



18 October 2025

Simon Upton's address to the Pukeiti Rhododendron Trust

It's hard to take in the scale of the pressures our species is placing on all the other species that constitute life on earth. We talk these days about biodiversity. It's a more technical sort of term – coined as recently as 1985. It's a revealing comment on the technocratic culture we inhabit that something as primordial as life, in all its diversity, has become a polysyllabic concept.

Now I'm not here to take aim at the vast scholarly and policy community that is now devoted to trying to do something about the loss of biodiversity. But I'd like to plant this thought, right up front: that abstract concepts rarely win hearts and minds.

Go to UNEP's website and you can gather the grim high-level statistics:¹

- 75% of the Earth's land surface and 85% of wetlands significantly altered by human actions.
- One million out of eight million species of plants and animals are threatened with extinction.
- 24,000 of the 28,000 species are at risk of extinction with global food systems the primary source of pressure. Ongoing agricultural expansion is expected to account for 70% of the projected loss of terrestrial biodiversity according to the UN.
- Of course, there's more to it than food production. Pollution in all its forms leading to poisoned water and soil, together with climatic disruption is degrading not just the quality of life but its diversity. Almost 600 seed plants have become extinct in the last 250 years.²

If you, like me, you start to glaze over with facts and dimensions that are beyond our comprehension I'd suggest, as an antidote, a recent book by Charles Foster called *Cry of the Wild*.³ Foster imagines the lives of eight different species under pressure in his native United Kingdom – including, by the way, one known as *Homo sapiens*. It is a feat of imagination as well as an attempt to inform meticulous observation with scientific insight. Let me give you a taste. One of the species he selects is a gannet that flies to Africa and back and then, coming home, tries to breed – without success – on a craggy precipice on the west coast of Scotland. The eggs keep breaking. Here's how he ends the chapter:

“It is tempting to rush to judgment. Various pollutants, including organochlorines (with which the apparently pristine seas around the rock were awash) have been implicated in pathologically thin eggshells in gannets. Perhaps it was that. Or perhaps the female had a defective shell gland. Or perhaps our bird had a chromosomal defect or a mistranscription of a base-pair sequence that meant that all eggs to which he'd contributed were doomed. If so, perhaps perfluoroalkyl substances in the sand eels his parents or grandparents had eaten were the cause. We can't know.

What I can say is that both birds left the rock early that season, flying south together, and that the male did not fly round and look down at the nest this time, and that neither of them looked back, and that they flew slowly, as if their wings were heavy, and that when a former [member of his group] returned to the rock next March he found the nest empty, and raised in it a single raucous truculent chick. And that I do not know if this story is a tragedy.”

That sort of imaginative engagement with the world would have, I think, some resonance for iwi Māori for whom all forms of life are linked through whakapapa.

1 See UNEP's website. <https://www.unep.org/facts-about-nature-crisis>

2 Humphreys, A.M., Govaerts, R., Ficinski, S.Z. et al., 2019. *Global dataset shows geography and life form predict modern plant extinction and rediscovery*. *Nat Ecol Evol* 3, 1043–1047. <https://doi.org/10.1038/s41559-019-0906-2>

3 Foster, C., 2023. *Cry of the Wild*. Publisher: Doubleday

But let me step back into the more antiseptic scientific space to downscale UNEP’s global picture to Aotearoa. We think there are about 80,000 native species of which we have named about 54,000. But it is difficult to get a clear picture as all the various taxonomic groups are rarely aggregated.

