

Appendix: Lord Howe Island Restoration Projects

Table 1. Feral Animal Eradication and Control Programs

Project	Species/community/habitat impacted	Recovery actions/techniques	Project outcomes	Stakeholder & research links	Budget
<p>Eradication of the feral Pig & Cat</p> <p>1979 - 1981</p>	<p>Both species introduced 1840's or 50's.</p> <p>Species impacted:</p> <ul style="list-style-type: none"> • LHI Woodhen • All ground nesting birds accessible by pigs & cats • LHI Gecko • LHI Skink • LHI Placostylus & other terrestrial invertebrates • Pigs damage vegetation by wallowing, rooting for rhizomes, eating seeds, disturbing soil invertebrates and causing erosion. Also spreads Cherry Guava • Cats predate birds, reptiles & palatable terrestrial invertebrates. 	<p>To eradicate both species.</p> <p>Eradication of pigs & cats commenced in 1979 as part of the Woodhen Recovery program. Cats were eradicated in 1979 and Pigs in 1981.</p> <p>The LHIB placed a bounty of \$15 per pig, resulting in 183 being shot by island hunters from 1979 to 1981.</p> <p>Feral cats were successfully eradicated by 1979 using traps and shooting as part of a Woodhen Recovery program.</p> <p>The LHIB banned the keeping of domestic cats in 1982, with a grandfather clause allowing existing desexed pet cats to remain until deceased. The last cat died by 2006.</p>	<p>Successfully eradicated</p> <p>Eradication of both species was fundamental to the recovery of the Woodhen. It also assisted recovery of other ground nesting and burrow nesting seabirds, both sp. of reptiles & terrestrial invertebrates.</p> <p>Two seabird species breed again on the main island following the eradication of cats. The Wedge-tailed Shearwater <i>Puffinus pacificus</i>, which breeds in dune areas of the main island. The Little Shearwater <i>Puffinus assimilis</i>, has recolonised parts of the island.</p>	<p>Lord Howe Island Board</p> <p>New South Wales National Parks & Wildlife Service</p> <p>Island hunters</p>	<p>\$25,000</p>
<p>Eradication of the feral Goat <i>Capra hircus</i></p> <p>1999</p>	<p>Introduced 1840's or 50's by passing sailors as a source of fresh meat.</p> <p>Goats caused significant impact to the island's vegetation through trampling, browsing and grazing; denuded areas around camps and created tracks. Promoted the establishment and spread of exotic grass seed to remote areas of southern mountains and</p>	<p>To eradicate goats from the wild.</p> <p>In March 1999 the LHIB endorsed a plan to eradicate goats from the island, commencing in early September 1999 and ending mid October 1999. A total of 295 goats were killed during this operation, with 189 being shot from the air and 106 from the ground. One year after the operation 3 non reproductively capable nannies were found to remain in the</p>	<p>All but three non reproductive nanny goats were eradicated.</p> <p>Regeneration and recruitment of native species. Noticeable increase in Crofton <i>Ageratina adenophora</i> in mountain areas following</p>	<p>Local islander hunters</p> <p>Lord Howe Island Board</p> <p>New South Wales National Parks & Wildlife Service</p>	<p>\$80,000</p>

	<p>northern hills in droppings. (e.g. Giant Parramatta Grass <i>Sporobolus africanus</i>, <i>Ehrharta erecta</i>), ring barking of trees (e.g. <i>Carmichaelia exsul</i>), selective browsing of palatable species and preventing their regeneration. Faecal downwash from camps (especially caves) caused ingress of weeds following disturbance events.</p> <p>Goats caused considerable disturbance to ground and burrow nesting seabirds in the northern and southern hills (eg Sooty Tern & Flesh-footed Shearwater).</p>	<p>wild, which are all nearing life expectancy and being left to succumb to natural attrition.</p> <p>To minimise the potential for the re-establishment of a viable wild population of goats the LHIB introduced a Goat policy restricting the keeping of reproductively capable Billy goats and prohibiting the importation of goats or sperm.</p> <p>NSW TSC Act & EPBC Act both list Competition and land degradation by the Feral Goat as a Key Threatening Process (KTP).</p>	<p>eradication.</p> <p>11 registered pet goats remaining on leases.</p> <p>Grandfather clause will ensure goats eventually die out.</p>	<p>Pro Hunt New Zealand</p> <p>Landcare Research New Zealand</p>	
<p>Eradication of the African Big headed Ant (ABHA) <i>Pheidole megacephala</i>.</p> <p>1998 - 2009</p>	<p>First recorded on the island in 2003, although presumed to have been introduced around 1997 in soil medium.</p> <p>Extensively established in settlement area throughout all vegetation types, although primarily associated with Calcaranite soils and debris such as logs, rocks and concrete slabs and paves.</p> <p>Potential to cause significant impact to endemic invertebrates. Known to aggressively out-compete native ants and presumed to prey upon small endemic snails.</p>	<p>To eradicate the species from the island.</p> <p>Initial work required mapping of infestations to determine best eradication strategy. Community consultation to ascertain distribution across perpetual leases.</p> <p>Application for approval to use chemical.</p> <p>Palatability studies of baits to determine effectiveness and potential off target impact on native ants. This confirmed that ABHA were attracted to bait with little to no impact on native ants.</p> <p>Systematic broad-scale hand baiting program of all mapped infestations and surrounding buffer area commenced in the summer of 2007/08.</p>	<p>Initial results suggest that eradication is close to being achieved with only 1 area re-infested (minor) 1 year after control (this site has been re-treated).</p> <p>Annual summer surveys are required for several years to determine effectiveness and to undertake rapid response control should an outbreak be identified.</p> <p>Regular quarantine checks of imported materials undertaken to prevent reintroduction.</p>	<p>Lord Howe Island Board</p> <p>Gary Webb consultants</p>	<p>\$125,000</p>
<p>Eradication Plan for Mallard x Pacific Black Duck hybrids <i>Anas superciliosa</i> x <i>A. platyrhynchos</i></p>	<p>Mallards & Hybrids first recorded in 1970's.</p> <p>Impact on the native Pacific Black Duck.</p>	<p>To eradicate hybrids from the island.</p> <p>DPI feasibility study completed in January 2008 confirmed that eradication was possible.</p> <p>Application for approval to use sedative to control ducks approved.</p>	<p>Eradication works commenced with over 140 ducks being shot between September 07 & October 08.</p> <p>Eradication of the last</p>	<p>Lord Howe Island Board</p> <p>Department of Primary Industries</p>	<p>\$45,000</p>

