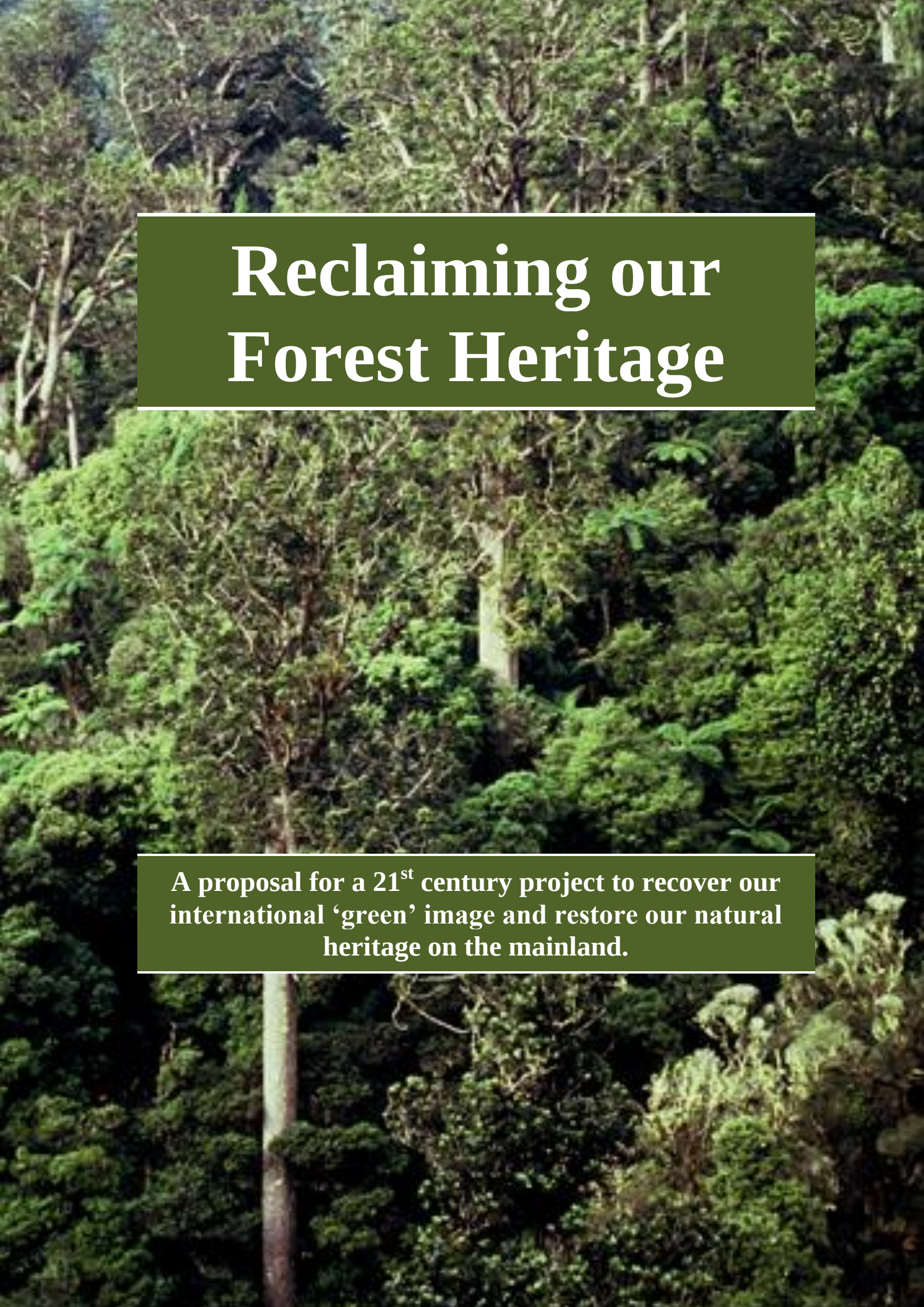


Reclaiming our Forest Heritage

A proposal for a 21st century project to recover our international 'green' image and restore our natural heritage on the mainland.

Contents

Part 1. Concept Plan

The following section details the background, the need for mainland restoration and the details of the proposition of ‘large conservation zones’.

1.1. Imagine

It is 2050 and you are entering a large forest somewhere in New Zealand. This could be somewhere like Waitutu in Southland, Waipoua/Matawaia/Waima in Northland, Pureora in the central North Island or somewhere on the West Coast of the South Island. It is a tall, mature forest which has the particular look typical of the area: kauri, podocarp or beech.

As you walk through this forest you are immediately struck by the noise and the busyness; large clusters of bellbird occupy the canopy, calling continuously to each other in a rotating chorus, noisy tuis gurgle, wheeze and chime and flutter rowdily through the branches, flocks of mohua (or whitehead in the North Island) send out their canary-like trills in a continuous stream, kakariki chatter and flash green through the tree tops in noisy flocks, dozens of kaka wheel and swoop overhead and 'skrark' and chortle noisily in the treetops.

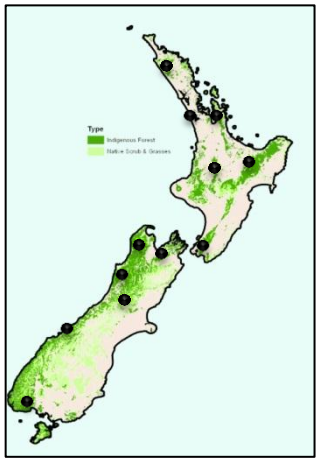
At almost every turn in the track a pair of robin hop down to investigate and scratch in the litter, pairs of saddleback leap from branch to branch through the shrub layer as they forage for bugs, flighty stitchbird chirp and flutter through the canopy and the 'whoosh' of pigeon wings is everywhere. From the higher branches the long liquid chime of the kokako floats across the forest, lifting above the other constant bird song.

As you walk along (and depending on the season) you will be struck by the show of flowers; the crimson aerial swathe of the rata, the yellow and red blush of the mistletoe and the bold yellow of kowhai. Closer investigation will reveal the massed flowers and fruit of fuchsia, five-finger and rewarewa. Closer still and you will see the quick movements of lizards and large insects. The undergrowth is dense and varied with strong signs of growth and rude health – as is the tops of the tall trees. Where the occasional big tree has fallen, a thicket of seedlings of the forest giants jostles to take its place.

If you are there at dawn you will hear the rising cacophony of chimes and chatter that signal the dawn chorus and in the evening the equally impressive dusk chorus rings through the forest as it settles down. As the day birds quieten, the ruru (morepork) start, followed shortly by the shrill calls of kiwi echoing through the dense forest from every swale and valley.

If you walk out to the river you will see the pairs of blue duck which space themselves out carefully along the banks and the kingfisher and shags that glide up and down the river. This is a living and vibrant place with the obvious stamp of New Zealand – our New Zealand.

Could this scene really happen? It can if we dream and follow that dream to make it happen.



An illustrative example of how representativeness could work across New Zealand. **Note**: These do not represent proposals for specific sites.

1.2. The Concept

The concept is to recover up to 15% of New Zealand's mainland forest ecosystems by establishing up to 12 representative 'large restoration zones' of approximately 100,000 ha each spread across the country and together restoring approximately 1 million+ hectares of mature, intact forest.

This concept would be aimed at:

- Re-establishing New Zealand's reputation as a 'green' nation and confirming our leadership in biodiversity restoration technology.
- Preserving and restoring our forest heritage for future generations.

The chosen sites would represent the full range of mainland forest ecosystems.

The broad concept would involve:

1. Selecting up to 12 large forest zones of approximately 100,000 hectares each which are representative of all the major New Zealand forest ecosystems.
2. Deploying all of our available conservation technology in concert to:
    - Reduce pests to zero or to minimal densities;
    - Maintain these densities long term while seeking further improvement in technology to achieve "pest free" status long term;
    - Re-establish missing but extant fauna and flora to each site and managing them to carrying capacity as soon as possible (expected to be about 20 years).
    - Re-establish key natural processes to the managed area.

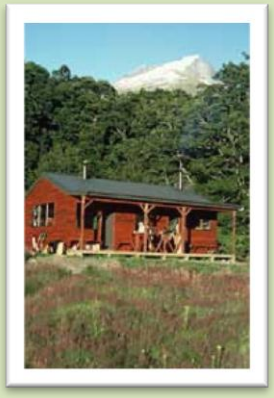
The concept envisions a 20 year development programme – beginning with a pilot site and bringing on stream one further zone every 1 to 2 years.

