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Macquarie Island in Danger

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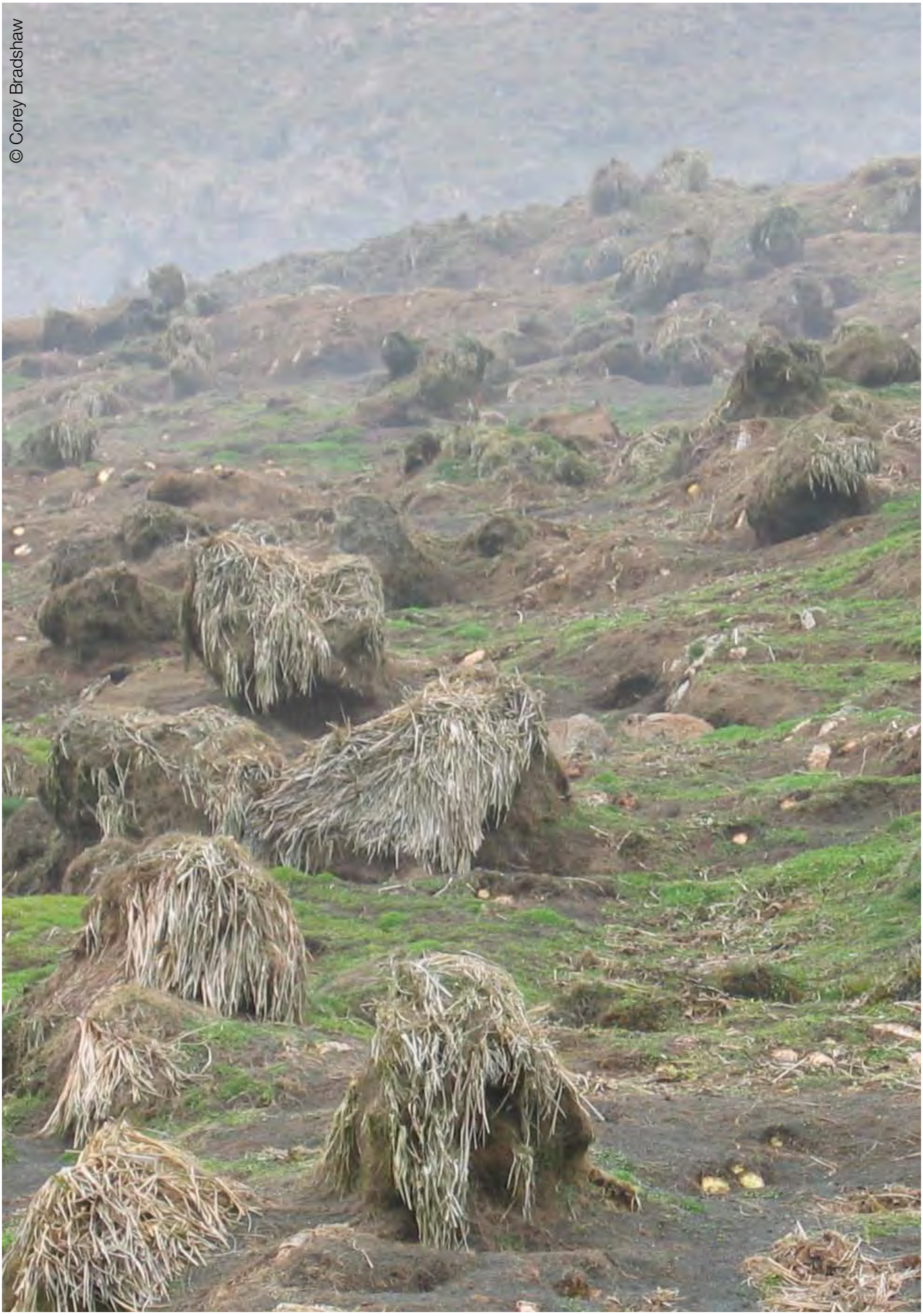

Grazed tussock stumps with pale dead leaves

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Executive Summary

Macquarie Island is an outstanding natural property owned by Australia and located in the subantarctic region of the Southern Ocean. It was inscribed on the World Heritage List in 1997 on the basis of its natural values. During the past decade, the worst levels of environmental damage recorded over the last century have been experienced on the island. This ongoing damage is the result of rising numbers of feral rabbits and rodents. The effects of rabbit damage are especially evident in widespread degradation of natural landscape values, with destruction of vegetation and associated landslipping and erosion. This in turn is impacting on the habitat of threatened species of seabirds.

A comprehensive eradication plan for both rabbits and rodents was prepared in 2004-05 and has awaited commencement for 18 months or more. The plan is expected to cost $A24.6 million. In early June 2007 the Australian and Tasmanian State Governments came to an agreement to fund the eradication by splitting the costs equally over the life of the plan. In the meantime, the destruction on the island has continued unchecked. Although funding for eradication has now been approved, there will be two or three years' lead time before on-ground baiting work for eradication can commence, with further damage continuing until actual eradication occurs. After eradication, further slope erosion is predicted before eventual stabilisation.

The ongoing nature of these processes leads us to recommend strongly that the World Heritage authorities and the Australian and Tasmanian governments should closely monitor the conservation state of the Macquarie Island World Heritage property until on-ground corrective action has been achieved, namely the actual eradication of the pest species.

Furthermore, we recommend that State of Conservation reports be regularly prepared for, and considered by, the World Heritage Committee until on-ground corrective action has been achieved.

State of Conservation

A VISUAL RECORD

2004 – red circles:
15 major regions of significant damage identified, most on west and south coastal slopes.

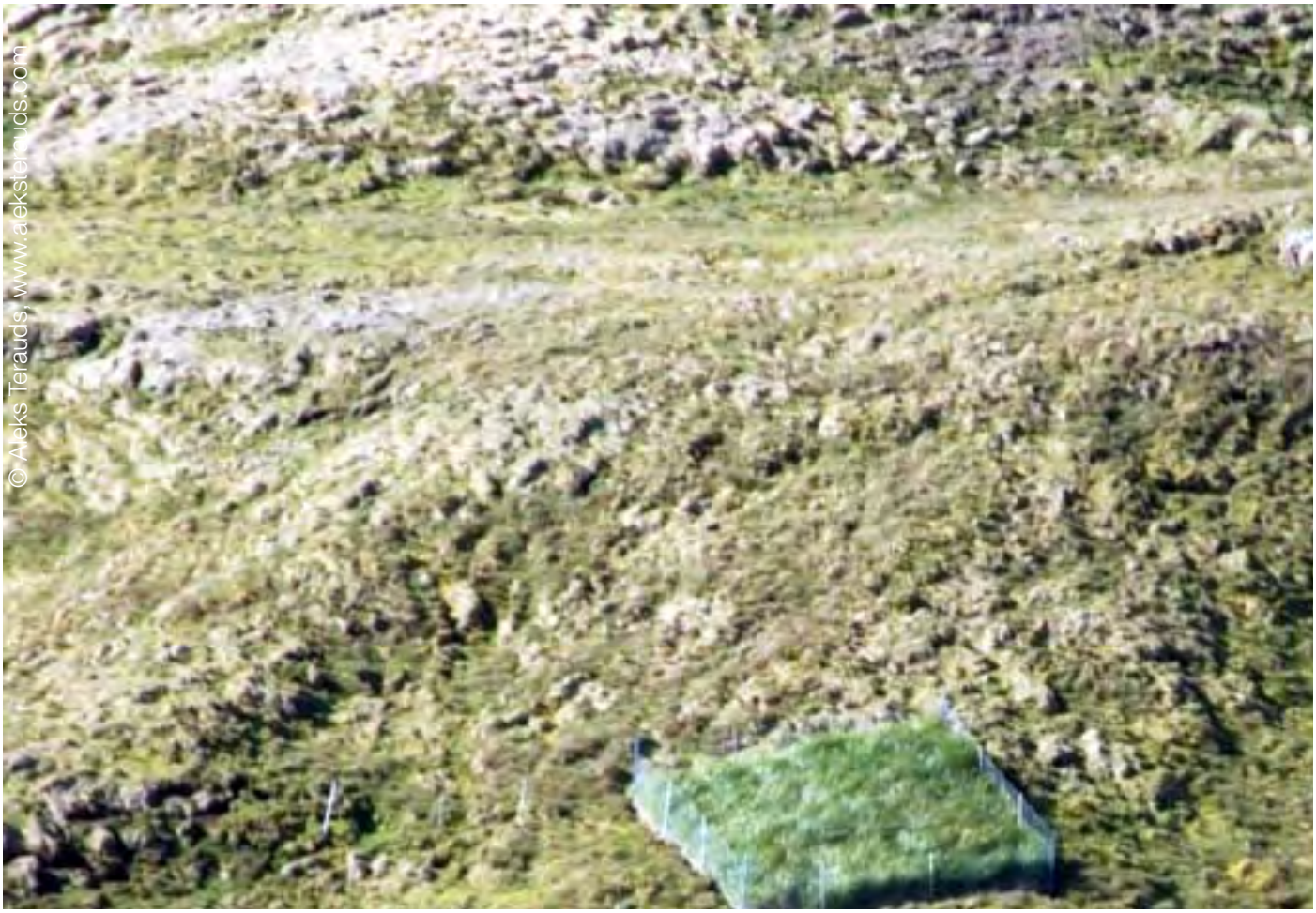
2006 – blue circles:
A further 6 coastal slope areas identified with extreme rabbit damage.

