



Restoring Lord Howe Island's Ecosystems

Summary

Over the past 30 years the Lord Howe Island Board (LHIB) has undertaken a range of coordinated projects aimed at restoring Lord Howe Island's ecosystems. These projects have worked towards eradicating introduced pest plants and animals and implementing targeted threatened species recovery actions to assist in the restoration of native habitats and ecological processes. The LHIB recognized that failure to act would result in further declines of species and their habitats. Coordinated actions are showing strong signs of success on Lord Howe Island, NSW.

Introductions of species that have impacted the island's biodiversity commenced as early as the 1820's when passing sailors introduced pigs and goats as a source of food. Soon after settlement (1834) additional species were introduced including the feral cat and a diversity of exotic plants. Despite these impacts the island's natural values were recognised soon after discovery. Between 1852 and 1854 the first official biological survey was conducted and by 1878 the island was proclaimed by the NSW Government as a Forest Reserve. The establishment of a palm seed (*Kentia Palm *Howea forsteriana**) industry in 1870 assisted in the preservation of much of the island's bushland, through provision of a reliable source of income for the island.

In 1918 rats were accidentally introduced to the island when the ship SS Makambo ran aground at Ned's Beach. Within two years five endemic birds had become extinct and by 2003 at least eleven species of invertebrate had become extinct due to predation from rodents. Many other species have been significantly impacted by rodents with the most notable being the endemic Lord Howe Island Phasmid (*Dryococcus australis*), which was thought to be extinct until 2002 when it was rediscovered on Ball's Pyramid, 26 km south of Lord Howe Island.

From the mid 20th century tourism grew and then significantly expanded again following the island's inscription onto the World Heritage list in 1982. This has led to an increased appreciation of the island's biodiversity values and a general understanding by residents and tourists of the need to restore degraded habitats and recover threatened species.

Island restoration actions commenced in 1979 with the eradication of the feral Pig (*Sus scrofa*) and Cat (*Felis catus*), resulting in the successful recovery of the endemic and Endangered Lord Howe Island Woodhen (*Gallirallus sylvestris*). The LHIB has been coordinating targeted weed control activities since the 1970s, with a formalised approach adopted in 2002 following the results of quantified weed density mapping which found that weeds had penetrated into the southern mountains (one of the island's biodiversity hot spots).



This integrated project provides a model for holistic island-wide restoration initiatives. The development of a multi species recovery plan (Lord Howe Island Biodiversity Management Plan LHI BMP 2007) has been used as a model for landscape scale recovery planning in North eastern NSW and has application to other bioregions undertaking multi species and habitat threat abatement management. The greatest current challenge is to implement a systematic, island wide approach to the eradication of key pest species,

which still severely compromise the island's diverse habitats, inhibit important ecosystem processes and the islands World Heritage values.