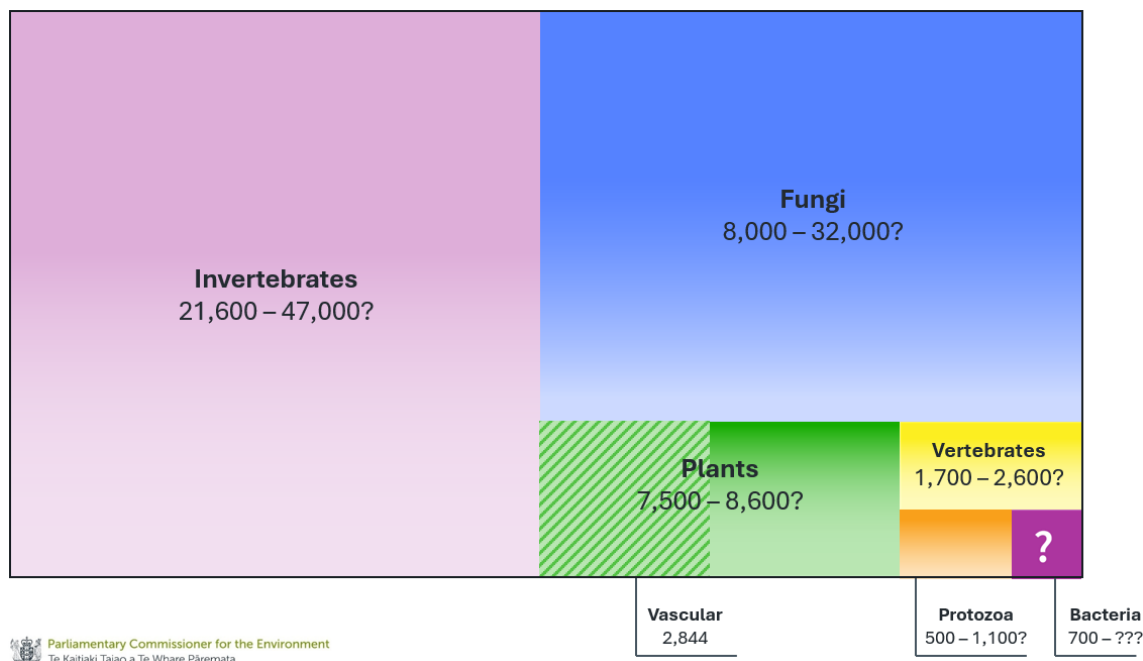


Figure 1: An approximation of the likely number of some major groups of flora and fauna in New Zealand. Many species remain undescribed.

This diagram provides a rough idea of how well some groups of species are known. As you can see, we have described around 21,600 invertebrate species, but there may be more than twice that number. For fungi, we have described 8,000 or so here, but there may be as many as 32,000 and it is hard to know which are native or not. For vertebrates and other related species, we’ve identified about 1,700 but there may be as many as 2,600. Maybe that’s because we don’t really know so much about what’s out to sea. We have described 700 bacteria, but again it is hard to say which are actually native and the true number is simply unknown. Protozoa paint a similar picture – we have described about half of what there may be – 500 out of 1,100.⁴

This brings us to plants, of which there may be as many as 8,600. Roughly half of these are algae and moss. Finally, when it comes to vascular plants, DOC provides a very precise total of 2,844! But it’s a number that continues to grow as new discoveries are made.⁵

In line with the global state of things, their survival is under pressure. Between 2012 and 2017, 61 native vascular plants showed declining populations. The pressures here match the global ones. Over roughly the same period, a further 12,869 hectares of indigenous land cover was lost. But there are other factors at play. As some of you may be aware, I’ve undertaken an appraisal of the threat that invasive exotic plants pose to our indigenous biodiversity. If 2,844 indigenous vascular plants sound like a lot, reflect on the fact that we have introduced more than 25,000 exotic ones. That’s an order of magnitude more. Nearly 3,000 of them have been found growing in the wild. Some do more than merely survive. Almost 1,800 exotic plant species are now considered naturalised. In other words, they have jumped the garden fence and are successfully maintaining populations in the wild without human help.