Base map courtesy of Tasmania Parks and Wildlife Service

Ungrazed and grazed tussock

Ungrazed and grazed Macquarie Island cabbage

Exclosure plot protected from grazing, with Macquarie Island cabbage



Exclosure plot protected from grazing, with tussock

Albatross chick (arrow) just above landslip on a rabbit devestated slope. Dead tussocks are grey

Pleurophyllum hookeri before and after grazing

Macquarie Island rabbit grazing frontiers

Rabbit grazing damage at Cape Toutcher, Macquarie Island, March 2006
Below the green line shows the original centre of damage, with tussock there killed and the pedestals bare.

Between the green and red lines shows the progression of grazing to the point where tussock has been totally grazed but the pedestals are covered in dead straw. At this stage pedestals will still have shoots emerging but will be grazed down before they can develop fully, and will soon look like the area immediately below.

Above the red line shows the area into which rabbits will be moving, but is still green and apparently healthy. In March 2006 the slopes to the right (into Rockhopper Bay) were among the last healthy tussock slopes remaining on Macquarie Island.

Grazing frontier, southwest coast
This indicates clearly the grazing frontier coming down the slope – the upper third of the slope on middle right of image has had tussock removed, then there is a light cream-brown band where tussock has very recently been destroyed, leaving dead leaves – then further down, a grey-brown band indicating partially grazed tussock – ie in progress- then lower third of slope, as well as slopes to the left of image, shows tussock not yet grazed. It is expected that these slopes will lose all their tussock in the near future.

This shows a similar scenario to image above – left side of image shows as-yet ungrazed slopes, then slanting down from upper left to lower right, there is a boundary where light brown takes over from green – this is where the tussock has been destroyed. The frontier will move further left and in the near future it is expected that all the green tussock will go. New landslipping is already visible on upper slopes all the way along the ridge.

Lusitania Bay landslip

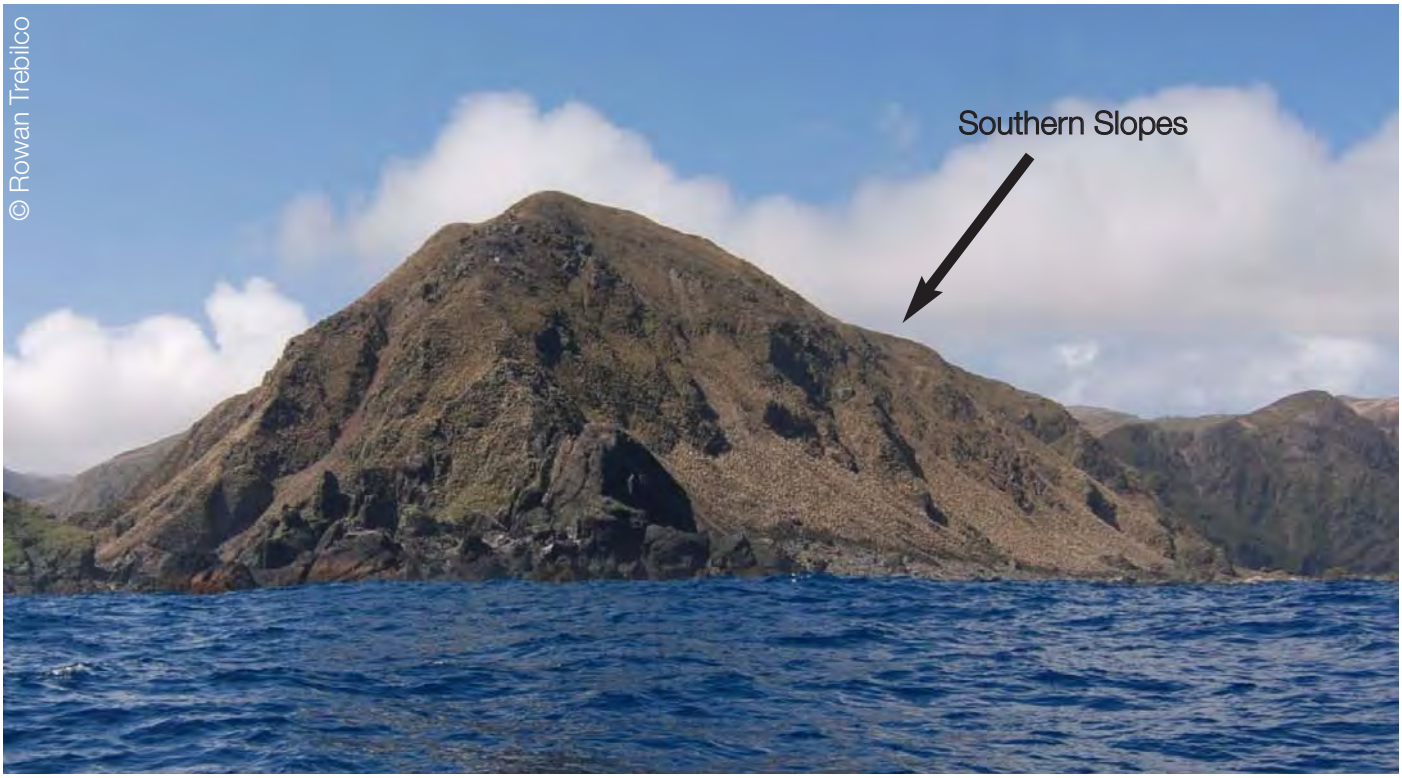
The Lusitania Bay landslip occurred in September 2006 and possibly killed hundreds of king penguins and chicks in the large colony below the slope.

King penguins

Dead chick buried in mud

Petrel Peak

HABITAT FOR THE GREY-HEADED ALBATROSS

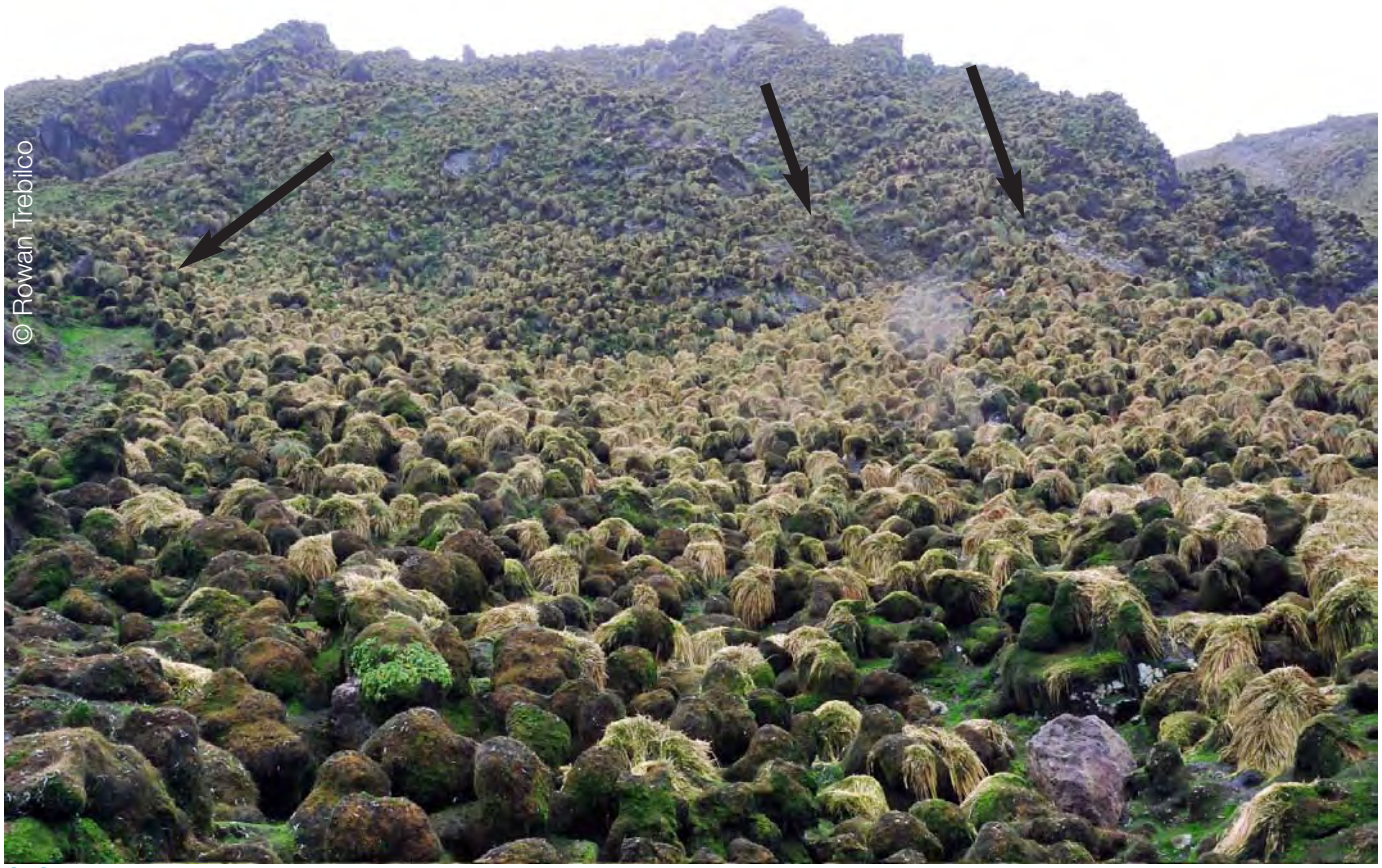


Petrel Peak grazed grey-headed albatross slopes
On the right hand side of the large peak are the steep slopes of the grey-headed albatross breeding area. The light brown colour indicates very recent grazing and death of tussocks. The whole breeding area has had the tussocks destroyed – the slopes should be a dark green colour, covered densely with huge tussocks, not dead and brown.

