distribution (Figure 1).

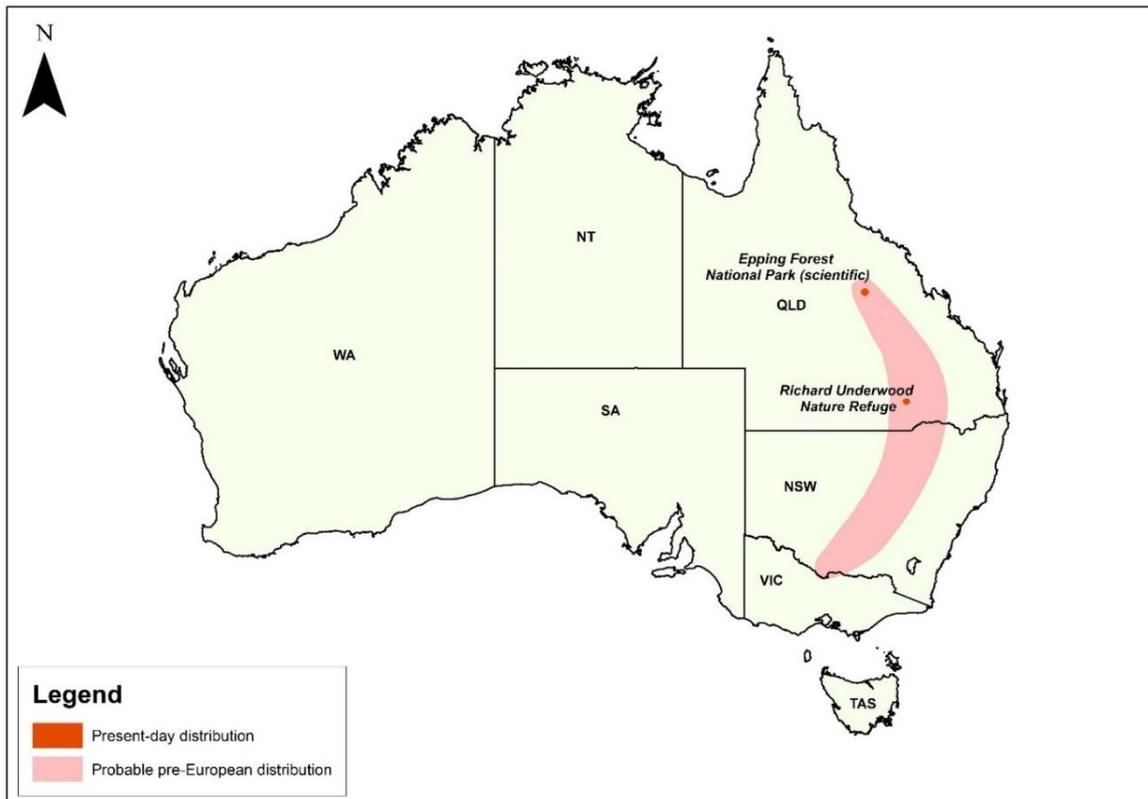


Figure 1. Map showing the historic and current distribution for the northern hairy-nosed wombat. (Not shown: Future third site located around 44 km east of Richard Underwood Nature Refuge)

Population status

In 2021, the estimated population is around 300 at EFNP and 15 at RUNR, a total of around 315 NHW across the two sites (Figure 2). In the early 1980s the population was estimated to contain just 35 individuals, and with increased management the population increased to around 65 in the mid-1980s but then did not increase for many years, believed to be the result of a prolonged drought, low reproductive rates, an aging population, and a sex ratio skewed to males. Subsequent increased management including securing habitat, exclusion of predators, provision of supplementary resources and mitigation of threats has since seen the population increase since early 2000s.