<p>LHI. 2008/09</p>		<p>Eradication plan adopted in 2008 and commenced using various techniques including shooting, trapping and targeted free feed baiting using a sedative.</p>	<p>remaining ducks is planned for winter 2009 using targeted shooting and free feed baiting using a sedative.</p>		
<p>Rodent control program 1986 - 2009</p>	<p>The Black Rat <i>Rattus rattus</i> established on LHI following shipwreck in 1918. Rats soon after established across the whole main island.</p> <p>Within 2 years of the arrival of rats 5 species of birds became extinct including:</p> <ul style="list-style-type: none"> • LHI Fantail <i>Rhipidura fuliginosa cervina</i> • LHI Gerygone <i>Gerygone insularis</i> • Robust White-eye <i>Zosterops strenuous</i> • LHI Thrush <i>Turdus poliocephalus vinitinctus</i> • LHI Starling <i>Aplonis fusca hullianus</i> <p>In 2003 11 species of large flightless invertebrate were found to be extinct due to rat predation. (A full list of species impacted by rats is available by emailing LHIB.)</p> <p>Rats impact on a wide range of species, including invertebrates such as the LHI Phasmid, LHI Placostylus <i>Placostylus bivaricosus</i>, and LHI Wood eating Roach <i>Panesthis lata</i>; the 2 species of endemic reptile (LHI Gecko, LHI Skink); seabirds such as the White bellied Storm Petrel <i>Fregata grallaria</i>, plants such as the Kentia Palm <i>Howea fosteriana</i>, Curly Palm <i>Howea belmoriana</i>, Little Mountain Palm <i>Lepidorrhachis mooreana</i> , and Big Mountain Palm <i>Hedyscepe canterburyana</i>, as well as destroying seeds, plant shoots, fungi</p>	<p>Control of rats through a bounty on tails commenced over 80 years ago. Since 1986 the LHIB have been utilising warfarin based rodenticides to primarily reduce rat numbers in Kentia Palm seed areas and provide conservation benefits in biodiversity hotspots. Rodent control increases native seed production & recruitment and reduces the degree of rodent predation on susceptible plants & animals.</p> <p>31 grid based bait areas. Bait stations at 40m grids. Total number of stations =1200 across island, covering 140 ha.</p> <p>Stations are baited with Warfarin 6 times per year. LHI supports one of the last populations of rats that are not resistant to Warfarin. LHIB are currently seeking approval to use Coumatetralyl.</p> <p>The work is undertaken by a local contractor.</p>	<p>Improved seedling production and recruitment in control areas.</p> <p>Persistence of several species rare or absent from uncontrolled areas.</p> <p>Baiting has continued for over 80 years, although the current baiting system and schedule has been in place since 2001.</p>	<p>Lord Howe Island Board</p>	<p>\$45,000/year</p>

	and f leaves and bark of palatable species.				
<p>Planning the eradication of rodents Black Rat and House Mouse <i>Mus musculus</i> on LHI</p> <p>2002 – 2011</p>	<p>Species impacted as above + 38 plants + 12 plant communities.</p>	<p>To eradicate Black Rat and House Mouse from the island using aerial and hand broadcast application of brodifacoum toxin baits across the whole island.</p> <p>Meticulous planning and research is currently underway to inform a proposed eradication. This is to ensure non-target species are adversely impacted. This will advise the development of an eradication plan, species impacts statement, approval from the APVMA (Australian Pesticides & Veterinary Medicines Authority) to use the toxin across the island to enable an island wide eradication to take place.</p> <p>Invasion of rodents to offshore islands under 100,000 ha listed as a Key Threatening Process under TSC Act 1995 and EPBC Act 1999.</p> <p>This project will enable the recovery of endemic species currently under threat from predation by rodents and Masked Owl, including the eventual reintroduction of ecologically equivalent subspecies that have become extinct due to predation and competition.</p>	<p>Feasibility study completed 2002 with funding from Foundation for National Parks & Wildlife (FNPW).</p> <p>Planning commenced 2004 and continuing.</p> <p>Non toxic bait trials undertaken to determine bait uptake by all species. Rats and mice take all bait from a baited area and details of which native species consume bait.</p> <p>Community consultation underway and application for funding continuing.</p>	<p>Dept. of Environment and Climate Change</p> <p>Department of the Environment, Water, Heritage and the Arts (DEWHA)</p> <p>Caring for our Country (Federal funding)</p> <p>Foundation for National Parks & Wildlife</p> <p>Lord Howe Island Board</p> <p>Natural Heritage Trust</p>	<p>\$450,000 currently spent or committed.</p> <p>Projected costs for eradication estimated at over \$7 million.</p>
<p>Planning the eradication of the introduced Masked Owl</p> <p>2008/09</p>	<p>Intentionally introduced by LHIB in 1930's in effort to manage rats. By 1950 it was implicated in the extinction of the LHI Boobook Owl <i>Ninox novaeseelandiae albaria</i>.</p> <p>Masked Owls are known to predate on:</p> <ul style="list-style-type: none"> • LHI Woodhen • LHI Currawong <i>Streptera graculina crissalis</i> • White Tern <i>Gyris alba</i> 	<p>To eradicate this species coincident with the rodent eradication.</p> <p>A draft Masked Owl eradication plan has been prepared outlining research required on ecology of Masked Owl on LHI to inform eradication.</p>	<p>Funding has recently been granted through Caring for Our Country to commence research to inform on the best approach to eradication.</p>	<p>Caring for our Country (Federal funding)</p> <p>Dept. of Environment and Climate Change</p> <p>Lord Howe Island Board</p>	<p>\$85,000 required for initial research, of which \$65,000 has been granted through CFOC.</p>