4 Gordon, DP, 2013. New Zealand’s genetic diversity. In Dymond JR ed. Ecosystem services in New Zealand – conditions and trends. Manaaki Whenua Press, Lincoln, New Zealand. https://www.landcareresearch.co.nz/assets/Publications/Ecosystem-services-in-New-Zealand/1_13_Gordon.pdf

5 DOC, 2020. Biodiversity in Aotearoa: an overview of state, trends and pressures. https://www.doc.govt.nz/globalassets/documents/conservation/biodiversity/anzbs-2020-biodiversity-report.pdf#page=5_13

In passing, let me note that rhododendrons have done that. I am aware that *Rhododendron ponticum*, well known internationally as an invasive species, is widely distributed in New Zealand. It is prudent to ask: do we understand the risks? The i-Naturalist website has 99 observations of *R. ponticum* spread across both islands. Confirmed identification is lacking for some but some of the locations seem well away from suburban gardens.

One of the observations – which still needs its ID confirmed – is near Fiordland National Park. Is there a chance that *R. ponticum* will spread into national parks and other conservation land?

I am tempted to ask if our own collection here at Pukeiti poses any risks? When last I was here (during that blissful period when New Zealand was COVID-19 free and you could travel your own country without hordes of foreign tourists), I am sure I noticed on the side of the road not far from the car park, seedling rhododendrons. I have no idea what species they were. But it made me wonder if we fully understand any risks that this collection may pose? I'm assured by a friend who is a nurseryman that if there was a problem, we would know about it by now.

In any case, we can't turn the clock back. A large number of plants have arrived and naturalised and we will have to live with the consequences. What we know about these plants is very patchy. My 2021 report, *Space Invaders*, tried to get a handle on what we knew and what we didn't, and how well our biosecurity system performed in protecting indigenous biodiversity. That's Chilean Flame Creeper (*Tropaeolum speciosum*) on the cover. To emphasise my own implication in the problem, I opened that report with an inventory of all the weeds growing happily on my farm.



Figure 2: *Space invaders: A review of how New Zealand manages weeds that threaten native ecosystems*. Published by the PCE in 2021.

Unsurprisingly, we know quite a lot about the plants, pathogens, and other pests that pose a risk to our agricultural and horticultural production systems. But interactions between exotic plants and native biodiversity are complicated. Some wanted production species are a threat to indigenous ecosystems. A high-profile example of this is wilding conifers. Exotic trees, such as *Pinus radiata* and *Douglas fir* are widely grown in plantations in New Zealand for their timber. But they haven't stayed in their plantations. These photos, taken from the same point just three years apart, illustrate the spread of wilding conifers in the upper Clarence River.



Figure 3: The speed with which wilding conifers can spread and grow can be seen in these two photos of the upper Clarence River taken from the same point just three years apart.

Image source: Sherman Smith

In parts of the country, some exotic conifers have spread rapidly beyond the boundaries of erosion control efforts or commercial plantations and are invading native and exotic ecosystems alike. Farmers are losing grazing land to wilding conifers, homeowners are losing houses to wildfires, conservators are losing habitat, and water yield in some catchments is being reduced. Those are all high profile, visible impacts that manage to mobilise varying levels of concern – and money.

By comparison, the impacts of exotic plants on native ecosystems are often less obvious and less well understood. Furthermore, our objectives aren't always aligned. Many of us want to preserve our unique biodiversity as well as enjoy the botanical richness that imported plants bring to our parks and gardens. It would help if we could rely on better information. Here are some of the problems we face:

- Even when we know plants are here, we don't know where they are or how fast they are spreading.
- Surveillance is, at best, patchy. We tell the story in *Space Invaders* of how pink ragwort was accidentally discovered in Golden Bay by a passing biosecurity officer who just happened to spot a plant in a pot outside a house. It turned out that pot plants, along with unwanted hitchhiking weeds, had been moved from Wellington along with the possessions of the new occupiers of the house.
- There is no up-to-date and authoritative list of plant species growing in New Zealand so we can't be sure what plants are here.
- If we don't know what's here, how can we say what may be new to New Zealand? The Plant Biosecurity Index (PBI), which is used by MPI for biosecurity purposes, contains over 30,000 plant species, but is incomplete. If a species is not listed in the Index, it can't be imported

into the country. I know from reading a recent article in your magazine, the problems this has created for you when trying to prove that a species you wish to import would not be new to New Zealand because it is already present. I can understand your frustration.

