THREATS TO NATIVE PLANTS AND NICHES FOR SURVIVAL IN NEW ZEALAND CULTURAL LANDSCAPES

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WHAT ARE THE THREATS?

The threats to New Zealand's plants and animals have been thoroughly documented over the past century and will be widely known to readers of this journal. The main causal factors in the decline of our native flora have been human disturbance, introduced plant competition, mammal browsing, functional interference, and genetic pollution.

Human disturbance encompasses vegetation clearance for building, agriculture, forestry, flood protection (which ironically constrains natural disturbances that some plants depend upon), and other activities or developments. Reducing and fragmenting habitats, removal of buffering edges to natural communities, draining land in and around wetlands, burning bush, scrub and tussock, filling low-lying areas and poldering salt marshes are all examples of the many cases of disturbance or disruption. Direct harvesting of land-based native species is now quite limited merely because there is little remaining harvestable material. But included are logging of native forests, high country pastoralism, and localised cultural harvest of plants and animals (the latter having indirect effects on plants). Some harvesting is carried out "sustainably" (that is, the dominant utilised species are perpetuated), although the natural (post-Polynesian) integrity of the ecosystems is interfered with. Some harvesting is, of course, not at all sustainable.

Plant competition is a special case of human interference. Settlers brought many species into the country for agricultural production, timber, amenity, and nostalgia. Others come in accidentally as seed contaminants. New Zealand has a flora of some 2500 vascular plants. There is a similar number of naturalised exotic species, but a monstrous 30–40 000 lurk in the wings (in gardens, hothouses and conservatories) continually and increasingly impinging on remaining natural habitats (Bill Sykes pers. comm. for estimate of numbers). In each case there is a further displacement of indigenous species or genetic combinations as the most competitively vulnerable genotypes or marginal habitats succumb. Since the exotic flora is the pick of the world's vast 'crop', it is not surprising that they are competitively superior to most of the more generalist native species that are typical of even large islands such as New Zealand.

The invaders represent an increasingly dispersed presence of ticking time bombs in the landscape. This brings the exotic flora into increasing contact with the indigenous species even in remote places and there is competition initially between relative sizes of seed banks. As a society we are largely blasé about this subversive presence. Indeed we continue to aid and abet its spread by lax biosecurity, deliberate and inadvertent movement of propagules to ever more remote parts of the country (every school fair and garage sale is a propagating ground for male fern, wandering willy or North Island lacebark and kowhai), and through casual or even hostile attitudes to our

indigenous biota by people who tend to be politically influential (competition of values). It seems only a matter of time before almost every native plant in the country has been constrained to a greater (extinction) or lesser extent (as a reduced gene pool co-existing with introduced species).

This raises the matter of the frequent misconception that packing more introduced species into an area increases biodiversity. Biodiversity is a global concept, so if an endemic species (as most of New Zealand's species are), or only part of its variability, is displaced by imported (usually common) species then global biodiversity declines. We can demonstrate this by considering that if the 35 000 exotics spread and extinguished all our indigenous plants, local species richness will have clearly increased, but world biodiversity will have shrunk by 2500 species. And this doesn't account for the dozen or so invertebrates (on average) and uncountable microbes that have an obligate relationship with every one of our plant species.

Mammal browsing is a killer for many of our highly palatable plant species. It can also further skew the competitive advantage towards exotic plants that generally have come from lands where they became co-adapted to browsing mammals. New Zealand plants are subjected to browsing at all levels – by arboreal marsupials to mice feeding on fallen seed, to introduced soil fauna. Many species can cope with one source of attack, but if grazing is added to burning, or if there is no respite from the grazing, or if it is combined with other human disturbance that reduces populations below viable states, then there is a steady and sometimes rapid decline. 'Living dead' (reference) is an apt name for mature plants in the landscape that lack recruitment due to exotic plant competition or browsing of young seedlings. Many of our lowland shrub and grass species are in this dead end category.

Functional interference is an indirect consequence of the previous or other related pressures. The predation of kereru by introduced mammals reduces the dispersal and regeneration of large-fruited trees such as miro, matai, titoki, tawa and so on. Likewise, the reduction in honey-eating birds, again due to predation by introduced fauna (and wasps eating honeydew in beech forests), will interfere with pollination of many plants including mistletoes. An interesting functional imbalance – which affects both native and exotic grasses – is the spread of the native grass grub to plague proportions in managed pastures. This may be partly attributed to reduction of native shrubs, especially matagouri, in eastern landscapes. A native fly has to feed on the pollen of these shrubs before becoming a larva that then parasitises grass grub. With the gradual elimination of the pollen source, grass grub (and perhaps porina) has spread and may have contributed to the decline of fescue tussocks – as well as exotic pasture grasses.