Introduction to the Island

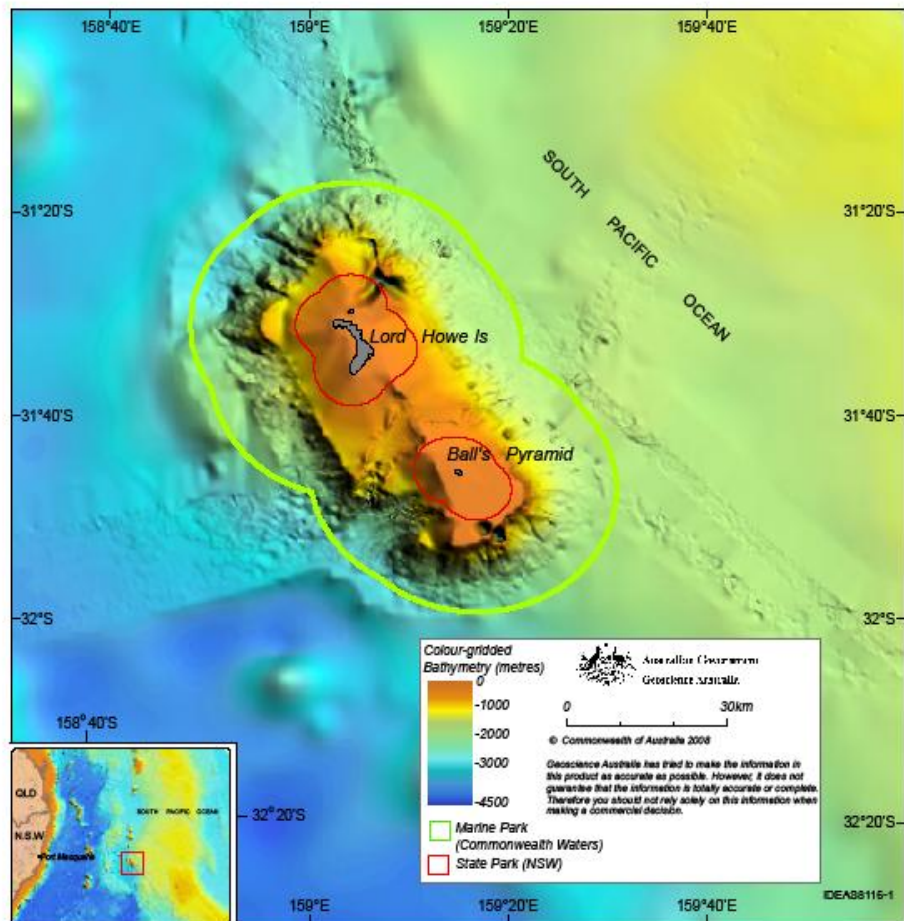
The Lord Howe Island Group (LHIG) of islands lies in the Tasman Sea (31°31'S 159° 03'E) and is located 760 kilometres north east of Sydney and 1350km north-west of New Zealand. The Island is associated to the Lord Howe Island Rise, a volcanic undersea ridge that separates the Tasman from the New Caledonian basins. Lord Howe Island comprises the main Island of 1455ha with smaller offshore islands and rocks including Balls Pyramid.

Lord Howe Island is approximately 11km long and up to 2.8km wide, rising to the south with Mt Lidgbird (777m) and Mt Gower (875m) at its highest point. The principal geologies of the island are aeolian calcarenite and basalt. The islands flora comprises a high level of endemism with floristic links to mainland Australia, New Zealand and New Caledonia.

The island is 87% vegetated with 75% of the island protected under the Permanent Park Preserve (PPP). The outstanding natural values, both terrestrial and marine resulted in the LHIG being listed as a World Heritage Area in 1982. Pest plants and animals and climate change pose the main threats to the islands ecology today.

The Lord Howe Island Group of islands falls under the jurisdiction of the New South Wales (NSW) State Government, with the Lord Howe Island Board (LHIB) being responsible for the care, control and management of the island group in accordance with the *Lord Howe Island Act 1953* (LHI Act).

The island's main industries are tourism and the export of the Kentia Palm (*Howea fosteriana*). Tourist numbers are intentionally limited to 350 beds and the permanent human population peaks at around 1000, during the summer tourist season.



Key stakeholders in the restoration projects include the Lord Howe Island Board, NSW Department of Environment and Climate Change, Commonwealth Department of Environment, Water, Heritage and the Arts, NSW Environmental Trust, Northern Rivers Catchment Management Authority, NSW Foundation for National Parks, Friends of Lord Howe Island, Melbourne Zoo and the Lord Howe Island community.

Ecosystems and impacts

LHI supports a diverse array of habitats with many unique flora and fauna assemblages, with a high level of endemism. There are 239 native vascular plant species with over 45% being endemic (113 species) with 5 endemic genera. Up to 34 vegetation communities are described for the LHIG with 18 of these of concern, due to threatening processes and/or very restricted distributions (e.g. cloud forest and mangrove communities).