- Finally, information is scattered across multiple databases, is often not easily available or accessible, and the taxonomy (the naming of plants) is not consistent.

This issue of taxonomy is important. To extract as much information as possible it is essential that people are clear about what plant is being discussed. For example, common names such as blackberry can refer to multiple species, including:

- Cut-leaved blackberry (*Rubus laciniatus*)
- Himalayan blackberry (*Rubus armeniacus*)
- Black raspberry (*Rubus occidentalis*)
- Trailing blackberry (*Rubus ursinus*)
- Allegheny blackberry (*Rubus allegheniensis*)
- European blackberry (*Rubus fruticosus* aggregate).

The Himalayan blackberry and European blackberries are generally considered more invasive than the others, forming dense, impenetrable thickets.



Figure 4: Common names such as blackberry can refer to multiple species.

Image source: iNaturalist

Similarly, banana passionfruit can refer to:

- *Passiflora tarminiana*
- *Passiflora tripartita* var. *mollissima*, or
- *Passiflora tripartita* var. *azuayensis*.

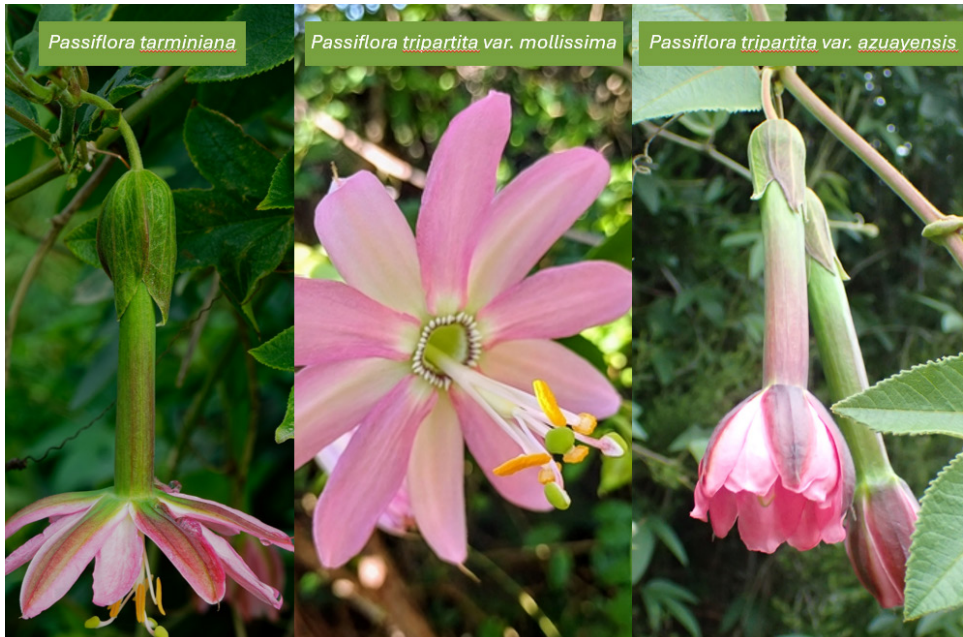


Figure 5: Common names such as banana passionfruit can refer to multiple species.

Image source: Wikimedia Commons

In addition, as any grower will attest, there can be many varieties or subspecies of any single species of plant. That's the story of Rhododendrons.

Furthermore, just because a plant has a Latin name, it doesn't mean that it's stable. The taxonomists are indefatigable re-classifiers. Asiatic knotweed has been referred to by three different scientific names. Taxonomists working from specimens in the eighteenth and nineteenth centuries independently named it *Reynoutria japonica* and *Polygonum cuspidatum*, respectively, but these were later found to be the same species. Early descriptions of Asiatic knotweed in New Zealand used these names but further research led to the plant being renamed *Fallopia japonica*.