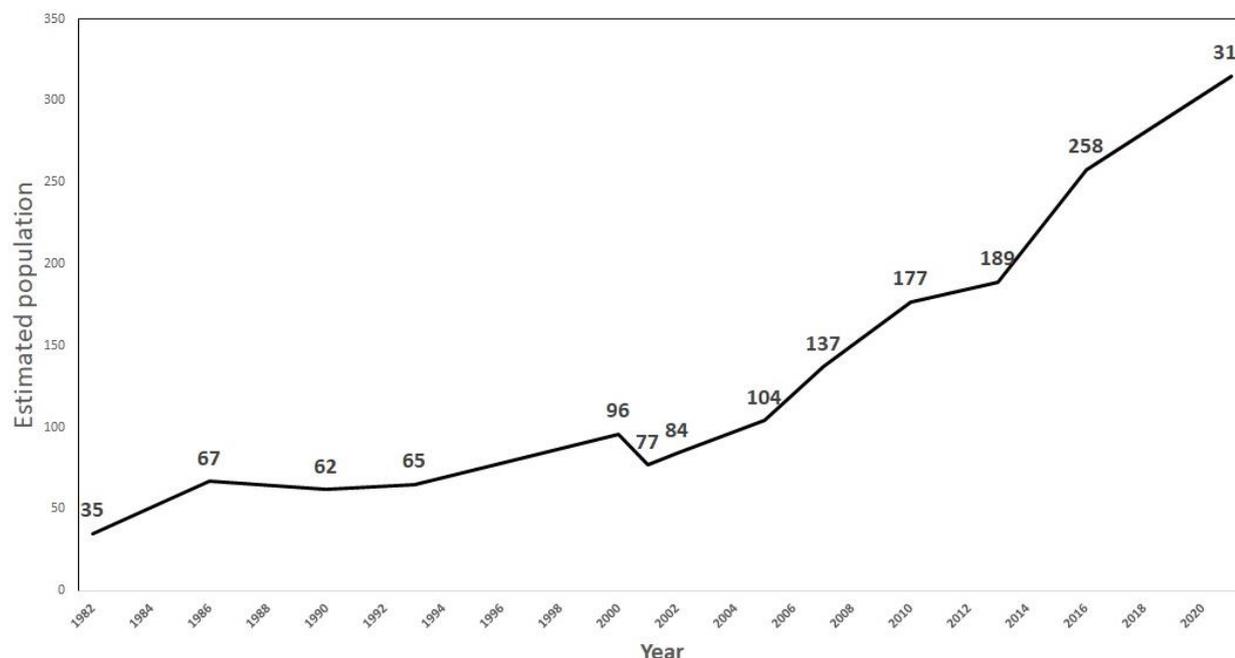


Figure 2. Population estimates for the northern hairy-nosed wombat from 1982 to 2021

Threatening processes

Predation

Canines (dingo, wild dog, hybrid) are the main predator of NHWs. Despite intensive dog baiting at EFNP, almost 10% of the NHW population was killed by dingoes in 2000-2001, resulting in building a dog-proof fence around the population at EFNP and subsequently at RUNR prior to translocation. Maintaining a dog-free environment is considered paramount for success of the recovery program.

Fire

Fire is an element of the natural environment. Fire may negatively impact NHW by reducing sustainable population levels due to loss of habitat and essential resources. Alternatively, complete removal of fire may alter the habitat and reduce carrying capacity. Fire management seeks to balance these two alternative threats.

Drought

Since major droughts in the early 1990s were believed to have impacted NHW numbers, current and future NHW sites have a year-round water supply. In exceptional circumstances, supplementary feeding may occur where it becomes apparent that there are insufficient food resources.

Weeds

Buffel grass *Cenchrus ciliaris* has been considered a threat to the wombat population and to the vegetation communities at EFNP and RUNR as it changes the composition, possible food resources, increases fuel loads and fire risk. However, buffel grass is a source of food for the NHW. Currently available techniques for controlling buffel grass (e.g. fire, slashing and chemical control) are not considered effective over large areas so new techniques or localised control methods are being investigated.

An introduced cactus species, tiger pear *Opuntia aurantiaca*, is common throughout RUNR. This weed grows along the ground and the segments are easily transferred by animals. The long sharp spikes pose an injury hazard for wombats. Surveillance of emerging weed species that may impact NHW is warranted.

Competition for resources

Historically the greatest competition for resources for the NHW was introduced or feral grazing species (including cattle, sheep, rabbits). Removing cattle from the existing wombat sites at EFNP and RUNR eased the threat of direct competition. However, cattle may be strategically used as a conservation tool for habitat management (e.g. to reduce buffel grass biomass and consequent risk of fire).

Within the fenced populations the greatest competition for resources is with macropods: eastern grey kangaroos *Macropus giganteus* and swamp wallabies *Wallabia bicolor*. In the absence of predators and with a constant water supply, macropods can reach unsustainably high numbers. Both species compete with wombats for access to supplementary water. Eastern grey kangaroos compete with wombats for grass, especially during extended dry periods. Swamp wallabies are known to slow the recruitment of some tree species. Therefore regular control of macropod numbers is warranted.

Reduced genetic diversity

NHWs have already been through a genetic bottleneck when the population was as low as 35 animals in the early 1980s. Fortunately inbreeding concerns have been reduced following research in 1994 (Taylor *et al.*) that showed a lack of heterozygote deficits, helped by the species having a high female dispersal rate. Lowered genetic diversity may result in populations that are less fit or restrict ability to adapt to change. As such it is important to maximise the genetic diversity which will require a good understanding of the current genetic diversity and moving individuals between sub-populations (refer to Appendix 1).