Before and after grazing damage - Petrel Peak southern slopes
(arrows denote landslips)

1995

2007



Before and after grazing damage - Petrel Peak southern slopes

1995

2007

Caroline Creek Gully

1995: Healthy tussock and Macquarie Island cabbage, before grazing

2003: All cabbage grazed, tussock startng to be grazed, new erosion

2006: All tussock destroyed, further erosion

2007: Further erosion between 2006 and 2007

Sandy Bay tourist boardwalk

1990: Heathy tussock

2005: All tussock destroyed

2007: No tussock regrowth; tussocks probably dead

* This boardwalk was inaccessible to tourists during the 2006-07 summer because of landslipping below (see next images)

Sandy Bay tourist staircase

1990: Heathy tussock and Macquarie Island cabbage

2005: Most tussock and cabbage destroyed, new slope erosion, spread of weed *Poa annua* (short green grass)

2007: Further erosion including large landslip to right of staircase

* This landslip next to the staircase occurred in September 2006 and resulted in the staircase (and boardwalk above it) being closed to tourists in the 2006-07 summer.

Finch Creek

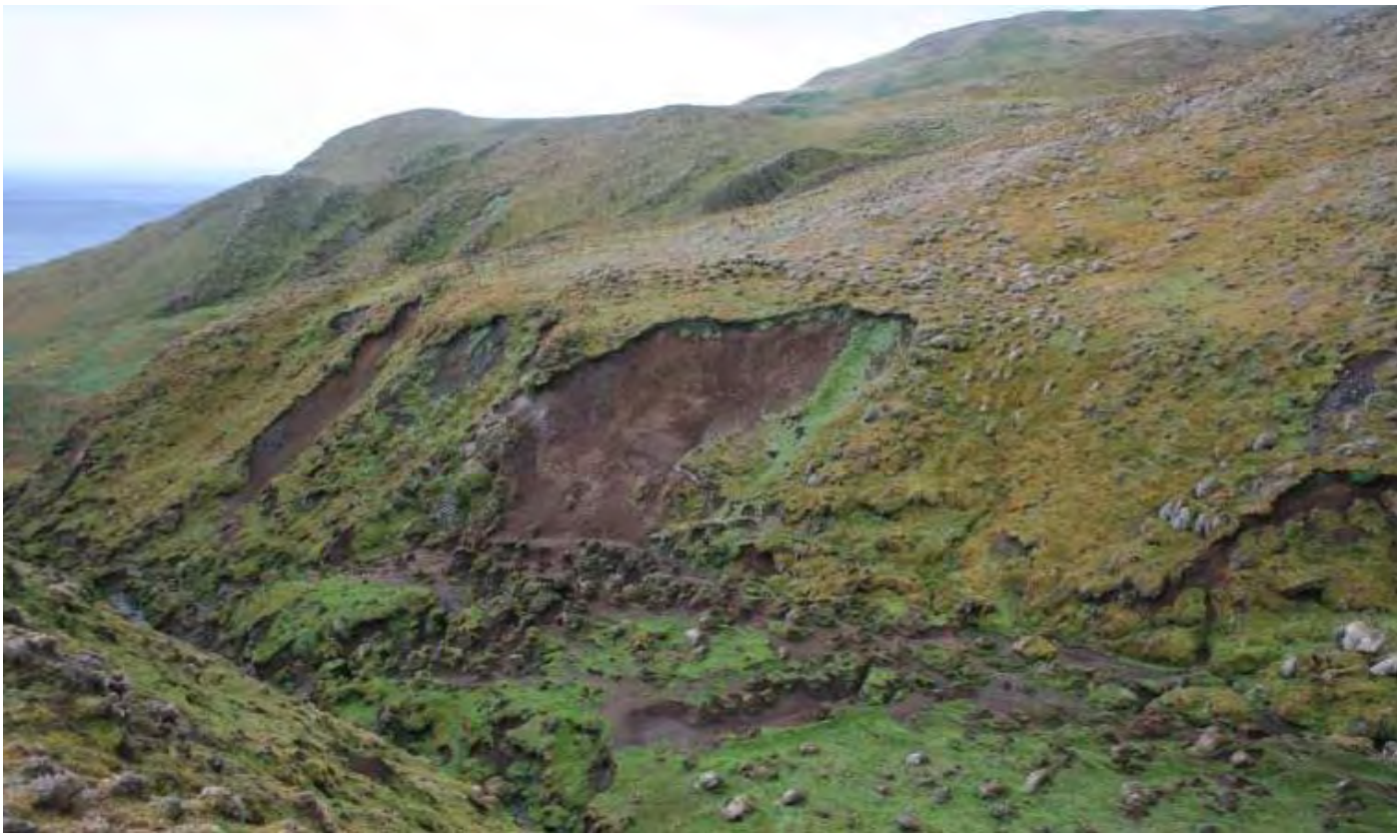
2003: The brown ferns (*Polystichum vestitum*) and the pale green *Pleurophyllum hookeri* are starting to be grazed

2007: All ferns, *Pleurophyllum* and tussock (in background) destroyed

Finch Creek valley

2003: All tussocks have been recently grazed (pale stumps) and erosion has started

2007: Increase in erosion and disappearance of tussock stumps as small plants take over



Hurd Point Gully

1995: Healthy tussock in foreground, scattered tussock on slopes above

2003: Tussock starting to be grazed and slope erosion increasing

2007: All tussock now destroyed, continuation of erosion and landslipping

Hurd Point landslip

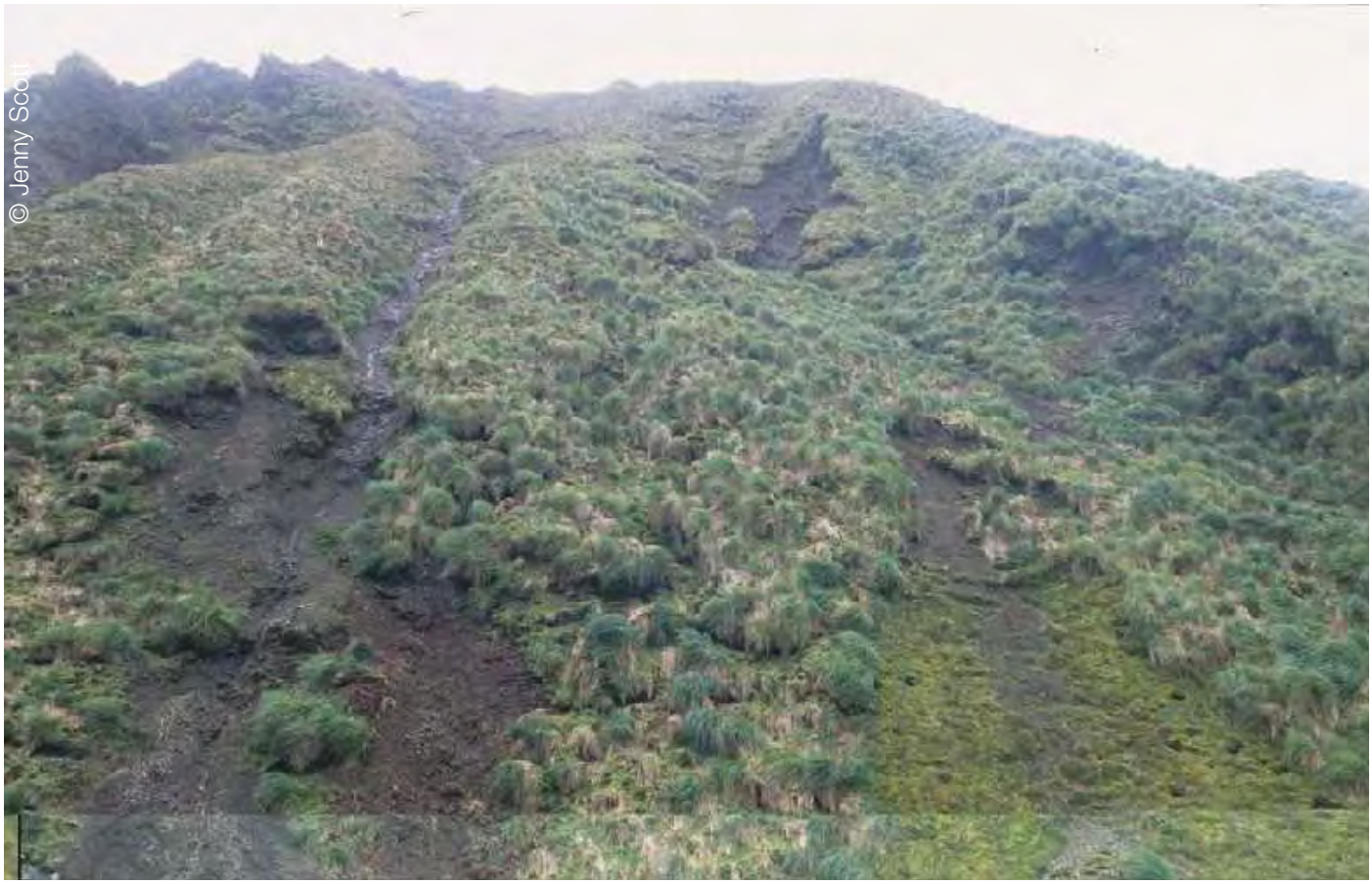
1995: Healthy tussock surrounding old revegetating landslip

2003: Tussock staring to be grazed, new rabbit diggings and erosion on slope

2007: All tussock destroyed, increased slope erosion

Hurd Point slope

2003: Tussock starting to be grazed, new slope erosion



2007: All tussock destroyed, slope erosion continues

Light-mantled sooty albatross chick on nest next to recently eroded slope

Light-mantled sooty albatross nest crushed by a rockfall (chick in nest was killed)

1.0 INTRODUCTION

1.1 Macquarie Island

Macquarie Island (54°30'S, 158°55'E) is a remote Australian subantarctic island located about 1500 km south-south-east of Tasmania in the Southern Ocean. The island is around 34 km in length and is an elongated plateau of up to 433 m above sea level, surrounded by steep coastal slopes 100-250 m in height. Macquarie Island has high nature conservation significance and is listed as both a World Heritage property and UNESCO Biosphere Reserve. It ranked amongst the top five islands in a delphi analysis of the natural conservation values of the majority of islands in the Southern Ocean region (Chown et al., 2001). The island is also a Nature Reserve of the State of Tasmania. It has a detailed management plan prepared by the Tasmanian Government, the *Macquarie Island Nature Reserve and World Heritage Management Plan 2006* (Parks and Wildlife Service, 2006).