Most New Zealand databases and current regional pest management plans (or RPMPs) list the species as *Fallopia japonica*. However, it is listed as *Reynoutria japonica* in the Greater Wellington Regional Pest Management Plan 2019–2039, demonstrating the potential for confusion when comparing what's being managed where in the country.



Figure 6: Asiatic knotweed (*Fallopia japonica* and *Reynoutria japonica*)

Image source: Shutterstock

New Zealand needs a single authoritative and publicly accessible database of all exotic plants present in the country. It needs to use an agreed taxonomy and be constantly updated so that confusion about what is and isn't present can be minimised.

Getting there would be tricky enough in a world that stands still. But it isn't. In fact, it's changing faster than at any time since the end of the last ice age. Climate change is the ultimate symptom of the pressures we are placing on the earth system. The mid-point for projected warming in New Zealand by 2040 is 0.8°C, with 30–50% fewer frosts each year. But within a maritime country that spans 1,600 km of latitude, different regions will be affected by climatic changes in different ways. Frosts, for example, will be progressively limited to higher altitudes and latitudes.

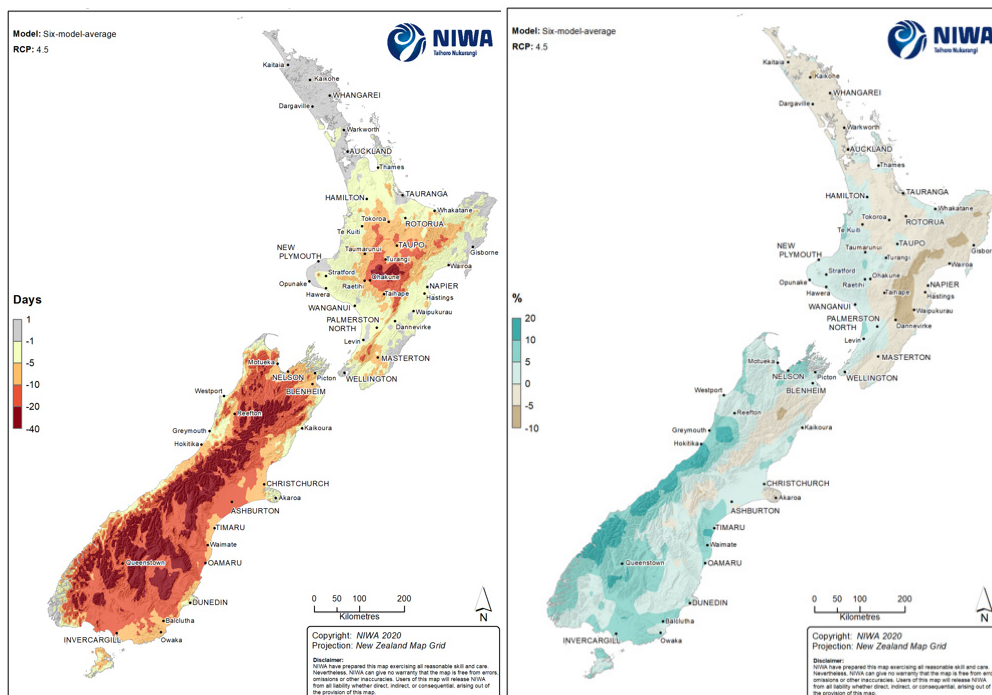


Figure 7: (Left) Predicted change in number of annual frost days between 1995 and 2090. (Right) Predicted change in number of annual mean rainfall between 1995 and 2090.

Image source: NIWA

The east coasts of the North and South Islands are expected to be hotter and drier, increasing the likelihood of drought conditions. In the southwest of New Zealand, more rain is expected annually and with it a greater likelihood of flooding. With a changing climate will come stronger and more frequent storms, and worsening fire risk. Extreme events such as these increase the potential for land disturbance, favouring those ecosystems and plants that are better adapted to respond quickly to upheavals.