Genetic pollution is a phenomenon only brought to our attention over the past 30 years, initially by Dr Eric Godley who warned well-meaning forest and birders against planting species willy nilly across the countryside from outside their own territory. This applied especially to geographic races of plants like kowhai where it was postulated that local genetic types might be displaced or disrupted by new genes and combinations from other districts thereby erasing or scribbling over the genetic stories inherent in every species and local population.

There is a useful term that applies well to the situation of extinguishing the biological and genetic stories in the land. It is a term borrowed from the landscape architects, referring to story-telling and local identity. It is the concept of 'legibility'. With the loss of characteristic local species and genetic forms, not to mention the underlying landforms, hydrology and soils, the land is no longer legible – it cannot be read or understood – it has no meaning (except perhaps financial). But what a barren existence we then have – when we homogenise and 'purify' the landscape or place a blanket of foreign species across it.

WHY ARE OUR NATIVE PLANTS THREATENED?

Above I have defined the agents of decline, but this does not explain why the native species are so vulnerable or why introduced species are often competitively superior. There are biogeographic causal factors that revolve around the long period of relative isolation our biota has had from the cut and thrust of continental evolutionary forces. Although it now appears there may have been marsupials, snakes, crocodiles and other large reptiles in New Zealand during the Tertiary era, these became extinct at least by the onset of the glaciations. The co-adapted plants also became extinct or lost their adaptations (such as rapid regrowth after defoliation) through lack of use. As they say, use it or lose it!

On one level, New Zealand is a tectonically unstable land, but it appears not to have suffered from frequent disturbances of fire and herd grazing, and so there was no evolutionary premium on rapid regrowth as is the case for continental species. These have been further honed by arid or cold climates and fires in the context of generally fertile substrates. Such frequent natural and even human-induced disturbances, in a 'high-revving', fertile environment, have gone on for millions of years. Tectonic disturbance (slips, floods) usually results in cleaning the slate of all vegetation. There is a long plodding succession back to forest, which may remain undisturbed for hundreds or thousands of years – the maximum ages of our forest trees. However, fire and browsing merely removes the foliage or stems, and suitably adapted species (that abound in the continents) can resprout – and the fastest wins. On the continents this has led to the evolution of turf-forming grasses that are dense masses of leaves held close to the ground where the growing tips are below the teeth of the grazer.

The major disruptions of the glaciation left New Zealand with a depauperate flora (and fauna), meaning a rather loose filling of niches and many generalist species. These holey habitats were an easy target for the numerous introduced species. We continue to (or try to) import new species or genomes - as though we hadn't already caused enough problems. Because New Zealand has such a relatively benign climate, plants from almost every corner of the planet can grow or thrive here – especially in the absence of the competitors and natural biocontrols of their homelands.

New Zealand was the last substantial land mass to be colonised by people, a mere millennium ago. So it is not surprising that the biota was living in a virtual 'Garden of Eden' by comparison with the 'tough' evolution experienced by the continental species that were soon being liberated all over the land.

The other critical explanatory factor in the decline and luke-warm desire to arrest these trends is the social-cultural circumstances of what was a predominantly colonial

nation. Practicality (need for productive species that fit the industrial paradigm), home sickness, belief in the superiority of the homeland, all probably contributed to decisions about land management and importation of familiar plants – and today desire for instant novelty and fantastic colour is satisfied by the market. Only very few settlers, such as Gerald Loder, who bequeathed the Loder Cup to New Zealand to be awarded to those who promoted understanding and protection of the "Dominion's incomparable flora", broke away from the type.

But the die was cast by the majority of colonials, and arable lands like the Canterbury Plains (which were largely treeless at the time of European settlement) were transformed into factory farms almost exclusively populated by exotics more suited to the settler's modes of production, commerce and livelihood. These plains were perhaps more completely modified than almost anywhere in the country – even the world. Once economic and psychological imperatives had been fulfilled there was almost nothing left of the natural heritage. Powerful technologies would eventually obliterate everything that was once there apart from a narrow sliver of nature, a few cm wide, which sometimes survives on dry soils beneath the bottom fence wire – having escaped the plough in the paddock and the grader on the side of the road. And just when we thought it couldn't get any worse, and a few steep scarps of unproductive, unploughable land supporting remnants of matagouri or coprosma bushes had escaped, the forestry companies discovered a use for it and even these fortuitous survivors are now disappearing under the green wave of pine needles.

So, primary vegetation (non planted) is still disappearing. These are not mitigated by planting new trees, even when that is an undeniably good thing to do. We can't recreate whole natural systems. Recently a well-known landowner in the Hurunui allowed his manager to spray dead 400 ha of up to 100-year-old matagouri. The replacement cost of the bushes alone, and not the infinite complexities of the whole ecosystem, is in the order of $40 million – and might take a century to complete. You can't buy time at any price! Would we continue to destroy 'time' in such a cavalier manner if we thought about these costs?