	<ul style="list-style-type: none"> • Black winged Petrel <i>Pterodroma nigripennis</i> • Providence Petrel <i>Pterodroma solandri</i> • Flesh footed Shearwater <i>Puffinus carneipes</i> • Wedge tailed Shearwater <i>Puffinus pacificus</i> • Little Shearwater <i>Puffinus assimilis</i> • Sooty Tern <i>Sterna fuscata</i> 				The outcome of this research will inform budget required to undertake eradication
<p>Feral Pigeon <i>Columba livia</i> and Common Starling <i>Sturnus vulgaris</i> control.</p> <p>1998 - 2009</p>	<p>Feral Pigeons compete for seabird nesting sites on northern cliffs.</p> <p>Starlings occur at low density but may have an impact on invertebrates, competition for nest sites with the Sacred Kingfisher and potentially spread mites.</p>	<p>The Feral Pigeon and Common Starling are controlled opportunistically by shooting at nest/roost sites. The level of control is dependant on numbers.</p> <p>Eradication options are currently being investigated, although self re-introduction is likely.</p>	Periodic control	Lord Howe Island Board	\$2,000/yr

Table 2: Plant Pathogen Control

Project	Species/community/habitat impacted and threat	Recovery actions/techniques	Project outcomes	Stakeholder & research links	Budget
<p>Control of <i>Phytophthora cinnamomi</i> root rot pathogen</p> <p>2002 ongoing</p>	<p>Up to 14 plant genus susceptible to the pathogen including endemic plant species such as <i>Dracophyllum fitzgeraldii</i> (EPACRIDACEAE family).</p> <p>Threats to LHI are the spread from the localised outbreak or import of pathogen via soil on visitors' shoes and hiking poles.</p>	<ul style="list-style-type: none"> • Dieback caused by the Root- rot fungus <i>Phytophthora cinnamomi</i> listed as a Key threatening process under the <i>NSW TSC Act</i> Infected 1995. • Infected Avocado tree detected in 1992, in lease holders orchard. • Series of soil tests undertaken in proximity to infected site (1 out of 26 tested positive). • Drenching of orchard/site with fungicide @Ridomil (active ingredient metalaxlyl-M) and monitoring. • Prevent erosion of the site (which is located in an elevated position). • Education of visitors and community re: Root rot pathogen threats. • Establish boot scrub stations at commencement of walking tracks. • Application of quarantine procedures for Plant Importation. Only plants in soil-less medium allowed for import. Avocados only from certified 'phytophthora free' suppliers. 	<p>Phytophthora control strategy (in preparation).</p> <p>Interim control of infestation site achieved. To date, the site of infection is inactive. Ongoing testing and drenching of infection site as required.</p> <p>Continued surveillance across the island, with collection and testing of soil from tree and shrub species showing signs of decline.</p> <p>No further importation of <i>Phytophthora</i> infected soil or plants.</p> <p>Ultimately protection of the Island's Biodiversity'.</p>	<p>Dept. of Environment and Climate Change</p> <p>NSW Department of Primary Industries (DPI)</p> <p>Island residents</p> <p>Lord Howe Island Board</p> <p>Sydney Royal Botanical Gardens - Plant Pathologist</p>	<p>\$5000</p>

Table 3: Weed Eradication Program

Project	Species/community/habitat impacted/threat	Recovery actions/techniques	Project outcomes	Stakeholder & research links	Budget
<p>Target control of dense weed infestations</p> <p>1970-2003</p>	<p>All vegetation communities in the mid to low lands highly threatened by weed invasions; spread of weeds threatening higher elevation communities.</p> <p>Multi-species weed invasions (tree, vine and scrambler) collectively have capacity to modify all strata of vegetation communities on LHI.</p>	<p>Locality based treatment of weeds from 1994 to 2002 using various control techniques (spray to manual removal).</p>	<p>Localised reduction in mature weeds; however some recolonisation of weeds due to lack of resources for follow-up.</p> <p>Application of weed control techniques and approach at this early stage providing an opportunity to scope effectiveness and viability for future control works.</p>	<p>Lord Howe Island Board</p> <p>NSW State Grants</p>	<p>unknown</p>
<p>Friends of Lord Howe Island Volunteer Group</p> <p>1997- ongoing</p>	<p>Habitats impacted: seabird nesting grounds, modification of ground layer invertebrate habitat, habitat for ground foragers such as the Woodhen, <i>Placostylus</i> etc</p> <p>There are over 18 invasive flora species targeted for eradication in the PPP, with an additional 10 serious environmental weeds being considered for addition to the eradication list.</p> <p>Widespread weeds impacting the PPP:</p>	<p>Formation of the Friends Group. Up to 10 volunteer trips from the mainland per year.</p> <p>Trips run for 10 days with participants undertaking half a days work and the remainder undertaking tours with local specialists.</p>	<p>Locality based control of weeds.</p> <ul style="list-style-type: none"> • Over 50% control of 4ha dense Climbing <i>Asparagus</i> infestation from Transit Hill • Lobby group/raising awareness of the greater community (locals and volunteers from the mainland) • Control of Ground <i>Asparagus</i> on foreshore • Education and training • In-kind contribution towards external funding • 1600 hrs of voluntary labour towards weed control • Information exchange re: restoration techniques 	<p>Friends of Lord Howe Island</p> <p>Lord Howe Island Board</p> <p>Local residents</p>	<p>Volunteer trips charged per person inc. flights, housing, food, and ecological guided tours.</p>
<p>Island wide weed inventory & species based weed assessment</p> <p>2001 - 2002</p>	<p>*<i>Asparagus asparagoides</i> Bridal Creeper, *<i>Asparagus aethiopicus</i> Ground Asparagus, *<i>Asparagus plumosus</i> Climbing Asparagus, *<i>Cotoneaster glaucophyllus</i> Cotoneaster *<i>Chrysanthemoides monolifera</i></p>	<ul style="list-style-type: none"> • Weed inventory/ checklist of known weeds on LHI • Development of herbarium and digital plant database • Categorization of weed risk per species • Mapping general weed distribution 	<p>Preparation of an outline for a weed control strategy</p> <p>Development of interim Weed Strategy with recommendations (un-prioritised)</p>	<p>Lord Howe Island Board</p> <p>Ian Hutton/Jenni Le Cussan</p> <p>LHIB rangers</p>	

