

Creating a metacollection: the New Zealand National *Rhododendron* Collection and ex situ Conservation Project

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Abstract

Various analyses have indicated that gardens in New Zealand hold a collection of *Rhododendron* species that can make a contribution to international ex situ conservation. In consequence, a project was initiated in 2017 to manage the New Zealand holdings, which are held on a range of sites, as a metacollection for conservation. This article describes the development of that project and its operation up to 2026. It provides a summary of the context and priorities for *Rhododendron* conservation, and outlines the project's objectives and development. Project activities are described under six categories: (1) the search for, and propagation and distribution of plants; (2) the network of collections and the National Collection; (3) communication and external relations; (4) data and analysis; (5) biosecurity, including the framework that controls importation of seed into New Zealand; (6) research. The project is based on a series of global analyses carried out in the period 2016–2018. Since then, however, the global situation has changed. A new global analysis is therefore required to reflect recent changes in threat status and collection holdings.

Introduction

The goal of the New Zealand National *Rhododendron* Collection and ex situ Conservation Project (hereafter referred to as the Project) is to manage *Rhododendron* species cultivated in New Zealand (NZ) as a metacollection to contribute to international ex situ conservation. This collaborative project demonstrates practical application of conservation principles, driven by a scientific approach. Following the Red List assessments of 2011 (Gibbs *et al.*, 2011) and 2015 (Argent, 2015), and an ex situ survey (BGCI, 2012), several analyses have examined priorities for *Rhododendron* conservation. These

analyses identified the following priorities for collections worldwide and indicated how those in NZ could contribute to ex situ conservation:

- Subgenera *Vireya* (now considered to be subgenus *Rhododendron* section *Schistanthe*) and *Hymenanthes* had the most acute conservation problems (MacKay & Gardiner, 2017a).
- Subgenera *Vireya* and *Azaleastrum* had the poorest representation in cultivation and were therefore the highest priority for ex situ conservation (MacKay & Gardiner, 2017a).

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- By country of origin, red-listed² taxa from Indonesia, China and Papua New Guinea were the highest priority for ex situ conservation (MacKay & Gardiner, 2017b).
- In subgenus *Vireya*, taxa originating from New Guinea, Sumatra and Sulawesi were the highest priority for conservation (MacKay *et al.*, 2016).
- An analysis of 20 collections in NZ found that 67% of taxa in cultivation globally were present in NZ, including 224 red-listed taxa (MacKay *et al.*, 2017).
- Finally, a global analysis of 1,386 taxa on the Botanic Gardens Conservation International (BGCI) database in 10 collections worldwide and 20 collections in NZ was undertaken to support the *Rhododendron* Conservation workshop in 2018 (MacKay *et al.*, 2018).

Three factors drive conservation of *Rhododendron* species. The first concerns global conservation initiatives. The Global Strategy for Plant Conservation (GSPC) set 16 targets (CBD, 2012). The relevant targets for the analysis carried out in 2018 were (1) Target 2, to make conservation assessments (Gibbs *et al.*, 2011; Argent, 2015; MacKay *et al.*, 2018) and (2) Target 8, to achieve 75% of red-listed taxa in cultivation. Both these targets can be used to prioritise ex situ action. Conservation of species is also supported by the Global Conservation Consortium for *Rhododendron*, a group of institutions that shares information and collaborates to support conservation of the genus. The consortium lead is based at the Royal Botanic Garden Edinburgh (RBGE) (Global Conservation Consortium for *Rhododendron*, 2026).

² Red-listed taxa were defined to include those in categories EX, EW, CR, EN, VU, NT and DD of the Red List.