Introduced plants outnumber natives with over 271 exotic species defined as weeds and a further 400 species found in cultivation. At least 18 exotic species are listed as noxious or environmental weeds, many of which have escaped into natural areas of the island.

Weed invasions threaten all vegetation communities across LHI. Several weeds have a wide environmental tolerance and exhibit ecosystem changing characteristics such as the ability to invade intact communities and dominate lower stratum to the extent of inhibiting native recruitment. The key weed species on LHI are either fleshy fruited (bird) or wind dispersed.



***Dracophyllum* dominated forest on the upper slopes of the southern mountains. Photo: LHIB**



Widespread Ground Asparagus *Asparagus aethiopicus* infestations from Transit Hill pose the next weed management frontier for Lord Howe Island. Photo: LHIB



Cherry Guava *Psidium cattleianum* is the ultimate ecosystem invader. Over 330,000 juvenile to mature plants have been removed since late 2004 from cleared land and undisturbed forest up to 500m elevation. Its spread has been aided by birds, pigs and humans. Cut stump applications using 100% triclopyr® (Garlon™) have proven the best control method. Photo: LHIB.

The fauna is dominated by birds, supporting amongst the highest diversity and density of nesting seabirds in Australia (14 species). At the time of human settlement 16 resident land birds were recorded, of which 50% were endemic species or subspecies, including the Lord Howe Island Woodhen. Since human settlement 9 endemic land birds have become extinct (5 succumbing to rat predation, 3 to human pressures and 1 from competition with the introduced Masked Owl *Tyto novaehollandiae* ssp. *castanops*). An additional 18 land birds and five sea bird species have established populations on the island since settlement, either due to intentional introduction or unassisted colonisation (LHI BMP 2007).



Woodhen. Photo: Ian Hutton

The island supports 2 endemic reptiles (Lord Howe Island Gecko *Christinus guentheri*, Lord Howe Island Skink *Oligosoma lichenigera*, both also known from Norfolk Island) and over 1600 terrestrial species of invertebrates. Invertebrates are characterised by relatively high species richness and a high level of endemism. By 2003 eleven species of large flightless endemic invertebrate were found to have become extinct and another eleven species of invertebrate are currently listed as endangered, largely due to rat predation. The island has one introduced skink (*Lampropholis delicata*), a turtle (*Chelodina longicollis*) and a frog (*Littoria dentata*), with the skink and frog being widespread.



Red-tailed Tropic Bird. Photo: LHIB

The island's isolated geographic location, limited access and small size means that it is vulnerable to the impacts of invasions and species extinctions. Conversely its limited size and access enables conservation managers to aim for eradication of certain pest plant and animal species; to implement effective threatened species recovery actions and planning for species re-introductions. The underlying premise for pest species management is eradication rather than control.



LHI Gecko. Photo: W. Neilan

Restoring and protecting the unique ecosystems of the Lord Howe Island Group

To effectively restore health to the island's ecosystems and protect, maintain and improve its World Heritage values, the Lord Howe Island Board (LHIB) has been implementing a holistic island-wide ecological restoration program aimed at eradicating priority pest plant and animal species and ameliorating threats to threatened, endemic and significant species and their habitats. The overall aim of the project is to reverse species declines and extinctions, protect and enhance priority habitats and to restore the unsettled parts of the island to as near as pristine a condition as possible. In settlement areas the aim is to remove threats that impact the integrity of native habitats and to revegetate areas of cleared land with native vegetation.

The project is guided by a range of key legislative, strategic and management documents including:

- Lord Howe Island Act 1953,
- Lord Howe Island Regulations 1994,
- Lord Howe Island Permanent Park Preserve Plan of Management 2002,
- Lord Howe Island Group World Heritage Property Strategic Plan for Management 2000-2005;
- Lord Howe Island Biodiversity Management Plan (LHI BMP) 2007; and
- various Federal and State Government environmental legislative instruments.