The concept also envisions innovative governance structures to establish a dynamic public/private partnership governance and management model.

The costs are manageable both immediately and over time and represent excellent value for money. The concept is achievable with current technology and will only become more feasible and cheaper as technology improves over time.

It represents an interim strategy until technology allows us to pursue "pest free" goals across even larger areas.

The aim would be to re-establish missing fauna and flora and re-establish natural processes.



The proposal has many biodiversity, economic and social benefits.

The expectation is that the concept would have immediate national benefits which would far outweigh the costs. Benefits would include:

- **Biodiversity**: retaining our natural heritage for current and future generations and assisting our ability to fulfil our obligations under the Rio convention.
- **Economic**: cost-effectively maintain our international 'clean green image and adding value through recreation, tourism, soil conservation and carbon sequestration.
- **Social**: providing a focal point for recreation, volunteer activity and mutual co-operation amongst interest and user groups to achieve national goals.

Note: This proposal is only about forests. Cases can also be made for our oceans, freshwater lakes and rivers, coasts, alpine zones and tussock land. Some of these (other than oceans) could be encompassed in this proposal where they are adjacent to or part of the selected zones.

1.3. The Nature of New Zealand Nature

New Zealand was originally the 'land of forest' (85% of the land mass) and the 'land of the birds' which comprised 90% of the large-bodied fauna. David Attenborough has described New Zealand as 'a window into a world that might have been if mammals had never evolved'.

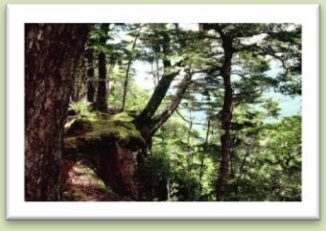
New Zealand biota is characterised by high endemism (many species found nowhere else), depauperate taxa (few species compared to other places) and vulnerability (caused by long isolation).

New Zealand forests are slow to grow and regenerate (typically 500 years to maturity through all successional phases) and vulnerable to threats such as fire and browsing.

New Zealand forests can be roughly classed in three distinctively New Zealand groups: kauri, podocarp and beech. There are numerous variations on these depending on latitude, substrate, climate, altitude and coastal proximity. There is a long latitudinal range from the subtropical north to subantarctic south, but all New Zealand forests are essentially temperate rain forests.

A healthy, mature New Zealand forest is 'tiered' with emergents (e.g. kauri, rimu, rata), canopy (e.g. tawa, hinau), sub-canopy (e.g. fuchsia, five-finger, tree ferns) and floor (e.g. ferns, kawakawa) with lianes (rata, supplejack) and parasites (kiekie, mistletoe) spread throughout.

New Zealand forests are highly productive with a huge potential fruit or seed load and rich all-year-round nectar run resulting in a very high potential fauna carrying capacity.



Birds were the dominant fauna in the forests of 'Old New Zealand'. Other fauna such as frogs, lizards, invertebrates and microbes also occupy the forests. Due to the productivity of these forests, the carrying capacity for birds in healthy systems is extremely high (1500 per hectare on Kapiti Island at this time). This carrying capacity will vary greatly according to latitude, altitude, climate and fertility but fertile and warm mainland systems such as the Waikato and Northland must originally have had carrying capacity well in excess of what Kapiti Island has now.

Many New Zealand birds and other fauna are very sensitive to loss and degradation of habitat, and especially to predation. Some, particularly those which have been here the longest (and therefore are the most special) are very slow breeders. Generally these species find it impossible to live in the highly modified landscapes and degraded forests of mainland New Zealand and would require a special effort to make their return to the mainland possible.

New Zealand forests were highly productive, with huge carrying capacity.

New Zealand fauna is highly sensitive to predation.

New Zealand was the 'land of birds'.

1.4. The Fate of our Forests

Adzebill - extinct

Huia – extinct 1910

Snipe – extinct 1960

The story of our forests and fauna following Maori occupation and European settlement is well known, but could be summarised as follows.

Maori burning and clearance reduced forest cover from 85% to about 45%. Hunting and the spread of the kiore rat caused the extermination of 35 species and greatly reduced the range of many others.

European settlement quickly reduced forest cover to about 30% (1950) and it was still declining as late as the 1990s. Loss of habitat and introduced predators caused a further 33 extinctions with catastrophic range retraction for many others.

By the late 1890s the concern for our forests and species was so high that native reserves (Kapiti Island, Little Barrier Island) and national parks (Tongariro, Taranaki) were set up.

Deer and goat became such a problem during the 1930s that the Wild Animal Control Act was passed and professional deer cullers were employed.

The 1950s saw many more national parks founded.

The invasion of Big South Cape Island by rats in 1960 highlighted the vulnerability of those species restricted only to islands and resulted in pioneering translocation and species management techniques.

The early 1980s saw the first major island rat eradications About 200 islands have since been cleared of pests, with Campbell Island (112,000ha) currently the biggest.

The late 1980s and 1990s saw the slowdown then virtual cessation of the systematic exploitation of native forests. Very little native timber is now milled and virtually none on public land.

Widespread forest collapse in the early 1990s, caused by possum browsing, saw the more intensive aerial application of 1080 introduced. This was subsequently greatly extended by the Animal Health Board to control bovine TB.

The 1990s saw the first of DOC's mainland islands created; six intensively managed zones ranging from 200 ha to 5,000 ha aimed at recovering forest ecosystems and species.

Karori Sanctuary became the first predator fenced sanctuary and mainland eradication when their fence was completed in August 1999.

The 1990s in particular saw great advances in conservation technology: aerial 1080 application, helicopter hunting, anti-coagulant toxins, eradications on islands, intensive control on the mainland, improved traps and lures, species translocation and management, and predator fencing.

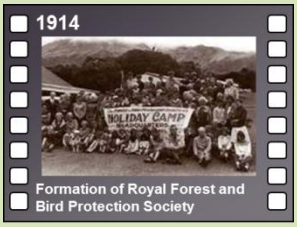
The Biodiversity Strategy (2000), which followed the Rio convention, injected major funding into DOC operations and science.

These developments led to great optimism that recovery of mainland ecosystems was possible.

1.5. The Social and Economic Context

Native forests in New Zealand were originally managed primarily by the NZ Forest Service and the Lands and Survey Department. Fauna was managed by the Wildlife Service, a division of the Department of Internal Affairs.

All these agencies had mixed objectives. The NZFS held much of its forests for timber production and encouraged recreational hunting in native forests. The Lands and Survey Department held much native forest land for the purpose of future conversion to farmland and its national parks were initially focused more on recreation and scenery-based tourism than forest protection. In addition to native species protection, the Wildlife Service also managed some exotic species. It was not until the 1960s that biodiversity became a significant objective for these agencies.



The NGO sector was dominated by The Royal Forest and Bird Protection Society and tramping clubs, with acclimatisation societies and fisher and hunter societies having a major say in the use of forest lands, lakes and rivers for their recreational purposes.

Exploitation of forest lands was a national priority and it wasn't until the 'Save Manapouri' campaign in the 1960s that this attitude began to change. Despite this there was still major loss of native forests occurring as late as the 1980s with the marginal lands scheme and the 1990s with wood chipping and logging.

In 1987 the Department of Conservation was formed from the Environmental Forestry division of the Forest Service, the National Parks division of the Lands and Survey and the Wildlife Service. Since then DoC has struggled with declining budgets and the sheer scale and complexity of the task despite a major injection of funding following the 2000 biodiversity strategy. DoC's priorities now seem to be to retract to managing fewer high priority areas and to try to develop partnerships with private sector; so far with only limited success (kakapo and kiwi recovery, takahe, whio and several other lesser partnerships). DoC currently has no plans for large scale restoration activities on the mainland and seems to be focusing on 'holding the line' at a least-cost level.

The NGO sector tends to be small and relatively unco-ordinated. Forest and Bird does not generally regard itself as a management agency but supports local management initiatives (e.g. 'Ark in the Park'). The fenced community sanctuary movement got underway with great enthusiasm in 2000 but has since stalled on financial issues.

There is still widespread and vocal opposition to aerial 1080 application and conservation is still viewed by many as a waste of resources or a use of resources which limits people's access and lifestyles.

Despite this there has been a growing understanding of the wider benefits of conservation and the issue now enjoys quite widespread support across the nation. This support is generally quite passive and tends to focus on local initiatives.

