

National recovery plan for the Proserpine rock-wallaby *Petrogale persephone*



Australian Government



**Queensland
Government**

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Contents

Executive Summary	3
1. General information	4
Conservation status	4
International obligations	4
Affected interests	4
Consultation with Indigenous people	4
Benefits to other species or communities	4
Social and economic impacts	5
2. Biological information	5
Species description	5
Life history and ecology	6
Distribution	6
Habitat critical to the survival of the species	8
Important populations	8
3. Threats	9
Biology and ecology relevant to threats	9
Identification of threats	9
Areas and populations under threat	11
4. Evaluation of the previous recovery plan	11
5. Recovery objectives, Performance criteria and Actions	14
Overall objective	14
Specific objective 1: To maintain and protect known habitat and ensure that the species continues to exist in the wild	14
Specific objective 2: To maintain and monitor, in the wild, the population of wallabies on Hayman Island	15
Specific objective 3: To minimise disease, incidental kills and other threatening processes on populations	17
Specific objective 4: Improve understanding of Proserpine rock-wallaby ecology and threats to its survival	19
Specific objective 5: Ensure recovery plan continues to operate with high levels of community participation	20
Summary Table	21
6. Management practices	23
7. Cost of recovery	24
8. Evaluation of recovery plan	26
Acknowledgements	26
References	27
Appendix 1: Help save the Proserpine rock wallaby!	29
Appendix 2: Creating habitat for the Proserpine rock wallaby!	30

Executive summary

Species and current status

The Proserpine rock-wallaby *Petrogale persephone* is listed as 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the Queensland *Nature Conservation Act 1992*. This is the second national recovery plan for the Proserpine rock-wallaby.

Habitat and distribution summary

The Proserpine rock-wallaby occurs in Conway National Park/Conway State Forest and areas of Conway Range, Gloucester Island National Park, Dryander National Park/Dryander State Forest, Proserpine State Forest/Clarke Range, Mt Julian, Mt Lucas and around the town of Airlie Beach. An introduced wild population exists on Hayman Island.

On the mainland this rock-wallaby prefers rocky outcrops, rock piles and cliffs within a microphyll/notophyll semi-deciduous dry vine forest. On Gloucester Island National Park the habitat includes rocky outcrops and rock piles covered with dry vine scrub, usually associated with beach scrub. At higher elevations the habitat consists of rocky outcrops, rock piles and rocky creeks within an acacia open forest.

Threats summary

Proserpine rock-wallabies are threatened by the following processes:

- Land clearing and habitat fragmentation (residential developments, quarrying, grazing and transport corridors)
- Introduced predators (feral dogs and cats)
- Introduced diseases (toxoplasmosis and hydatids)
- Roads and traffic
- Introduced toxic plants

Recovery objective

The overall objective is to improve the conservation status of the Proserpine rock-wallaby through habitat protection, reducing threats to the species and increasing public participation in recovery activities.

Summary of actions

- Monitor and map known wallaby populations and colony refuge sites.
- Continue to update Proserpine rock-wallaby habitat mapping and identify areas for protection, restoration and management.
- Promote the conservation and management of Proserpine rock-wallaby habitat off protected areas.
- Identify, monitor and manage habitat areas threatened by grazing, weeds or fire.
- Develop and implement weed control strategies on Gloucester Island.
- Monitor and survey the introduced colony of rock-wallabies on Hayman Island.
- Maintain appropriate fire management procedures on Hayman Island.
- Continue to implement actions to reduce the incidence of road mortality.
- Support implementation of Whitsunday Regional Council Rural Feral Cat and Stray Cat Management Plan and dog registration program.
- Continue to encourage the replacement of toxic plants with native plants.
- Determine home ranges for colonies in close proximity to residential expansion.
- Promote and facilitate community involvement in the wallaby's recovery.

1. General information

Conservation status

The Proserpine rock-wallaby (PRW) *Petrogale persephone* is listed as 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) and the Queensland *Nature Conservation Act 1992* (NCA).

International obligations

The actions in this recovery plan are consistent with Australia's international obligations regarding biodiversity conservation.

Affected interests

Affected government authorities, organisations and individuals include:

- Indigenous communities, councils and representative bodies.
- CSIRO
- Department of Transport and Main Roads (DTMR)
- Department of Employment, Economic Development and Innovation (DEEDI)
- Department of Environment and Resource Management (DERM)
- Ergon Energy
- Fauna Rescue Whitsundays
- Hayman Island Resort
- Private landholders
- Reef Catchments Mackay Whitsunday Inc.
- SunWater Queensland
- Research institutions
- Wildlife Preservation Society of Queensland (WPSQ)
- Whitsunday Catchment Landcare (WCL)
- Whitsunday Regional Council (WRC)

Consultation with Indigenous people

Consultation with Indigenous people has been undertaken with advice from, and through, the NRM Indigenous Land Management Facilitators for Burdekin Dry Tropics and Reef Catchments Mackay Whitsunday regional groups. The facilitators were provided with the draft recovery plan for comment and for dissemination to representatives of local Indigenous groups and traditional owners. It is acknowledged that some Indigenous groups may lack social and economic resources to support their capacity to be engaged and therefore have their views represented in planning processes. Consequently, further engagement and consultation with Indigenous communities are recommended when implementing the actions contained in this recovery plan.

Benefits to other species or communities

The area encompassed by PRW habitat contains threatened plant and animal species that could be linked to the species recovery. Measures to protect PRW habitat and mitigate threats will also protect many other threatened species. The recovery of PRW populations also focuses attention on land management issues such as wildlife corridors, land clearing, habitat fragmentation, weed and feral animal control.

Protection of remnant vegetation will result in retention of the vine forest community occurring in PRW habitat, semi-deciduous microphyll/notophyll vine forest on slopes, including areas of Regional Ecosystem 8.12.11 semi-deciduous microphyll rainforest on

volcanics (dry coastal ranges), listed with a biodiversity status 'Of concern' in Queensland.

Habitat benefits for other lowland provenance species will include 'Vulnerable' plant species listed under the NCA, they include: *Medicosma obovata*, *Neisosperma kilneri*, *Graptophyllum ilicifolium* and 'Near Threatened' plant species *Actephila sessilifolia*, *Brachychiton compactus*, *Graptophyllum excelsum*, *Hernandia bivalvis*, *Macropteranthes fitzalanii*, *Rhodamnia pauciovulata* and *Solanum sporadotrichum*.

'Near Threatened' and 'Vulnerable' fauna listed under the NCA that will directly benefit from PRW habitat protection include the orange-sided skink *Eulamprus amplus*, the rufous owl southern subspecies *Ninox rufa queenslandica*, and the coastal sheathtail bat *Taphozous australis*. Other conservation-significant fauna that will also benefit include the orange-footed scrubfowl *Megapodius reinwardt*, leaf-tailed gecko *Phyllurus ossa* and northern quoll *Dasyurus hallucatus* (EPBC – Endangered).

Social and economic impacts

The implementation of this plan is unlikely to cause significant adverse social or economic impacts. Consideration of habitat issues in relation to broadscale clearing has been given in the Queensland *Vegetation Management Act 1999*. Consideration for clearing of habitat for urban developments is undertaken by the Whitsunday Regional Council (WRC) at the development approval stage with referral to the DERM.