Habitat change

Historically the main driver of population decline is thought to have been from a combination of habitat clearing and competition from introduced grazing species, and possibly predation by dingoes. Recovery actions to address habitat clearing or alteration is dealt with by ensuring the site for the natural population and all subsequent translocated populations are within protected areas and managed as appropriate for the NHWs.

Disease

No life-threatening disease has been reported in NHWs to date. Current management actions may lessen the likelihood of disease such as removing or reducing interactions with canines, cats and foxes through fencing, and avoid moving NHW from other sites to EFNP. However, to promote genetic diversity it is likely that increased movement of individuals between populations is needed. Further screening, research and the development of a disease risk analysis is needed (Appendix 1).

Previous and existing conservation and management actions

The recovery program has been guided by the *Recovery Plan for the Northern Hairy-nosed Wombat (Lasiorchinus krefftii) 2004–2008*. Some actions have been achieved or exceeded while others are no longer considered a high priority based on knowledge and information developed since the plan was written (Appendix 2).

Although recovery actions to date have significantly improved numbers, the species is still considered to have a very high risk of extinction due to 95% of the population existing at one location. A disease outbreak, major wildfire or flood could result in the extinction of this population. To reduce these risks, existing protective measures at EFNP and RUNR need to be maintained, and further populations established.

Extensive systematic searches of the NHW probable pre-European range in Queensland applying all collective knowledge about suitable habitat have been undertaken to identify potential sites to establish further populations. The current focus is on a State Forest which is of a sufficient size, with suitable habitat to establish a third population.

Recovery program

The recovery of the NHW is a long-term endeavour. The 20-year vision is presented below, along with goals and objectives for the recovery program over the next 10 years.

Vision

The long-term aim of the recovery program for the NHW is to improve the species' conservation status primarily by increasing the size of existing sub-populations and the number of sub-populations. The vision is:

“By 2041, there are multiple (>4), viable wild sub-populations of NHW that are protected, effectively managed, and geographically spread.”

Goals and objectives

There are four goals presented in the following sections, each with specific objectives and actions, that are practical and operational steps toward achieving the long-term vision. Further explanation on priority, timeframe, costs, performance criteria and responsibility are detailed in Table 1. *Definition (and scoring) for priority, performance criteria, timeframes, costs, and responsibility.*

Table 1. Definition (and scoring) for priority, performance criteria, timeframes, costs, and responsibility.

Factor	Description	1	2	3	4
Priority	Level of importance of the action	Taking prompt action is necessary to mitigate the threats and ensure the persistence of the species	Action is necessary to mitigate threats and work towards the long-term recovery of the species	Action is desirable, but not critical to recovery at this time but will provide for longer term recovery	N/A
Performance Criteria	A statement defining what success looks like or what needs to be achieved to consider the action has been successfully completed	N/A	N/A	N/A	N/A
Timeframe	Expected time to implement and /or achieve the result	Very short: 1-2 years	Short: 2-5yrs	Medium: 5-10yrs	N/A
Cost ¹	Indicative cost estimate	\$1000s	\$10,000s	\$100,000s	\$1,000,000s
Responsibility ²	Who is responsible for taking the lead (L)? Proposed other contributors (C) are also identified where possible	N/A	N/A	N/A	N/A

Notes

1. The indicative cost estimate for implementing this RAP for the first five years is presented. Costs do not account for inflation, and do not include standard management activities on conservation estate by the department that are to be considered as in-kind contribution. If an action is attributed a cost and it is led by the department then at least a partial in-kind contribution is assumed. The provision of funds necessary to implement actions are subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities.
2. The nominated lead for actions is not necessarily responsible for cost, however the lead should coordinate as necessary to determine source/s of funding for the activity.

Acronyms

AWC	Australian Wildlife Conservancy	DES	Queensland Department of Environment and Science
MOU	Memorandum of Understanding	PASI	Protected Area Strategy and Investment DES
QPWS	Regional Operations QPWS DES	RIU	Research institutions and universities
TSO	Threatened Species Operations DES	TWF	The Wombat Foundation

Goal 1: Ensure established sub-populations are maintained at sustainable levels and genetic diversity is maximised

The NHW population currently exists across two sites (EFNP and RUNR), and these are considered as established sub-populations. This goal will also apply to future sub-populations once established.

The protection of the EFNP sub-population remains paramount to the success of the program as they are the last natural population of the species.

Sustainable levels are site specific and defined as the population size capable of being maintained at a site (carrying capacity) without exhausting natural resources or causing severe ecological damage. These may vary over time.

Ensuring established sub-populations meet their full potential and reach their site-specific sustainable levels requires effective management of habitat and threats at the site. Threats such as fire, drought, competition, weeds, and predation specifically need to be managed.

