

Education Day - 2 November 2014

Handout notes

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Ecological restoration on Otamahua / Quail Island

Centuries of unsustainable activities have damaged the environments that give rise to the diversity of wildlife and plants of the ecosystem in which we all live and of which we are all a part. Ecological restoration can be simply described as reversing this degradation and restoring the earth's ecological balance for the benefit of humans and nature.

Ecological restoration assumes a number of guises but the desired outcome is always the same, that is to improve the habitat for indigenous biodiversity.

Throughout New Zealand there are numerous restoration projects taking place, from large-scale poison drops on offshore islands to kill predators to the more modest harbour islands of Otamahua and Matiu in Lyttleton and Wellington harbours respectively.

To date much of the focus on Otamahua has been the establishment of more than 80,000 seedlings. The majority of these have been planted by volunteers on weekend excursions. These plants also recieved essential aftercare maintenance in the form of weeding in the months that followed planting.



The following are a few of the terms and phrases that relate to ecological restoration:

Eco-sourcing

When ecological restoration is undertaken, the plants and animals re-introduced to the site are best sourced from nearby populations as a preference. This ensures they are best adapted to the local conditions, and it also helps maintain the genetic diversity that exists across the country.

Succession

The natural process of one community being replaced by another. In typical situations low growing species are replaced by taller species.

Seral species

Some species are often a temporarily dominant component of a plant community. Examples of this are manuka and kanuka.

Kick starting – speeding up

The primary objective of planting plants or introducing animals in ecological restoration is to speed up the process of colonisation by indigenous species. This can skip years, decades or even centuries of natural processes.

Pioneer species

Some species are considered rapid colonisers and some are capable of growing in very hostile conditions such as very young soils – for example tutu, native brooms.

Nurse species

Nursery species are used for their ability to grow in exposed situations and provide shelter for more sensitive species. Nursery species can be native or exotic. Manuka and introduced gorse are examples.

Competition

One of the barriers to natural regeneration is weedy competitors. They outcompete for light, nutrients and water. They are particularly troublesome for newly planted seedlings and naturally occurring seedlings. Exotic grasses pose the greatest threat of competition to restoration plantings.

Ecological weeds

Ecological weeds threaten biodiversity either by invading degraded habitats or revegetated areas – for example wilding pines.

Mycorrhizae

Many plants form close associations with fungi, thus widening their net for nutrients. The plant will provide sugars that it has made by photosynthesis and the fungus will provide additional nutrients to those that the plant will collect through its own roots. This can aid plant establishment.

Dispersers

One of the obstacles to the colonisation of areas devoid of native biodiversity is the absence or reduced numbers of seed dispersers. Some species have mutualistic relationships – for example birds that specialise in the dispersal of a particular plant species.

Pollinators

Again some species have mutualistic associations and the absence of these pollinators (eg a bird or lizard) can be detrimental to some populations.

Herbivores – browsers

Another threat to the establishment of restoration plantings are the myriad of browsing and grazing mammals that will greedily devour the fruits of our labours. This can include rodents, possums, deer as well as farm animals.

Cook's scurvy grass

An objective of some projects is to establish a specific threatened species to increase wild populations. On Quail Island we have one such plant – *Lepidium aegrum* or Cook's scurvy grass.

Invertebrates

- Invertebrates are animals without backbones including insects, spiders, mites, snails, centipedes, worms, etc
- They make up 95% of species on earth
- NZ has some iconic species including giant weta (heaviest in the world at 71g), velvet worm or *Peripatus* (an ancient 'missing link' between worms and insects that spits sticky goo on its prey), alpine weta that can freeze and come back to life, and huia louse (which was extinct before it was discovered!)
- They utilise all habitats on earth
- They have important ecological roles/ecosystem services:
 - Native pollinators e.g. bees, flies, wasps, butterflies
 - Biological control e.g. parasitic wasps, spiders
 - Soil drainage, mixing e.g. worms, beetles, mites
 - Decomposition & recycling e.g. earthworms, flies, millipedes, beetles, mites, springtails
 - Seed dispersers e.g. ants, weta, dung beetles
 - Food for other species e.g. birds, fish, lizards, bats, plants and other invertebrates
 - Cleaners e.g. leaf-vein slugs, beetles

Threats to invertebrates

- Exotic predators e.g. rats, mice, hedgehogs, possums, cats, mustelids
- Habitat loss e.g. clearing, fire
- Global warming
- Exotic invertebrates e.g. German & common wasps, spiders, etc often prey on and compete for resources with the natives species

Invertebrates on Quail Island

- >670 species collected
- 77% NZ endemic
- Some are several Banks Peninsula endemics including:
 - 5 spider species including trap-door spider
 - Ground weta, Cockroach, Snail, Cicada, Darkling beetle, Millipede & Silverfish

References

Bowie, M.H. et al. 2003. A biodiversity inventory of Quail Island (Otamahua): towards the restoration of an invertebrate community. NZ Natural Sciences 28: 81-109.