There is potential for social and economic benefits for landholders with a nature refuge over some or all of their property. They may be eligible for a council rate reimbursement. They may also receive financial assistance through the competitive tender process of DERM NatureAssist program. Funding can be applied for to assist with land management activities such as fencing, weed management and vegetation rehabilitation.

2. Biological information

Species description

The PRW was discovered in 1976 and scientifically described by Maynes (1982). It is one of 11 species of rock-wallaby currently recognised in Queensland. Its larger size and preference for deciduous vine forest habitat differentiate this species from the neighbouring unadorned rock-wallaby *Petrogale inornata*, which has a preference for areas of rocky habitat in open forest.

The PRW is the second largest member of the genus *Petrogale*, with males 4.3 -10.2 kg and females 3.5 – 8 kg (Nolan B, pers. comm. 2007). The yellow-footed rock-wallaby *Petrogale xanthopus*, a close relative of PRW, and the brush-tailed rock-wallaby *Petrogale penicillata* are of a similar size to the PRW.

The PRW is marked with subdued colours which enable it to blend into its shaded habitat. The surface body colour is dark grey with a light mauve tinge. Backs of the ears are dark brown to black with a lighter pencil marking running about the edge of the ear, while the chest and belly are a light grey to dirty cream colour. The tail is long and mostly black in colour with the base a rich rufous brown and the dorsal surface of the tail lighter in colour. Some individuals have a light rufous-brown colouration on the forearm with dark brown to black on the wrists and forepaws. A distinctive cream tip on the brush of the tail is present in some individuals, while others may lack any lighter tail marking (Johnson 2003). Like all rock-wallabies the toe nails on the hind feet are reduced to short stout hooks and the

soles of the hind feet have thick fleshy pads which aid grip when the wallabies are moving over rocks.

Life history and ecology

The PRW has an oestrus cycle range of 33-35 days and a gestation period of 33-34 days. Post-partum matings generally occur within hours of birth. The young have a pouch life averaging 209 days, and generally on the day that one young exits the pouch the next young is born. Young are weaned about 122 days after permanently leaving the pouch (Johnson and Delean 1999). They can live for 7–10 years on average in the wild.

Preliminary data indicate that leaf drop from trees forms approximately 60% of the diet of the PRW, with grasses, vines, ferns and fungus also contributing (Winkel 1997). During dry periods the PRW move to the edge of the forest and graze on grasses such as guinea grass *Panicum maximum*. Riparian vegetation and beach scrub act as a drought refuge and provides critical food resources during the drier months when food is scarce. The PRW will also graze on lawns and a number of common garden plants such as balsam and hibiscus flowers (Nolan B, pers. comm. 2007).

A preliminary study of PRW movement patterns on an isolated hill indicated a home range in the vicinity of 30 ha (Winkel 1997).

Distribution

The PRW occurs naturally in scattered colonies in Conway National Park, along the northern, eastern and sections of the western margins of the Conway Range, around the town of Airlie Beach, on Gloucester Island NP, in Dryander NP and in vine forest areas of the Clarke Range (Johnson 1991).

Figure 1 shows the area of known PRW essential habitat. Colonies or subpopulations that are connected by continuous habitat form metapopulations, with animals moving between colonies (Johnson pers. comm. 2008, Spencer 1996). These colonies are interlinked genetically and are dependent on the animals living in critical refuge sites, to replenish populations following declines due to drought, predation, disease or localised disaster.

In accordance with Action 3 of the 'Recovery plan for the Proserpine rock-wallaby *Petrogale persephone* 2000–2004' (Nolan and Johnson 2001), captive bred PRWs from Queensland Parks and Wildlife Service (QPWS) captive colony at Pallarenda in Townsville were introduced onto Hayman Island to establish a population less likely to be threatened by disease, parasites, road strike, introduced predators and toxic plants. Twenty-six individuals were initially released on the island and since 1998 the population has more than doubled (Mares and Nolan 2006). Final introductions of five PRW (three females and two males) to Hayman Island from David Fleay Wildlife Park (DFWP) captive-bred colony occurred between 2006 and 2008 to strengthen the genetic viability of the introduced colony. The Hayman Island population may provide a source for future introductions or translocations to supplement existing colonies that suffer catastrophic losses.

Ground surveys conducted from 1989 to 2002, between Mackay and Bowen and up to 75 km inland, positively identified 24 PRW locations. All the sites occur within approximately 14,000 ha of the essential habitat shown in Figure 1. It is estimated that approximately 40-50 percent of PRW habitat is found on freehold and leasehold land (Nolan and Johnson 2001).