There is also a greater understanding developing of the wider benefits of conservation; some positive such as carbon sequestration, soil and water protection and eco-tourism and some defensive such as the need to protect our 'clean green' image or corporate responsibility in a warming world. The stage may be set where meaningful public/private partnerships can emerge around the right initiatives.

1.6. The State of our Forests

Northern kauri forest under represented.

Exotic animals form the largest mobile biomass in our forests.

Fuchsia – palatable species absent from many forests.

Silvereye – one of the few survivors in unmanaged native forest.

Native vegetation cover in New Zealand currently amounts to about 28% of the nation, or about 12 million hectares. About 6,500,000 ha of this is designated forest, the rest will be shrublands, wetlands and grasslands. Most of the remaining primary forest is located in the south, west and northwest of the South Island and the central North Island.

Beech forest and southern and north central podocarp are well represented in the remaining forest but kauri forest, lowland podocarp, swamp forests and dry eastern podocarp are very poorly represented.

Of the remaining forest the majority (80%) is under DOC management; the rest is in private hands with a substantial amount in Maori ownership. Significant amounts are in the hands of forest companies and local authorities.

The Parliamentary Commissioner for the Environment recently assessed the amount of the conservation estate receiving management of any kind as about 12.5%.

A DSIR study in the Orongorongos during the 1980s and 1990s indicated the following:

- By far the largest surface mobile biomass in New Zealand forests are exotic fauna (possums, deer, goats, pigs, rodents, mustelids, cats and exotic birds). This is as much as 99% in most places.
- Without management the browsers degrade the ecosystem by progressively eliminating palatable plant species over time from the system. It is a slow but certain death.
- There is little chance of a state of equilibrium until many of the palatable species are gone. You will then have a forest comprised largely of a much smaller number of unpalatable species (e.g. rimu, horopito, leatherwood and crown fern).
- Much of our mainland forest has a severely degraded shrub/sub-canopy layer as a result of herbivore browsing. Ecosystem 'drivers' such as fuchsia and mistletoe are largely absent from many large forest tracts.
- Without management predators progressively eliminate all vulnerable fauna species, leaving only a very few (e.g. silver-eye, grey warbler) which have survival strategies which enable them to cope with intense predation.

This research indicates that further forest degradation, species range retraction and mainland extinction is likely under existing management, or worse, a future of reduced or no management.

Degraded forests, especially in unstable hill country, are susceptible to catastrophic mass erosion and release of carbon as the forest dies. Healthy growing forests are carbon sinks, degrading dying forests are carbon emitters.

Strenuous efforts to manage goat and possum over the last 20 years, and helicopter hunting of deer in the 1980s, arrested the decline in many places It is very hard to get firm evidence but indications are that the health of our forests is only improving in those areas which are managed and is worsening in others. Large areas are virtually devoid of indigenous fauna. As the area under management is shrinking steadily due to funding cutbacks, there is genuine cause for alarm.

1.7. What is meant by 'restoring'?

The term 'restoration' is commonly used to describe processes of improving the condition and health of ecosystems, including species.

Restoration could be taken to mean:

- Re-establishing the extant (i.e. still existing somewhere) species assemblages (fauna and flora) and natural processes one would expect to see in a healthy functioning ecosystem and which are representative of the place where the management occurs.

Natural processes are such things as flowering, fruiting, seeding, dispersal and establishment of appropriate plant species, and the succession of the forest over time to a mature multi-tiered ecosystem. For fauna it involves the establishment of species populations and the growth and sustainability of those populations through successful breeding, the raising of young and, eventually, their dispersal to fill vacant habitat. For the whole ecosystem it means re-establishing relationships between species such as symbiosis, parasitism and mutualism, and retaining the evolutionary potential of the species.

This can take a long time (hundreds of years in highly degraded sites) and one can only expect to see steady progress towards such a goal. In addition, some species and processes cannot be restored as they are either extinct or so threatened that they are limited to salvage sites (kakapo, takahe) or the ecosystem processes have been irrevocably altered by the wider context such as agricultural and urban development.

Restoration is complex but at a minimum in any given site we would want to see quite quickly the successful and enduring re-establishment of populations of more than just a few threatened species, major population recovery of resident species and good recovery of processes such as flowering, fruiting, breeding and dispersal of common species, and major improvement in the general condition of the vegetation and overall forest structure.

Moreover we would want to see a 'halo' effect; species dispersing outwards and re-establishing in nearby habitat. The isolated island is a little unsatisfying sitting there on its own. You only get this halo effect through quickly creating species mass in a core area and having peripheral habitat of reasonable (and improving) quality.

And we would want to see 'big' – postage stamps or small islands are a little disturbing to all who work in conservation. About 100,000ha is what we would like to see for starters before we look at restoring entire provinces.

We would also want to see 'many'; at least a dozen of these large sites evenly distributed across the country. A dozen 100,000 ha large restoration zones would give us 1,200,000 ha of quality habitat – about 20% of our forests. That's probably a big enough chunk for starters.

Flora processes – flowering, fruiting, seed dispersal and regeneration.

Fauna processes – breeding, fledging, dispersal and survival.

Natural events - natural fire, slippage, floods, wind throw.

Barrier - water

Barrier - fencing

Toxin - ground

Toxin - aerial

Shooting – ground or aerial

1.8. How we manage our Forests

The Department of Conservation was formed in 1987 from parts of the Forest Service, Lands and Survey and the Wildlife Service with a mandate to manage our natural heritage – essentially indigenous ecosystems and species.

DOC's biodiversity budget (Output Class 1) is approximately $150 million pa. The conservation 'estate' runs to approximately 8 million hectares (this includes many alpine and grassland ecosystems); threatened species number almost 3,000.

Other agencies (regional and district councils, private individuals and companies, and iwi) own about 2 million hectares of native ecosystems but actively manage only a small amount of this. About 100,000 ha of private land is protected under the QE II Trust scheme, mostly in our most threatened lowland ecosystems.

The major agents for forest and species decline are browsers (goats, deer, pigs, possums) and predators (mustelids, cats, rodents). Weeds and birds can be a problem but are of a lesser nature.

Management of forest ecosystems and species is conducted using a very small range of tools. These are:

- barriers (water, fencing);
- toxins (aerial and ground applied);
- trapping (ground or water);
- shooting (ground or aerial);
- bio agents (parasites and pathogens);
- weed control (herbicides, cutting, grazing, etc.).

Apart from fencing, these tools have not changed much in their basic character since the 1990s but there have been significant advances in how they are used (to increase their efficiency and reduce costs) and improvement in design (to improve effectiveness).

Eradication of mammal pests from forest ecosystems to allow their restoration and the recovery of threatened species has long been the conservation goal. This has been achieved on offshore islands with excellent results. DOC has eradicated pests from about 70 islands, which together amount to about 20,000 hectares. The island programme is a world-class conservation success story.

The problem with islands is they are limited in size, have little or no 'halo' effect and restrict the range of ecosystems and species which can be managed. They are also remote and, therefore, difficult to access. The application of water as an effective barrier is not feasible in mainland systems.

In the 1990s DOC attempted to achieve 'zero pest density' in what became known as 'mainland islands'. These used all the available tools (except fencing) to intensively manage small areas (200 to 5,000 ha).

DOC's 6 mainland islands (plus a larger number of intensively managed areas) have been operating since about 1993 – almost 20 years in some cases. They have achieved the survival and expansion of populations and more robust threatened species already existing in the managed area (e.g. kaka, kiwi, robins, kokako) and increased populations of common species, but seem to

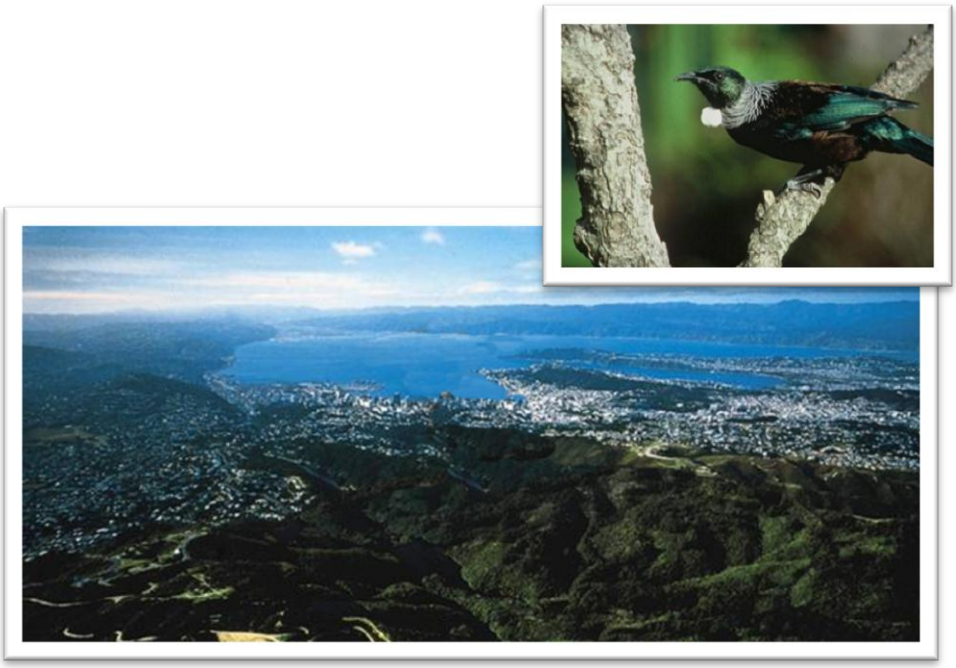
have had very limited success in re-introducing threatened species to the mainland (mostly robin and kiwi have been successfully attempted).