According to DOC, “many native plants identified as highly vulnerable in the assessment are already critically endangered and confined to rare ecosystems”.⁶ “Most South Island limestone dependent plants were assessed as highly vulnerable, such as the Castle Hill buttercup. Pingao, a taonga coastal plant species, is highly vulnerable to projected increases in coastal flooding and sea surges.” The Royal Society has noted that, “even with the current rise in average temperatures (about 1°C above pre-industrial), up to 70 species of native plants are likely to be at risk of extinction this century.”⁷



Figure 8: Castle Hill Buttercup (left), Pingao (right).

Image source: iNaturalist

But climate change is not just re-dealing the cards for native species – it will also be a game changer for many of those 22,000 arrivals. New Zealand’s native species have had to adapt to changes in climate in the past, but the current rate of warming is much faster than anything the planet has experienced for millennia. Many of our native plants risk being outpaced by recent arrivals that are better suited to responding to these changes.

- For example, several pine species are serotinous – meaning that resins keep their cones closed until it’s hot enough for their bonds to break, releasing the seeds inside. Cones of radiata pine in New Zealand open at 45°C on average – a temperature that can currently be reached on summer days with an ambient high of 33°C, leading about half the cones to open. The wilding potential of pines could therefore increase as warmer summer temperatures permit cone opening that would otherwise have been held in check by their resin-bonded cones. With that comes an increased risk of wild fire.

6 DOC, 2025. 100s of NZ species highly vulnerable to climate change. 30 January 2025. <https://www.doc.govt.nz/news/media-releases/2025-media-releases/100s-of-nz-species-highly-vulnerable-to-climate-change/>

7 MfE, 2024. Climate Projections Map. <https://map.climatedata.environment.govt.nz/>

- Climate warming will also enable some potential native ecosystem weeds that struggle to grow at all in the wild to survive and successfully reproduce. For example, fewer frost days could allow more plants to survive in milder winters. The seedlings of three subtropical to tropical woody ornamentals – the bangalow palm (*Archontophoenix cunninghamiana*), common guava (*Psidium guajava*) and the Queensland umbrella tree (*Schefflera actinophylla*) – cannot currently survive the winter in Lincoln, Canterbury, and some will even die in an Auckland winter if there are frosts. An increase of just 1°C in the average minimum temperature over winter in Auckland can mean the difference between all Queensland umbrella tree seedlings dying or all of them surviving.
- In general terms, a warmer climate is expected to enable many exotic plant species that are already naturalised in the north of New Zealand to extend their range southwards. Models predict that current climatic conditions provide some suitable habitat in the South Island for common guava, though this is restricted to areas very near the coast. However, under predicted climate change scenarios, most of the North Island as well as significant parts of the South Island become suitable by 2090.



Figure 9: Three subtropical to tropical woody ornamentals – the bangalow palm (*Archontophoenix cunninghamiana*), common guava (*Psidium guajava*) and the Queensland umbrella tree (*Schefflera actinophylla*).

Image source: iNaturalist

So it will come as no surprise to you to hear me say that climate change will disrupt the favoured conditions of many rhododendrons, whether they are in their hugely varied native habitats or in refuges like Pukeiti. I would be surprised if there was anyone in this room who hasn't worried about what the future holds for their collections. I certainly have. It would be a brave person who would confidently predict that Pukeiti will be unscathed by climate change. I don't believe we really know what will happen or within what timeframes. Interestingly, according to the climate projections summary from MfE, under a high climate change scenario, total rainfall in 2080–2099 is projected to be 4.6% lower than in the base period of 1986–2005.⁸ We had better hope that Pukeiti is less affected than many places because by accident – and more recently by design – it has become an internationally important refuge for around 300 different taxa (species, sub-species and varieties) of rhododendrons.