The LHI BMP 2007 is the principal document guiding all threat abatement and restoration actions relevant to the Island's biodiversity and in particular its rare and significant species. The plan does not detail management of marine areas as these are covered by the NSW Marine Parks Authority and *Marine Parks Act* 1997. The BMP interacts with other plans including:

- Draft Weed Management Strategy for Lord Howe Island 2006,
- Strategic Plan for Weed Management 2002,
- Lord Howe Island Revegetation Plan 2002,
- Draft eradication plan for the Ship Rat on LHI 2008,
- Threat abatement plan for rats on small islands,
- Eradication plan for Hybrid Mallard/Pacific Black Duck 2008,
- Draft eradication plan for the Introduced Masked Owl 2008,
- LHI Woodhen Recovery Plan 2002,
- LHI Phasmid Recovery Plan 2001,
- Rare plant surveys Lord Howe Island 2001, 2005, 2008.



LHI's unique environment is a major tourism draw card. Balancing the needs of a local population, tourism industry and the natural values of a world heritage listed island is an ongoing challenge for the LHIB. Photo: LHIB.

Summary of key outcomes and actions

The key outcomes and actions implemented through this program are summarised below. Additional details are provided in the Appendix.

Feral Animal Eradication and Control Programs

- Successful eradication of Feral Pig (1979), Cat (1981) and Feral Goat (1999) and the African Big headed Ant (ABHA) *Pheidole megacephala* (2009).
- Eradication Plan developed for Mallard x Pacific Black Duck hybrids *Anas superciliosa* x *A. platyrhynchos* on LHI. Eradication commenced in 2008 with follow up control in 2009. Ongoing control required for new arrivals.
- Rodent control program comprising 1200 bait stations covering 140 ha. Primarily aimed at keeping rodent numbers in check in Palm seed areas and biodiversity hot spots.
- Planning and research to inform the eradication of rodents Black Rat and House Mouse *Mus musculus* on LHI, 2002 - 2011.
- Planning the eradication of the introduced Masked Owl from LHI, 2008 – 2011. This project is to run coincidentally with the rodent eradication program.
- Annual control of Feral Pigeon *Columba livia* and Common Starling *Sturnus vulgaris* aimed at reducing numbers in key areas. 1998 – 2009. Ongoing.



LHIB goat hunters prior to the aerial based eradication program. Photo: LHIB

Plant Pathogen Control

- Control of *Phytophthora cinnamomi* root rot pathogen. One infestation detected and controlled in 2002. Ongoing management including quarantine and establishment of scrub down bins.

Weed Eradication Program

- Target control of dense weed infestations at target sites undertaken subject to funds. 1970-2003.
- Friends of Lord Howe Island Volunteer Group. Weeding ecotours. 1995 – ongoing
- Island wide weed inventory and species based weed assessment undertaken in 2001 – 2002. Basis for development of Weed Management Strategy 2004/06.
- Quantitative mapping of major weeds on LHI 2002 – 2003. Basis for development of Weed Management Strategy 2004/06.
- Development of an island wide Weed Management Strategy 2004/06.
- Implementation of the Weed Management Strategy, undertaking the strategic eradication of key invasive weeds, 2004 – 2015.
- Integration of LHI Weed Management Strategy into broader national/state/regional policy, legislation and parallels to State & Federal weed management strategies.
- Community education. 2002 – ongoing.



A dedicated 'on ground' bush regeneration/weed team is essential to achieving island wide weed eradication. Photo: LHIB

Threatened species recovery and habitat restoration actions, techniques and outcomes

- Recovery of the endemic and endangered Woodhen. Ongoing surveys from 1970 to present. In 1970s only 37 wild birds remained. Now over 300.
- Recovery of the LHI Phasmid. Rediscovered on Balls Pyramid in 2001. Captive population of 400 bred at Melbourne Zoo and repatriated in enclosure at LHI in 2008.
- Lagoon Dune and Estuarine Coastal Vegetation Restoration. Coastal restoration works first commenced in 1988. Recent funding has reinitiated on-ground actions.
- Threatened Plant surveys. Target surveys and weed control for threatened plant locations. 2001 – current.
- Research on flora/fauna attributes in rodent exclusion enclosures. 2007 – present.
- Threatened fauna research. Diverse research topics into threatened fauna.
- Managing impacts of climate change.