Conservation principles are the second factor. These demand that ex situ collections should be documented, verified and labelled; that they should have adequate genetic representation; that they should be representative of taxonomic and geographic groups; and that they should be of known wild origin (Blackmore *et al.*, 2011; Rae, 2011). Collections on multiple sites can be coordinated into a metacollection, whereby taxa are matched to climatic conditions and where the aggregation of collections and data facilitates management of duplication, genetic diversity and prioritisation (Linsky *et al.*, 2024). Conservation priorities should consider factors such as threat, endemism, geographic hotspots and taxonomic distinctiveness (Maunder, 2001b; Farnsworth *et al.*, 2006; Kozłowski *et al.*, 2012; Castenada-Alvarez *et al.*, 2015; Cavender *et al.*, 2015; Hoban *et al.*, 2020).

The third factor is that *Rhododendron* is a taxonomically complex genus, and that complexity can confound decision-making and priorities for conservation (Frodin, 2004; Ennos *et al.*, 2005; Moonlight *et al.*, 2024). It is within the context of these three factors that the Project was conceived and developed.

The Project has been operating since 2017, and annual reports have been published (MacKay, 2025). Its strategy was reviewed after five years (MacKay, 2023; PRT, 2023). This article will outline the project rationale, its goals and objectives, and its development and activities, along with the next steps for it. The early years of the Project responded to a global analysis of the status of *Rhododendron* conservation carried out in 2018 (MacKay *et al.*, 2018). Since then, however, new species have been described and new conservation assessments have been made, and these changes alter the metrics. An updated global analysis is therefore discussed in the conclusion.

Project rationale

Analysis of the threat status and holdings globally of the genus *Rhododendron* (Table 1) found that 730 of 1,232 (59%) assessed taxa required conservation intervention of some kind to prevent extinction (MacKay *et al.*, 2018). Only 502 taxa were assessed as LC. Red-listed taxa included taxa classified as DD, as data deficiency indicates an unknown and we cannot assume a positive change until more data become available.

A total of 73% of all taxa and 61% of red-listed taxa were in cultivation as defined by the analysis (MacKay *et al.*, 2018). DD taxa had the lowest representation in cultivation (37%). Only VU taxa (82% in cultivation) met Target 8 of the GSPC of 2012, to maintain ‘more than 75 per cent in cultivation’ (MacKay *et al.*, 2018; CBD, 2012).

By geographical origin, taxa from Papua New Guinea (31%) and Indonesia (37%) had the lowest representation in cultivation (MacKay *et al.*, 2018). While the analysis showed an improvement on some metrics when compared with the ex situ survey carried out by BGCI (BGCI, 2012), the data demonstrated that there was still much work to do.

The second reason for development of the Project was the substantial number of taxa in NZ. NZ does not have any native *Rhododendron* species, but about 538 taxa are in cultivation there (MacKay *et al.*, 2017). These cultivated plants amount to the fourth largest ex situ collection of the genus globally (MacKay *et al.*, 2018). The largest individual collection in NZ is at Pukeiti Gardens in Taranaki province (Smith, 2020, 2021). Pukeiti holds about 330 taxa; of the 44 CR

Table 1 Number of *Rhododendron* taxa in each Red List category, and number of taxa in cultivation.

Assessment category	Number of taxa	Number of taxa in cultivation
Extinct (EX)	3	1 ¹
Extinct in the Wild (EW)	1	1
Critically Endangered (CR)	45	27
Endangered (EN)	43	31
Vulnerable (VU)	260	213
Near Threatened (NT)	62	58
Data Deficient (DD)	316	116
Total	730	447
Least Concern (LC)	502	456
Total	1,232	903
Not Evaluated	154	114
Total	1,386	1,017

¹ MacKay *et al.* (2018) included one taxon in this category based on an entry in the German gene bank. It is likely that this was a misinterpretation and the taxon should be in the EW category.

taxa in 2018, 27 were in cultivation globally (MacKay *et al.*, 2018) and 9 of these were at Pukeiti Gardens, including *R. acrophilum*, *R. formosum*, *R. griersonianum*, *R. rousei*, *R. subansiriense* and *R. taxifolium*.