The island is a rare example of uplifted oceanic crust in its original state, remaining relatively un-deformed by subsequent geological processes. It has spectacular landscapes, particularly along its rugged coasts where vast numbers of seals and seabirds, especially penguins, congregate during the breeding seasons against a backdrop of steep high slopes covered with tall tussock grass *(Poa foliosa)* and megaherbs such as the Macquarie Island cabbage *(Stilbocarpa polaris)*. Of the 27 species of native breeding birds, 15 are listed as threatened in some way (endangered, vulnerable or rare) under the *Environment Protection and Biodiversity Conservation Act* 1999 (Cth) ['EPBC Act 1999'] and/or *Threatened Species Protection Act 1995* (Tas) ['TSP Act 1995'].

Like most other subantarctic islands, Macquarie Island has populations of animals introduced during the sealing era. The weka *(Gallirallus australis scotti)*, a feral predatory bird, was eradicated by 1989 and feral cats *(Felis catus)* were eradicated by 2000 (PWS and BCB, 2007). However, three other introduced mammals remain on the island: European rabbits *(Oryctolagus cuniculus)*; black (ship) rats *(Rattus rattus)*; and house mice *(Mus musculus)*. Rabbits are causing significant environmental impacts to vegetation, natural landscape processes and habitats of threatened seabird species, while rodents are implicated in seabird predation and vegetation damage.

1.2 Criteria for inclusion on World Heritage List

Macquarie Island was inscribed as a World Heritage property in 1997, meeting two of the four criteria for listing a natural site, namely:

Criterion (i) *outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.*

Criterion (iii) *contain superlative phenomena or areas of exceptional natural beauty and aesthetic importance.*

(DEWR, 2007).

1.3 Macquarie Island World Heritage values

Criterion (i) geological values are not considered to be under threat and are not considered here. Under Criterion (iii), the Australian Government sets out examples of the World Heritage values for which Macquarie Island was listed, as follows:

'Macquarie Island has exceptional natural beauty and aesthetic importance and contains superlative natural phenomena. The World Heritage values include:

- *spectacular steep escarpments;*
- *extensive peat beds;*
- *large numbers of lakes, tarns and pools;*
- *dramatic changes in vegetation cover due to climatic conditions;*

- *extensive congregations of wildlife, including Royal and King penguins, present especially during the breeding season;*
- *majestic albatross (4 species) nesting on cliffs which are easily viewed;*
- *impressive colonies of elephant seals, allowing ability to view breeding and mating behaviour; and*
- *the remote, dramatic and essentially undisturbed location'.*

(DEWR, 2007)

All but one of the above Criterion (iii) World Heritage values are currently under threat from the impacts of feral animals, rabbits in particular. Listing under Criterion (iii) recognizes the importance of the island's natural landscape quality which is a summation of many factors - its wild and remote location, the geomorphological processes acting to shape the landscape, and the island's wildlife and vegetation. The impacts on these values are considered in Section 4.0 below.

Severe rabbit damage among dead tussock stumps, Hasselborough Bay

2.0 CONTEXT FOR CONCERN REGARDING THE CONDITION OF MACQUARIE ISLAND

2.1 Summary of the problem

In the first decade of the twenty-first century there has been an alarming escalation of environmental damage on Macquarie Island. A progressive increase in feral rabbit numbers has been associated with a massive loss of tall tussock *(Poa foliosa)* and megaherbs *(Stilbocarpa polaris* and *Pleurophyllum hookeri)* and increased landslipping and erosion. Subantarctic vegetation has no adaptations to mammalian herbivores, whose introduction to subantarctic islands has resulted in dramatic changes well-documented throughout the region (Frenot et al., 2005). Most significantly on Macquarie Island, the steep tussock-covered slopes, the most iconic landscape feature of the island and habitat for a number of threatened seabird species, have been degraded at a rapid rate. Rats and mice are implicated in vegetation damage. They also predate on invertebrates and threatened burrowing petrel species.

The *Macquarie Island Nature Reserve and World Heritage Area Management Plan 2006* recognises the eradication of rabbits, rats and mice as one of the highest conservation priorities for the island (Parks and Wildlife Service, 2006, p. iv). A detailed eradication plan for all three species was prepared in 2004-05 (PWS and BCB, 2007). Various delays prevented its commencement until early June 2007. The plan is expected to cost $A24.6 million, of which the Australian Government and the Tasmanian Government have committed to paying half each (Turnbull, 2007; Wriedt, 2007a, 2007b). The Australian Government will 'front-end' the first $A8 million over Years 1 and 2, with the Tasmanian Government contributing its share from 2009-10.

The delays in commencing the eradication plan have allowed severe rabbit damage to increase and spread on the island. Up to and including the time of writing, World Heritage and biodiversity values remain under threat. Furthermore, the damage will continue for several years after commencement of the plan (see below). The plight of Macquarie Island has generated considerable national and international media attention and public concern over the past year (see Appendix).

Due to the complex planning requirements and logistics of the eradication plan, there is at least two years' lead time from when the funding commitments were made, until on-ground baiting can commence. The funding was committed in early June 2007, which means it is likely that baiting will occur in winter 2009 at the earliest or, at worst, in winter 2010. The sooner that on-ground eradication can occur, the more comprehensive and rapid the recovery of the island's ecosystems will be. Financial costs will increase with additional delays. Given the rapid rate of ongoing damage, it is likely that the great majority of the steep coastal slope tall tussock vegetation (apart from a very small section of slopes which will be protectively fenced during 2007) will have been destroyed by rabbits before baiting can occur. Significant additional slope erosion will have further impacted the habitats of threatened seabird species, and vulnerable plant species of restricted distribution will have been further compromised. Recovery times for environmental damage will vary (see below) although these will become longer with additional delays and some damage may be irreversible.

2.2 History of the problem

Rabbits were introduced to Macquarie Island in the late 1860s by sealing gangs as a supplementary food source. In the 1950s the damage they were causing to the island's environment was recognized by scientists (Taylor, 1955) and a control program was instigated in the 1970s by the Tasmanian Parks and Wildlife Service, with introduction of the myxomatosis virus in 1978-79 (Brothers and Copson, 1988). This resulted in a large knockdown of the population. At this time most of the vegetation showed the effects of heavy grazing, apart from the steep remote tussock-covered slopes in the southwestern part of the island which had always escaped rabbit incursion (Scott, 1988). Between 1980 and 1995 evidence of vegetation regrowth was widespread over the island (Copson and Whinam, 1998, 2001), although localised patches of severe grazing still occurred sporadically.

There was general optimism from managers and scientists that the rabbit control program was keeping rabbits in check so that vegetation recovery could continue until eradication became technically possible (Brothers and Copson, 1988). In 1997 the island was listed as a World Heritage property.

In the late 1990s rabbit numbers started to expand again and are currently increasing rapidly. Rabbit numbers were estimated at 150,000 in 1978-79 when myxomatosis was introduced, declining to approximately 50,000 over the next six years and remaining below 20,000 between 1985 and 2000 (Copson et al., 1981; Copson and Whinam, 2001; Kirkpatrick and Scott, 2002; Department of Primary Industries and Water (DPIW), unpublished data). The latest rabbit population estimates range between 100,000 and 152,000 between 2005 and 2006 (PWS, unpublished data).

The current explosion in rabbit numbers appears to be due to a combination of factors. The myxoma virus is no longer available and had started to lose its effectiveness; no other control measures are considered suitable, including calicivirus; rabbit breeding success during winters appears to have increased, possibly due to climatic factors; and cats, a major predator, were eradicated by 2000 (PWS and BCB, 2007).

Since the late 1990s grazing damage around the island has escalated, largely reversing the effects of vegetation recovery during the 1980s and 1990s and going beyond the extent of environmental damage before the rabbit control program began. Of particular concern is the severe damage which has been occurring at the far southern end of the island on some of the few extensive areas of steep coastal slopes which had never been accessed by rabbits (Scott, 1988). The island's landscapes, especially the steep coastal slopes which provide a backdrop to the spectacular wildlife congregations along the beaches, are currently undergoing severe damage. Threatened seabird species are being impacted, and changes are occurring in the rate of natural geomorphic processes.

2.3 Potential for ecosystem recovery

Eradication of rabbits and rodents will allow substantial recovery of the island's vegetation without the need for any large-scale intervention to assist rehabilitation, although recovery may take many years, even decades, in the more severely degraded areas and some changes may be irreversible.

Scott and Kirkpatrick (submitted ms) documented the processes of vegetation recovery, then subsequent deterioration, over the 23 year period between 1980 and 2003 on the steep coastal slopes. The study covered the period of initial knockdown of the rabbit population, then the increase in numbers. They concluded that, if grazing pressure is removed soon from slopes which have been severely grazed for the first time within the past decade, the majority of the tall tussock vegetation will recover rapidly - most likely within a decade, rather than not for many decades or even longer. However, the nature of vegetation change meanwhile, and the likely changes in associated water relations and soil properties, may mean that recovery will be slow and in some cases may not occur. The sooner that grazing is halted, the more rapidly and completely the vegetation will recover to its natural state. The introduced weed (*Poa annua)*, common and widespread on newly grazed and seasonally disturbed areas, will be out-competed within several years by native plant species once the disturbance factor is removed (Scott and Kirkpatrick, submitted ms).