<p>Quantitative mapping of major weeds on LHI</p> <p>2002 - 2003</p>	<p>subsp <i>rotundata</i> Bitou Bush *<i>Lantana camara</i> Lantana *<i>Lycium ferrocisium</i> Box Thorn *<i>Psidium cattleianum</i> Cherry Guava *<i>Ochna serrulata</i> Ochna, * <i>Pittosporum undulatum</i> Sweet Pittosporum *<i>Anredera cordifolia</i> Maderia Vine *<i>Arundo donax</i> Elephant Grass *<i>Bambusa spp.</i>Bamboo * <i>Gloriosa superba</i> Glory Lily *<i>Melia azederach</i> White Cedar *<i>Ricinus communis</i> Castor Oil Plant *<i>Setaria palmifolia</i> Palm Grass *<i>Toxicodendron succedaneum</i> Rhus Tree *<i>Schefflera actinophylla</i> Umbrella Tree</p>	<p>Flora Manager engaged.</p> <p>Mapping distribution & density of major weeds per landscape unit [Malabar, north-west slopes Mt Lidgbird, Intermediate Hill and Transit Hill]. Refer to Figure 1 & 2 weed density mapping.</p> <p>Survey transects set up through bushland at 100m intervals. Density of weeds counted every 20m on the transect within a 4m diameter (12. 566m²). Weeds recorded per life stage (seedling, juvenile, mature). Data entered onto Geographic Information System.</p>	<p>Establishment of baseline weed density data and reference point for measuring changes in weed density and effectiveness of control measures.</p> <p>Indication that weed spread and density was far greater than expected. Evidence that weeds are extending into the southern mountains (biodiversity hot spot).</p> <p>Awareness that resources required to effectively manage weed impacts are beyond the scope of the LHI Board alone.</p>	<p>Lord Howe Island Board</p>	
<p>Developing an island wide weed management strategy</p> <p>2004/06</p>	<p>Both Crofton Weed <i>Ageratina adenophora</i> and Formosa Lily <i>Lilium formosanum</i> are listed as noxious, are widespread in mountains, occur in difficult to access remote areas (e.g. on waterfall faces, cliffs, ledges and crevices) and threaten rare plant habitats. Localised control is only achievable until bio-control becomes available.</p> <p>There are at least another 24 weeds of concern that are not yet listed but are of concern due to their invasiveness in similar environments on east coast Australia, NZ or Pacific Islands.</p> <p>Email LHIB for full list of environmental weeds.</p>	<p>Investigation into the management, control and monitoring of Cherry Guava in 4 park areas in the Indo-pacific. Review of issues, control techniques and mgt approaches.</p> <p>Acknowledgment of long term ecological threats posed by Cherry Guava. On the island of Mauritius, Cherry Guava is forming complete monocultures in the understorey; inhibiting native species regeneration and causing decline of canopy trees; threatening remaining upland forest remnants.</p> <p>Intervention of weed impacts required before infestations reach a critical threshold.</p>	<ul style="list-style-type: none"> • Preparation & adoption of the Lord Howe Island weed management strategy 2005 (i.e. rationale, approach, control trials, monitoring, staffing, training, research priorities, key policies etc). • Adoption of Department of Conservation (DOC) NZ – Raoul Island in the Kermadec Group weed mgt program (management approach and methods of data recording). • Eradication rather than control as a basis for weed management for at least 20 key invasive weeds. • Expansion of LHIB volunteer program. 	<p>Lord Howe Island Board</p> <p>Winston Churchill Memorial Trust</p> <p>Park managers from 4 indo pacific islands</p>	