From the 1990s some tracts of the mainland conservation estate have been treated with aerial toxins and broad-scale shooting programmes have been maintained. There seems to have been some success in preventing forest collapse in areas where management has occurred and there is evidence of recovery of common birds (e.g. pigeon, bellbird, tui). Aerial toxin and aerial/ground shooting are the most cost efficient methods by far and the only methods practical on a very large scale. There have been very few instances of aerial toxins alone allowing reintroduction of threatened species although it has often been used to supplement ground control.

In 1999 Karori Sanctuary/Zealandia pioneered the construction of a predator/browser exclusion fence in the middle of Wellington city. The first species introduction (little spotted kiwi) occurred in 2000 and one or two more species have been added each year since. Fifteen locally or nationally threatened species missing from the valley have been reintroduced, including several (little spotted kiwi, saddleback, stitchbird, tuatara, Cook Strait giant weta) which occur nowhere else on the mainland in self-sustaining populations. The density and variety of species here is likely to exceed those on intensively managed 'mainland islands' and, in time, could well equal offshore islands as its severely degraded habitat improves over time.

Moreover, Zealandia has achieved a notable biological 'halo' effect with significant populations of tui and kaka now occurring throughout the city. It is still very early days for these fenced sanctuaries as the oldest have been operating for only 12 years and species build-up is still occurring, but they do seem to be able to rapidly create the species 'mass' needed to establish sustainable populations relatively quickly and they do allow the establishment of species which cannot establish in the presence of predators.

Predator fencing is controversial because of its relative cost. It requires capital injections at the outset and experience shows that only small to medium areas (optimum 1000ha) are practical to fence and maintain.



Zealandia has achieved a notable halo effect

DOC Mainland Islands:

Trounson

Boundary Stream

Paengaroa

Rotoiti

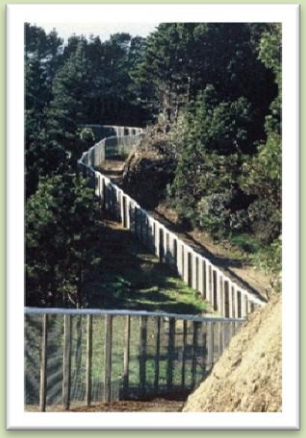
Otamatuna

Hurunui

Eradication is only possible on offshore islands and in fenced areas.

Ground control has moderate effect over medium-sized areas.

Aerial control has limited effect over large areas.



Fencing allows excellent results over small areas.

1.9. What have we learnt?

Over the last 20 years much has been learnt about what we can and cannot do with existing methods and which of these methods work best in what situation. Very little work has been undertaken investigating new approaches to reducing or removing pests. Current methods can be summarised as follows.

The most effective and cost effective scenario by far is eradication on and restoration of offshore islands. This island programme demonstrates that indigenous ecosystems and species thrive in the absence of predators and habitat recovers in the absence of browsers.

The mainland island programme demonstrates that continuous ground/aerial toxin/trapping/shooting alone achieves outcomes limited to the steady improvement and maintenance of existing sensitive species and habitat recovery of existing vegetation. It shows that establishment of abundant populations of sensitive species is unlikely using these methods alone. It also indicates these programmes are labour-intensive and hard to maintain long term and have a size limitation (up to 10,000ha is the most usually attempted).

The broad-scale aerial toxin and ground shooting programmes demonstrate that pest numbers can be kept relatively low over very large areas to allow forest health and common species to recover, but probably not low enough to allow the establishment and steady build-up of absent common species and certainly not absent sensitive species. Aerial toxin and shooting are the most cost efficient methods by far.

The Karori Sanctuary (and, increasingly, other fenced areas) demonstrates that predator/browser fencing is very effective in allowing localised eradication of pests and the rapid establishment and build-up of even the most sensitive species. It is the only method practical for use on the mainland which can rapidly achieve the species 'mass' needed to repopulate large areas. It has been demonstrated (kaka and tui in Wellington) that it can create a strong 'halo' effect by facilitating rapid dispersal in the surrounding areas. However, these projects also demonstrate that due to maintenance issues only comparatively small areas (optimum 1,000 ha) can be practically enclosed in a fence and the cost of fencing in relation to area protected is relatively high.

The costs, capabilities and limitations of each of these methods are well known and could be summarised as follows.

Water allows eradication and complete ecosystem and threatened species restoration over time. Limited to small remote areas and no application on the mainland. No 'halo' effect. Very cost effective after eradication.

Predator fencing allows eradication and complete ecosystem and threatened species restoration over time. Limited to small areas (1000 ha optimum) but can be applied anywhere on the mainland. Strong 'halo' effect. High capital cost for area protected after which maintenance costs would depend on the outcome sought but should be no more than ground control.

Ground toxin/trapping control allows maintenance of low densities of predators and some ecosystem and threatened species restoration over time. It is limited to medium sized areas (10,000 ha optimum), but difficult to maintain this size at maximum levels for long periods. Some 'halo' effect, especially for common species. Medium establishment and maintenance costs for area protected.

Aerial control allows achievement of low densities of predators for a short time until retreatment and the maintenance of ecosystem structure and improvement in common species populations over time. Effective at this level over large areas (100,000+ ha) and achieves some 'halo' effect. It has very low costs for the area protected.

From this the following conclusions can be drawn:

1. There is no one single 'best' method for large scale mainland restoration. Large scale mainland 'restoration' as defined previously cannot be achieved by using only one of the above methods.
2. All methods have their strengths and their limitations. Broadly speaking the most effective methods are the costliest and the least effective are the cheapest.
3. Predator fencing is the only method that can create the rapid species 'mass' which is essential to meaningful restoration. Aerial toxin and, to a lesser extent, ground control are the only methods which can deal with scale and cost efficiency.

1.10. How this Concept would Work

Nowhere have all methods been used together in concert on a large scale.

Nowhere on the mainland have a combination of all these methods (fencing, toxins, shooting) been tried in a co-ordinated programme on a large scale. Each method has advantages and limitations and this concept proposes that by using them together to counter their weaknesses and capitalise on their strengths, a synergistic effect could be achieved resulting in much greater outcomes than is achieved from using each in isolation.

12 forest blocks of 100,000 ha+ selected.

The proposition is to identify as many as 12 significant forest blocks (approx. 100,000 ha each in size) distributed across the country to ensure representativeness.

A pilot would be selected to test the technology and management issues, and a public/private partnership arrangement with DOC would be developed with an explicit contractual arrangement, clear goals and roles, and a 20-year funding profile.

Fence a core area – 1,000 ha.

In the pilot zone a selected area (approx. 1,000 ha) would be chosen to enclose in a predator/browser proof fence. The fence plus ancillary infrastructure (field bases, roads, tracks, etc.) would be constructed and suitably qualified staff employed. This would take up to two years.

After fence construction an eradication of the enclosed area would be undertaken using best practice methods. A monitoring and emergency response grid would be left in place. The eradication would take 6 months.

Species would be progressively released and established in the enclosed area using best practice methods and their progress (including dispersal) carefully monitored. This species establishment programme is likely to take 10 years before it reaches maintenance. **Aim**: To establish a totally safe 'nursery' zone to enable the establishment of sensitive species and rapidly create population 'mass'.