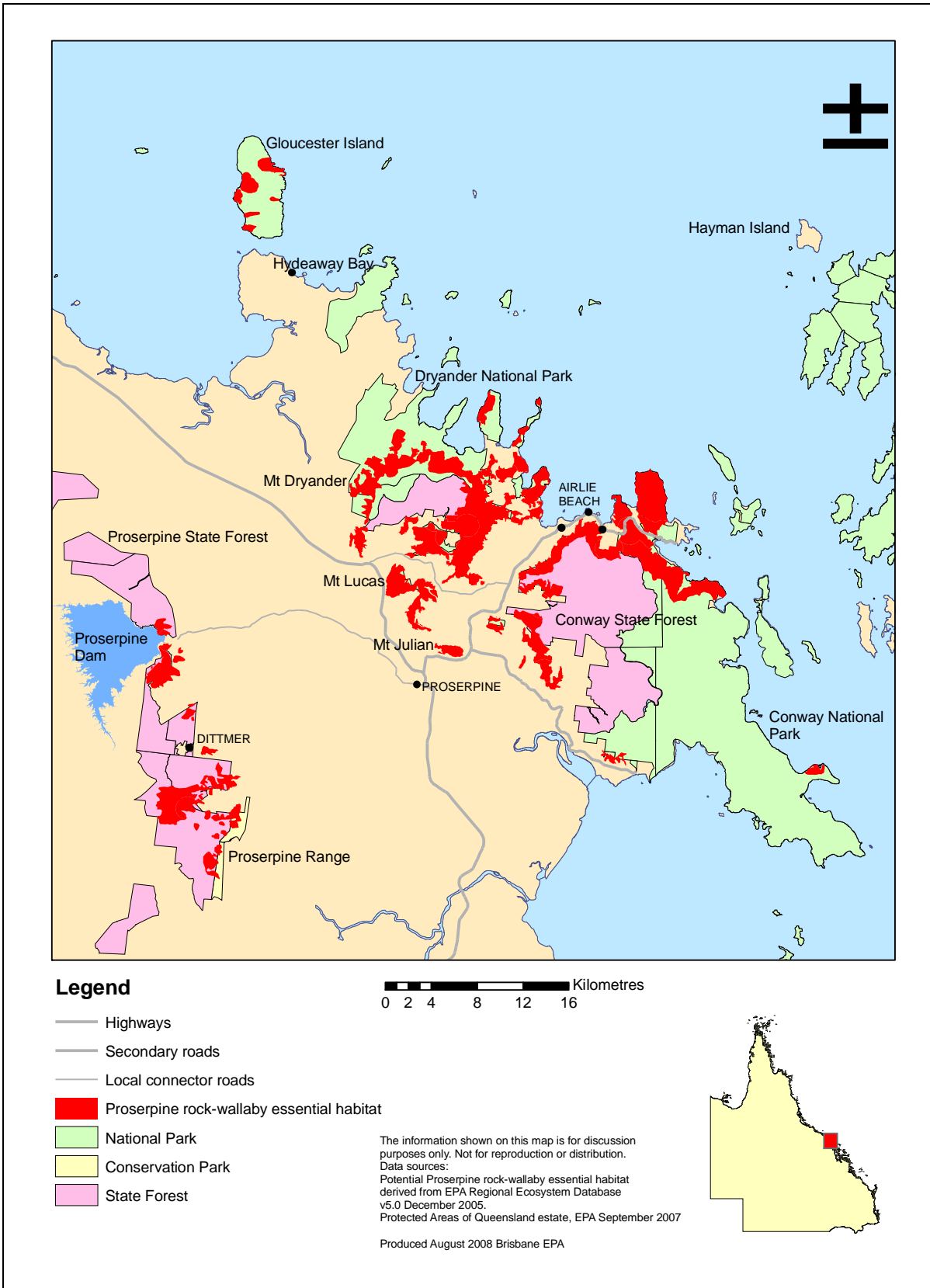


Figure 1. Known Proserpine rock-wallaby essential habitat

Habitat critical to the survival of the species

On the mainland, the PRW requires rocky outcrops, rock piles and cliffs within a sloping microphyll/notophyll semi-deciduous dry vine forest (Pott 1996). These are critical refuge without which the PRW would not survive. Additional to these sites, the PRW requires sloping microphyll/notophyll semi-deciduous dry vine forest on rocky substrate. This habitat provides them with access to food and the ability to evade predators.

In Gloucester Island NP the habitat includes rocky outcrops and rock piles covered with dry vine scrub, usually associated with beach scrub (Pott 1996). At higher elevations the habitat consists of rocky outcrops, rock piles and rocky creeks within a predominant *Acacia* open forest (Johnson and Nolan 1995).

The PRW uses large rock piles as refuge sites for protection against predators and to reduce the effects of high temperatures and humidity during the summer months. Colonies of between 15 and 30 PRWs inhabit the larger rock piles and when these areas are connected by continuous habitat, wallabies move between colonies (Johnson pers. comm. 2008). Rocky water courses also form a critical role both as a feeding area particularly during dry periods, and as a means of moving safely to and from feeding areas adjoining habitat.

On the mainland during dry periods, the PRW will move to the edge of the vine forest to feed on grasses. This species has not been recorded in wet tropical rainforest on the mainland and has a preference for the narrow band of dry vine forest between the wet tropical forest and the open forest. On Gloucester Island NP this species utilises beach scrub and browses plants such as young *Pandanus brookei* during the dry latter part of the year.

Important populations

The Proserpine Dam / Clarke Range colony has been identified as potentially one of the largest and most viable colonies in the region (Mares and Nolan 2005a).

Other important areas critical for the species' survival in the wild occur at Mandalay Point, Mt Lucas and Flametree Creek in the Conway Range, Mt Julian, Dryander Creek and Gregory River in the Dryander State Forest and Woodward Bay and Charlies Creek adjacent to Dryander NP.

Of these habitat areas, Mt Julian and Mt Lucas are extensively separated from larger areas of habitat by intensive agriculture and/or residential developments. Isolation could affect the genetic diversity and viability of these populations (as for any isolates).

3. Threats

Biology and ecology relevant to threats

The PRW has one of the smallest distributions of any of the 16 *Petrogale* species (Close 2001). PRW numbers per colony are low and many colonies occur in areas where there is strong demand for housing, tourism development and rural clearing. Clearing of habitat, construction of barriers affecting dispersal, hunting by feral and domestic predators, exposure to diseases of domestic animals (Johnson et al. 1998), and vehicle collisions are all threats which, if uncontrolled, are likely to increase as the local human population grows in number and area of occupancy (Nolan 1997).

The impact of these threats is intensified because the four main foci of the PRW population, Conway Range, Mt Dryander, Proserpine Range, and Gloucester Island, are all separated by unsuitable habitat which would prevent gene flow between colonies or recolonisation after populations are lost.

In addition to human-induced pressures, several natural factors could threaten the existence of this species. Its limited distribution makes the species vulnerable to fire, drought, cyclones and other natural events.

Anthropogenic climate change is also a potential long-term threat as the crossover of boundaries of various species of *Petrogale* in Queensland may be influenced by climate (Sharman et al. 1990). This combined with the relationship between the unadorned rock-wallaby and the PRW may have an effect on the survival of the PRW. The unadorned rock-wallaby adjoins the PRW at the northern and southern ends of the Proserpine Range and on the north-western side of Mt Dryander. It also inhabits the mainland directly south of Gloucester Island. The unadorned rock-wallaby is more of a habitat generalist and therefore has the potential to displace PRW populations. There is also the potential threat that the two species may interbreed, producing infertile off-spring (Close and Bell 1997). Producing sterile offspring is considered a threat, particularly for small colonies that are disjunct or isolated from larger populations. A diminished breeding pool within a colony will place further pressure on the genetically depauperate species in the long term through in-breeding, which in turn will impact on that colony's ability to survive current and emerging threatening processes (Eldridge 2008).

DNA analysis shows that the PRW has relatively low genetic variation, indicating that the species has probably had a small distribution and low numbers for some time (Eldridge and Close 1993). Given that the mainland populations are now effectively separated from each other, further loss of genetic variation may be an additional threat to the species (Close 2001).

Identification of threats

Land clearing and habitat fragmentation (major threat)

Land clearing has led to habitat fragmentation and isolation of PRW colonies, which has resulted in a decrease in PRW population size. The valley separating the Conway Range and Mt Dryander populations has been extensively cleared for intensive sugar cane farming and residential developments, creating a 3km barrier at its narrowest. Continued land clearing within the coastal areas is still occurring due to increasing residential development. The Proserpine Range population is separated from other areas of habitat by 20km of intensive agricultural development.

Gloucester Island is an isolated population separated from the mainland by water; unfortunately the adjoining area of the mainland is unsuitable PRW habitat.

Genetic islands of wallabies have been and are still being created through intensive clearing for residential developments and agriculture. This can lead to decreasing genetic diversity in isolated populations, and leave them susceptible to disease and effects of inbreeding depression (Lundie-Jenkins 2000).

Work is required to determine what impact fragmentation has had on individual areas containing PRWs and what impact any additional fragmentation is likely to have. It is not known whether the fragmented areas can support viable populations indefinitely.

Introduced predators (major threat)

The residential development boom has led to an increase in domestic dogs and cats within and adjacent to habitat areas. This has led to an increase in the number of fatal dog attacks on rock-wallabies (Nolan pers. comm. 2008).