<p>Implementation of the Lord Howe Island Weed Management Strategy</p> <p>Eradication of key invasive weeds</p> <p>2004 - 2015</p>		<ul style="list-style-type: none"> • Mapping of weed blocks and marking of blocks on the ground using semi permanent tape. Blocks delineated by tracks, lease boundaries and landscape features (creek lines and tracks) (414 blocks in total over 9 landscape units). Approx 270 in Permanent Park Preserve/Crown Land. Refer to Figure 3: Example of weed mgt blocks. • Sourcing external funding. • Engagement of weed control staff including local people and trained bush regenerators from DOC NZ and mainland. • Training staff (approaches to weed mgt; control techniques, plant identification) • Commencement of systematic weed control using grid searches (2004 to current). Weed blocks prioritised according to maturity of weed infestation and seasonality to avoiding ecological impacts (e.g. disturbance to migratory seabirds) and appropriate weather conditions. • Research into the population biology of <i>Lilium formosanum</i>. • Aerial spray and abseil treatment of cliff line Bitou Bush infestations. 	<ul style="list-style-type: none"> • Kickstart of the strategy through acquisition of funds through the Environmental Trust – Environmental Integrated Project. • Weed control trials established. Registration of special permit through the APVMA to use undiluted @Garlon 600 active ingredient Triclopyr butoxyethyl ester 600g/L to treat guava as cut stump application. • Database regularly updated recording all weeds controlled (species, life stage, no. of plants). • 80% of the island [Permanent Park Preserve/crown land] searched and treated of mature infestations of Cherry Guava, Sweet Pittosporum and Ochna. • 2nd round of aerial Bitou control programmed for June 2009. • Transit Hill – Ground Asparagus infestation (approx 40 ha of heavy to moderate infestation). Commencement of control underway. • Labour engaged at 6.3 EFT per year (pending funding) • Up to 20 volunteers engaged per year working a minimum of 4 weeks per session. • Over 50,999hrs with 1,351,631 million weeds controlled between 2004 -2008 Records of mature to juvenile plants controlled include: <ul style="list-style-type: none"> - Cherry Guava 176,958; 152,902 - Pittosporum 8,881; 25,735 - Cotoneaster 1,713; 9,092 - Bitou Bush 450; 490 - Ochna 10,259; 50,301 - Bridal Creeper 4,617; 6,205 - Ground Asparagus 42,210; 24,743 (strategic spray of dense infestations in progress) 	<p>Lord Howe Island Board</p> <p>Caring for our Country (Federal funding)</p> <p>Department of Environment & Climate Change</p> <p>Environmental Trust</p> <p>Natural Heritage Trust</p> <p>Northern Rivers Catchment Mgt Authority</p> <p>Department of the Environment, Water, Heritage and the Arts (DEWHA)</p> <p>NSW Department of Primary Industries (DPI)</p> <p>University of New England Weeds CRC</p> <p>Volunteers</p>	<p>At least \$2,154,400 million dollars</p> <p>Yearly investment of at least \$500,000 per yr required for staff;</p> <p>Support of volunteers</p>
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			<ul style="list-style-type: none"> - Climbing Asparagus 5,412; 1,616 - Madeira Vine 3,165kg dug 		
<p>Policy, legislation and parallels to State & Federal weed mgt strategies</p>	<ul style="list-style-type: none"> • Weeds of National Significance (WONS) • Prioritising Sleeper Weeds • Noxious Weeds Act 1993 • Lord Howe Island regulations 2004 • Plant Importation Policy 2004 • Quarantine Strategy for Lord Howe Island 2003 • Key threatening processes relevant to Lord Howe Island under the <i>Threatened Species Conservation Act</i> 1995 -Invasion and establishment of exotic vines and scramblers -Invasion, establishment and spread of Lantana -Invasion of Native Plant communities by Bitou Bush 	<p>Amelioration and prevention of key threatening processes through undertaking the planned control of key weed species and promoting the regeneration and extension of native plant communities across the Permanent park Preserve.</p> <p>Listing of key weeds as noxious under the Noxious Weeds Act 1993 & LHIB regulations 2004;</p> <p>Annual noxious weeds inspections on perpetual and special leases; including training in plant recognition and control techniques</p>	<p>Application of Quarantine and Plant Importation procedures. No further importation of invasive plant species to LHI.</p> <p>Reduction in cover and abundance of noxious and environmental weeds on Special and Perpetual leases</p> <p>Protection and enhancement of Lord Howe Islands Natural heritage through control of currently known weeds and restriction of import of potential weeds.</p>	<p>Lord Howe Island Board</p> <p>Quarantine & Inspection Resources P/L</p> <p>CSIRO/World Wildlife Fund (WWF)</p> <p>Department of Environment & Climate Change</p> <p>Friends of Lord Howe Island</p> <p>Leaseholders</p> <p>Noxious Weeds Authorities and Advisory Council</p>	
<p>Community education.</p> <p>2002 - ongoing</p>	<p>As above</p>	<ul style="list-style-type: none"> • Preparation of educational resource material 'Grow Native' booklet detailing desirable native plants for the garden, undesirable weeds and weed control techniques. • Provision of funding to assist publishing A Field Guide to the Plants of Lord Howe Island. • Establishment of mini botanic gardens with labeled plants in the local hospital grounds. Prior weed dominated garden has been replaced by native plants. • Presentation to the local community of the threats to the island from weed invasions namely Cherry Guava; based on research findings. Setting the scene for the LHI weed management strategy. • Propagation of native plants by the LHIB nursery. 	<ul style="list-style-type: none"> • Improved understanding of the local community and visitors of the threat posed by introduced weeds to the island's natural heritage. • Improved visitor experience through access to resource material. • Native plants available to leaseholders through the LHIB nursery, at a cost. • Endorsement of the LHI weed strategy 	<p>Lord Howe Island Board</p> <p>Ian Hutton</p>	