All of this is more insidious than the direct effects. If we accept the postulate that culture is based on what we come to know and love (in the climate, the land and the natural history), then the absence of indigenous nature from most people's daily experience (for several generations for many people) results in the loss of sensitivity, identity and desire to protect it. It is a chicken and egg argument. How can we protect what is left and how can we restore what is lost if the object is no longer a revered or comfortable part of our culture and its prevailing imagery.

GLIMMERS OF HOPE

Well, things are not quite so grim. There has been a growing interest in conservation and nature among the post-war generation in line with worldwide awareness of the environment, recognition of the regional uniqueness of biota, evolution of a sense of place that this engenders, and political acknowledgement of a duty to preserve each region's species. This translates into private individuals growing native plants in their gardens, local government protecting and restoring native habitats in parks, reserves and waterways, and incremental increases of functionality (reproduction, dispersal, germination, etc) of indigenous biota within urban ecosystems.

But it is a struggle as it is difficult to convince landowners and governments to protect something and forgo profit when such altruism is not a part of the contemporary socio-political idiom. Even when there is a desire, economic survival dictates otherwise – *noblesse oblige* seldom operates in the modern world regardless of inclination.

It is true that more people and local governments are protecting, promoting and planting indigenous species. But, more or less 'green' administrations come and go. Christchurch saw a virtual frenzy of 'waterway enhancement' during the 1990s, but then organisational restructuring saw this environmentally progressive stance slowed and even reversed. The same has happened with successive Waitakere City Councils – although 'green' is currently the 'in' political shade. There always seem to be new dilemmas to face such as hostility to spraying a biologically-derived insecticide onto western Auckland suburbs, to eradicate painted apple moth, which may otherwise devastate both exotic and native trees.

Everyone wants a nice clean environment and biodiversity, but there are seldom votes in it. Councils are captured, especially in Christchurch, by a generally retired, older generation who were not participants in the baby booming environmental wave, but are nonetheless politically influential when it comes to city management reflecting a past age of manicured lawns, herbaceous borders, and exotic shrubberies or parklands. Managed urban 'wilderness' is outside their comfort zone.

Nevertheless, nature is fighting back. Probably a million native plants have been propagated and planted into the Christchurch urban 'woodlands' in the past decade. These are now producing seed and fruit, and are dispersing and germinating across receptive sites in the city – which currently has >75% exotic trees and shrubs. Many of these newly regenerating plants will be chopped out (a recent letter in The Press essentially incited people, who were in doubt about their legal rights, to go and chop down cabbage trees on their properties). But others keep coming up – in untended ground at the back of the section or even in gutters. I have seen seedlings around Christchurch of tree fuchsia, tanekaha (from planted tree), titoki, kahikatea, wineberry, totara, fivefinger, mahoe, *Lachnagrostis filiformis* (in a shingle pit), *Poa imbecilla* (on the edge of a footpath yet not seen recently in Riccarton Bush), as well as many more common species like cabbage tree and karamu, that have been regenerating into older gardens and cracks in the pavement for decades. I have even seen *Blechnum penna-marina* growing in the brickwork beside a leaky downpipe in an alleyway off Lichfield St, and other native spp nearby include *Senecio glomeratus*, *Hydrocotyle heteromeria*, *Cotula australis*, bracken, *Blechnum procerum* (P. Bellingham pers. comm.) and *Epilobium nummulariifolium*. Other interesting and spontaneous recruits are the black orchid, *Gastrodia cunninghamii*, and the tree fern, *Dicksonia squarrosa*, on the Avon River bank opposite Milbrook Reserve. It could be said that when our native plants have become 'weeds', then we will know we have a viable nature again.

OPPORTUNITIES FOR SURVIVAL AND RECOVERY

The solutions are both ecological and cultural. We may be able to (and certainly hope we can) technically save our flora, but that will be irrelevant unless there is a will to

do this by the people of New Zealand. For the reasons stated, Christchurch citizens (or at least its decision makers) seem ambivalent or indifferent about the decimation and plight of the indigenous flora locally. Huge sums of money are going into trying to keep willows, oaks and elms alive while kereru sadly survey a virtual desert park (the common exotic trees bear neither fleshy fruit nor nectariferous flowers) from their precarious strongholds in the Botanic gardens, Riccarton Bush and the Port Hills. But, as I've pointed out, there is regeneration and natural processes starting up again within urban habitats. We can also expect other ecosystem components and processes to recuperate in time. It is also not to say that exotic trees provide no value to native birds. Tall exotic trees (often the tallest in the landscape) provide safer nesting and roosting sites, and kereru have been observed eating spring shoots of linden, elm, tree lucerne and Douglas fir, flowers of horse chestnut and broom, and fruits of holly and plums. One has to balance these gains against the invasiveness of holly and other problems.