The few exclosure plots on the island also indicate the potential for rapid recovery once rabbits are removed (Copson and Whinam, 1998; Bergstrom et al., 2006; J. Scott, unpublished data; J. Jenkin, unpublished data; PWS, unpublished data) (refer to p 5). We know definitely that vegetation recovery will be rapid in small areas where nearby tall tussock vegetation remains intact, if disturbance ceases within several years after its occurrence.

However, it is not known how long it will take for regrowth to occur on very large severely grazed areas without adjacent seed sources.

There may be justification for fencing of *P. foliosa* and *S. polaris* plots in southern areas of the island where these two species have been removed over large expanses of the coastal slopes, to provide a readily available local seed source once eradication occurs.

A total of 24 of the 27 native species of breeding birds on Macquarie Island, including 15 threatened species, are expected to gain long-term benefits from eradication of rabbits and rodents (PWS and NCB, 2007).

It will be important to ensure that regular reporting, including State of Conservation reporting, and monitoring mechanisms are in place to ensure that the eradication program proceeds as planned. On-ground monitoring programs already established will continue (PWS and BCB, 2007).

2.4 Likely scenario until on-ground eradication occurs

Photo-monitoring of Scott and Kirkpatrick's study sites has continued to 2007, and in the four years since the sites were last measured most have undergone significant further deterioration. The April 2007 voyage to Macquarie Island included an official inspection team with members of the Australian and Tasmanian State Governments and WWF-Australia. The team observed severe rabbit damage to the island and its World Heritage values. As from early June 2007 commitment to corrective action has been achieved, and demonstrable action (on-ground eradication) will now be able to commence either during the austral winter of 2009 or winter 2010.
Until on-ground eradication of rabbits and rodents occurs there will be continued loss of natural landscape character and World Heritage values, continued depletion of vegetation communities and an increase in associated slope instability, continued spread and maintenance of the weed *Poa annua*, and further flow-on effects to threatened seabird populations which are dependent on the tall tussock vegetation communities for breeding areas. Predation of small burrowing birds by subantarctic skuas *(Catharacta lonnbergi)*, a native predatory seabird, is likely to intensify, and impacts from rodents will continue, although little is known of their current predation levels. Wounding of albatross chicks by mice has been reported on other Southern Ocean islands, and until mice are eradicated from Macquarie Island the potential risk of similar behaviour cannot be ignored (see below).

2.5 Likely scenario if no agreement for eradication was achieved

If the commitment to eradicate rabbits and rodents had not been given there would have been a continued massive loss of World Heritage values as described in Section 2.4 above.

Additionally, there have been alarming reports of widespread mouse predation on the chicks of threatened species of albatross and petrels on Gough Island, another Southern Ocean World Heritage property, resulting in severe wounding and death of chicks, and anecdotal evidence of a similar problem on subantarctic Marion Island with mice wounding wandering albatross *(Diomedea exulans)* chicks (Wanless et al., 2007). Although this has not been reported on Macquarie Island, the extremely small size of the island's wandering albatross population (less than 10 eggs laid per year, Parks and Wildlife Service, 2006) was a potential cause for future concern if the eradication plan for rabbits and rodents had not been activated. The costs of non-action in terms of ecosystem damage, and the resources necessary to repair this damage, would have continued to escalate the longer the problem was left unresolved.

3.0 FRAMEWORK FOR CONCERN REGARDING THE CONDITION OF MACQUARIE ISLAND

3.1 State Party's Duty under World Heritage of World Heritage Convention Articles 4 and 5 (d)

Under the *Convention concerning the Protection of World Cultural and Natural Heritage* (hereafter, 'the Convention'), art 4, each State Party, inter alia:

'recognizes that the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage [of outstanding universal value] situated on its territory, belongs primarily to that State. It will do all it can to this end, to the utmost of its own resources and, where appropriate, with any international assistance and co-operation, in particular, financial, artistic, scientific and technical, which it may be able to obtain.'

State Parties are also required, under art 5(d), to:

'take the appropriate legal, scientific, technical, administrative and financial measures necessary for the … conservation, presentation and rehabilitation of this heritage.'

The financial measures necessary for the "conservation, presentation and rehabilitation" of the heritage of Macquarie Island entail the funding required for the eradication plan to commence. The Convention required the Australian Government to ensure this occurred. In early June 2007 the Australian and Tasmanian Governments "agreed in principle to provide funding of $24.6 million in equal shares to implement the *Plan for the Eradication of Rabbits and Rodents on Subantarctic Macquarie Island*" (Turnbull, 2007). The Australian Government committed to funding the first two years of the plan with $A8 million, with the Tasmanian Government starting its funding contribution thereafter (Turnbull, 2007; Wriedt, 2007a, 2007b).

However, as described in Section 2.1 above, it will be the austral winter of 2009 or winter 2010 before demonstrable corrective action (on-ground eradication) can commence. Until then the damage to the island's World Heritage values will continue. The sooner grazing is halted, the more rapidly and completely vegetation will recover to its natural state (Section 2.3 above).

Hence, having made the above financial commitment, it is now incumbent on the Australian and Tasmanian Governments "to take the appropriate legal, scientific, technical, administrative … measures necessary for the … conservation, presentation and rehabilitation" of Macquarie Island's natural heritage: Convention art 5(d). Both Governments must therefore use their best endeavours to ensure that all necessary measures are taken to fully implement the plan and enable actual eradication to commence in winter 2009, rather than winter 2010.

3.2 List of World Heritage in Danger

The Convention, art 11(4), provides for World Heritage properties to be placed on the List of World Heritage in Danger. As UNESCO states:

'The List of World Heritage in Danger is designed to inform the international community of conditions which threaten the very characteristics for which a property was inscribed on the World Heritage List, and to encourage corrective action……

…Dangers can be 'ascertained', referring to specific and proven imminent threats, or 'potential', when a property is faced with threats which could have negative effects on its World Heritage values.'
(UNESCO, 2007a)

Until the funding for corrective action was committed in early June 2007 we regarded the situation on Macquarie Island as fully meeting the requirements for placing on the List of World Heritage in Danger, under Operational Guideline 180 of the *Operational Guidelines for the Implementation of the World Heritage Convention* (WHC, 2005). Even now, with commencement of the eradication plan in early June 2007, significant further damage will continue to occur on the island for either two or three more years before on-ground eradication actually occurs.

3.3 Ascertained danger: Operational Guidelines, clause 180(a)(i) and (ii)

As noted above, even with funding now agreed it will be two or three years before on-ground corrective action can commence and further damage to Macquarie Island and its World Heritage values will occur during this period. Given this, in our view Macquarie Island meets the test for 'ascertained danger' under clause 180(a)(i) and (ii) of the *Operational Guidelines for the Implementation of the World Heritage Convention* (WHC, 2005), namely that 'the property is faced with specific and proven imminent danger' through:

' (i) A serious decline in the population of the endangered species or the other species of outstanding universal value for which the property was legally established to protect ….

(ii) Severe deterioration of the natural beauty or scientific value of the property ….'

(WHC, 2005)

The further evidence for this assertion is outlined in Section 4.0 below.

3.4 Relevant examples of properties on the List of World Heritage in Danger

Out of the 830 properties currently on the World Heritage List, 31 are inscribed on the List of World Heritage in Danger (UNESCO, 2007b). The majority are cultural rather than natural sites, and the majority of both categories are in developing countries.

Currently there is only one example of a World Heritage in Danger property in a developed country which is listed under Operational Guideline 180 (natural properties). This is the Everglades World Heritage Area in the USA. The major threats to the Everglades include alterations to the hydrological regime as well as impacts from adjacent urban growth (UNESCO, 1994). Despite the initiation of substantial Government actions in recent years which have resulted in significant improvements to the state of conservation of the property, the threats represent a series of ongoing processes which in 2006 still justified the World Heritage in Danger inscription (UNESCO, 2007b).

In a similar way, implementation of the eradication plan for rabbits and rodents for Macquarie Island will not produce immediate results, and it will take time for the on-ground baiting phase of the eradication to occur (two years minimum lead time from when funding was committed) and then to reach completion (follow-up on-ground operations for up to five years after baiting). Evidence from regular photo-monitoring up to early 2007 indicates that the damage to the island is an ongoing process and will progressively worsen until the time when actual eradication can occur. After eradication it is expected that the island's ecosystems will recover over time, although initially some slopes may exhibit further landslipping and erosion before starting to stabilise. Ecosystem recovery will occur without the need for large-scale active rehabilitation, although some of the most severely damaged areas may take a very long time to recover and in some cases damage may be irreversible.

4.0 MACQUARIE ISLAND WORLD HERITAGE VALUES: THREATS AND IMPACTS

It is clear from various sources of information, including Scott and Kirkpatrick's study on vegetation change, the recent nomination to upgrade the threatened status of the grey-headed albatross population, and long-term photo-monitoring documentation up to early 2007, that World Heritage values for Macquarie Island under Criterion (iii) are under threat, and are undergoing serious impacts, from ongoing rabbit activity. The island's landscapes, especially the steep coastal slopes which provide a backdrop to the spectacular wildlife congregations along the beaches, have experienced, and are experiencing, severe damage. Threatened seabird species are being impacted and changes are occurring in the rate of natural geomorphic processes. Although funding has now been committed for eradication of rabbits and rodents, on-ground corrective action will not proceed until winter 2009 at the earliest, winter 2010 at the latest. In the meantime the threats and impacts will continue.