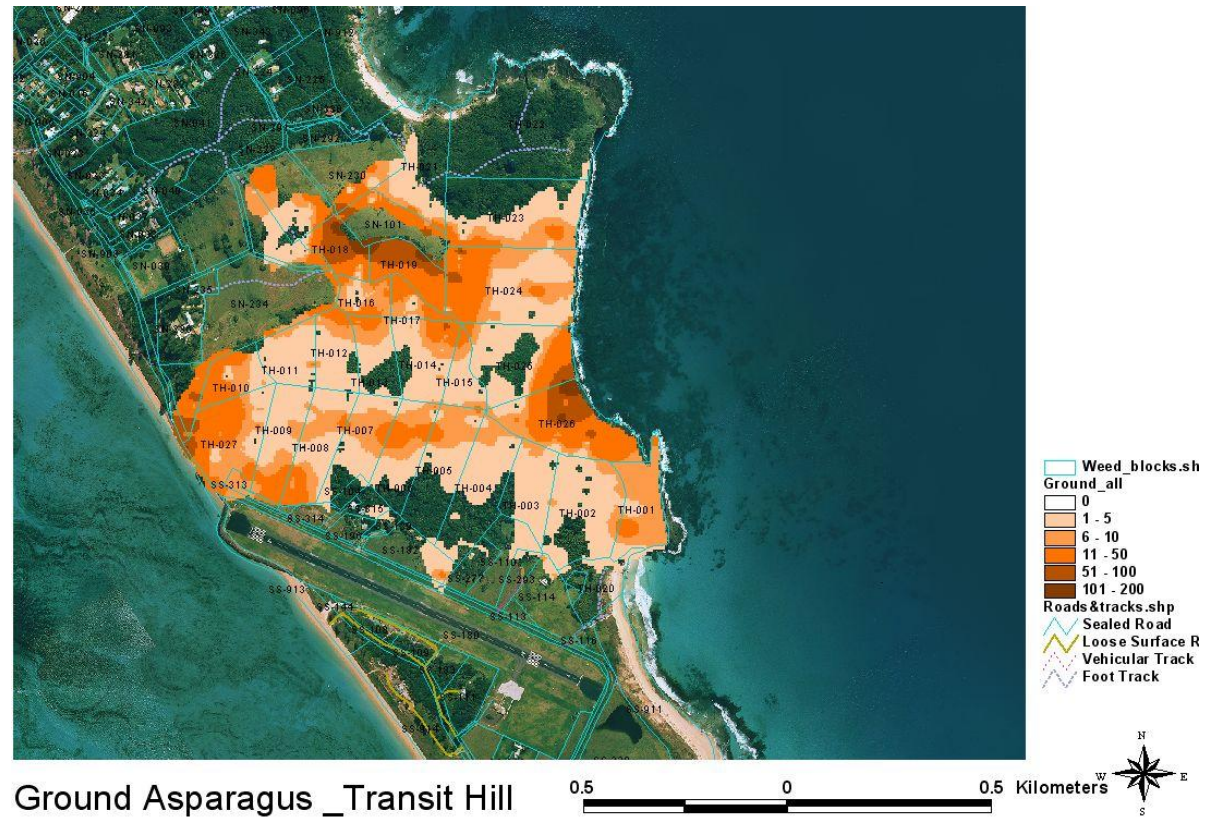
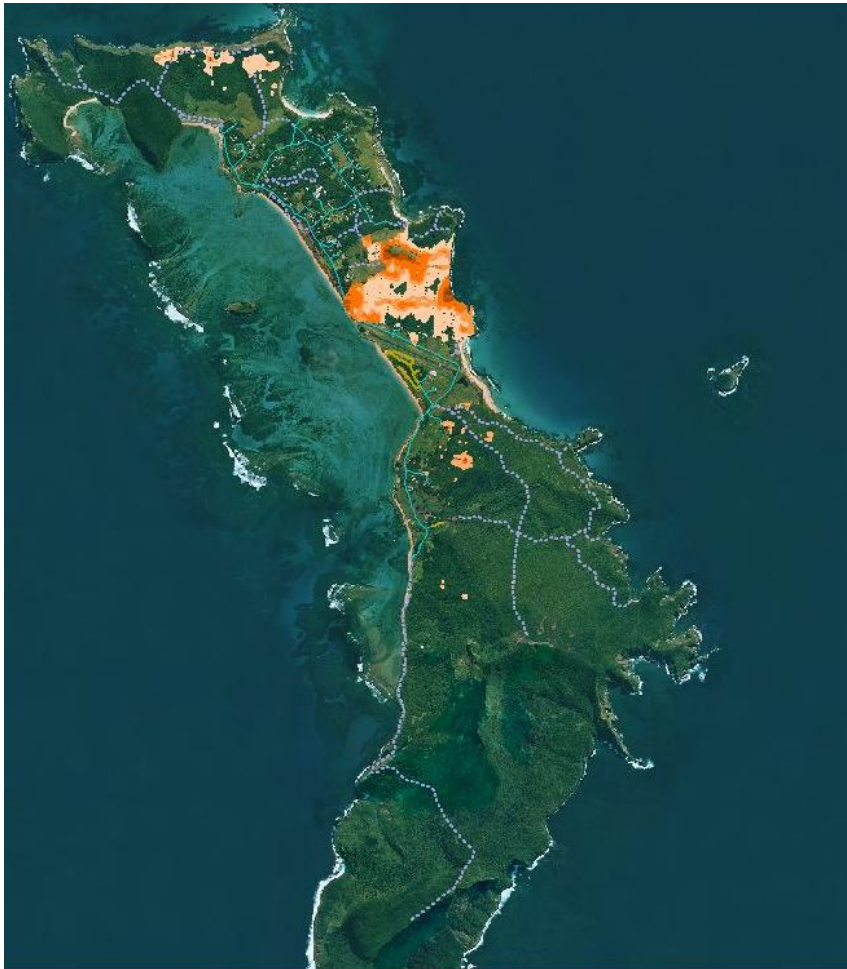


Figure 1 & 2. Distribution and density mapping of Ground Asparagus, Lord Howe Island.

Mapping undertaken by Jenni LeCussan 2002/3 - Lord Howe Island Board.