Feral dogs which have crossbred with dingoes are also present in habitat areas and have been responsible for PRW mortalities. Control of feral dogs is presently difficult due to limitations placed on where registered poisons (1080) can be utilised. This is primarily due to the proximity of large areas of PRW habitat to expanding residential developments (Nolan pers. comm. 2007).

Roads and traffic (moderate threat)

Urban development has also led to roads being constructed through areas of PRW habitat, resulting in road kills. The mortality of PRW usually peaks during the dry season, from September to November, as green pick in the bush becomes less available and animals wander to roadside verges to feed. During surveys at Proserpine Dam, four PRW were killed on Crystalbrook Road near the dam in a period of nine days in late November 2004 (Mares and Nolan 2005b).

PRW road deaths have also been recorded on Shute Harbour Road, Flametree Hill; Mandalay Road; Staniland Drive at Mt Lucas; and Dingo Beach Road. Given increasing residential development and traffic volume, this could significantly impact on populations. Most road deaths occur where road speeds are of 80km/h or greater and/or where there are feeding areas in close proximity to roads (Johnson and Nolan 1993).

Introduced toxic plants (moderate threat)

The propagation of introduced toxic plants poses a serious threat to the PRW which is known to graze in household gardens, especially during the drier months. Invasion of palatable toxic species such as pink periwinkle *Catharanthus roseus* into habitat areas on Gloucester Island may pose a threat (Batianoff and Dillewaard 1994). The PRW may not differentiate between a native plant if it forages on and an introduced palatable plant, particularly garden ornamentals of the same genus which are known to be toxic.

Disease (moderate threat)

Domestic and feral cats spread *Toxoplasmosis gondii* which has been documented to cause blindness and death in rock-wallabies (Begg et al. 1995; Owen 2005). There are few data available the effects of toxoplasmosis on mortality rates in PRW populations. However, given the extensive areas of development adjacent to PRW habitat and the recorded incidents of death due to toxoplasmosis, it is believed they form an increasing threat.

Hydatids, a type of cyst formed by tapeworm larvae, may also be contracted from dogs and has proven fatal for the PRW (Johnson et al. 1998). PRW post mortems conducted by vets concluded that hydatids directly attributed to the deaths of some animals. Only a small sample size of deceased PRW have undergone an autopsy so it is of concern to find hydatids the primary causal factor of death, particularly as domestic and wild dogs

occur extensively throughout their habitat. Given the extensive existing and proposed residential developments in and adjacent to PRW habitat and the limitations to controlling feral dogs in these areas, Hydatid infection must also be considered an increasing threat.

Areas and populations under threat

The Mandalay and Flametree Creek populations, in the Conway Range, are under threat from land clearing, domestic and feral animals, disease, increasing traffic volume causing road kills, and habitat degradation through weed invasion.

The Mt Julian and Mt Lucas populations are under threat from domestic and feral animals and disease, land clearing, toxic plants, and increased traffic volume. Reductions in genetic diversity through isolation of populations and removal of remaining movement corridors pose additional threats.

Proserpine Dam / Clarke Range colonies are under threat from feral animal predation and diseases, habitat degradation from intense fires, weeds and grazing and from traffic.

Dryander Creek in the Dryander State Forest and Woodwark and Charlies Creek colonies, adjacent to the Dryander NP, are under threat from predation and diseases from feral animals, habitat degradation from land clearing and intense fires, weeds and isolation through clearing and removal of movement corridors.

Populations of PRW isolated due to land clearing occur at Mt Dryander and the Proserpine Range. The population on Gloucester Island is separated from the mainland and the adjacent area of the mainland is unsuitable habitat. The long term isolation of PRW populations can lead to a decrease in their genetic diversity, which may render them susceptible to disease and inbreeding.

4. Evaluation of the previous recovery plan

The overall objective of the 'Recovery plan for the Proserpine rock-wallaby *Petrogale persephone* 2000-2004' was 'to increase the population size and area of distribution of the PRW within five years'. There has been progress towards achieving this objective through the introduction of the species to Hayman Island and in increased habitat protection and management.

Following is an overview of the outcomes achieved against each performance criterion.

1.1 Monitoring - Monitor continued existence of known colonies and search for new colonies.

Progress: Annual monitoring until 2006 had confirmed the presence of the PRW at all 24 known colony sites. Gregory River and Woodwark Bay sites were also monitored in 2007.

1.2 Mapping - Continue mapping of habitat and regularly monitor habitat.

Progress: Habitat mapping for the PRW has been updated. This mapping will continue to be fine-tuned with further ground-truthing work undertaken to clarify difficulties in mapping. Critical vine thickets, on rocky slopes, inhabited by the PRW, are difficult to map remotely as the canopy masks identification of areas with rocky slopes and regional ecosystem mapping does not differentiate between habitat critical for survival and other habitat. This mapping is shown in figure 1. This habitat mapping has been included under the *Vegetation Management Act 1999*.

1.3 Implement habitat protection strategies - Protect known colonies through reservation or Nature Conservation Agreements. Implement other habitat protection strategies.

Progress: Whitsunday Regional Council can provide for a covenant as part of an approval. Council can dedicate land without the need for a covenant if the developer surrenders an area of land to the Council's trustee for park purposes. This can limit the need for council to covenant each title and provides management options for open space areas of PRW habitat that is suitable to the needs of the PRW. Discussions with council and developers will be continued as outlined in Action 1.4 of the revised plan.

2.1 Extension and land holder participation - Relevant extension officer communicates with land holders.

Progress: The Proserpine Rock Wallaby Public Contact Plan was revised in 2003. The review of the plan focused on gaining landholders support in recovery actions for the PRW, and improving land developer's awareness and compliance with recovery actions.

The WRC has been encouraged to consider PRW essential habitat mapping when assessing development applications. Development proposals within identified habitat or potential habitat are forwarded to DERM for comment.

2.2 Establishment of Nature Refuges - Protect known colonies on private land through Nature Conservation Agreements/ Nature Refuges.

Progress: Seven Nature Refuge Agreements have been developed over habitat areas adjoining the Conway Range and Mt Dryander areas, during the period of the previous recovery plan. A Nature Refuge Agreement is being prepared for Hayman Island where a population of PRWs has been introduced. Some additional habitat areas on the mainland have been secured under Land for Wildlife agreements managed by the Whitsunday Catchment Landcare (WCL).

2.3 Circulation and promotion of key information and measures - Review and implement the Proserpine Rock Wallaby Public Contact Plan. This involves targeting regional media outlets for circulation of information. Circulate information to wildlife care groups and fauna sanctuaries / zoos.

Progress: School talks have been given at local schools on request.

Community volunteers have previously been involved in the PRWs recovery in various ways. They have attended rural shows with PRW displays and assisted in radio-tracking and trapping. Volunteers continue to provide assistance with the care and raising of orphaned pouch young for the release back into the wild.

Volunteers assisted with the keeping of some captive bred animals at the former DERM's Townsville site and also at Conway NP when the program was temporarily relocated to that site.

Various media releases, newspaper and magazine articles (e.g. WPSQ 2003) were written and published during the life of the previous recovery plan. Several radio and television segments were also produced.