To determine the effectiveness of site management strategies, and to provide warning of any declines, monitoring of all sub-populations is required. Monitoring of NHW is essential to detect trends and trigger appropriate responses as early as possible. Monitoring of their habitat and key threats is required to maintain effective management.

Objective 1.1: Manage habitat and threats so sites are optimal for the survival of NHW

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead C = Contributor</i>	Links
1.1.1	Develop and implement site management plans and subordinate documents to ensure habitat remains optimal for NHW.	2	Habitat is managed to optimal levels for NHWs. Site management plans are developed, current, effective and regularly reviewed.	1	In-kind	L – QPWS C – TSO, AWC	Actions 1.1.2 - 6
1.1.2	Maintain the exclusion of wild dogs.	1	Exclusion fences are effective. Fence surveillance and maintenance or upgrades occur regularly and as required. Fence incursions are dealt with immediately.	1	2	L – QPWS C – volunteers, TSO, AWC	
1.1.3	Implement fire management practices to ensure negative impacts associated with fire on NHW and their habitat is minimised.	2	NHW habitat requirements are considered during the planning and implementation of prescribed burns, and management of bushfires.	3	2	L – QPWS C – TSO, AWC	1.1.1
1.1.4	Develop effective protocols to manage the distribution and abundance of buffel grass to ensure negative impacts are minimised.	2	Protocols are developed and implemented and include further trials and associated monitoring.	3	In-kind	L – QPWS C – TSO, AWC	

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
1.1.5	Monitor and manage weed species that may impact NHW.	2	Weed species are controlled to a point where they have nil to low impact on NHW or their habitat.	2	In-kind	L – QPWS C – TSO, AWC	
1.1.6	Manage macropod populations (and other potential competitor species) to ensure negative impacts to NHW habitat are minimised.	2	Competitors are maintained at a level where they have nil to low impact on wombats or their habitat.	2	In-kind	L – QPWS C – TSO, AWC	
1.1.7	Develop response plans for high risk threats such fire, disease, drought and predator incursions.	2	Response plans are developed and kept current. Implementation occurs as required.	2	1	L – TSO C – QPWS, AWC	
1.1.8	Investigate suitable fence designs as and when situations and/or research (Appendix 1) identify a need.	3	Cost-benefit analysis of fence redesign is assessed and evaluated for NHW and other key species.	2	In-kind	L – TSO C – QPWS, AWC	

Objective 1.2: Implement actions to enable NHW sub-populations to reach full potential

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
1.2.1	Provide water throughout NHW habitat.	1	Water is constantly available to NHW.	1	In-kind	L – QPWS, AWC C – TSO	1.2.1
1.2.2	Provide supplementary food when needed.	2	Criteria and protocols are determined for supplementary feeding. Supplementary feeding occurs when pre-determined criteria are met.	When triggered	In-kind	L – QPWS, AWC C – TSO	
1.2.3	Exclude other species from food and water stations.	3	Most effective options to exclude other species from food and water stations are implemented.	2	In-kind	L – TSO C – AWC	Appendix 1, item 15
1.2.4	Options to expand established sites are investigated.	1	Expansion of established sites is assessed and evaluated.	2	2	L – TSO C – AWC, other (eg consultant)	

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
1.2.5	Genetic management of reintroduced populations.	2	Develop and implement genetic management plans to maintain sufficient genetic diversity in reintroduced populations.	2	2	L – TSO C – AWC	Appendix 1, items 1, 2

Objective 1.3: Monitor to inform effective management

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
1.3.1	Implement a monitoring regime to determine NHW population trends.	1	Accurate sub-populations estimates and/or trends can be determined to inform management (i.e. 5-year census).	2	2	L – TSO C – QPWS, AWC, volunteers, RIU	Appendix 1, item 3
1.3.2	Implement a monitoring regime to determine NHW population dynamics and health.	1	Annual monitoring detects change in: <ul style="list-style-type: none"> • normal activities • reproduction incidences • health incidences • disease screening 	1	2	L – TSO C – QPWS, AWC, volunteers, RIU	Appendix 1, item 3
1.3.3	Ensure results of monitoring informs management.	1	Monitoring data is analysed and reported to inform management decisions.	1	In-kind	L – TSO C – QPWS, AWC	Advisory group 4.2.1
1.3.4	Monitor to detect the presence of potential predators such as wild dog/dingo, feral cat and European fox.	1	Predator incursions are detected.	1	In-kind	L – QPWS, AWC C – TSO, volunteers	Actions 1.1.1, 1.1.2, 1.1.7
1.3.5	Monitor the impacts and/or effectiveness of habitat management actions.	2	Fire, buffel grass, weeds, and macropods are monitored as per site management plans and the QPWS Values Based Management Framework.	1	In-kind	L – QPWS, AWC C – volunteers, TSO	Actions 1.1.1, 1.1.6
1.3.6	Trial novel techniques and new technologies to improve population monitoring.	3	New technologies are incorporated into monitoring regime where appropriate.	2	2	L – TSO C – QPWS, AWC, TWF, RIU	Appendix 1, item 3