This mapping indicates Transit Hill and Malabar (northern hills) as having the highest density of Ground Asparagus. Densities of 101 to 200 plants per 12m² have been recorded. Plants have also established on the lower slopes of Mt Lidgbird. Isolated mature plants have recently being controlled from higher up on the Black Face and Round Face indicating that Ground Asparagus is on the move !



Figure 3: Weed blocks from Malabar (northern hills).

The Island has been mapped into 414 weed blocks across 9 main landscape units. Each block is demarked on the ground with permanent marking tape and individually coded.

All weed control work is recorded per block and entered onto database, which provides a system for monitoring changes in weed densities and resource outputs.

Table 4: Threatened species recovery and habitat restoration actions, techniques and outcomes.

Project	Species/community/habitat impacted	Recovery actions/techniques	Project outcomes	Stakeholder & research links	Budget
<p>Woodhen recovery and surveys 1970 - current</p>	<p>Only 37 Woodhen remained in the wild in late 1970's.</p> <p>Impacted by Feral pigs, cats, Masked Owl and habitat clearing/fragmentation. Highest unnatural mortality currently from road kill.</p> <p>Uncontrolled use of Talon by leaseholders remains a concern.</p>	<p>Eradication of feral pigs & cats.</p> <p>Captive breeding program commenced 1980. Captive bred stock released across island with population increasing to 140 by 1985.</p> <p>Development of Recovery Plan in 2001.</p> <p>Annual censusing is undertaken by LHIB to monitor population. Currently estimated at around 300 individuals.</p> <p>Strict dog controls imposed by LHIB</p> <p>Initiate research into Masked Owl to inform their eradication.</p> <p>Revegetation of cleared lands, particularly fertile and well watered lowlands has increased habitat.</p> <p>Development of draft feeding guidelines in 2008</p>	<p>Rapid recovery of the Woodhen after eradication of pigs & cats and implantation of a captive breeding program.</p> <p>Woodhen population is currently estimated at about 300.</p>	<p>Lord Howe Island Board</p> <p>NSW NPWS/ Department of Environment & Climate Change</p> <p>Foundation for National Parks & Wildlife</p>	<p>Annual surveys \$28,000/yr</p>
<p>LHI Placostylus recovery</p>	<p>LHI Placostylus impacted by rodent predation and habitat fragmentation</p>	<p>Surveys to identify key habitats and inform the development of habitat models/maps.</p> <p>Development of Recovery Plan in 2001</p> <p>Captive breeding trials</p>	<p>Development of community education</p> <p>Development of GIS habitat models</p>	<p>Lord Howe Island Board</p> <p>Department of Environment & Climate Change</p>	

<p>LHI Phasmid recovery</p> <p>2001- ongoing</p>	<p>LHI Phasmid. Wild population estimated at 40 individuals.</p>	<p>Thought to be extinct for over 80 years.</p> <p>Re-discovered on Ball's Pyramid in February 2001 (with a total population of 40), which initiated a recovery program.</p> <p>Establishment of a captive population from 2 pairs (4 individuals) at Melbourne Zoo in 2003.</p> <p>In December 2007 20 individuals repatriated to LHI in a rodent proof enclosure.</p> <p>Targeted control of Coastal Morning Glory <i>Ipomoea cairica</i> from core habitat area on Balls Pyramid in 2006.</p> <p>Investigation into eradication of rodents.</p>	<p>Captive population now exceeds 600, with 20 housed in a rodent proof enclosure on LHI.</p>	<p>Lord Howe Island Board</p> <p>Department of Environment & Climate Change</p> <p>Melbourne Zoo</p>	<p>\$25,000/yr</p>
<p>Lagoon Dune and Estuarine Coastal Vegetation Restoration</p> <p>1988 - current</p>	<p>Beach dunes and estuarine communities of LHI.</p> <p>All have been heavily degraded by clearing, grazing and weed invasion.</p>	<p>Undertaken by LHIB and volunteers in stages as funds become available.</p> <p>First concerted efforts started as early as 1988 aiming to replace Buffalo Grass with a complex of native species:</p> <ul style="list-style-type: none"> • Cryptocarya/Howea forest; • Cassinai/Melaleuca scrub; • Coastal Spinifex-vine-herb field. <p>Revegetation of highly modified areas dominated by pasture grasses.</p> <p>Strategic spot spraying of exotic grasses to promote natural regeneration.</p> <p>Targeted weed control of serious weeds eg Ground Asparagus, Bridal Creeper, Glory Lily, Coastal Tea Tree <i>Leptospermum laevigatum</i>.</p> <p>Create corridors between remnant patches and revegetation areas.</p>	<p>Control of exotic grasses and preparation of areas for planting by June 2009.</p>	<p>Lord Howe Island Board</p> <p>Northern Rivers Catchment Management Authority</p> <p>Friends of Lord Howe Island</p> <p>Lord Howe Island Central Public School</p>	<p>\$21,000</p>