The World Heritage values under Criterion (iii) are being negatively affected by rabbits in the following ways. Rats and mice are also implicated and their effects are noted wherever sufficient information is available. The sub-headings in inverted commas are the values as given in the listing statement.

'Spectacular steep escarpments'

Many of the vegetated escarpments, especially in the south of the island, have recently been denuded of the dominant plant species (tall tussock, *Poa foliosa* and Macquarie Island cabbage, *Stilbocarpa polaris*). Along the north-west and east coasts where broad coastal terraces allowed incursion of rabbits onto the steep slopes from below, the removal of this vegetation had occurred in the past before myxomatosis was introduced in 1978-79, leaving a mosaic of vegetation communities and large expanses of short grassland in place of the natural 'climax' tall tussock community. Up until the last decade the steep coastal slopes in the south and south-west of the island remained ungrazed by rabbits, as they were more difficult to access, and they had retained their spectacular extensive stands of tall tussock vegetation and their wild remote character (Scott, 1988).

Within the last decade however, these slopes have been dramatically impacted. Analysis of a series of images taken from offshore during the 2006-07 summer and covering the south and south-west coast indicates significant recent damage. Over a 14 km stretch of coastline more than two-thirds of the tall tussock vegetation on the steep coastal slopes has recently undergone severe grazing. An active 'grazing frontier' is clearly visible, and it is likely that the rest of the slopes will also lose their tall tussock vegetation in the near future (refer to pp. 8-9).

From a distance many of these slopes in early 2007 presented a knobbly light-brown appearance from grazed tussock stumps with their dead leaves still attached, indicating that the damage probably occurred in the previous year. New landslips are evident and the slopes are likely to remain unstable until re-establishment of vegetation cover which can bind the soil surface layer together. Unless rabbit eradication is undertaken in the near future the likelihood of the tussocks regenerating is low. Inhibition of regrowth by preferential grazing of the shoots will lead to death of the tussock root mass, a process which may take several years, and *P. foliosa* seedling growth will similarly be prevented. In the meantime further soil erosion and landslipping is inevitable, as the roots of small herbs and grasses establishing on the slopes are not likely to be as effective at stabilising the soil as the rhizome systems of *P. foliosa* regrowth. With further delays in implementation of eradication, or non-action, the eventual scenario would either be replacement by short grassland or partial recovery to a mosaic of vegetation communities. Either scenario would represent a significant loss of the island's natural landscape quality.

There are now very few areas remaining on the island which indicate the once-pristine nature of the coastal landscape. The two dominant plant species, tussock and

Macquarie Island cabbage, are being removed along all sections of the coast, not only in the south. New landslips and severe erosion in gullies are common all around the island's coasts and inland valleys. A small 0.5 km^2 area at the northern tip of the island, North Head, has some of the few remaining tussock-covered slopes with a minimal amount of rabbit damage. This area is to be fenced against further rabbit incursion during 2007 in recognition of this fact. A series of exclosures will also be constructed around the island to protect the seedbank of vulnerable plant species with restricted distributions (J. Shaw, pers. comm.) such as the two endemic orchid species *Nematoceras dienema* and *N. sulcatum*, the large fern *Polystichum vestitum* and the club-moss *Huperzia australiana.*

Macquarie Island is tectonically active and subject to considerable mass movement (Jones and McCue, 1988; Selkirk, 1996). Landslipping is a natural part of the coastal slope environment, with large rainfall events and seismic events the two major initiating factors (Scott, 1988; Selkirk, 1996). However, in the last decade the incidence of landslipping has increased in association with slope denudation through rabbit activity. In addition to more landslips occurring, the expansion of bare eroded areas has been noted where the surface peat layers upslope of the eroded areas are no longer bound together by *P. foliosa* roots and slump downwards. This in turn can lead to further landslipping.

As a related but less visible impact, the balance between soil water, groundwater and surface runoff is likely to have been affected by removal of large areas of tall tussock vegetation, which would have transpired large volumes of soil water to the atmosphere. Subsequent build-up of soil water is likely to impose large stresses on slopes no longer stabilised by tussock roots. This may explain the observed increase in landslip activity over the slopes in general.

'Extensive peat beds; large numbers of lakes, tarns and pools'

There has certainly been an acceleration in land degradation on Macquarie Island over the last decade. This has been well documented through long-term photo-monitoring programs.

Changes in soil water and springflow regimes on the island, and possibly also in deeper groundwater regimes, appear to be leading to increased surface runoff and an increased rate of stream incision. This in turn will lead towards an increased rate of landslipping and slumping of banks in central stream channels in the mid-altitude plateau valleys and on the coastal slopes. On the island's plateau and in the inland valleys, burrowing by rabbits is already impacting upon relict geomorphic features indicative of past environments, such as raised beaches and lunette dunes, and disrupting the stratigraphy of ancient lakebed deposits. These features will not recover after damage.

On Macquarie Island the widespread effects of rabbits on vegetation, soil and water have resulted not in a change of geomorphic processes, but in an increase in the rate at which they operate. This goes against an important principle in geoheritage management, the 'maintenance of natural rates and magnitudes of change' in environmental processes (Sharples, 2002, p. 16). Following eradication of rabbits, some elements of the landscape will revert to natural rates of change, although due to the widespread scale of the damage it may take many years for the natural rates of processes to be restored.

'Dramatic changes in vegetation cover due to climatic conditions'

Detecting natural changes in vegetation communities due to changes in micro-climate and micro-habitat is now

difficult and sometimes impossible on Macquarie Island due to the widespread confounding and blurring effect of rabbit grazing. This is in stark contrast to Heard Island, Australia's other World Heritage subantarctic island property which has no feral animal influence and where dramatic changes in vegetation communities can be seen over very short distances. On Macquarie Island rats and mice are likely to be impacting upon ecosystem functioning including nutrient recycling systems, as has been documented for other subantarctic islands (Frenot et al., 2005). Evidence of rodents severely impeding seedling recruitment has been documented on Macquarie Island, and dietary evidence indicates that invertebrate populations are being impacted (Shaw et al., 2005; PWS and NCB, 2007).

'Extensive congregations of wildlife, including Royal and King penguins, present especially during the breeding season'

The large coastal penguin populations are not currently affected to any great degree by rabbit damage. A number of king penguins *(Aptenodytes patagonica)* however, possibly several hundred although this has not been confirmed, were killed at Lusitania Bay in September 2006 as a result of a landslip on rabbit-damaged slopes behind the colony. The penguins' habit of congregating in stream-courses at the base of the coastal slopes makes them potentially susceptible to further mortalities from an increased rate of landslipping (refer to pp. 10-11).

Macquarie Island supports breeding populations of at least seven species of burrowing petrels, most of which are listed as threatened in some way (endangered, vulnerable or rare) under the EPBC Act 1999 and/or the TSP Act 1995. At least three of these threatened species (grey petrels *Procellaria cinerea*, blue petrels *Halobaena caerulea*, white-headed petrels *Pterodroma lessoni)* and possibly soft-plumaged petrels *(Pterodroma mollis)* depend on tall tussock habitat for shelter and survival. All burrowing petrel colonies on the island have now been affected by rabbit grazing (PWS and NCB, 2007). A number of colonies have had their tussock vegetation removed, exposing the birds to increased predation from skuas. Skua numbers themselves have risen to unnaturally high levels on the island as a result of the recent increase in rabbit numbers. Competition for bird burrows from rabbits, and destruction of nesting habitat and nesting sites by slope instability and erosion, have also been noted (PWS and NCB, 2007). Rats are identified as an ongoing threat to at least nine species of birds breeding on Macquarie Island, and mice have been documented eating burrowing petrel eggs (PWS and NCB, 2007).

'Majestic albatross (4 species) nesting on cliffs'

Four species of albatrosses breed on Macquarie Island, and all are listed as threatened in some way (endangered, vulnerable or rare) under the EPBC Act 1999 and/or the TSP Act 1995. The nesting habitat of three species is under threat from rabbit-induced degradation on coastal slopes where tall tussock vegetation has been removed. Nests of light-mantled sooty albatrosses *(Phoebetria palpebrata)* have already been reported as lost in longterm study areas. Under conditions of increasing slope instability, the pedestalled nests can simply topple off the hill, and at least one chick has been reported killed in its nest due to rockfalls from above (refer to p. 29). At one light-mantled sooty albatross breeding area, several years of severe rabbit grazing resulted in such slope instability that nest loss contributed to almost half the nesting birds failing to rear a chick at the site in one season (A. Terauds, pers. comm.).

On Petrel Peak in the island's south, the entire slope habitat of the black-browed albatross *(Thalassarche melanophrys)* and the grey-headed albatross *(Thalassarche chrysostoma)* has now been denuded of *P. foliosa* tussock and some landslipping has already occurred (see description in 'Spectacular steep escarpments' section above and see pp. 13-15). Nest loss is expected if not al-

ready occurring. The slopes are expected to remain in an unstable state for some time, with further landslipping and erosion expected.

The south-facing slopes of Petrel Peak represent the sole breeding area both on Macquarie Island and in Australia for the grey-headed albatross, which has a small breeding population of less than 100 pairs annually (Terauds et al., 2005). The breeding slopes cover a small area of around 0.12 km^2 (WWF-Australia, 2007). The species is currently listed as 'vulnerable' under the EPBC Act 1999 and as 'endangered' under the TSP Act 1995 (Parks and Wildlife Service, 2006). In recognition of the importance of this habitat for the grey-headed albatross, Macquarie Island was listed in 2002 on the Register of Critical Habitat under the EPBC Act 1999 (Parks and Wildlife Service, 2006).