<http://www.doc.govt.nz/conservation/native-animals/invertebrates/>



Photo 1: Banks Peninsula trapdoor spider



Photo 2: Banks Peninsula endemic beetle



Photo 3: Hover fly feeding on nectar

New Zealand's Birds – how long have they been here?

- from most endemic to least endemic (approximate only)

- Oldest – endemic family at least; ancestors may date back to Gondwana: eg. kakapo, kaka & kea; rifleman, rockwren and extinct NZ 'wrens' (early branch of Passerine order); huia / kokako/ saddleback; and many extinct species eg. Adzebill
- Ancestor arrived millions of years ago - endemic genus at least: eg. kiwi species; mohua and brown creeper; tui / bellbird; extinct geese; some extinct duck species; kereru; takahe; Waitaha penguin, laughing owl; piopio ('native thrush'), Haast's eagle (under review – may be close relative of the Little eagle!)
- Endemic species / quite closely related to nearest relatives elsewhere, mainly Australasia (i.e. same genus): fantail; grey warbler; kingfisher; extinct NZ quail; S. merganser; some duck spp (incl. brown teal, paradise shelduck); kakariki (parakeet) species; crested penguin species
- Native but not endemic (may be endemic subspecies, but species occurs elsewhere, mainly Australasia) eg. ruru / morepork, little penguin; Australasian harrier; pukeko; silver-eye; spur-winged plover; welcome swallow. Some have arrived within the last 1,000 years or less.

Many of the above birds would have been on Banks Peninsula when humans arrived.

Characteristics of the 'more endemic' species that make them more vulnerable to extinction through predation –

- Tend to be long-lived, slow breeders (small clutch size / infrequent breeding)
- Tend to be heavier, less able to fly or totally flightless
- Adapted to avoid avian predators, so rely on camouflage which is not useful against mammalian predators with a good sense of smell. Some strongly scented – easy for mammals to find. Many are easily caught as they forage and nest on the ground.



Haast's eagle attacking moa
Image: John Megahan
Published in PLoS Biol 3(1)

New Zealand's Seabirds

- Today, 86 seabird species breed in New Zealand, most on offshore islands. Most nest in burrows and feed in the surrounding ocean.
- Seabirds such as Sooty Shearwaters travel enormous distances and dive to great depths to feed. They bring significant quantities of nutrients to the land, driving the productivity of terrestrial ecosystems.
- In the past, many seabirds bred on the mainland, including on Banks Peninsula and far inland in the Southern Alps. There would have been hundreds of millions throughout New Zealand.
- Several species of penguin – ‘Fiordland’ crested penguin, Waitaha penguin (cousin of hoiho) and little blue penguin would have been numerous around most of the coastline of New Zealand.
- When kiore (Polynesian rats) arrived around 1300AD they expanded rapidly, and most of the small seabirds (eg storm petrels, prions) were wiped out from the mainland, surviving only on rat-free islands.
- Larger mammalian predators introduced from around 1800 removed larger seabirds, and a few remaining colonies of the larger petrels (eg Sooty shearwaters) are declining over the decades.
- On Otamahua/Quail Island, penguin nests are steadily increasing since predator control began 15 years ago. On other pest-free sites, techniques to attract or reintroduce a range of seabirds are proving effective. (Lighting around the port and towns in Lyttelton Harbour may be a barrier, but many Banks Peninsula headlands and cliff tops would be suitable if pests were controlled.)

Colony of Campbell and grey-headed albatrosses on Campbell Island, doing well in the absence of large mammal predators. Rats had wiped out smaller-sized seabirds here, but have recently been eradicated so recolonization by birds from nearby islands is likely.

Photo: Tina Troup



Birds on Banks Peninsula and Quail Island, past and present – future possibilities?