One of the greatest opportunities is inherent in the surviving primary habitats of Christchurch where nearly 400 native vascular plants grow wild. This is a similar number to those that inhabit our national parks (and other cities for that matter) and there is little overlap between the floras of these vastly different environments. We can start to see even formal garden environments – walls, rock/scree gardens, lawns, hedges, shady alleys between house and fence, trellises, herbaceous borders and traffic islands – as biodiverse surrogate habitats for natural rock ledges, riverbeds, avian lakeshore turfs, exposed coastal shrublands, sheltered gullies, vine hosts, or successional herbfields. The value of these 'islands' of habitat for maintaining populations of invertebrates, dependent on now vulnerable shrubs and herbs which would otherwise be engulfed by vigorous alien grasses and other weeds, is perhaps far greater than we have realised.

We are at a crossroads. We are facing perhaps the last chance to protect Canterbury's natural heritage. We have to take that chance now, before the attrition further undermines the viability of our native plants and animals and their habitats.

NECESSARY ACTIONS

I conclude with a recipe for action, for hand-wringing and procrastination will not work. If we value our heritage then we have to do something – quickly.

- We have to become serious about biosecurity. We have to get tough and stop importing and spreading around more species, and control many more species than are currently on eradication lists.

- Stop destroying and fragmenting primary (natural) habitats, no matter how degraded they may be – they are all we have as models and sources of material for restoring the functionality of biodiversity. And they contain more complexity than we can restore and often we don't even know what that complexity is.

- Enhance those habitats that survive.

- Make the flora visible – so that like the furniture, it becomes familiar, 'mainstreamed', and an essential part of life that is cherished and identified with.

- Landscapes must become legible (informative). The stories in the land have to be made digestible - the emotions of it need to be incorporated into our literature, comic books, drama, music, films, sculpture and paintings – just as the heart of oak is part of England's unquestioned vernacular.

- Mayors and other local signatories have to proudly show off their natural history to visitors – or its status is diminished.

- Incoming planeloads of tourists and immigrants have to be shown in-flight videos that explain, interpret and celebrate our unique flora and fauna – and cultural context. Then we might not have the farcical situation of the tourist industry promoting imagery and activities that are harmful or destructive to our biodiversity. We have to stop tourists being taken to Mt Cook-Aoraki in order to take pictures with the lupins in the foreground (as advertised in the tour brochures), and stop bus operators handing out packets of lupins to tourists and encouraging them to scatter them out of the windows as they cruise through the countryside.

- Rebuild indigenous habitat to a minimum level of 10% of vegetative cover across our cultural landscapes (both urban and rural). This can be achieved by long term regional planning – that provides >5 ha sanctuaries for larger wildlife at ca. 5 km intervals, 1–2 ha habitats for viable populations of plants and invertebrates, and small groves or individuals of our noble native trees (podocarps, hinau, pokaka, etc.) at 200 m spacings, as stepping stones and larders for bush birds, and about 5% of the intervening urban or rural matrix in native plants – along road verges, riparian margins, field margins etc. It is projected from models based on empirical data (Graeme Hall pers. comm.) that this will not only achieve an ecologically sustainable, functional and connected indigenous ecosystem, forming a web of life underlying the cultural landscape, but it will also develop or contribute to neighbourhood identity and a close experience of indigenous nature (within walking distance) of every residential home, thereby achieving cultural sustainability.

- Establish a major Canterbury Plains park along a wedge of land from McLeans Island to West Melton-Halkett, where one seventh of Christchurch's plant biodiversity resides. There is evidence for a high level of invertebrate diversity as well, and much of it threatened. A flightless moth that feeds on *Raoulia* spp., is known only from one specimen each collected at McLeans

Island and Tekapo (Steve Pawson pers. comm.). And an *Olearia* species, centred in this district, previously known as *O. virgata*, has recently been recognised as a new species (Brian Molloy and Peter Heenan, pers. comm.) endemic to the Canterbury Plains. Less than 40 specimens are known in the wild and 5% of these were ripped out by cattle a few months ago. This and the poorly known fauna highlight the need for an integrated control and management of this area. Otherwise the broad panoramic vistas of the plains, from the city to the mountains under the nor' west arch, free of pine shelterbelts, and the microcosm of dry plains' plants and dependent invertebrates, will be lost forever. It is interesting to note that one of the scourges of grasslands in the intermontane basins (the various hawkweeds) is almost non-existent in the McLeans Island area – presumably because it is climatically and edaphically too dry.

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