Other publicly accessible sites include Dunedin Botanic Garden (Thomson, 2015), Tannock Glen in Dunedin (Wilkie, 2024), and Heritage Park (Wilkie, 2023) and Cross Hills Gardens (Bublitz, 2020) in the Manawatu region. Private collections include Omahuri Garden in Palmerston North (Davies, 2016), and a privately owned collection in Dunedin which was the site of the former Dalebrook Nursery and contains many species of interest (Murdoch, 1994–2001). Some of these sites have become formal partners in the metacollection, and all have contributed data to the analysis.

There are other factors that make NZ an important place for conservation. Firstly, the relatively mild climate means that the tender groups such as *Maddenia* and *Vireya* can be grown outdoors, which is an advantage over many Northern Hemisphere collections. Secondly, the principle of duplication (BGCI, 2016; Westwood *et al.*, 2020) requires that important collections should be held on more than one site. Most of the large collections are in the Northern Hemisphere (Mounce *et al.*, 2017; Sharrock, 2020; Hu *et al.*, 2024b), and so the development of a metacollection in NZ provides duplication in the Southern Hemisphere. Thirdly, NZ holds one of the largest collections of *Vireya* after the Rhododendron Species Botanical Garden (RSBG) in the USA and RBGE (MacKay & Hootman, 2019). Given the high international priority for conservation of *Vireya* (MacKay & Gardiner, 2017a), it is important that the NZ *Vireya* collection is conserved.

Project development

The Project is a collaboration between Pukeiti Rhododendron Trust (PRT), Taranaki Regional Council (TRC), the NZ Rhododendron Association (NZRA), Massey University and a network of partner sites. It operates as a subcommittee of PRT and has a multidisciplinary team with representatives from PRT, TRC, NZRA and Massey University. In addition, there are collaborations with the Royal New Zealand Institute of Horticulture (RNZIH) for the biosecurity work, and with Massey University and the former New Zealand Institute of Plant & Food Research Limited (PFR) for research. Project leaders maintain contact with the Global Conservation Consortium for Rhododendron at RBGE and the Rhododendron Species Botanical Garden in the USA. Objectives and operating protocols are outlined in a project strategy (PRT, 2023) along with Key Performance Indicators (KPIs).

Project goals and objectives

The goal of the Project is to manage the NZ holdings as a metacollection so that it contributes to global ex situ conservation. Its aims (PRT, 2023) are to develop:

- a documented set of NZ collections that contains a wide range of species, making use of the country's cultivation advantage, with an emphasis on wild-sourced material and red-listed species
- connections to international networks and programmes.

The aims will be achieved through:

- collaboration between members of the project team
- a project plan, developed in five-year intervals

- building the collections as a metacollection, with a focus on (1) species that are scarce in NZ or which have been present in NZ in the past but have no current collection listings, and (2) increasing genetic diversity among the accessions held
- developing a national network of sites to hold the NZ metacollection.

A set of project activities has been developed to meet these objectives.

Project activities

Project activities fall into six categories:

- (1) the search for, and propagation and distribution of plants;
- (2) the development of the collections network and the National Collection;
- (3) communication and external relations;
- (4) data collection and analysis;
- (5) biosecurity;
- (6) research.

Search

The first big challenge was to find out which species are already in NZ. MacKay *et al.* (2018) contains data from about 20 NZ sites, and in the first phase of the project those data were used to establish the extent of *Rhododendron* species in cultivation there (for example, see Thomson (2017)). MacKay *et al.* (2018) also contains data on ten of the largest collections globally, including data from the BGCI database (BGCI, 2017). Comparison of the data on NZ collections with those worldwide gave focus to the strategy. The Project is particularly interested in identifying species held on three or fewer sites, as these are a high priority for propagation. For example, the vireyas *R. album* (VU) (Fig. 1) and *R. mindanaense* (EN) are held at only one site in NZ (and at three sites and one other site respectively internationally) and have never been sold in the NZ nursery trade. Given their threat status and suitability

for cultivation in NZ, they must be propagated with urgency. Under current regulations neither can be imported into NZ, so obtaining new material from overseas is not possible.