- In the past, many of the birds found in Canterbury would have been on Banks Peninsula and probably Quail Island. Some, such as the New Zealand quail (koreke), the piopio and laughing owl became extinct within the last 150 years; and many more within the last 700 years of human settlement.
- Others are locally extinct on Banks Peninsula, but are still found elsewhere – for example the mohua (yellowhead), South Is kaka, kakariki, South Is saddleback, South Is robin, buff weka, brown teal, brown kiwi, takahe, kakapo.
- Others are found elsewhere on Banks Peninsula, but not currently on Quail Island – such as rifleman, tomtit, brown creeper, morepork, New Zealand falcon, titi (sooty shearwater).
- Now the native birds you might to see on and around Quail Island include:
 - Sea and shore birds: white-fronted tern; black-backed gull; red-billed gull; white-flippered (little blue) penguin; pied shag (and other shag species); variable oystercatcher; pied stilt; and sometimes other waders on mudflats.
 - On land: kingfisher, fantail, grey warbler, shining cuckoo, pipit, Australasian harrier, paradise shelduck, welcome swallow and increasingly as the planted native plants mature and produce flowers, nectar and fruit – kereru, bellbirds, silvereyes, and an occasional tui.
- Introduced birds – a dozen or so species including the California quail are found on the Island.



Bellbirds feeding on kowhai nectar pollinate the flowers. However silvereyes (right) sometimes rob nectar without transferring pollen by lifting the outer sepal and punching a shortcut though to the nectary, as they lack the long tongue of the bellbird.

Photos: Tina Troup



Further reading:

Ghosts of Gondwana: The History of life in New Zealand. George Gibbs. Craig Potton Publishing, 2006.

The Flight of the Huia: Ecology and conservation of New Zealand's frogs, reptiles, birds and mammals. Kerry-Jayne Wilson, Canterbury University Press, 2004.

Websites:

nzbirdsonline.org.nz

teara.govt.nz/seabirds-overview teara.govt.nz/petrels teara.govt.nz/penguins

New Zealand Reptiles

Tuatara are reptiles endemic to New Zealand and date back to the dinosaur era. There are two species. They were once widespread around New Zealand but are now only located on predator-free islands & sanctuaries. Although resembling lizards, tuatara are in a separate lineage.

Lizards

Since people and mammalian predators arrived in New Zealand, at least three lizard species have become extinct. Another eight are extinct on the mainland and can only be found on predator-free islands. Almost half of New Zealand's reptiles are threatened or endangered. About 100 lizard species are known in New Zealand today.



There are two types of lizards in New Zealand:

- **Skinks** have smooth skin, small legs, and small eyes that can blink.
- **Geckos** have scaly skin that looks a bit baggy, stout legs, and large eyes that cannot blink.

It is illegal to handle or keep any native lizard without a permit from the Department of Conservation.

Lizards help scatter the seeds of some of our native plants and may also pollinate their flowers. They eat berries, nectar, seeds and invertebrates. Lizards have a large range of exotic predators: rats, mice, cats, dogs, hedgehogs, ferret, stoats, weasels and possums. *Quail Island fauna*

Historically Quail Island would have once hosted tuatara, plus at least two geckos and three skink species. But now only has the Canterbury gecko, McCann's skink and common skink.



Photo: McCann's skink (*Oligosoma maccanni*) on Quail Island

New Zealand Frogs

In pre-human times, New Zealand had at least 7 species of frog, all in the ancient endemic family Leiopelmatidae. Four species survive in small numbers – Hochstetter's frog and Archey's frog in the North Island, Hamilton's frog on Stephens Island, and the Maud Island frog in Marlborough Sounds.



Maud Island frog
Photo: Department of
Conservation / Te Ara

□

Leiopelmid frog remains have been found in parts of the South Island, but it is not known for sure if there were populations on Banks Peninsula.

There are two introduced Australian frogs on Banks Peninsula – the bell frog and the whistling or tree frog; and a third only in the North Island.

New Zealand Bats – our only land mammals

Until recently there were three species of tiny endemic bat – now there are just two. The greater short-tailed bat (extinct since 1967) and the lesser short-tailed bat (in danger of extinction) are both in the unusual endemic family Mystacinidae. They are omnivorous, and feed mainly on the ground. The insectivorous long-tailed bat (vulnerable) has living relatives in Australasia. All are difficult to see, and best found with an acoustic bat-detector. Long-tailed bats may have been on Banks Peninsula in recent times.