In view of the extent of habitat destruction already evident on the grey-headed albatross breeding slopes, and the likelihood of the species' future population decline as a result, a proposal has been put forward to upgrade its threatened status from 'vulnerable' to 'endangered' under the EPBC Act 1999 (WWF-Australia, 2007). The impact from rabbits has the potential to affect both breeding numbers through a reduction in habitat, and breeding success through increased slope instability. If rabbit grazing continues then the already low numbers of grey-headed albatrosses on Macquarie Island are extremely likely to decline, and it is predicted that the decline would be rapid (WWF-Australia, 2007).

Mouse predation on albatross chicks has been documented for other Southern Ocean islands (see Section 2.5 above). Although this has not been observed on Macquarie Island it does present a potential scenario for the future if rodents were allowed to remain on the island, an alarming possibility considering the low population numbers of several of the albatross species.

'Impressive colonies of elephant seals, allowing ability to view breeding and mating behaviour'

Not affected.

'The remote, dramatic and essentially undisturbed location'

Macquarie Island is remote and its scenery dramatic. The location is most definitely not undisturbed however, and the disturbance is spreading rapidly. Many of the coast-facing slopes, a backdrop for the spectacular wildlife congregations on the beaches, have a degraded and ugly appearance, with dead brown tussock stumps, bare soil and erosion. Rabbit activity is contributing to spread of the introduced weed *Poa annua*, which establishes and flourishes on continually disturbed ground.

Visitors to the island on tourist cruises are permitted to land at two sites only, due to the 'sensitivity' of the environment. However, these two sites, at Sandy Bay and the Isthmus on the north-east coast, are both now exhibiting severe effects of rabbit grazing and slope degradation. At Sandy Bay the boardwalk staircase which formerly led inland to view a colony of endemic royal penguins *(Eudyptes schlegeli)* had to be closed during the 2006-07 tourist season on safety grounds, due to landslipping and erosion on the slope (refer to pp. 18-21). This means that visitors can no longer view these unique seabirds in a breeding colony, and can no longer access the island inland of the landing beaches. Experience as a lecturer on the cruise ships by one of the authors (Jenny Scott) confirms that visitors are distressed and concerned by the degradation. On one of the cruise ships last season, a letter and petition to the Australian Commonwealth Environment Minister was organised by several passengers and signed by 87 of the 110-odd passengers and staff.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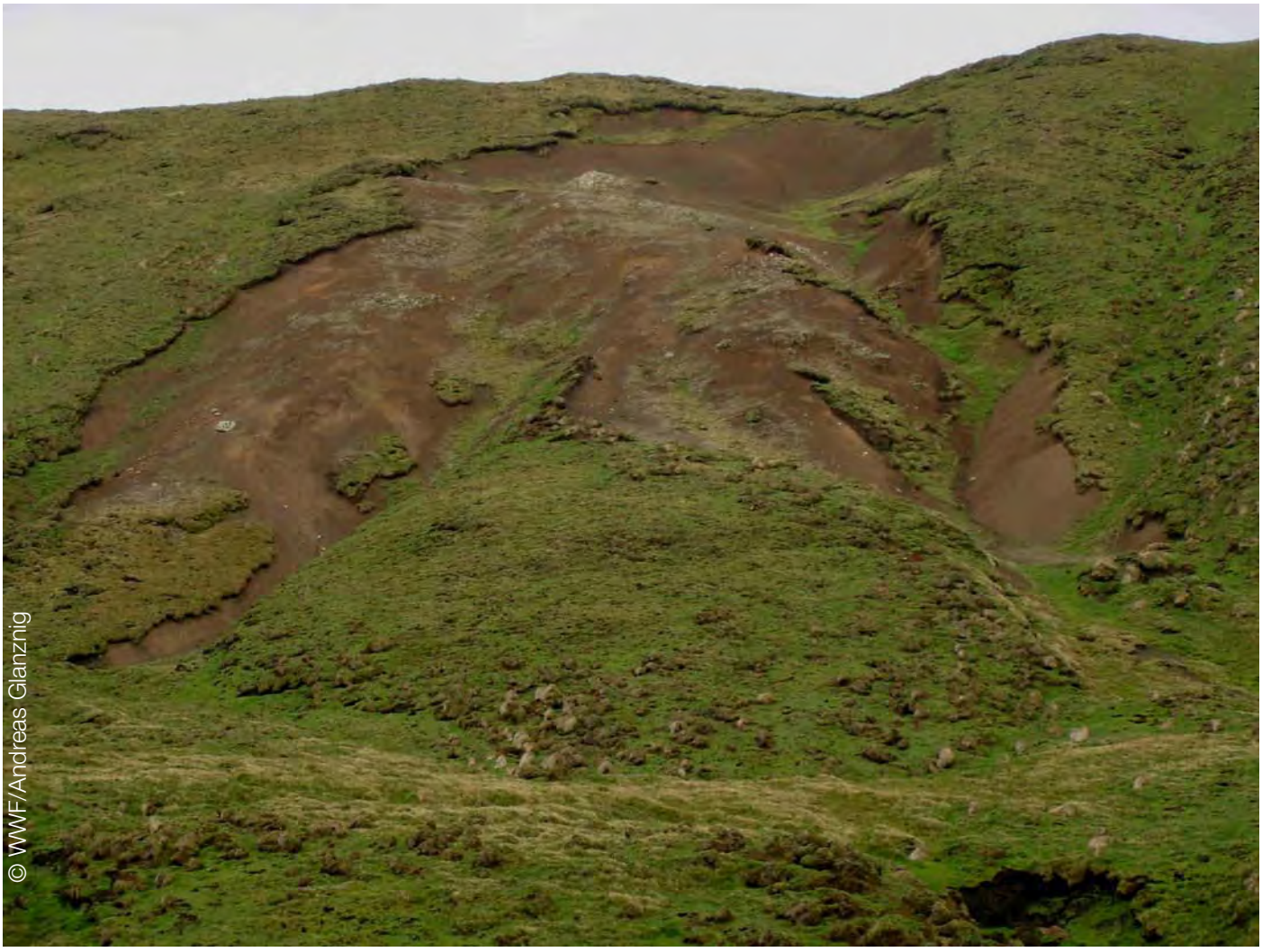

Landslip on severely rabbit grazed slope, Bauer Bay

5.0 CONCLUSION AND RECOMMENDATION

From the material presented above it is clear that the natural heritage of Macquarie Island, including World Heritage values, is being severely impacted by rabbits and rodents with the effects of rabbit damage especially evident. A comprehensive eradication plan for rabbits and rodents has been prepared and approved, and the Australian and Tasmanian State Governments committed to fully funding the plan in early June 2007 after considerable delays of 18 months or more. During the delays, the situation was one of increasing levels of damage. As from early June 2007 there will be several years' lead time before on-ground eradication work can commence, with further damage continuing before actual baiting occurs. After eradication, substantial recovery of ecosystems will occur over time without the need for large-scale active rehabilitation, although further slope erosion is predicted before eventual stabilisation.

The ongoing nature of these processes leads us to recommend strongly that the Macquarie Island World Heritage property should be closely monitored, and regular State of Conservation reporting undertaken, until on-ground corrective action has been successfully applied, namely the actual eradication of the pest species.

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APPENDIX:
WWF-Australia media summary

Date	Title	Media Outlet
Thursday 19/10/06	Island sanctuary ruined by rabbits	The Australian
Thursday 19/10/06	Island sanctuary ruined by rabbits	Herald Sun
Thursday 19/10/06	Vic: Rabbit explosion “devastating” heritage-listed island	AAP
Friday 20/10/06	Vermin ruining remote island	The Border Mail, p. 20
Friday 20/10/06	Rats and rabbits ruin isle	Herald Sun, p. 13
Friday 20/10/06	Macquarie is. rabbit warning	Launceston Examiner, p. 4
Friday 20/10/06	World Heritage island in Australia threatened by rabbits and rats	WWF International website
Saturday 21/10/06	Rabbits blamed for penguin deaths in landslide	ABC Tasmania
Saturday 21/10/06	Rabbits devastate Macquarie Island	Canberra Times, p. 18
Saturday 21/10/06	Researcher calls for Macquarie Is rabbit cull	ABC on line
Saturday 21/10/06	Penguins die in landslide	Sun Herald, p. 32
Saturday 21/10/06	Macquarie Island’s $10m rabbit cull	Ninemsn/AAP
Sunday 22/10/06	Isle of devastation	Sunday Tasmanian p. 3
Monday 23/10/06	Rabbits decimating Macquarie Island	Central Western Daily, p. 5
Tuesday 24/10/06	Tas: work under way to address rabbit problem	AAP
Tuesday 24/10/06	Rabbit plague threatens fragile Southern Ocean birds	Reuters foundation
Tuesday 24/10/06	Rabbit plague threatens fragile Southern Ocean birds	Reuters India
Tuesday 24/10/06	Rabbit plague threatens fragile ocean birds	Reuters South Africa
Tuesday 24/10/06	Rabbits ‘destroy’ seabird habitat	BBC News
Tuesday 24/10/06	Island sanctuary to be rid of rabbits	The Australian
Wednesday 25/10/06	Island on burrowed time	The Mercury Newspaper
Wednesday 25/10/06	Rabbits, rodents vs. penguins, albatross on isle	MSNBC (U.S) online
Wednesday 25/10/06	[No title]	International Herald Tribune
Wednesday 25/10/06	Tasmania to exterminate rabbits	The Kalgoorlie Miner
Thursday 26/10/06	Insel der Killer-Kaninchen (Island of the Killer Rabbits)	Sueddeutsche Zeitung (German daily newspaper)
October 2006	World Heritage island threatened by rabbits and rats	World Commission on Protected Areas Australia and New Zealand Newsletter 4
Tuesday 21/11/06	[No title]	ABC Radio 936 “Drive”
Tuesday 21/11/06	[No title]	ABC Radio national news, 6 pm
Tuesday 21/11/06	[No title]	ABC TV news, 7 pm
Wednesday 22/11/06	Australia’s grey-headed albatross faces extinction	WWF International website, Switzerland
Thursday 23/11/06	Rabbits putting albatross at risk, environmentalists warn	ABC Radio National -The World Today
Sunday 17/12/06	Macquarie plague plea Rabbits wrecking Antarctic habitat	The Sunday Tasmanian
Sunday 17/12/06	Rabbits ‘wrecking’ Macquarie Island	The Australian
Friday 19/01/07	Macquarie Island fights ferals	AAP / Travel Trade