Two brochures were created which explain how landowners could assist in the recovery of the species by planting native species instead of toxic introduced species (Appendix 1 and 2).

Overall engagement with key target audiences and the general community has been sporadic due to lack of available resources.

3.1 Release project - Preparation of further translocation proposals. Release animals. Monitor translocated population.

Progress: In 1998, 26 individuals from the QPWS captive colony at Pallarenda in Townsville were initially released onto Hayman Island and since then the local population has more than doubled. Final introductions from the captive breeding colony located at David Fleay Wildlife Park (DFWP) occurred in 2008 to strengthen the genetic viability of the introduced colony. The Hayman Island population will provide a source for future introductions or translocations on the mainland should they be required.

3.2 Captive colony - Maintain captive colony.

Progress: The captive colony has been maintained at DFWP. There are currently five PRW in captivity. One female and one male were bred at DFWP in 2006 and have been released on Hayman Island. Two females were bred at DFWP in 2007 and were released onto Hayman Island in November 2007. The final two captive bred animals (one female and one male) were released onto Hayman Island in 2008.

This program is no longer required. Future introductions to Hayman Island can be achieved using naturally occurring mainland animals, especially animals brought into care for rehabilitation purposes and then requiring release into the wild.

4.1 Road mortality – Research the effectiveness of reflectors. Implement reflector program based on research. Negotiate the installation of speed reduction signs at appropriate locations.

Progress: WRC has been provided with maps showing likely road kill problem areas. Several methods have been trialled in an attempt to reduce road mortality in key PRW areas. Along Shute Harbour Road, Mandalay Road and Staniland Drive, guinea grass was sprayed and vegetation planted to shade grass, in an attempt to stop the PRW from coming out on to the road verges to graze. This method was found to reduce the occurrence of animals moving onto the road and subsequently being killed in those areas.

The WRC and the DMR carried out a 12 month trial placement of road reflectors, along Dingo Beach Road and Shute Harbour Road, with the aim of deterring wallabies from going on the road. On completion of the trial, the project managers determined that road reflectors were ineffective in deterring the wallabies from going on to the road. During the trial, DMR received no complaints from motorists regarding the reflectors.

In a joint project with the WRC and SunWater, turf has been planted on the colony side (south-eastern side of Proserpine Dam), in an attempt to encourage wallabies to feed at this site and not cross the road to feed on the irrigated grass around the recreational picnic areas. Subsequent monitoring of animals using the new turfed site is continuing with positive early results.

Local wildlife care groups have attempted to collate records of PRW killed on roads, however this information is incomplete and inconsistent. Future aims are to collect this information systematically.

DERM was advised by the DTMR that it was not possible to install speed reduction signs at high risk areas, as roads in these areas are steep and narrow and therefore pose a risk

to motorist visibility. Other traffic calming devices such as wildlife advisory signs should be considered.

4.2 Predation - Encourage councils to introduce laws relating to domestic animal (dog and cat) control and containment.

Progress: Communication with WCL staff has been ongoing regarding the threat that cat and dogs pose to the PRW. To date WRC has used education awareness activities to actively promote cat and dog control measures and educate the community about how their pets can have detrimental effects on wallabies.

The WRC has prepared a Rural Feral and Stray Cat Management Plan (2007) which will encourage control of rural feral and stray cats and implement monitoring of local populations.

4.3 Disease transmission - Carry out toxoplasmosis survey.

Progress: This action has not been undertaken as it was deemed not to be a priority during the life of the recovery plan.

4.4 Toxic plants - Discourage the use of toxic plants in garden and urban development landscapes.

Progress: Brochures were prepared and disseminated to the public, by DERM, promoting the removal of toxic plants and encouraging the use of natives. These will continue to be available on the DERM website and will be reviewed in the future (Appendix 1 and 2).

5.1 Administration of recovery program - Administer the PRW program.

Progress: An internal DERM report was prepared at the end of 2004 detailing the progress of actions and proposing possible future directions for recovery. Reports were also produced and provided to Department of Environment, Water, Heritage and the Arts (DEWHA) for recovery actions completed using funding from the Natural Heritage Trust.

5.2 Provision of resources and support for implementation of recovery program - Resource and support the implementation of the recovery plan.

Progress: The Natural Heritage Trust (NHT) 2 funded projects to reduce road mortality at Proserpine Dam and to conduct camera trap monitoring and trapping on known and potential colony sites. The majority of actions were completed with additional support from DERM and in-kind support from volunteers.

5.3 Co-ordinate recovery team - Co-ordinate the PRW recovery team.

Progress: The recovery team met sporadically during the life of the plan to determine implementation schedules, implement particular actions and review the plan.

5. Recovery objectives, Performance criteria and Actions

Overall objective

To improve the conservation status of the PRW through habitat protection, reducing threats to species and increasing public participation in recovery activities.

Specific objective 1: To maintain and protect known habitat and ensure that the species continues to exist in the wild

Performance criterion: *During the life of the plan, the number of PRW colonies remains the same or increases, essential habitat mapping is updated at least once and further areas of PRW habitat are protected under Nature Refuge Agreements*

Action 1.1 Monitoring of known PRW populations is continued to determine presence or absence and colony condition

The PRW has been found to exist in 24 sites. Many of the PRW colonies at these sites are disjunct, so if they are lost they will not naturally recolonise. Monitoring to determine the continued presence of populations and their condition at each site is required.

Potential contributors: DERM, Mackay Conservation Group, Reef Catchments Mackay Whitsunday Inc and research institutions.

Action 1.2 Identify, map and monitor colony refuge sites

The PRW rely on large rock piles to provide them with protection from predators and environmental extremes. Only a few of these critical refuge sites are known, and surveys are therefore required to locate and map important rock piles in remaining habitat areas.

PRW refuge sites will be surveyed to identify areas requiring weed control, fencing, removal of cattle and protection from intense fires in the attempt to protect these critical sites.

Potential contributors: DERM, Mackay Conservation Group, Reef Catchments Mackay Whitsunday Inc, WRC.

Action 1.3 Update PRW habitat mapping in accordance with changes to regional ecosystem classification

Update PRW habitat mapping taking into consideration changes to the regional ecosystem classification. Changes to the regional ecosystem classification may affect priority sites for protection, restoration and management including corridors between areas of habitat that are important in maintaining the population.

PRW habitat mapping is to be refined taking into account knowledge of the habitat requirements of the PRW. Mapping should be provided to the WRC, DERM planners and DEWHA to assist in reviewing planning/development applications or referrals.

Potential contributors: DERM, Reef Catchments Mackay Whitsunday Inc.

Action 1.4 Promote the conservation and management of PRW habitat off park estate through voluntary conservation agreements, council open space habitat areas and management of covenant areas

A number of Nature Refuges were declared during the life of the previous recovery plan, as well as Land for Wildlife properties. Extension activities should occur with interested landholders to secure areas of PRW habitat for protection and management. Incentives may be available to landholders through the Nature Assist program. Through this competitive tender process funding may be available to assist in land management activities.

WRC also has a scheme to support landholders who are conserving remnant vegetation with a nature refuge by providing a rate rebate.