Ground control a peripheral 'buffer zone' – 10,000 ha.

Immediately after (or during) fence construction a peripheral zone (approx. 10,000 ha) surrounding the nursery zone would be targeted for intensive future continuous ground management. A grid of bait stations and traps would be immediately established ready for use, and a continuous management regime designed. **Aim**: To establish a 'safe' buffer zone around the nursery zone to prevent reinvasion, allow survival of dispersing species and their establishment in the wider ecosystem and boost resident species populations.

Aerial control in the outer zones – 90,000 ha.

The outer zones (approx. 90,000 ha) would be targeted for rotating cyclical aerial toxin application and systematic hunting of herbivores. **Aim**: To maintain relative safety in the wider zone for dispersing species and minimise reinvasion risks.

Once the operation of the pilot was in place, the process and technology can be reassessed and the overall programme would be given the 'green light' for the establishment of the next series of large conservation zones.

Species breed in and disperse from the core area.

It would take a minimum of 20 years **for each site** to reach a state which could be regarded as optimum in each site. This is the timeframe which governance and funding models should be built around.

1.11. The Need and Benefits

As alluded to in previous sections there is an urgen need to undertake a venture such as this on three countes – biodiversity, economic and social.

The benefits are considerable.

The Biodiversity Need

Our forest estate is at a low ebb, current strategy and activity is making little impression, DOC is focused on the full range of biodiversity and 'holding the line', we need to restore a large area to keep management options open for the future!

The Economic Need

New Zealand's reputation as 100% pure is under attack. We need to rebuilde our reputation to safeguard our exports and our tourism industry. This programme would create jobs and aid tourism. It would make New Zealand a better place to attract talent. It would enhance returned from ecosystem services, i.e., carbon sequestation and soil conservation.

The Social Need

Communities want a focus for meaningful action. The zones would enhance recreation opportunities; local iwi could reconnect with their taonga on a major scale. This project would provide an inspiring focus for a dynamic public/business/community/iwi partnership which would be a model for many other nations.

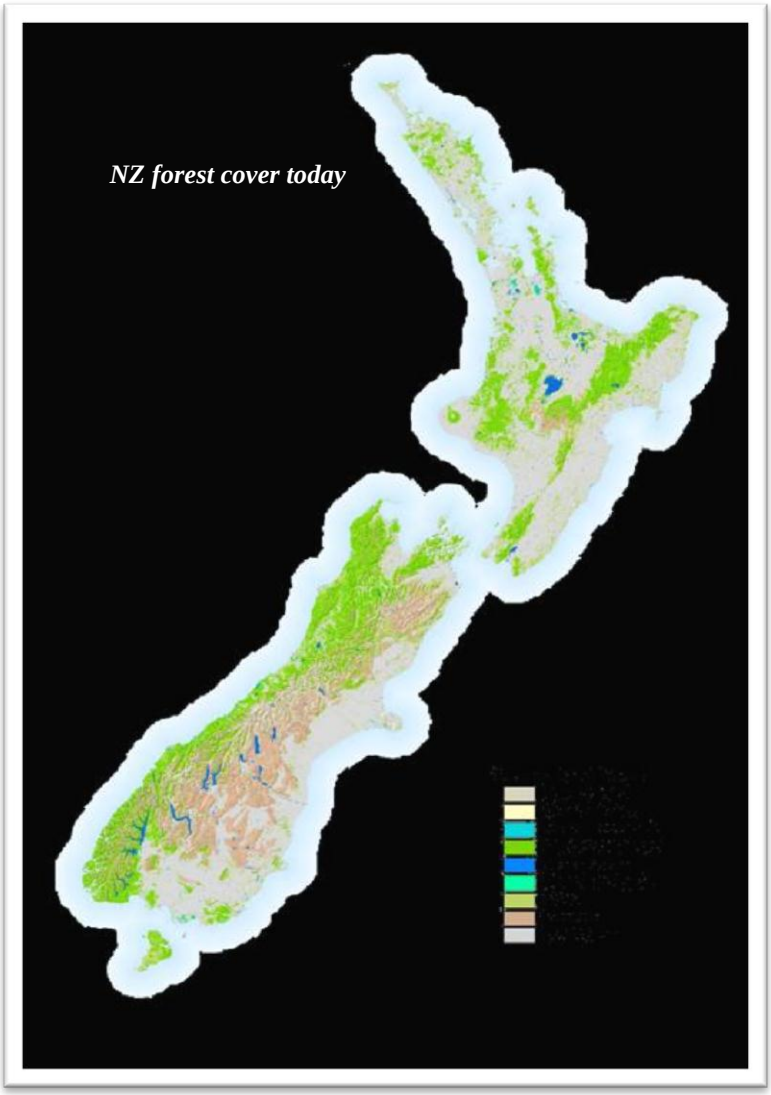
The costs of the programme are manageable and represent excellent value for money (see part Four).

Costs are manageable.

The opportunity costs are minimal. Loss of hunting opportunities would be the main one.

Part 2. The National Plan

The following section details how the National Conservation Trust might work and how it would select and broker sites round the nation.



2.1. The National Goal

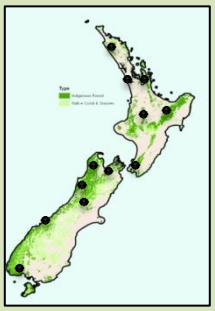
The national goal would be:

Have up to 12 sites of approximately 100,000 ha totalling 1,200,000 ha of primary forest representing all major ecosystem types under high outcome restoration action by 2035.

High outcome restoration action is defined as: action aimed at restoring to the managed area ecosystem processes and fauna and flora assemblages which were typical of the ecosystem.

Explanation

Up to 12 sites of 100,000 ha+ totalling 1,200,000 ha to be restored.



Only extant (i.e. still existing somewhere) fauna and flora can be restored, although near analogue species can be used as replacements.

Not all ecosystem processes can be recovered. Some, such as flood events, may have been permanently altered due to agricultural or urban development.

The goal states 'action' in recognition of the fact that it will take twenty or more years to recover fauna populations and shrub layers and it could take as long as several hundred years to recover emergent layers in forest to a natural pattern.

Representativeness implies that there will be a spread across the nation to cover all major types: northern kauri/podocarp/broadleaf, central podocarp/broadleaf, swamp forest, central and southern beech and southern podocarp/broadleaf.

Sites may include rivers, wetlands and shrublands but should be majority of primary, i.e. unlogged or unburnt forest or older growth secondary forest.

100,000 ha per site is a guideline only to indicate that these sites should be as large as possible. Smaller sites would be fine if they all add up to the goal in the long run and can be managed by the integrated methods described here.

This goal should be adjusted at 10 year intervals to update for new information and progress.

Sites would include wetlands, rivers and lakes.

2.2. The National Conservation Trust

A charitable trust is seen as the preferred governance structure to achieve the stated goal. A charitable trust is the ideal structure to facilitate public good activities on both public and private land; it can receive both public and private funding; it allows all interested parties, including the public to be involved; it is flexible enough to cope with both national and local levels of activity and it can have the longevity needed to pursue very long term goals.

A 'National Conservation Trust' to manage the task.

The 'National Conservation Trust' would therefore be incorporated to be the governance structure to facilitate and ensure achievement of the goal.

The role of the trust would be to:

1. Take responsibility to achieve the national goal.
2. Advocate for the goal and the programme.
3. Organise and invite partners to participate in the programme.
4. Facilitate membership to the trust by the general public.
5. Maintain records and databases as appropriate to support local cells and provide a national picture.
6. Identify suitable sites nationwide to form the national restoration network.
7. Develop funding options and pathways for the trust and the future national programme.
8. Select, set up and fund a pilot site and prove the restoration principles through this pilot.
9. Once sufficiently proven, develop a national programme of priority sites (i.e. how many sites, where and when to be set up) to meet the national goal.
10. Set up local cells of the trust according to the national programme to manage each site.
11. Maintain a national oversight for quality standards and progress of the national network.
12. Monitor overall progress towards the goal and make adjustments as needed.

A public/private partnership, operating primarily on public land.

The National Conservation Trust should be made up of representatives of DoC and private/community groups. The private component can be drawn from Conservation NGO's or seed funders or elected representatives of members.

Opportunity for the public to participate.

There should be the ability for the general public to participate by way of open membership.

The trust should have charitable status under the Charities Act. Its fundamental aim is to do public good primarily but not exclusively on public land.