Saturday 20/01/07	Rabbits destroying wildlife	Sunshine Coast Daily, p. 62
Monday 26/3/07	Growing rabbit problem on Macquarie Is	ABC Radio - PM
Tuesday 27/3/07	Island pest aid refused	The Mercury
Wednesday 10/01/07	War on feral cats triggers even worse disaster for Antarctic island	South China Morning Post
Sunday 21/01/07	Rare birds close to the edge	The Sun-Herald, p. 2
Monday 22/01/07	Cull upsets island's ecological balance	The UK Daily Telegraph
Monday 22/01/07	[No title]	BBC radio, live interview with Jenny Scott
Monday 22/01/07	Funds needed to tackle Macquarie Island's rabbits and rats: tour guide	ABC radio (Tony Dorr)
Wednesday 24/01/07	Rodent infestation spurs row	The Mercury, p. 18
Thursday 25/01/07	No title]	ABC radio interview (Jenny Scott)
Friday 16/02/07	No title]	ABC Stateline (Tas)
Saturday 17/02/07	Turnbull urges action on Macquarie Is pest management	ABC online
Sunday 18/02/07	No title]	ABC radio - Australia All Over, with Bill Burch (ANARE Club)
Monday 19/02/07	Govt accused of procrastinating on island pest threat	ABC online
Monday 19/02/07	Commonwealth accused of playing politics over pest program	ABC online
Monday 19/02/07	Wriedt puts rabbit blame on bureaucrats	The Examiner
Monday 19/02/07	View to a kill: pests threaten rare island life	The Australian
Monday 19/02/07	Putt lashes delay over Macquarie Is funding	The Mercury
Tuesday 20/02/07	Macquarie's feral cats: a delicate ecological balance	The Independent (UK)
Tuesday 20/02/07	Act now on Macquarie Is pests, Opposition says	ABC news online
Tuesday 20/02/07	Island eco-funds battle	The Mercury
Wednesday 21/02/07	Time running out to kill island pests	The West Australian
Wednesday 21/02/07	Groundwork laid for island purge	The Mercury
Wednesday 21/02/07	Politics threatens World Heritage island	The Herald Sun
Wednesday 21/02/07	Rare birds close to the edge	The Sun Herald
Wednesday 21/02/07	Premier backs Minister on Macquarie Is pests	ABC radio (Tas)
Thursday 22/02/07	State shirks heritage responsibility	The Mercury
Saturday 24/02/07	Macquarie Island menace	The Canberra Times, Forum B3
Sunday 4/03/07	Pest-infested heritage island 'a disgrace'	The Sunday Age
Tuesday 7/03/07	Island plague funds tiff flares up	The Mercury
Wednesday 8/03/07	Funding for island vermin	The Examiner
Wednesday 14/03/07	No title]	ABC TV (Tas)
Wednesday 14/3/07	State accused of not tackling feral pests	The Herald Sun
Wednesday 14/3/07	Macquarie island pest control funding debate continues	ABC news online
Thursday 15/3/07	Rabbit plan funding spat	The Mercury
Thursday 15/3/07	Island vermin in shooters sights	The Examiner
Friday 23/3/07	Macquarie Island eradication plan	936 ABC Radio (Hobart)
Friday 23/3/07	No title]	Drive 936 (Hobart) ABC Radio
Friday 23/3/07	Wriedt may cede island	The Mercury
Friday 23/3/07	Tas assured on rabbit problem funding	AAP
Saturday 24/3/07	Macquarie Is 'disgrace'	The Mercury
Saturday 24/3/07	Tas Govt's Macquarie Is neglect 'embarrassing' to nation	ABC online

Tuesday 27/3/07	Tas Govt refuses to fund Macquarie Is rabbit cull	ABC online
Saturday 10/3/07	International focus on our failure (Op-ed by Glenyce Johnson)	The Mercury
Monday 19/3/07	Live to air, Macquarie Island	ABC Radio National Bush Telegraph
Wednesday 21/3/07	Joint interview with CEO of Invasive Animals CRC with Alexandra Sloan.	ABC 666 Radio ACT
Monday 26/3/07	Growing rabbit problem on Macquarie Island	ABC Radio National
Tuesday 27/3/07	Island Pest Aid Refused	The Mercury
Tuesday 27/3/07	Macquarie Island	ABC TV – News (Tas)
Wednesday 28/3/ 07	Macquarie Island ABC radio (and Tim Cox 9 to 10 am about eradication programme)	ABC Radio World Today
Thursday 29/3/07	Macquarie Island	Drive ABC radio Nightlife with Tony Delroy
Friday 30/3/07	Macquarie Island	ABC 702
Sunday 01/04/07	Habitat help for penguins	The Sun Herald
Tuesday 3/4/07	Susie Maroney – Macquarie Island "Susie's Marathon Effort", Shelley Craft – The Great Outdoors	OK! Magazine
Tuesday 03/04/07	Save the penguins. Susie Maroney	St George & Sutherland Shire Leader
Wednesday 04/04/07	Macquarie Island 7.30 report	ABC 7.30 Report
Thursday 05/04/07	WWF Joins Macquarie Island Pest Expedition	ABC News Online
Thursday 05/04/07	Albatross facing Aussie extinction	Theage.com.au (AAP)
Thursday 05/04/07	Albatross facing Aussie extinction	Thewest.com.au (AAP)
Thursday 05/04/07	Albatross facing Aussie extinction	Brisbanetimes.com.au (AAP)
Thursday 05/04/07	Albatross facing Aussie extinction	Smh.com.au (AAP)
Thursday 05/04/07	Ship leaving for Macquarie Island	ABC TV – News (Tas)
Friday 06/04/07	WWF Angry over Macquarie Island inaction	ABC News Online
Friday 06/04/07	Island pests set to wipe out rare bird	The Mercury (AAP)
Friday 06/04/07	Funding stoush threatens island	The Weekend Australian
Tuesday 10/04/07	Rabbits (and bad policy) rooting Macquarie Island. Who knew?	Crikey.com.au
Wednesday 18/04/07	Macquarie Island degradation on World Heritage agenda	ECOS (CSIRO)
Saturday 21/04/07	Monster mouse peril on island	The Mercury
Sunday 22/04/07	Shock at isle rabbit havoc	Sunday Tasmanian
Sunday 22/04/07	Rabbits wrecking Australian isle	AFP, France
Sunday 22/04/07	Commonwealth urged to foot bill for 'trashed' Macquarie Island	ABC TV – News (Tas)
Sunday 22/04/07	Andreas, satellite phone in ship. Pre-record.	ABC Radio National - TAS
Sunday 22/04/07	Rabbits wrecking Australian isle	Associated French Press (AFP), (Yahoo! News California, US)
Monday 23/04/07	Interview with Fran Kelly on Macquarie Island	ABC Radio National AM, about 7.48am
Monday 23/04/07	Macquarie Island	"Charles Wooley Across Australia" - Macquarie Regional RadioWorks Network syndicated to 60 regional stations

Monday 23/04/07	Macquarie Island – live interview	ABC Radio National, Bush Telegraph
Monday 23/04/07	Rabbits wrecking Macquarie Island	AFP, abc.net.au/science/news
Monday 23/04/07	Rabbits wrecking Macquarie Island	AFP, www.dailytimes.com.pk
Monday 23/04/07	Rabbits 'trashed' Australian island	AFP (iafrica.com)
Monday 23/04/07	Rabbit attack	AFP (www.timesonline.co.uk)
Monday 23/04/07	Rabbits wrecking Australian isle	AFP (The Peninsula Online: Qatar's Leading English Daily)
Thursday 26/04/07	Rabbit Infestation	http://www.earthweek.com/
Friday 27/04/07	New photos from Macquarie Island	Stateline - Tas
Saturday 28/04/07	Rabbits lay waste to isle named for Scot as governments bicker	The Scotsman (by Tom Curtis, Perth)
Monday 30/04/07	EarthWeek: A diary of the planet	Arizona Daily Star www.dailystar.com
Wednesday 02/05/07	Macquarie Island	ABC Radio National (AM) with Fran Kelly
Thursday 10/05/07	Furry breeders wiping out other critters on remote island	The Brunei Times
Friday 11/05/07	Canberra fears Macquarie Island push could spread	ABC radio news online
Friday 11/05/07	Macquarie mauling	The Mercury
Tuesday 22/05/07	Island cull "should have been done sooner"	Sydney Morning Herald
Monday 28/05/07	Put plea for $300,000 to start island eradication	The Mercury
Monday 28/05/07	Push for Macquarie Island pest control	The Age
Tuesday 29/05/07	Island pest control wrangle	Central Western Daily, p. 11
Monday 4/06/07	(no title)	AAP
Tuesday 5/06/07	Better late than never	The Mercury, p. 5
Tuesday 5/06/07	Federal minister defends pest funding deal for island	ABC News online
Tuesday 5/06/07	Island rodents targeted. $24m funding for Macquaire	The Advocate, Tas
Wednesday 6/06/07	Macquarie Island Funding	ABC Radio 666

Macquarie Island in Danger

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