Potential contributors: DERM, landholders, Reef Catchments Mackay Whitsunday Inc WCL, WRC.

Action 1.5 Avoid or minimise further fragmentation within or between PRW habitat. Clearing of land has led to fragmentation of PRW habitat resulting in smaller PRW populations. Land continues to be cleared along the coast due to increasing development. Rural residential subdivisions further fragment important PRW habitat.

Investigation into the impact of fragmentation on populations of PRW is required; this may provide information on whether the fragmented areas can support viable populations long-term.

Currently there is no protection over areas that are not PRW habitat that join two habitat areas together. It is important to protect these areas to minimise the fragmentation of PRW habitat and where feasible restore and manage corridors between areas of PRW habitat to maintain the populations.

Potential contributors: DMR, DERM, Sunwater, WRC

Specific objective 2: To maintain and monitor the population of PRWs on Hayman Island

Performance criterion: The introduced colony on Hayman Island has expanded

Action 2.1 Monitor the introduced Hayman Island colony to assess its genetic diversity and manage the population's genetics.

The establishment of the Hayman Island colony, from a biological perspective and as an exercise in community collaboration has been successful. To assess the levels of genetic diversity in the Hayman Island population, DNA tissue samples from 40 individuals have been examined by Dr M. Eldridge. This baseline data will be used to monitor the population's genetic variation over time and determine future genetic supplementation requirements to mitigate in-breeding issues. Further study using sex specific markers will need to be carried out in order to fully understand the levels of diversity found within *P. persephone*, how much of this natural variation has been captured within the introduced Hayman Island population and the natural population dynamics and evolutionary history of this species (Eldridge 2008). DNA-scat analysis should eventually allow comparisons with the baseline data but this method is currently not considered viable or cost effective.

Potential contributors: Australian Museum, DERM, Hayman Island Resort, Reef Catchments Mackay Whitsunday Inc.

Action 2.2 Conduct surveys on Hayman Island to estimate the population and examine the age structure

A trap and release program during 2005 revealed that approximately 29 males and 28 females were resident on the island and this number included three original captive bred animals that had been released on the island (Johnson P, pers. comm. 2007).

The trap and release program will provide information on the current estimated size and age structure of the island population. From this information the home ranges and population carrying capacity for Hayman Island can be determined.

Potential contributors: Hayman Island Resort, Reef Catchments Mackay Whitsunday Inc, research institutions.

Action 2.3 Maintain appropriate fire management procedures on Hayman Island

Fire management protocols have been established with Hayman Island staff. To maintain suitable habitat for the PRW, ongoing dialogue and cooperative assistance will have to be maintained with the island staff. The current fire management plan will need to be reviewed by DERM and Hayman Island Resort.

Potential contributors: DERM, Hayman Island Resort.

Action 2.4 Conduct vegetation surveys on Hayman Island

To determine what impact the PRW have on the vegetation of Hayman Island, a vegetation survey should be conducted to compare changes in vegetation 10 years after the removal of goats, and eight years after the introduction of the PRW. Monitoring should be conducted every three years.

Potential contributors: Hayman Island Resort, research institutions.

Action 2.5 Develop a plan to document management of the population on Hayman Island over the next five years

A plan should be developed that will provide guidance for the future in the event that the Hayman Island habitat reaches carrying capacity. The plan will provide for consideration of excess animals becoming suitable for release back to the mainland and include identification of several key mainland sites where animals can be translocated.

The plan will need to follow DERM policy on management of threatened species.

Potential contributors: DERM, Hayman Island Resort, Reef Catchments Mackay Whitsunday Inc

Specific objective 3: To minimise disease, incidental kills and other threatening processes (such as weeds) on populations

Performance criterion: *A measurable decline in deaths resulting from disease or parasites, road strike, introduced predators and toxic plants is shown through the life of the plan*

Action 3.1 Continue to implement actions to reduce the incidence of road mortality

Continue planting trees to shade out palatable grasses on road verges along Shute Harbour Road and on Staniland Drive. The spraying of guinea grass by WRC on road verges along Shute Harbour Road, Mandalay Road and Staniland Drive should be continued.

When roads are being constructed 1.5 metre diameter drainage pipes (culverts) should be used under the roads for PRW to move about. These culverts have been demonstrated to allow safe passage of PRWs to and from habitat areas.

Formal monitoring of the turf area, established in the old quarry to reduce the number of PRWs crossing Crystalbrook Road at Proserpine Dam, is required to determine the effectiveness of this strategy in reducing road kills.

Road kill numbers are to be monitored and a public education campaign undertaken, to alert the public to areas where PRWs cross roads. Establishment of additional areas of turf adjacent to PRW habitat at Proserpine Dam will be undertaken if the established trial area is successful in reducing road kills. Conduct further discussions with DTMR on the implementation of traffic calming devices such as wildlife advisory signs that warn motorists of wildlife in the area and encourages them to slow down.

DERM will continue to encourage the reporting of PRW deaths to the agency to determine success of measures to reduce road mortality.

Potential contributors: DTMR, DERM, Sunwater, WRC.

Action 3.2 Support implementation of WRC Rural Feral and Stray Cat Management Plan and dog registration program

The predation of PRWs by dogs continues to be a major threat. The management of domestic dogs should continue through registration and implementing other measures such as promoting fencing in and adjacent to wallaby habitat.

Toxoplasmosis is a systemic disease caused by the cat parasite *Toxoplasmosis gondii* that affects the PRW. Through the introduction of the WRC Rural Feral and Stray Cat Management Plan it is hoped that there will be a reduction in feral cat numbers and thus a reduction in the incidence of this disease affecting the PRW population.

Investigate the option of developing a Residential Feral and Stray Cat Management Plan for the area.

Potential contributors: DEEDI, DERM, landholders, Reef Catchments Mackay Whitsunday Inc, WPSQ, WRC and other conservation groups.

Action 3.3 Conduct an education program on the incidence and effects of hydatids in the PRW population

An education program alerting the public to the deadly effects of hydatids on the PRW is being conducted. This program will highlight the life history and method of infection of hydatids, and encourage the public to keep domesticated dogs away from areas frequented by the PRW.

The public could be encouraged to report any instances of sick PRWs to DERM so that a distribution map can be produced to show which populations are affected by this disease. This may have a bearing on determining which wild-caught PRWs are suitable for translocation, should further introductions be required.

For areas where there are large populations of domestic or wild dogs adjacent to habitat, a program to treat both the dogs and PRWs should be undertaken to reduce the impact of hydatids. This may include a feral animal control program targeting wild dogs.

1080 is the only registered poison that can be used to control feral dogs and there are extensive restrictions in its application. Therefore mapping will be undertaken to determine what areas of habitat can be treated with 1080. A feral dog control plan that considers PRW habitat areas will be developed in consultation with the WRC and the DEEDI.

Potential contributors: CSIRO, DEEDI, DERM, research institutions, WRC.

Action 3.4 Identify, monitor and manage habitat areas threatened by grazing, weeds or fire

Action 1.2 will identify sites for weed control, fencing or removal of cattle and protection of the sites from intense fires. If degraded or cleared corridors are identified that may link colonies or areas of habitat, priority should be given to restoring native vegetation in these areas so as to establish habitat corridors. Local community groups may be involved in this work that may promote the recovery of the PRW.