- LHI revegetation Strategy 2002 – various projects:
 - Sallywood Swamp Forest Recovery. Revegetation of this Endangered Ecological Community. 2004 – ongoing.
 - Flesh-footed Shearwater Habitat Recovery. Revegetation of former breeding grounds and removal of Ground Asparagus from breeding habitat. 2008/09.



**Reconstructing Sallywood *Lagunaria* Swamp Forest in the lowlands near Old Settlement Beach.
Photos: LHIB.**

Friends of Lord Howe Island

The Friends of Lord Howe Island were formed to tackle the serious weed issues impacting the island's biodiversity and World Heritage values. The group provides strong community support for the Board's weed program by organising annual "weeding ecotours" where people pay to come for a holiday, and contribute 3 hours each morning to assist with weed control on the Island. Each group is taken on an ecotour each afternoon and lectures are provided in the evening. Since 1995 there have been 55 trips and over 18,000 hours of voluntary weeding provided. The focus has been on Climbing and Ground Asparagus Fern control on Transit Hill, but groups also assist leaseholders with weed problems and have undertaken targeted weed control along the lagoon foreshore.



Friends of Lord Howe Island controlling the Climbing Asparagus *Asparagus plumosus* infestation at Transit Hill. Photo: Ian Hutton

Lessons learnt and relevance to others

Threats posed by alien introductions to island ecosystems are well known. This project provides a valuable case-study for island communities and other localities dealing with landscape scale, multi-species pest species invasions.

Early intervention. A major lesson has been that early intervention of pest invasions provides significant cost savings when attempting eradication and leads to reduced environmental impact in the long term.

Meticulous research and planning to deliver eradication aims. The various projects undertaken as part of Restoring Lord Howe Island's Ecology have benefited from targeted research and meticulous planning, which ensures project aims and objectives are clearly stated and met. Research advises on best practise methodology and management requirements, which can then be incorporated into a project plan to guide on-ground actions and for securing grants. Project planning needs to include contingencies that ensure against re-introduction.

Inclusion of projects within a policy/strategic framework. Each project has been included into policy documents (such as the LHI BMP 2007) or incorporated into strategic plans such as the annual LHIB Corporate Plan and Operations Plan. This ensures projects are appropriately resourced and identified for actioning. It also ensures the community are aware of project aims.

Developing research partnerships. The benefits derived from research partnerships have been fundamental to guiding management actions and obtaining grant funds.

Securing reliable long-term funding. Ensuring eradications are achieved requires a commitment to resourcing the extent of the plan. The World Heritage status of LHI has assisted to obtain funds through external sources and from the LHIB.

The importance of volunteers. Volunteer programs provide value in labour, help build team capacity and enthusiasm through sharing of knowledge and experiences.

Community support and education. Maintaining a pest free environment requires community awareness and support. Ensuring the community understand the need to undertake management actions is fundamental to achieving on-ground outcomes.

The importance of comprehensive and long term commitment to weed control. Prior to developing a strategic plan for guiding weed management, weed control was often short term and ad-hoc due to a lack of secure funding. Following adoption of a planned, comprehensive and well resourced program the project has demonstrated a significant reduction in weed threat (reduced mature weed sources and soil seed banks).



The eradication of rodents from Lord Howe Island will assist the reintroduction of the Lord Howe Island Phasmid and aid the recovery of a host other endemic invertebrates and endemic plant species. Photos: LHIB.



**Unique island ecosystems are certainly worth protecting for current and future generations!
A view of the 'Razorback' off Mt Gower. Photo: LHIB.**

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Further reading

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