Objective 1.4: Sites are secure, protected and have the infrastructure necessary to optimally support the program

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead C = Contributor</i>	Links
1.4.1	Maintain a level of site presence to rapidly identify and respond to threats.	1	Surveillance of threats is undertaken and mitigated.	1	In-kind	L – TSO, QPWS, AWC C – volunteers	
1.4.2	Develop and maintain essential site infrastructure to support the delivery of objectives 1, 2 & 3.	2	Essential infrastructure is maintained at a level to support site and population management.	1	3	L – QPWS C – volunteers, TSO, AWC	
1.4.3	Develop and maintain any leases, MOUs, agreements to ensure sites are secure and protected for the purpose of supporting NHW.	1	Contracts and accords are in place and managed to secure and protect sites.	1	2	L – TSO, QPWS, AWC	

Goal 2: Establish additional wild NHW sub-populations at sites that can carry at least 250 individuals

The persistence and long-term recovery of NHW is reliant on the ability to establish additional populations to increase numbers and reduce extinction risk. Suitable habitat will limit the potential size of sub-populations but sites that have enough suitable habitat to support more than 250 individuals remains the goal. The limited size of the sub-populations and the inability for animals to migrate between sites will require ongoing and intensive management to ensure genetic diversity over the long term.

Given the likelihood of established sub-populations reaching carrying capacity in the near future, at least one additional sub-population needs to be established within 5 years. After extensive systematic searches of the NHW probable pre-European range in Queensland, applying all collective knowledge about suitable habitat, the next potential site has been identified.

Additional sub-populations in both Queensland and New South Wales (NSW) are part of this goal but the size of the source populations will limit the number of new sub-populations that can be established initially. The protection of the EFNP sub-population remains paramount and harvesting levels will be modelled with full consideration of this criteria. The current model includes a third Queensland sub-population established within 5 years, then facilitating the establishment of NSW sub-populations and additional sites in Queensland.

To achieve additional sub-populations, habitat needs to be suitable, and threats need to be effectively managed at any potential sites. Ideally the mitigation of threats should be demonstrated at proposed sites prior to embarking on establishing a new sub-population.

Once established, a sub-population would be managed as per Goal 1.

Objective 2.1: A translocation strategy is developed to guide the establishment of new sub-populations

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
2.1.1	Compile ecological species knowledge and information from past translocation and trapping to inform translocation activities.	1	All experiential and ecological knowledge compiled and documented.	1	In-kind	L – TSO	
2.1.2	Undertake modelling necessary to inform translocation strategy.	1	Modelling (e.g. population and genetic viability analysis) to inform translocation strategy is completed. Sufficient understanding of species ecology and biology is available to improve predictive accuracy of models	1	2	L – TSO C – Other (RIU/ consultant)	Obj. 3.1 Appendix 1, items 1, 8

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
2.1.3	Determine harvest limits and triggers for source sites, carrying capacity and optimal density of new and established sites to inform translocation strategy and set potential limits on numbers at each site.	2	Harvest limits and triggers set for each source sites. Carrying capacity and targets set for each site. Climate modelling of historic range complete and maps produced.	1	2	L – TSO C – Other (RIU/ consultant)	Appendix 1, items 1, 8
2.1.4	Determine protocols to move wombats between sites and/or management of genetically over-represented individuals.	2	Risks are assessed to inform movement/management of individual animals. Protocols developed and adopted.	1	In-kind	L – TSO C – DES (Vet)	Action 1.2.5 Appendix 1, item 2
2.1.5	Develop and document a translocation strategy to inform the establishment of additional NHW sub-populations.	1	Translocation strategy complete incorporating past experience, ecological knowledge and best practice principles. Expert workshop informs translocation strategy.	1	In-kind	L – TSO	Actions 2.1.1-4

Objective 2.2: Priority sites are secured, and threats assessed for immediate and future establishment in Queensland

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
2.2.1	Document the steps and processes used to identify suitable sites in Queensland including addressing habitat requirements, size and threats.	2	Site selection methodology is documented.	1	In-kind	L – TSO	
2.2.2	Address legal and tenure related impediments at priority sites (mining, forestry, leases, tenure issues, ILUAs, local planning).	1	Impediments assessed to determine optimal sites. Site/s are secure from impediments.	1	3	L – TSO, PASI, QPWS	
2.2.3	Management requirements are identified and assessed.	1	Threat mitigation and infrastructure needs are scoped.	1	In-kind	L – TSO C – QPWS	