Potential contributors: Community groups, DEEDI, DERM, landholders, Reef Catchments Mackay Whitsunday Inc, WRC.

Action 3.5 Develop and implement weed control strategies on Gloucester Island

On Gloucester Island NP infestations of weeds in and adjacent to the PRWs habitat need to be controlled. Pink periwinkle *Catharanthus roseus* and rubbervine *Cryptostegia grandiflora* have become established on Gloucester Island and are recognised as a threat to the PRW as both plant species are toxic when eaten (Batianoff and Dilleward 1994). Chemical control to remove both of these weed species is required.

Potential contributors: DERM.

Action 3.6 Continue to encourage the replacement of toxic plants with native plants

The current brochures discouraging the use of toxic introduced plant species in local gardens and encouraging the use of native species will be available to the local community through the DERM office and website, Council offices and provided to local landholders. The brochures will also be made available to local conservation groups and Fauna Rescue Whitsundays to distribute when needed.

There is a need to investigate whether landscaping with only native plants could be a condition of development approval in areas surrounding PRW habitat. The role of nurseries to support this condition needs to be examined.

Potential contributors: DERM, Fauna Rescue Whitsundays, nurseries, Reef Catchments Mackay Whitsunday Inc , WCL, WPSQ, WRC, other conservation groups.

Specific objective 4: Improve understanding of PRW ecology and threats to its survival

Performance criterion: *Reports have been produced which increase knowledge of home range size, disease and parasites, and interactions with other Petrogale species*

Action 4.1 Determine home ranges for colonies in close proximity to residential expansion

Conduct a study to determine home range size for colonies, in particular those in close proximity to expanding residential areas. The colonies studied will be those at Mandalay Point in the Conway Range, Mt Lucas in the Conway NP, Woodwark Bay, adjacent to Dryander NP and Conway Range.

Potential contributors: DERM, Mackay Conservation Group, Reef Catchments Mackay Whitsunday Inc, research institutions, WRC.

Action 4.2 Map the distribution of *Toxoplasmosis gondii* and *hydatidosis* in the PRW population

Research is required to determine the extent of *toxoplasmosis* and *hydatidosis* in PRW colonies and the surrounding areas. Feral cats in close vicinity to human residential areas would be sampled for toxoplasmosis using standard testing systems. Post mortems conducted on dead wallabies should include tests for both diseases.

Results could have ramifications for both public health and the conservation of the PRW in general (link to Action 3.3).

As part of routine resource surveys of mainland PRW populations, trap and release programs will provide the opportunity for blood samples to be collected and tested for *toxoplasmosis*. This will enable continued mapping of this disease within PRW populations.

Potential contributors: Research institutions, Reef Catchments Mackay Whitsunday Inc.

Action 4.3 Study the interactions between the PRW and the unadorned rock-wallaby where populations are adjacent

A study of the ecological relationship of the PRW and the unadorned rock-wallaby, and the behavioural interactions between the two species could be crucial to the survival of PRWs in the wild.

Macquarie University has found captive unadorned rock-wallabies and PRWs interbreed, producing infertile off-spring (Close and Bell 1997). Infertile animals would reduce the capacity of the PRW colony to replenish numbers and would also contribute to a loss of genetic diversity. PRW colony sites have a limited capacity to support more than 30 animals, colony size surveyed indicates an average size of 15 -30 PRWs (Nolan pers. comm. 2007). Research is needed to determine if the species interbreed in areas where the PRWs range interfaces with that of unadorned wallabies in the wild.

The unadorned rock-wallaby occupies a variety of habitats and appears to be less affected by human interference. There is concern that the larger numbers of unadorned rock wallabies may be displacing the PRW, which are more habitat selective. This may need to be taken into account when making management decisions.

Potential contributors: Landholders, Reef Catchments Mackay Whitsunday Inc, research institutions.

Specific objective 5: Ensure recovery plan continues to operate with high levels of community participation

Performance criterion: *The recovery program operates with high levels of community participation and media attention*

Action 5.1 Promote and facilitate community involvement in PRW recovery

Local communities, including traditional owners, will be encouraged to participate in recovery actions. Population monitoring, habitat management, education and other programs identified in this recovery plan should where possible, involve landholders, schools and community conservation and other action groups.

Continue to promote local PRW recovery actions, such as dog and cat control, reducing the use of toxic plants, and promoting the recovery achievements to local and state media.

Potential contributors: Community groups, landholders, local schools, Mackay Conservation Group, Reef Catchments Mackay Whitsunday Inc, Traditional owners, WRC, WCL.

Summary

Summary of relationship between specific objectives, performance criteria, actions and potential contributors. Priorities H = High, M = Medium and L = Low.

Specific objective	Performance criteria	Action	Potential contributors	Priority
1. To maintain and protect known habitat and ensure that the species continues to exist in the wild	1. During the life of the plan the number of PRW colonies remains the same or increases, essential habitat mapping is updated at least once and further areas of PRW habitat are protected under Nature Refuge Agreements	1.1. Monitoring of known PRW populations is continued to determine presence or absence and colony condition	DERM, Mackay Conservation Group, Reef Catchments Mackay Whitsunday Inc, research institutions	H
		1.2. Identify, map and monitor colony refuge sites	DERM, Mackay Conservation Group, Reef Catchments Mackay Whitsunday Inc, WRC	H
		1.3. Update PRW habitat mapping in accordance with changes to regional ecosystem classification	DERM, Reef Catchments Mackay Whitsunday Inc	M
		1.4. Promote the conservation and management of PRW habitat off park estate through voluntary conservation agreements, council open space habitat areas and management of covenant areas	DERM, landholders, Reef Catchments Mackay Whitsunday Inc, WCL, WRC	H
		1.5 Avoid or minimise further fragmentation within or between PRW habitat	DMR, DERM, Sunwater, WRC	H
2. To maintain and monitor the population of PRWs on Hayman Island	2. The introduced population on Hayman Island has expanded or stabilised	2.1. Monitor the introduced colony of PRWs on Hayman Island to determine if it is a genetically viable population through assessment of it's genetic diversity	Australian Museum, DERM, Hayman Island Resort, Reef Catchments Mackay Whitsunday Inc	M
		2.2. Conduct surveys on Hayman Island to estimate the population and examine the age structure	Hayman Island Resort, Reef Catchments Mackay Whitsunday Inc, research institutions	M
		2.3. Maintain appropriate fire management procedures on Hayman Island	DERM, Hayman Island Resort	H
		2.4. Conduct vegetation surveys on Hayman Island	Hayman Island Resort, research institutions	L
		2.5. Develop a plan to document management of the population on Hayman Island over the next five years	DERM, Hayman Island Resort, Reef Catchments Mackay Whitsunday Inc	M