The trust should be governed by a national board drawn from the partners whose role is to advocate for the national goal, find seed funding, employ staff and oversee progress.

The staff of the national trust would initially be a national manager and a small support team of ecologist/site and programme designers and part time administration. The programme and site designers would over time become quality monitors and advisers to the local cells.

2.3. The National Restoration Programme

The National Conservation Trust would have as its primary task the setting up of a national restoration programme which would entail developing the national network of up to twelve large restoration sites.

This would involve the following tasks:

1. Reviewing all national forest biodiversity data and establishing a framework of forest types to determine representativeness and former and current extents of those forest types.
2. Develop a site selection criteria (see sample below) which encompasses biodiversity, economic and social criteria.
3. Review all existing forests to determine a short list of candidate sites which would be representative of the full range of forest ecosystems.
4. Survey these sites on the ground for suitability and refine to a final candidate list of fifteen to twenty.
5. Select a pilot site and organise a local cell for that site.
6. Develop a programme of local cell and site development with a target to bring at least one new site on board each year.

Tasks of the National Conservation Trust.

The national group would be heavily involved in the pilot site and would use this to write the national procedures manual for setting up and operating the large conservation sites.

Criteria for local site selection could look something like this:

1. Be of sufficient size (up to 100,000 ha) of primary and/or good quality secondary growth forest.
2. Be representative of a major forest ecosystem type typical of the locality, ideally with a wide range of associated ecosystem types e.g. wetland, rivers, herb fields etc.
3. Have the support of all the landowners or managers, i.e. they would be prepared to enter into a management agreement to restore the area.
4. Be capable of being secured in perpetuity for the purposes of ecological restoration and the preservation of biodiversity.
5. Contain a valley or area between 750 and 2000 ha which is centrally located in the site and can be predator fenced around its entire perimeter at reasonable cost.
6. Have the potential for broad support from the local iwi and population.
7. Be capable of being managed for restoration in perpetuity within a standard cost per hectare range.

Site selection must be done to specific criteria:

- ***Size***
- ***Representativeness***
- ***Support***
- ***Secure***
- ***Area able to be fenced***
- ***Restorable***

Note: The best site for existing biodiversity and current condition may not be the best candidate for restoration.

Selecting suitable sites is a very difficult and complex task. Forest areas are never conveniently shaped or uniformly sized and many may not have a smallish valley which can be made accessible and fenced. In the north island many blocks are fragmented and smaller than ideal and have crazy shaped boundaries. In the south island the blocks can be much bigger but terrain and climate is even more difficult and many valleys can be too large. An early survey to identify candidate sites is therefore vital.

2.4. Funding the National Conservation Trust

The national arm of the trust would operate two budgets:

Operating and development budgets required.

1. An operating budget for the national organisation, likely to be in the order of $700,000 pa. This would cover national staff salaries, research, design, membership recruitment and support, and national office overhead.
2. A development budget to seed local cells. This could be a capital fund of $15 million plus.

The operating budget could be funded from member subscriptions and donations, business donations, grants and partner contributions. Care needs to be taken that this organisation never becomes too centrally heavy.

Public subscription

At a subscription rate of say $50 per member plus an average of $20 per member donation it would need 10,000 members to fund the national operation. This is challenging but achievable over time. The contingency is a small annual operating grant from each of the partners (DoC, NGOs, LTAs) to supplement any shortfall.

The development budget can be sourced from business donors, philanthropic trusts, private individuals and a government establishment grant – perhaps from one of the existing environmental funds, e.g. Sustainable Development Fund, Forest Heritage Fund, etc.).

Capital fund

A $15 million capital fund would generate approx. $750,000 income per year to go towards seeding one site per annum.

It is expected that a 'big idea' such as this could attract significant backing from nationally focussed private funders. However experience shows that private funders seldom like to fund operations and especially the operations of national offices. They are much more likely to contribute to a capital fund to seed actual projects.

Moreover, it should not be overlooked that the government has a prime responsibility to manage their own lands and that they will be the major partner and landowner and therefore should be expected to always be the prime funder. Private funding can only ever be expected to be a supplement and is most likely to go towards capital or 'one-off' project funding.

Public/private funding ratio

A target ratio of 90/10 government to private funding would be reasonable and realistic. Accordingly, a government funding pool should be set up which would be designed to ramp up as the sites came on stream. See Appendix X for an estimate of the size of this pool.

Part 3. The Site Plan

The following section details how a particular cell of the National Trust might work and how it would set up and manage a particular local large conservation zone. The zone described here is an illustrative model only and is not meant to represent a particular place.

3.1. Site Planning and Feasibility

With a candidate site chosen for development from the national candidate list and before the local cell was set up, the National Conservation Trust would go through a site preparation process. This would involve testing the feasibility of the site.

The issues that the national trust would need to cover would include:

Format for feasibility study for a site.

1. Tenure of the site (lease, occupation rights and the extent of the boundaries);
2. Local Governance and Management structures;
3. Stakeholders and their needs;
4. Resource consents and other permits;
5. Fencing feasibility (fence design, route, access, site difficulties as regards terrain and vegetation clearance);
6. Restoration potential (what is the restoration target and time frames);
7. Restoration and management programme design and costs over 20 year's minimum;
8. Risk analysis and the mitigation of identified risks;
9. Funding sources and revenue potential;
10. Social issues (members, volunteers, existing user rights, new potential users, iwi involvement, potential opposition);
11. Benefits over costs (biodiversity, social and economic benefits over loss of rights, capital and operating costs and opportunity costs).

A site would be developed and managed by a semi-independent 'cell' of the National Conservation Trust.

The National Trust would then enter into an agreement with the local partners to set up a cell to manage the operation.

3.2. Setting up a Local 'Cell'

With a site chosen for development, the National Trust would set up a local 'cell' to develop and operate it. Local cells would have a reasonable degree of autonomy in that they would have:

Characteristics of a local 'cell'.

1. Independent trust status but be affiliated to the National Trust and with an agreement conditional on receiving seed funding;
2. Their own local partners and governance board;
3. Their own management team based on site;
4. Their own vision for the area and long term site plan;
5. Their own funding pathway and budget;
6. Their own local volunteer and membership base;
7. Their own relationship with the wider local community and interested parties.

They would also be required to be part of the national network of restoration sites. This would entail:

Cells would be required to meet national trust standards.

1. Meeting National Trust standards for governance, planning, management and accountability;
2. Following the pattern for site development and the recommendations of the national designers;
3. Sharing information and lessons with the wider network;
4. Agreeing to standards for operations and methodology.

Seed funding from the National Trust.

Cells would receive a seed grant from the National Trust in the order of $500,000 along with training and support. From there they would organise their own funding pathway which could include access to a government funding pool. Independent trust status would help these cells attract local community funding.

While their initial focus would be the chosen site, they could, in time, expand their activities to include a second large site and/or a number of smaller associated sites, or extend the managed area around the periphery of the existing site to make 'pest free' zones.

The first actions of the cell would be to hire a site manager who would immediately begin to organise a team and access local funding sources including community trusts, TLA contributions and private and business sponsorships.

Cells would also organise a local membership group which could either be a subset of, or a spin-off of, the National Trust membership. Some people may not want to join the national trust but would happily support local ventures.

The cell would also organise a local volunteer group to assist management in the practical tasks of operating the site. Local branches of NGOs are particularly useful for monitoring and project assistance and there will be many people who will be very keen to work in the site as their contribution.

The site manager and his/her team would complete final programme and site design including defining the management zones: fenced 'core' area (1000 ha), protective ground control 'buffer' zone (10,000 ha) around the fenced area and at selected high risk reinvasion points, and the aerial 'outer' control zones (90,000 ha).

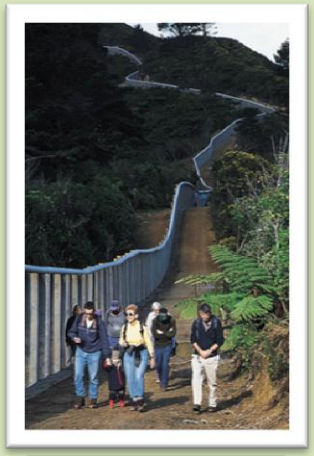
3.3. Fencing the Site

Fencing creates species 'mass' very fast, allowing for rapid dispersal.

With a structure in place and a team on board the Manager would begin their development phase. The first activity would be to build the fence. In the feasibility stage the location and route of the fence would have been surveyed, costs estimated and resource consents obtained.