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
2.2.4	Prepare contingency plan if the priority sites identified cannot be secured or threats mitigated.	1	Contingency plan prepared.	2	In-kind	L – TSO	

Objective 2.3: Site-specific implementation

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
2.3.1	Develop a comprehensive Project Plan for the new site, including but not limited to: <ul style="list-style-type: none"> • Site design • Threat mitigation • Habitat management/improvement • Infrastructure development/improvement. 	1	Project Plan is developed and endorsed by project directors and key stakeholders.	1	1	L – TSO, QPWS	Actions scoped in Obj. 2.2
2.3.2	Implement Project Plan at new site.	1	Site is ready for translocation of NHWs.	2	4	L – QPWS C – TSO	2.3.1
2.3.3	Develop and implement a site-specific reintroduction plan, as part of the overarching translocation strategy.	1	Site-specific reintroduction plan is developed and implemented, including release design, wombat criteria and selection, trapping, translocation, monitoring and research needs, and resource requirements. Additional self-sustaining sub-populations are established.	2	3	L – TSO C – QPWS	Obj. 2.1 Appendix 1, items 4, 6, 9
2.3.4	Review and document principles and processes to inform and improve future translocations.	2	Principles and processes reviewed and documented and incorporated into translocation strategy.	3	In-kind	L – TSO	Action 2.1.5

Objective 2.4: Facilitate the search and establishment of additional (e.g. NSW) NHW sub-populations

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead C = Contributor</i>	Links
2.4.1	Provide targeted stakeholders ¹ with known NHW habitat preferences and methodology to search and assess habitat.	2	Methodology used to search and assess habitat is provided to targeted stakeholders.	1	In-kind	L – TSO	Action 2.2.1
2.4.2	Support targeted stakeholders ¹ in the search process.	2	Provide technical advice on desktop assessments and undertake on-ground visits for priority sites. Support provided with site establishment and translocation planning.	2	1	L – TSO	
2.4.3	Develop and facilitate agreements, permits or permissions with targeted stakeholders ¹ and assist with developing a reintroduction plan.	2	All necessary agreements, permits and permissions are in place.	3	1	L – TSO	
2.4.4	Assist in intrastate translocation actions and provide support to establish new sub-populations at agreed sites.	2	Inter or intrastate translocations are undertaken.	3	2	L – TSO	

Notes

1. Targeted stakeholders are those that have a capacity and interest in establishing further sub-populations.

Goal 3: Research informs management decisions and fills knowledge gaps

Effective conservation and recovery of the NHW is dependent on having a good understanding of its biology, ecological requirements and the interaction of these characteristics and processes with the management of the species. Research will identify how threats are impacting sub-populations and assist in the identification of the most appropriate and effective mitigation. Monitoring of the effectiveness of mitigation actions will inform management and ensure on-going survival of NHW.

The focus is on identifying the knowledge gaps that are impeding management or the delivery of key recovery actions like those associated with establishing additional sub-populations. The timely and effective delivery of research by the department and/or research partners, based on priority, needs to be coordinated and informs recovery actions in a timely manner. It must be noted that there may be a need for management and recovery actions to proceed despite knowledge gaps, but these situations will be avoided where possible and informed by risk assessments.

Objective 3.1: Research is undertaken to meet the needs of the program and address priority knowledge gaps (Appendix 1)

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead C = Contributor</i>	Links
3.1.1	Identify and prioritise critical knowledge gaps.	2	Critical research needs are identified and documented as a research plan, reviewed periodically to remain effective.	1	In-kind	L – TSO C – QPWS	Appendix 1
3.1.2	Review and mine current data to address knowledge gaps and immediate management needs.	1	Knowledge gaps and management needs that can be filled from existing data/ knowledge are addressed.	1	In-kind	L – TSO	
3.1.3	Address priority knowledge gaps in-house (where capacity is available).	2	Priority knowledge gaps that can be addressed in-house are identified and delivered.	1	2	L – TSO C – QPWS	
3.1.4	Develop research prospectus and disseminate.	3	Identify and detail priority research projects in a research prospectus disseminated.	1	1	L – TSO C – RIU, QPWS	Appendix 1
3.1.5	Strategically partner with research agencies and other organisations to undertake priority research.	2	Priority research is being delivered through effective partnerships. Sites are utilised for best fit research.	2	2	L – TSO C – AWC, TWF, RIU, QPWS	Appendix 1