<p>3. To minimise disease, incidental kills and other threatening processes, such as weeds on populations</p>	<p>3. A measurable decline in deaths resulting from disease or parasites, road strike, introduced predators and toxic plants is shown through the life of the plan</p>	<p>3.1. Continue to implement actions to reduce the incidence of road mortality.</p>	DMR, DERM, Sunwater, WRC	H
		<p>3.2. Support implementation of WRC Rural Feral and Stray Cat Management Plan and dog registration program</p>	DERM, DEEDI, landholders, Reef Catchments Mackay Whitsunday Inc, WPSQ, WRC, other conservation groups	H
		<p>3.3. Conduct an education program on the incidence and effects of hydatids in PRW populations</p>	CSIRO, DEEDI, DERM, research institutions, WRC	M
		<p>3.4. Identify, monitor and manage habitat areas threatened by grazing, weeds or fire</p>	Community groups, DEEDI, DERM, landholders, Reef Catchments Mackay Whitsunday Inc, WRC	H
		<p>3.5. Develop and implement weed control strategies on Gloucester Island</p>	DERM	M
		<p>3.6. Continue to encourage the replacement of toxic plants with native plants</p>	DERM, Fauna Rescue Whitsundays, nurseries, Reef Catchments Mackay Whitsunday Inc, WPSQ, WRC, other conservation groups	M
<p>4. Improve understanding of PRW ecology and threats to its survival</p>	<p>4. Reports have been produced which increase knowledge of home range size, disease and parasites, and interactions with other <i>Petrogale</i> species</p>	<p>4.1. Determine home ranges for colonies in close proximity to residential expansion</p>	DERM, Mackay Conservation Group, Reef Catchments Mackay Whitsunday Inc, research institutions, WRC	M
		<p>4.2. Map the distribution of <i>Toxoplasmosis gondii</i> and hydatidosis in the PRW population</p>	Reef Catchments Mackay Whitsunday Inc, research institutions	L
		<p>4.3. Study the interactions between PRW and the unadorned rock-wallaby where populations are adjacent</p>	landholders, Reef Catchments Mackay Whitsunday Inc, research institutions	L

<p>5. Ensure recovery plan continues to operate with high levels of community participation</p>	<p>5. The recovery program operates with high levels of community participation and media attention</p>	<p>5.1. Promote and facilitate community involvement in PRW recovery</p>	<p>Community groups, landholders, local schools, Mackay Conservation Group, Reef Catchments Mackay Whitsunday Inc, Traditional owners, WCL, WRC</p>	<p>H</p>
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6. Management practices

Activities that may have significant impacts on the recovery of the PRW include:

- Further fragmentation of colonies as this will reduce the potential for recolonisation.
- Residential or rural-residential developments located in proximity to PRW habitat. Numerous threats may result from such developments, including loss of habitat and movement corridors, introduction of toxoplasmosis by cats, introduction of hydatids and predation by cats and dogs.
- Development or widening of roads through PRW habitat should be avoided or roadsides should be prepared in a way that discourages PRWs from coming out to graze on the edges of the roads. Installation of a number of culverts (greater than 1.5 metre diameter), should be installed under roads where rocky creeks are intercepted by roads to allow the PRW to cross safely from one side of the road to the other.
- Feral dog and cat control strategies should be developed for PRW habitat areas in consultation with WRC and DEEDI.

Management practices required to recover the PRW includes:

- protection of habitat through voluntary conservation agreements and council open space habitat areas;
- adoption of covenants over new development areas in and adjoining PRW habitat;
- weed control;
- fire management;
- grazing management;
- wild dog and feral cat control;
- control of dogs and cats in residential areas..

7. Estimated cost of recovery

Estimated cost of implementing recovery plan

Objective	Action	Year 1 (\$)	Year 2 (\$)	Year 3 (\$)	Year 4 (\$)	Year 5 (\$)	Total (\$)
1 To maintain and protect known habitat and ensure that the species continues to exist in the wild	1.1 Monitoring of known PRW populations is continued annually to determine presence or absence (Infra red cameras (as currently used) installed at remote PRW habitat locations is the most cost efficient method for monitoring populations. A sustainable population is comprised of a diverse age class consisting of females with various sized pouch young, presence of "at foot" young and large males. A decline in any of these criteria will generate more intensive surveys to ascertain any responsible threatening process)	15 312	16 230	17 203	18 262	19 357	86 364
	1.2 Identify, map and monitor colony refuge sites		8704	9226	9779	10 366	38 075
	1.3 Update PRW habitat mapping in accordance with changes to regional ecosystem classification	2052	4104	2310	0	0	8466
	1.4 Promote the conservation and management of PRW habitat off park estate through voluntary conservation agreements, council open space habitat areas and management of covenant areas	0	0	0	0	0	0
	1.5 Avoid or minimise further fragmentation within or between PRW habitat	0	0	0	0	0	0
2 To maintain and monitor the population of PRWs on Hayman Island	2.1 Monitor the introduced colony of PRWs on Hayman Island to determine if it is a genetically viable population	0	4104	11 800	0	0	15 904
	2.2 Conduct surveys on Hayman Island to determine population size and age structure	4304	0	14 750	0	0	19 054
	2.3 Maintain appropriate fire management procedures on Hayman Island	0	0	0	0	0	0
	2.4 Conduct vegetation surveys on Hayman Island	2052	0	7750	0	0	9802
	2.5 Develop a plan to document management of the population on Hayman Island over the next five years	2000	2120	2240	2360	2480	11 200
3 To minimise disease, incidental kills and other threatening processes,	3.1 Continue to implement actions to reduce the incidence of road mortality	1200	3800	4500	5200	5900	20 600
	3.2 Support implementation of WRC Rural Feral and	0	0	0	0	0	0

such as weeds on populations	Stray Cat Management Plan and dog registration program						
	3.3 Conduct an education program on the incidence and effects of hydatids in PRW population	12 500	14 700	1800	2000	2200	33 200
	3.4 Identify, monitor and manage habitat areas threatened by grazing, weeds or fire	0	3052	5800	6300	0	15 152
	3.5 Develop and implement weed control strategies on Gloucester Island	1500	7500	7950	8400	8850	34 200
	3.6 Continue to encourage the replacement of toxic plants with native plants	0	2000	0	2000	0	4000
4 Improve understanding of PRW ecology and threats to its survival	4.1 Determine home ranges for colonies in close proximity to residential expansion	7500	16 000	12 500	0	0	36 000
	4.2 Map the distribution of <i>Toxoplasmosis gondii</i> and hydatidosis in the PRW population	3200	3500	3800	0	0	10 500
	4.3 Study the interactions between PRW and the unadorned rock-wallaby where populations are adjacent	0	0	0	11 000	0	11 000
5 Ensure recovery plan continues to operate with high levels of community participation	5.1 Promote and facilitate community involvement in PRW recovery	2000	2120	2240	2360	2480	11 200
Estimated total cost per year (\$)		53 620	87 934	103 869	67 661	51 633	364 717

8. Evaluation of recovery plan

Completion of actions within this plan may require reporting by the recovery team or other contributor. These reports may be published and will be submitted to the Executive Director of Sustainable Communities, DERM. This report will be provided to DEWHA and DERM. Reports will be available to members of the public, local government and agencies through the DERM's Recovery Action Database (an interactive web-based information system). A full review of this recovery plan will be undertaken within five years from adoption as a national recovery plan.

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