⁸ MfE, 2024. Climate Projections Map. <https://map.climatedata.environment.govt.nz/>

When I say “by accident”, I am referring, of course, to the decision by the founding enthusiasts to found a collection here. The choice of site wasn’t accidental, of course, but they had no inkling of climate change and, I suspect, no real understanding of the scale of biodiversity loss that their descendants would face. They didn’t set out to build a survival raft for rhododendrons. They belonged to a former age – the age of amateur collectors whose interests were both scientific and aesthetic. I very much identify with their enthusiasm. It is not fashionable today to garden in the way or on the scale they did. I feel like a bit of a fossil relic myself. I doubt many 19 years old students today would devote their summer freezing works earnings to travelling to the UK to explore places like Kew, Westonbirt or Stourhead.

The collecting bug grew out of an early modern European fascination with naming and ordering the world. You can still visit the botanical garden founded at my old university, Oxford, in 1621. The Jardin des Plantes in Paris, founded in 1626, had a medical rationale. As the Enlightenment gathered pace in the eighteenth century, the passion for scientific classification took hold, but so did the cult of parks and gardens as places for both recreation and edification. What began as a fascination with oddities and rarities became a tradition of creating living encyclopaedias of plant diversity. Without planning for any such outcome, the seeds of the same industrial and technological revolution that has transformed the planet and placed it at risk also gave rise to a form of gardening and cultivation that has bequeathed us a network of refuges.

It is interesting to consider the role of botanical gardens as refuges for plants at risk.

An increasing number of plants that are imperilled in the wild may find their best chance of survival in gardens. As the author of a recent article has put it, “As the impacts of climate change and other threats mount, conservationists are racing to preserve endangered plant species in botanical gardens – “metacollections” in the hope of eventually returning them to the wild.”⁹

But what happens when there is no suitable habitat to return them to? These are the questions researchers are asking right now as habitat disappears and plants with them. Will these plants survive only far from their ancient homes in scattered metacollections? And will it be feasible and affordable to protect even a fraction of the tens of thousands of threatened species in such metacollections?

The authors of a recent paper note that botanic gardens are themselves struggling to keep up with the multiple challenges caused by the global biodiversity extinction crisis.¹⁰ Collectively, the world’s gardens form an extensive network of living plant collections, acting as refuges for biodiversity, sources of genetic material for research, and hubs for ecological restoration. But according to the authors, we have hit “peak capacity” in botanic gardens – both in the number of plants grown and in the diversity of species held. In other words, we are growing as many individual plants as we feasibly can, and our collections are as diverse as they are likely to be. While this may seem like a success, it reveals an uncomfortable truth: we are running out of space and resources to add more species.

Likewise, the authors assert that we have already passed “peak wild” by which they mean that we are collecting and sourcing fewer plants directly from the wild. Since 1992, the proportion of wild-collected plants entering botanic gardens has declined, alongside a decrease in material sourced across international political boundaries.

So what might this mean for Pukeiti’s future role? As a classic remnant from the age of the great collectors, we have assembled a magnificent collection of foreign plants in an indigenous temperate rainforest setting. In doing so we have created an ‘ark’ for threatened rhododendron species – one of the largest collection of rhododendrons in the world. By linking it to other suitable sites around the country through the New Zealand Rhododendron ex-situ Conservation Project to create a

9 Janet Marinelli, 2025. Imperiled in the Wild, Many Plants May Survive Only in Gardens. Yale Environment 360, 19 March 2025. <https://e360.yale.edu/features/plant-metacollections>

10 Cano, Á., Powell, J., Aiello, A.S. et al., 2025. Insights from a century of data reveal global trends in ex situ living plant collections. Nat Ecol Evol 9, 214–224. <https://doi.org/10.1038/s41559-024-02633-z>. See also Samuel Brockington, 2025. Botanic gardens are struggling to keep up with the biodiversity crisis – here’s what they can do. 28 February 2025. <https://theconversation.com/botanic-gardens-are-struggling-to-keep-up-with-the-biodiversity-crisis-heres-what-they-can-do-248722>

metacollection, we have done as much as we can do to spread out risks within the changing climatic parameters of our corner of the globe.