Objective 3.2: Research outcomes are used to support decision making

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
3.2.1	Design research and reporting protocols that feed back to management decisions.	2	Research outcomes are reported and inform management.	2	In-kind	L – TSO C – QPWS, AWC	Monitoring Obj. 1.3
3.2.2	Data management protocols are established and implemented to store and share data.	2	Data is effectively stored and shared.	1	1	L – TSO C – AWC	
3.2.3	Ensure species experts are active in program governance structure.	2	Key species experts are active participants on the advisory group.	2	2	L – TSO	Action 4.2.1

Goal 4: Secure support and long-term resourcing for NHW conservation and recovery program

Resources for threatened species recovery tend to be relatively short-term in nature and focussed on specific projects as there are many species and many issues competing for finite funds. A range of projects/actions are already being implemented for NHW and much success has been achieved. The species has a relatively high profile in Queensland and Australia in terms of threatened species in need of support, and projects have been sufficiently funded to date. But support comes in many forms, not just funding, and a successful program needs security and long-term commitment.

To carry out the recovery actions necessary for NHW various support is required. Ultimately support needs to be in the form of resources to fund and carry out the recovery actions but the ability to raise the necessary resources will be determined by the amount of awareness and involvement of the research, conservation and general community, and all levels of government, from a local to a national scale. As such, to achieve this goal the actions include education and raising awareness at all levels.

Objective 4.1: The NHW recovery program has adequate and secure funding to allow the implementation of a range of recovery actions

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
4.1.1	Develop a detailed budget for the program and new projects/initiatives.	2	Detailed budget developed.	1	In-kind	L – TSO C – QPWS, PASI	
4.1.2	Develop and implement a robust and diverse funding model from multiple sources, to enhance a foundation of government funding.	2	Funding model developed.	1	1	L – TSO C – AWC, TWF	
4.1.3	Develop and promote a prospectus of individual projects to sell to potential investors.	2	Prospectus developed and promoted.	1-2	1	L – TSO, C – DES, AWC	Obj. 2.3, Action 3.1.4.
4.1.4	Nurture current, and expand investors.	1	Partnerships are effectively maintained. Funding to achieve NHW recovery goals is secure and managed effectively across sites and actions.	1-2	In-kind	L – TSO C – AWC, TWF	

Objective 4.2: The NHW recovery program has strong support and decisions for NHW recovery are optimal to achieve success

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead C = Contributor</i>	Links
4.2.1	Develop and maintain a clear and effective multi-stakeholder governance structure for implementing the NHW recovery program.	2	Multi-stakeholder advisory group / recovery team actively steering implementation.	2	1	L – TSO C – Others	
4.2.2	Promote the NHW recovery program to all levels of government.	3	All levels of government are aware of the program, its needs and achievements.	1	In-kind	L – TSO C – DES Senior management	
4.2.3	Investigate opportunities to increase First Nations involvement in the program.	3	Opportunities for First Nations involvement in the program are identified and progressed.	2	2	L – QPWS, TSO, AWC C – DES Partnerships	
4.2.4	Engage and partner with the scientific and conservation community to actively contribute to the recovery program.	2	Increased number of stakeholders engaged in delivering the program. MoU, collaborative agreements or other partnership mechanisms are finalised.	2	In-kind	L – TSO	
4.2.5	Appoint/retain/develop staff that are suitably skilled and experienced to maintain and develop the skills and knowledge base needed to continue to undertake research, monitoring, management and mitigate threats.	2	Multiple staff have skills and experience to deliver the program.	1	In-kind	L – TSO, QPWS C – AWC	Obj. 4.1
4.2.6	Maintain a volunteer base that supports and promotes the program.	2	Volunteer pool maintained. Critical volunteer programs are maintained (e.g. caretaker program).	1	In-kind	L – QPWS, TSO, AWC C – TWF, volunteers	Actions 1.1.2, 1.3.1, 1.3.2, 1.3.4, 1.3.5, 1.4.1, 1.4.2

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
4.2.7	Facilitate or grow the involvement of other sections of the department in the recovery program.	2	QPWS delivers all land management at government-owned sites. Partnerships and Corporate Comms involvement in the program increases.	1	In-kind	L – TSO, QPWS C – DES Exec Leadership Group	