Long-tailed bat.
Photo: Department of
Conservation / Te Ara

Predators of NZ and Quail Island

New Zealand, a land of birds, had no warm blooded mammal predators before people introduced them. These are now the main threat to native bird survival—killing eggs, chicks and adults.

The main threats come from mustelids (stoats, weasels, ferrets), possums, rodents and hedgehogs. Cats are a problem, too.



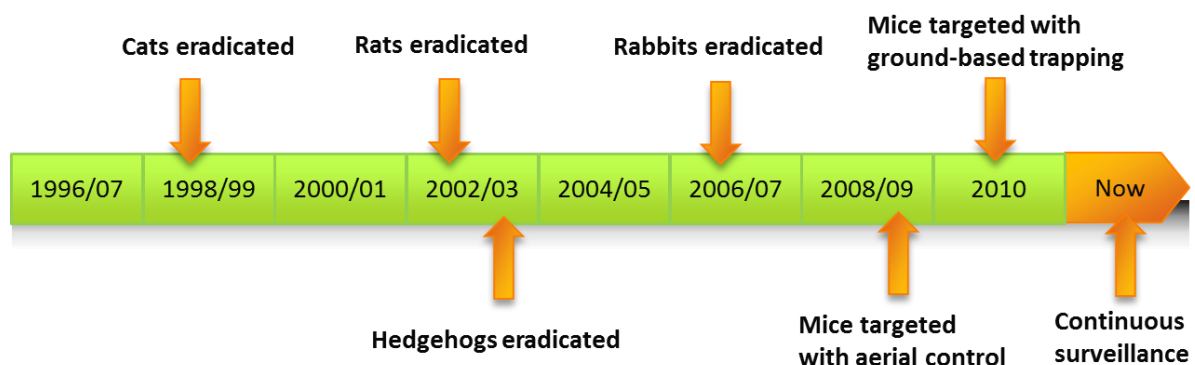
The mustelids were introduced to New Zealand to try to control a plague of rabbits. Tragically flightless ground-nesting birds, lizards and insects proved much easier to catch than rabbits.

Possums destroy native trees and shrubs, including one of their favourites, mistletoe. They also eat the berries needed by native birds, lizards and insects. New Zealand's native land snail, lizards, insects, and chicks and eggs are also prey to possums.



Rodents eat the fruit that native birds depend on for food and the forest needs for natural regeneration. Rats eat eggs and nestling chicks, and even mice predate on the smallest birds' eggs and chicks. Hedgehogs also eat the eggs of ground-nesting birds.

Over the past twenty years we have eradicated most of mammal pests from Quail Island.



The future is all about preventing re-invasions and also targeting remaining mice populations.

This will set the scene for future reintroductions of birds, lizards and invertebrates on Quail Island.

Source paper: Bowie, M., Kavermann, M., & Ross, J. (2011) et al. The Quail Island Story – thirteen years of multi-species pest control: successes, failures and lessons learnt. Island invasives: eradication and management. IUCN, Gland, Switzerland. Pp. 157-161.

Photos all sourced from: <http://www.kiwisforkiwi.org/about-kiwi/threats/predators-pests/>

Otamahua/Quail Island

- ★ Information Pedestals
- 1 Dog Kennels
- 2 Leper Hospital Site
- 3 Replica Leper Cottage
- 4 Lepers Grave
- 5 Quarry
- 6 View Ships Graveyard
- 7 View Stock Dam
- 8 View Seabird Nesting area
- 9 View Lava Cliffs
- 10 Wards Homestead site
- 11 Boatshed Gully
- 12 Lower Basalt Outcrop
- 13 Upper Basalt Outcrop
- 14 Old Meteorological site
- 15 Barracks Paddock
- 16 Top Oakwood
- 17 East Oakwood Paddock
- 18 Poroporo Patch
- 19 Saddle Gully
- 20 South East Summit site
- 21 North West Summit site
- 22 Stock Dam Valley
- 23 Upper Walkers Beach site
- 24 Mike s Gully
- 25 South West Manuka site
- 26 Ward s Valley
- 27 Puddingstone Valley
- 28 West Basin
- 29 Beach Gully
- 30 Hidden Gully
- 31 Plateau
- 32 Fringe (x,y,z)
- 33 Summit, Panorama Panels
- 34 Sewage Treatment Paddock

*Lyttelton Harbour
(Whakaraupo)*