Rhododendrons are in a sense 'lucky'. In the same way that charismatic animals like tigers and polar bears attract money, so do particularly photogenic plants. But not many flowering plants have the star attraction that rhododendrons have.

If we are providing a refuge for the at-risk plants of other nations, the question arises of whether we should be seeking overseas refuges for some of our most threatened endemic plants.

You're probably aware that some New Zealand plants have been displayed in other parts of the world for over two centuries. It was soon after Cook's first voyage with Banks and Solander in 1769 that the first New Zealand plants found their way back to Europe and into the botanical collection at Kew. Our swamp flax (*Phormium tenax*) and kākābeak (*Clianthus puniceus*) found their way into collections and were two of the first plants illustrated in Curtis' Botanical magazine. The importation of New Zealand plants into North America began in 1860 with Pohutukawa (*Metrosideros excelsa*), now one of San Francisco's most popular street trees.¹¹

According to a 2008 paper, at least 110 New Zealand plant collections exist in 15 different countries.¹² Native New Zealand plants can be found in a wide range of settings, ranging from botanic gardens and research collections to private gardens and plant nurseries. Whether they are species threatened in their wild habitats here I do not know, but we cannot any longer discount the possibility that they may be.

I have thrown a lot of facts and figures at you about biodiversity and the challenges we face. And Pukeiti has become a significant link in a global network of increasingly serious and scholarly endeavour to try to stave off the worst outcome that faces us, which is mass species extinction. That's apparent from the change in tone and professionalism that I've noticed in the publications I have received from you over the years.

But I'd like to finish up where I started, with something about hearts and minds. Because one thing has become increasingly clear to me over the time I have been Commissioner and it is this: that all the science and all the facts in the world won't turn the tide. They are necessary, of course, but not sufficient. I have spent a great deal of time in rural New Zealand talking to farmers and others about some of the water, emissions and biodiversity challenges we face. They need good information to know if they're making a difference. And there's a place for regulations rooted in good science. Cleaning up our act can't just be a voluntary, charitable act.

But the decision to get involved and try to improve things is usually rooted in a much more emotional connection with the land and the community. It gives people a lift to see clean water and healthy native bush returning to some of the bits that should never have been cut over. Being able to watch birds return as the pests retreat and see how magnificent the understorey of our rainforests can be if weeds and goats have been eliminated delivers a human reward that engages hearts and minds.

And this, to my mind, is Pukeiti value. It is immensely satisfying to know that the garden is on the map internationally and its curation is of a really high standard. But for the public at large, it's the rhododendron blooms that are a source of wonder. My wife and I never cease to get a thrill when our favourite Mrs George Huthnance is in full flower or when *R. montroseanum* finally manages to open its enormous blooms.

11 Michael Oates, n.d. The Role of Native Plant Collections - A Blue Print for the Future. <https://www.rnzih.org.nz/pages/nz-plants-and-their-story-71-78.pdf>

12 Fagan L, Bithell S, Fletcher J, et al., 2008. Evaluating the 'expatriate' plant concept: can we predict invasive threats to New Zealand natural ecosystems by focussing our efforts overseas? Better Border Biosecurity (B3) programme. https://www.researchgate.net/publication/230694415_Detecting_invasive_species_in_advance_of_the_border

Just this week we've watched our first ever *R. maccabeum* bud open. It's the visual shock and awe that brings us back, face to face, with the wonderful floral world we inhabit and why it's worth fighting for. If Pukeiti gives that experience to even a fraction of its visitors – and I'm sure it's more than a fraction – then it's playing a front-line role in keeping hope alive that we can mobilise our species to take the rest of the living world to heart and protect it.

Thanks very much for inviting me along.