Fencing to exclude predators and browsers is now a well proven technology. However it is still a method which requires excellent design and skilled engineering to execute well. Some of the issues and lessons learnt regarding fencing are as follows:

1. Valleys are by far the best option (as opposed to hills or peninsulas). A valley which is the headwaters of a stream is ideal as a road and fence can be constructed along ridge tops, which tend to be more lightly vegetated.
2. The fenced area must be located as close to the centre of the whole site as possible. This could mean a place with no existing access and service tracks may need to be built – not always easy in difficult terrain and often expensive.
3. Size is important. Too small and the cost per ha enclosed increases and the safe zone becomes less reliable, increasing the chances of 'fly-outs' in the early stages. Too large and the cost increases and the perimeter becomes difficult to patrol and maintain. About 1000 ha is optimal but in fact the actual area will normally be dictated by terrain. Most valleys will be an elongated ovoid shape.
4. The mouth of the valley will need to be bridged by a weir and the fence constructed across this weir. Allowance must be made for water egress and flood events and still maintain it as pest proof. The technology for coping with these issues is well established (flapper gates, debris barriers) but some hill country streams can run very fast.
5. The fence can be a standard Karori design which is more robust than *Excluder*. Robustness is important in back country areas where weather is more extreme. The Karori design has held up well in an extreme wind zone.
6. Fencing costs will vary considerably between sites with variables including hardness of rock substrate, the number of unstable or steep zones needing retaining, the remoteness of the site, the amount of vegetation needing clearance, the need for drainage and the influence of weather. A standard cost for budgeting purposes could be $300,000 per kilometre which would include a road on the fence line, fence, weir and gates. A 1000 ha site will have a perimeter of 15 to 18 km which would give a raw cost of $5,000,000 for a fence.
7. A fence of this size will take about 6 to 9 months to construct and needs to be built in summer.



Fence at Karori.

Predator/browser fencing is now well proven technology.

Cost of fencing is manageable on a small scale – approx. 1,000 ha.

The fence is the major capital item for the site but also required would be a field base (sheds for secure storage of vehicles, equipment and supplies), an access road to the fenced area and cabin style accommodation for field crews and volunteers. A helicopter landing site would need to be cleared.

3.4. Clearing the Site of pests

With the infrastructure in place and a team on board, the site Manager would begin the pest management phase.

The first activity would be to eradicate all mammal pests from the fenced area. The pests likely to be present are: goat, deer, pig, possum, wallaby, ferret, weasel, stoat, cat, Norway rat, ship rat, house mouse and hedgehog

The technology for eradicating these (apart from house mice) is well tried and effective and is as follows:

1. The fenced area would be tracked on transects on a 50m x 50m grid to eradicate hedgehogs, for later mouse control and for later monitoring for and response to reinvasion.
2. The fenced area would be aerially broadcast with brodifacoum anti-coagulant at 2kg per ha. A second sowing at the same rate would occur 10 days after the first toxic drop. This should eliminate all pests apart from hedgehog and some of the larger browsers. Hand broadcast would occur around the fence line and watercourses.
3. Hedgehogs would be poisoned from bait stations using cat's meat as bait. Surviving ungulates would be hunted and shot.
4. Monitoring would then occur to check for a complete kill. No detection after 6 months would result in an 'all clear' in the fenced area.
5. The 10,000 ha permanent bait and trap station grid would be laid out around the fenced area and at selected invasion points at the same time as the internal grid is laid. Spacing of tracks would be 100m x 50m and bait stations and trap lines placed along the tracks.
6. Immediately after the aerial drop inside the fenced area the whole zone (100,000 ha) would be sown with aerial non-toxic pre-feed bait at a rate of 2kg per ha. 10 days later the entire zone would be sown with toxic 1080 bait at a rate of 2-3kg per ha. This should reduce rodent, possum, cat and mustelid densities to less than 1% across the whole zone. Ungulate densities are likely to be reduced to 5%.
7. Immediately after the 1080 drop the 10,000 ha protective bait station and trapping grid would be loaded and serviced to ensure pest densities in the protective zone remain at or are reduced to undetectable levels. A regime of different toxin based baits should be used to reduce risk of resistance to any one toxin.
8. Ungulate hunting would continue throughout the area until densities were under control or local eradication achieved.
9. A programme to co-ordinate control with neighbours and other adjacent landowners would also get under way immediately.

House mice are a difficult problem. They are nearly impossible to eradicate permanently as they breed fast and can inhabit small spaces. No mainland site has succeeded in eradicating them permanently to date. Work undertaken by Innes it has shown that the effect of mice is substantial on small taxa and the ecosystem. Though currently there is no suitable technology to exclude mice long term their presence can be tolerated until methods to eradicate them have been refined.

Wasps will also remain a serious problem in south island honeydew beech forests until methods for their widespread control improve.

The effectiveness and costs of ground control are well known.

Aerial 1080 drops and shooting are established technologies.

Mice are a problem.

Robust species will recover and disperse rapidly.

3.5. Restoring the Site

With the pests either removed or under control the restoration phase can begin immediately. This will primarily centre on reintroducing missing fauna and replanting selected flora in certain places.

An early activity as part of the restoration design would have been a biological inventory of the site where all extant fauna and flora were identified and located and missing representative taxa listed and programmed for reintroduction or replanting.

Generally species which are still present in pest free sites will recover their populations reasonably quickly of their own accord if their habitat requirements remain intact. Fauna which are likely to still be present, albeit in mostly small numbers, include: tui, bellbird, pigeon, silvereye, grey warbler, fantail, morepork, shining cuckoo, rifleman, whitehead (north island),tomtit, brown creeper (south island) and pukeko, harrier, kingfisher, paradise duck, grey duck, scaup, grey teal and shags on wetlands, ponds and rivers. All of these are likely to bounce back of their own accord within five years. Within ten years they should be abundant throughout the whole zone or their particular habitat. Long-tailed cuckoo may be present if whiteheads and yellowheads are present.

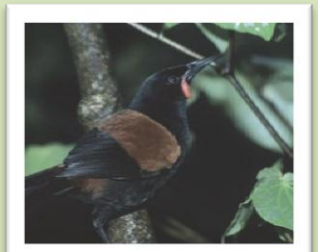
Lizards and invertebrates will depend a lot on the locality and it may take time (ten years) for them to re-emerge as they can be very cryptic in low numbers. Fish are unlikely to be affected unless trout are present in high numbers in the rivers.

Some ground breeding and slower breeding species will recover over time.

Likely missing species which could be reintroduced in the first ten years include: kaka, kiwi, saddleback, kokako, stitchbird, robin, kakariki, yellowhead (south island), takahe, weka, falcon, blue duck (on rivers), brown teal, grebe (on ponds), fernbird, bittern and banded rail (in swamps), tuatara, frogs, giant snails and weta.

The recovery of these species will be highly variable. Some, such as robin, yellowhead and kakariki, will establish and recover fast and spread throughout the zone (within ten years of release). Others, such as kaka, kokako and kiwi, will recover more slowly but steadily and will eventually (within twenty years of release) occupy the whole zone in dense numbers. Some very sensitive species, such as saddleback and stitchbird, may establish quickly but will only be in dense numbers in the fenced and intensively managed zones. Some, such as fernbird, rail, bittern, takahe, tuatara, frogs and the ducks, will be habitat restricted.

Extant plant species will recover, but slowly. It will take ten years before gains in flora can be measured and some species may take many decades to recover their numbers. Some planting of species which are entirely missing or vital to the ecosystem (e.g. fuchsia, king fern, mistletoe) can be planted quickly but it could be many years before they show significant recovery.



Very sensitive species may only be in substantial numbers in the inner zones.

Experience shows that generally only two or three major species can be reintroduced each year and close monitoring of establishment and survival is needed. Seasonal fluctuations are common and birds in particular can be very picky about their choice of habitat and will not always stay inside the fenced area. Tactics such as supplementary feeding and mass or slow release can be used to enhance the chances of success. Ground birds such as kiwi and weka will need to be relocated within the zone at times.

However it could be reasonably expected that, provided numbers of pests can be kept very low, within twenty years all missing fauna would have been re-established, that numbers will have dramatically recovered across the whole managed area and that the ecosystem will be progressing rapidly on a recovery trajectory. The scene described in 1.1 will be a reality.

Part 4. Costs

The following section details the potential costs for the programme over a twenty-year period.

4.1. National Programme Costs

The costs of the national programme will be represented by the budgets for the National Conservation Trust.