<p>LHI Revegetation Projects</p> <p>LHI Revegetation Strategy 2002 - ongoing</p> <p>Sallywood Swamp Forest Recovery 2004 - ongoing</p>	<p>Revegetation of priority areas identified in the LHI Revegetation Strategy</p> <p>Regeneration and reconstruction of Endangered Ecological Community (EEC) – Sallywood Swamp Forest.</p>	<p>Revegetation projects aim to link fragmented remnant vegetation, establish buffer plantings to improve micro-climate for the extension of remnant and bushland edges (to abate harsh wind impacts).</p> <p>Sallywood Swamp Forest is represented as a few scattered remnants (<1 ha remains as scattered remnants & paddock trees).</p> <p>Areas that formerly supported Sallywood Swamp Forest were targeted for revegetation in an effort to reconstruct this highly depleted community. Where possible old remnant paddock trees were included in revegetation areas.</p>	<p>Revegetation of previously cleared areas with local native species, reconstruction of past vegetation associations prior to settlement.</p> <p>Increase in the area of habitat for island species; reinstating natural regenerative process.</p> <p>Up to 4 ha of reconstructed forest has been planted in association to estuaries, waterways and other low lying land.</p> <p>Species selection was replicated from reference communities.</p>	<p>Environmental Trust</p> <p>Lord Howe Island Board</p> <p>Lord Howe Island Public School</p> <p>Northern Rivers Catchment Management Authority</p> <p>Volunteers</p>	
<p>Flesh-footed Shearwater Habitat Recovery</p>	<p>Restoration of Flesh-footed Shearwater nesting habitat.</p> <p>The Flesh-footed Shearwater has experienced significant declines since 1970's, due to long line fishing and loss of 35% of their breeding habitat through historical development for housing and agriculture.</p> <p>The project aims to increase the area of suitable breeding habitat to increase recruitment.</p>	<p>Reconstruct habitat suitable for breeding by Flesh-footed Shearwater to increase potential breeding.</p> <p>Project first commenced in 1996 with funding from the NSW Environmental Trust (ET).</p> <p>The current project aims to revegetate 1km of cleared erosion prone seacliffs to create suitable substrate for constructing nest burrows for Flesh-footed Shearwater. It will also benefit the Black-winged Petrel, Wedge-tailed Shearwater and Little Shearwater. The project commenced in late 2008 with funds from NRCMA & CFoC.</p>	<p>1 ha of cleared pasture planted to closed forest in 1996 and now supporting a breeding shearwater colony.</p> <p>Over 1 km of cleared eroding coastline fenced and first stage earmarked for planting by June 2009. Ongoing funding will be required for over 5 years to complete this project. I</p>	<p>Caring for our Country (Federal funding)</p> <p>Environmental Trust</p> <p>Lord Howe Island Board</p> <p>Northern Rivers Catchment Management Authority</p>	<p>\$25,000</p> <p>\$42,000</p>

<p>Threatened Plant surveys</p>	<p>Commenced in 2001, with 2nd round of surveys conducted 2005 and 3rd round of surveys conducted in 2007/08 for 17 threatened or endemic flora species.</p> <p>Email LHIB for full list of species.</p>	<p>Targeted surveys and establishment of quantitative baseline monitoring.</p> <p>Determine distribution and abundance of threatened species for baseline monitoring of climate change.</p> <p>Assess impact of rodent predation on endemic palms in cloud forest at Mt Gower</p> <p>Control of weeds at key survey sites</p>	<p>Establishment of permanent monitoring plots.</p> <p>Reduction in weed threat to target species and surrounding habitat.</p> <p>Collation of plant population data, distribution and abundance.</p> <p>Collection of climatic gradient data along vertical transects at Southern Mountains.</p>	<p>Lord Howe Island Board</p> <p>Department of Environment & Climate Change (Dr Tony Auld/Andrew Denham) & Ian Hutton</p> <p>Ian Hutton/ Robert Conrads</p>	<p>\$45,000</p>
<p>Genetic analysis of LHI endemic flora</p>	<p>Commenced in 2007 and ongoing</p>	<p>Collection of genetic material of endemic plants</p>	<p>Research commenced.</p>	<p>Kew Gardens, UK.</p>	
<p>Rat exclusion research</p>	<p>Establish rat exclusion areas to assess vegetation dynamics and impacts to invertebrates</p>	<p>Monitor vegetation and invertebrate dynamics in enclosures excluded from rats.</p>	<p>Collection of information important to planning a rodent eradication on LHI.</p>	<p>LHIB, Aust Museum, UNSW</p>	<p>\$40,000</p>
<p>Threatened fauna research</p>	<p>Research conducted on the following species:</p> <p>Flesh-footed Shearwater 1978 - present</p>	<p>Monitoring population trends since 1978.</p> <p>Mapping of core breeding habitat.</p> <p>Various research to determine breeding & feeding ecology, population trends, threats, recruitment, burrow occupancy, chick provisioning and migration,</p>	<p>Population decline observed and management actions put in place to reverse threats on island.</p> <p>GIS mapping of breeding habitat for 1978, 2002 and in preparation for 2008/09 season.</p> <p>Various papers published in journals on ecology of FF Shearwater</p>	<p>Lord Howe Island Board</p> <p>Department of Environment & Climate Change</p> <p>University of Tasmania, UNSW,</p> <p>Department of Environment & Climate Change UNSW, Charles</p>	

	<p>Providence Petrel 2000 - 2008</p> <p>LHI Currawong 2005 – ongoing.</p> <p>Sooty Tern 2002 - 2007</p>	<p>Research into foraging ecology, nest provisioning of chicks and threats.</p> <ul style="list-style-type: none"> ▪ Determine the population size and distribution of the Lord Howe Currawong. • Determine home range and movement patterns of individual birds. • Develop techniques and procedures, including an annual monitoring program, to assess future trends in population size. ▪ Identify threats to the population. <p>Removal of pigs, cats and goats.</p> <p>Research into the breeding and feeding ecology.</p>	<p>PhD and undergraduate reports prepared.</p> <p>Research findings used to improve species management</p> <p>Population census undertaken with majority of family groups banded to monitor movements.</p> <p>Research findings used to improve species management.</p> <p>Research will be fundamental to implementation of a rodent eradication on LHI.</p> <p>Recolonisation of the main island.</p> <p>PhD thesis prepared and findings used to improve species management.</p>	<p>Sturt University</p> <p>Lord Howe Island Board</p> <p>Department of Environment & Climate Change</p> <p>Department of Environment & Climate Change</p> <p>Charles Sturt University</p>	
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