Objective 4.3: NHW is widely known as an iconic threatened species in Australia

Action	Project and/or activities	Priority	Performance Criteria	Timeframe	Cost	Responsibility <i>L = Lead</i> <i>C = Contributor</i>	Links
4.3.1	Develop & implement a strategy that provides a suite of tools that can be used to increase awareness of NHW (and other threatened species) and targets influential drivers of change.	2	Strategy and tools are developed and implemented. Awareness of NHW is increased.	2	2	L – TSO C – QPWS, TWF, DES, AWC	
4.3.2	Support other stakeholders to take a lead role in increasing awareness and investment.	3	Awareness and investment for the program has increased through the effort of external partners.	2	2	L – TWF C – TSO, AWC	
4.3.3	Encourage staff to publicise and promote their work.	3	Publish data; Attend and present at conferences; Media; Newsletters; Website.	2	In-kind	L – TSO C – AWC, TWF	

Implementation and evaluation

The NHW is a high-profile, iconic species that has intrinsic value to the Australian community. For the program to progress to the next stage, further investment of resources and support will be required, and a long-term commitment by the department. The recovery program is a priority for the department that will continue to be the primary driver for this recovery program. However, it is recognised that the program benefits from a multi-stakeholder approach and a species advisory group established to facilitate and provide guidance and expert advice with delivery and review of the program.

The performance criteria will be used to measure the success of the program. A comprehensive review will be undertaken every five years, however, may be more frequent if actions undertaken or research/learnings highlights a need, and again at the completion of the plan. The evaluation findings will inform future implementation and improve program effectiveness.

All actions have been prioritised based on their benefit to the species, their likelihood of success and their cost. The provision of funds necessary to implement actions are subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities.

The priorities listed in this report will be incorporated into current strategic planning discussions for the NHW. The wider recommendations from stakeholders, working groups and the NHW recovery team will also be utilised to provide greater detail and clarification of recommended strategies, and will be returned to periodically for incorporation into planning as priorities dictate.

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Appendix 1: Knowledge gaps identified

Research Theme	Action	Priority rating (1-3)	Ref #
Genetic health	Understand the genetic health of existing populations to inform translocation strategies and reintroduction planning	1	1
	Monitor genetic diversity at established and new sites to ensure ongoing viability within and genetic representation across sub-populations	2	2
Population monitoring	Trial new technologies to improve population monitoring	1	3
	Determine best available technologies to track movements , interactions, and survivorship	1	4
	Understand social structure and behaviour to inform the demographic make-up when preparing translocation strategies and reintroduction planning	1	5
	Refine wombat capture techniques	1	6
	Undertake a disease risk analysis to inform level of surveillance and management actions needed to mitigate risks at new and established sites	1	7
	Monitor the effects of harvesting NHW from established populations to inform/improve population viability analysis (PVA) modelling	2	8
	Develop trap alarm system based on mobile coverage	2	9
	Investigate effects of buffel grass on NHW diet, health, behaviour and habitat use	2	10
Wombat habitat, distribution and climate change	Investigate the interaction between cattle and NHW during buffel grass management	1	11
	Determine the areas of historical NHW distribution with suitable habitat that have the lowest expected effects of climate change	2	12
	High quality aerial mapping of each site to provide baseline data on habitat and extent of occurrence	3	13
	Determine effect of browsing macropods on tree recruitment	3	14
Provide water and food	Develop techniques to effectively supply food and water to NHW (while excluding non-target species)	1	15

Appendix 2: Assessment of previous recovery plan objectives

Objective	Performance Criteria	Level	Comment
Identify and control threats and manage habitat to optimise conditions for wombat survival at EFNP	Wombat habitat is optimised and threats to the wombats minimised on EFNP	●	Achieved resulting in increased population at EFNP to 300
Facilitate community involvement and education in NHW conservation	Increased community awareness and involvement	●	Increased awareness and involvement including formation of The Wombat Foundation and volunteer programs
Accurately monitor wombats	Increased population size, improved population composition and extended distribution are detected	●	Census applied tri-annually to monitor EFNP population. Size and extent increases detected
Finalise reintroduction site selection	A translocation site is selected	●	RUNR was selected
Prepare and manage reintroduction site	The translocation site is procured and prepared	●	RUNR was prepared
Translocate northern hairy-nosed wombats	A second wild population of northern hairy-nosed wombats is established	●	Small population established at RUNR
Develop captive techniques in other wombat species.	Improved captive breeding success has been achieved in other wombat species.	●	Other wombat species successfully held in captivity, but breeding fails regularly in captivity
Establish northern hairy-nosed wombats in captivity.	A captive population of NHW has been established to support the wild population	●	No longer considered a priority with increasing numbers in the wild sufficient for establishing new populations
Increase understanding of wombat biology and ecology	Management related aspects of wombat biology and ecology are better understood.	●	Improved understanding of biology and ecology but knowledge gaps remain
Effectively manage the recovery program	The recovery program is managed effectively to ensure implementation of all actions on schedule	●	The program is effectively supported and managed. Recovery team established

● Objective achieved

● Objective partly achieved

● Objective not achieved