The Trust will have two budgets:

1. Operating
2. Developmental.

The operating cost is the figure which will need to be covered by income from member subscriptions and partner operating grants.

The development budget would be covered by income generated from the capital fund.

The capital fund would be set up in year one from private donations/subscriptions, government grants from Forest Heritage Fund, Sustainable Development Fund or TFBIS fund, or special appropriation.

The projections on the following page indicate that each cell would require:

1. A 'start up' of $6,500,000 in year 1, and
2. An annual operating budget of approx. $2,500,000 pa.

Assumptions include a standard cost of $15 per ha for pest control. Given that all set up costs and some maintenance costs are included elsewhere, this should be sufficient to cover the programmed aerial drops and bait station servicing, including bait.

National Conservation Trust Cost Projection

Operating budget – 20 year (units = $1000 in 2012 $)							
Item	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 10**	**Year 20**
Salaries[1]							
CEO	130	130	130	150	150	175	200
Advisors	70	140	210	210	210	250	275
Admin	50	100	100	100	120	150	175
Overheads x20%	50	75	88	92	94	104	130
	300	**445**	**528**	**552**	**574**	**679**	**780**
Office, travel, member services, board[2]	300	450	500	550	600	700	800
Total Operating Costs	600	895	1028	1102	1174	1379	1580
Development costs[3] **($750k per start up)**	Nil	750	750	750	750	750	Nil
Capital Fund	10,000	15,000	No change	No change	No change	20,000	No change

Assumptions

1. Salaries assume a CEO paid equivalent to a DOC Conservator.
   - Advisors would be brought on board progressively as the organisation expands
   - Administration personnel would be engaged primarily in national membership recruitment and finance.
   - Overheads at 20% of salary for holiday pay, ACC, special leave, bonuses, etc.
2. Office, travel, member services and boar arbitrarily assessed at 100% of salary costs.
3. Development costs assume a 5% pa return from the capital fund.
   - Assume no injection in first year and one per year after that, increasing to one per year after that.
   - The capital fund becomes available for supplementation of member subscriptions and partner grants after year 15 – or for allocation to further projects if expansion beyond 12 cells or sites is proposed.

4.2. Budget for a Typical Site

The costs for a typical site will be represented by the budget of a local 'cell' of the National Conservation Trust.

Each cell will have two budgets:

1. Operating
2. Capital.

The operating cost is the figure which will need to be covered by income from local members, local donations, partner operating grants (90% from government appropriations through the DOC budget).

The capital budget would be covered by the development grant from the National Conservation Trust and a government grant from appropriations through the DOC budget.

Each cell would then work to maximise its income from local sources although it would be unrealistic to expect them to fully fund the operations locally.

Budget for a Typical Site

Operating budget – 20 year (units = $1000 in 2012 $)							
Item	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 10**	**Year 20**
Eradication (zone 1)		300					
Monitoring and response		75	75	75	75	75	75
Species management		300	300	300	200	150	50
Maintenance (roads, fence, vehicles, tracks, base)		100	100	100	100	100	100
Pest control (ground, aerial)		1500	1500	1500	1500	1500	1500
Back office and overheads (project mgr, support staff, accommodation, etc.)	250	300	350	350	400	400	400
Total Operating	**250**	**2575**	**2325**	**2325**	**2275**	**2225**	**2125**

Capital Budget							
Predator fence (15km)	**5000**				**200**	**200**	**500**
Bait station grid (11,000 ha)	**300**				**100**	**100**	**100**
Field equipment (traps, radios)	**100**				**100**	**100**	**100**
Roads and tracks	**300**				**200**	**200**	**200**
Vehicles	**200**						
Field base/ helicopter pad	**100**						
	6000				**600**	**600**	**600**

4.3. Total Costs

The complete costs of the whole programme over 20 years are assessed in the following table.

These show operating costs as starting low: $1m in year 2, increasing to $9.1m in year 5 and increasing to $29m by year 13 when it remains stable (assuming no other projects are undertaken).

Operating costs of $29m pa represents less than one-fifth of DOC's current budget and equals .0002% of New Zealand's GDP.

Capital costs are shown to be $10m in each of the first two years and $6m for the next 11 years. Total capital over 13 years equals $87,000.

These costs seem to be very affordable and represent excellent value for money considering the return based on the benefits as identified in part 1.11.

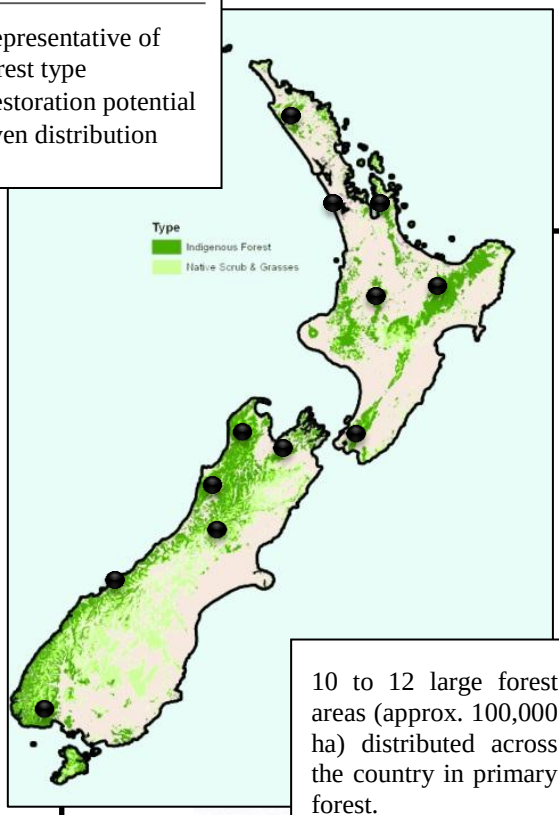
Total National Costs

Operating	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 20
National office	600	875	1030	1100	1175	1380	1580
'Cells' of the Trust	Nil	(1) 250	(2) 2770	(3) 5300	(4) 8000	(9) 20000	(12) 27500
Total	**600**	**1125**	**3800**	**6400**	**9175**	**21380**	**29080**
Capital							
National	10000	5000	Nil	Nil	Nil	Nil	Nil
'Cells' of the Trust		(1) 6000	(2) 6000	(3) 6000	(4) 6000	(9) 6000	(12) Nil
Annual Cap Total	**10000**	**11000**	**6000**	**6000**	**6000**	**6000**	**Nil**
Cumulative Cap Total	**10000**	**21000**	**27000**	**33000**	**39000**	**69000**	**87000**

Large Conservation Zones

Criteria for Selection

- Representative of forest type
- Restoration potential
- Even distribution



Species Dispersal

10 to 12 large forest areas (approx. 100,000 ha) distributed across the country in primary forest.

Outer Zone 3

Fenced Core

Aim: a safe 'nursery' zone to create rapid species 'mass'.

Complete eradication

Buffer Zones

Aim: prevent reinvasion of core and allow survival of dispersing species.

Zero detectable pest levels

Outer Zone 2

Outer Zone 1

Outer Zones

Aim: to minimise reinvasion and maintain habitat quality and security for dispersing species over a large area.

2-5% pest levels

Tenure	DOC estate primarily, with smaller parcels of LTA land or iwi and private land.
Governance	**Option 1:** • A national 'eco trust' drawn from all constituent partners: private/community, iwi, research groups whose purpose is to manage large restoration sites. • Doc as contractor and policy overseer. **Option 2:** • DOC or other landowner as manager.
Vision	**National:** To restore the species assemblages and natural processes to a representative 15% of the nation's forests. **Local:** To restore the species assemblages and natural processes to the designated managed area.
Method – fenced core area	Predator fence a core area as a safe nursery (approx. 1,000 ha) and eradicate all pests and establish species missing from the whole area. **Outcome:** Sensitive species establish in the safe core area and later disperse into the outer zones. Creates rapid population build up and species mass needed for dispersal.
Method – buffer zones	Ground bait station and trap a 'buffer' one (approx. 10,000 ha) to reduce pest densities to undetectable levels. **Outcome:** Sensitive and robust species establish and increase in numbers in the buffer zone. Core zone is protected from reinvasion.
Method – outer zones	Aerial toxin and ground shooting (approx. 90,000 ha) to reduce pest densities to levels which will allow survival of more robust threatened species, increase in common species and the recovery of the forest ecosystem and habitat. Protects the inner zones from reinvasion.