Importation of seed is permitted only for species that are already in NZ and are listed on the NZ Plants Biosecurity Index (PBI). This means locating species that are on only a few sites and then distributing them more widely. Red-listed species are a priority; however, LC species (such as *R. przewalskii* and *R. micromalayanum* (Fig. 2)) which are scarce in cultivation are also a high priority in the search.

An important component of the search work involved the private collection at the former site of Dalebrook Nursery in Dunedin. In this case, the task of locating plants was combined with identifying them, as the collection was largely unlabelled when the current owner acquired the property. After many site visits, 97% of the 1,379 *Rhododendron* plants in that collection have now been identified (the KPI was 75%). These plants belong to about 190 species, including about 70 red-listed species.

Propagation

Species found on three or fewer sites in NZ, particularly red-listed species, are the priority for propagation. (The criterion of 'three or fewer' comes from the British plant collections scheme (R. Lowe, 1988; T. Lowe, 1989), and arises from a situation where a species was held at three sites *ex situ*, but at one the plant had died, at the second the name was wrong and at the third the site had intended to obtain the plant but never actually did.) Red-listed taxa are often held in three or fewer collections (Maunder *et al.*, 2001a, 2001b; Pritchard *et al.*, 2011; Rae, 2011; Cires *et al.*, 2013), with 11% being in just one collection (Sharrock, 2020), indicating a risk to the security of those taxa in cultivation.



Fig. 1 *R. album* (VU) at Pukeiti Gardens. Cultivated in New Zealand since 1997 from material received from RBGE. Four sites globally in 2017; One other site globally in 2026. Photo: Marion MacKay.



Fig. 2 *R. micromalayanum* (LC) at Pukeiti Gardens. Cultivated in New Zealand since 1990 from wild material collected by Keith Adams in North Sarawak. Three other sites globally in 2017; four in 2026. Photo: Marion MacKay.

From 2019 to 2025 about 240 taxa were propagated, including 103 red-listed taxa. Some of the species propagated include *R. coxianum* (CR, 3 BGCI records) and *R. serotinum* (LC, 17 BGCI records), which are

only cultivated at Pukeiti Gardens and have never been sold in commercial trade, and *R. hellwigii* (LC, 8 BGCI records) (Fig. 3), which has been offered for sale in the past but is presently only listed at Pukeiti.

The KPI was to propagate 50% of species with conservation or horticultural merit at the privately owned Dunedin collection. Between 2020 and 2022, 140 species (73% of the species present) were selected for propagation. Not all have been successful, and some remain scarce in cultivation due to propagation challenges. Of the 70 red-listed species on that site, 51 are currently being propagated. Two of these are *R. exasperatum* (NT, 6 BGCI records), which was offered for sale in NZ once in 2011, and *R. piercei* (VU, 10 BGCI records), which was offered for sale three times but only by the Dalebrook Nursery. Common species with accessions of horticultural merit are also propagated; lovely forms of *R. megacalyx* (Fig. 4) and



Fig. 3 *R. hellwigii* (LC) at Pukeiti Gardens. Cultivated in New Zealand since 1976 from wild material collected by Paul Kores in Papua New Guinea. Seven sites globally in 2017; nine in 2026. Photo: Marion MacKay.



Fig. 4 *R. megacalyx* (LC) in the private collection in Dunedin. This species has been cultivated in New Zealand since 1945, offered for sale many times, and is present in 11 New Zealand collections. Six other sites globally in 2017; nine in 2026. Photo: Sue Davies.

R. arboreum ssp. *zeylanicum* are presently in the propagation pipeline.

Distribution

Once propagated, plants are distributed to build the National Collection. Plants are also offered for sale through the Pukeiti Plants for Members scheme, including hard-to-get (in NZ) species such as *R. noriakanum* (DD, 3 BGCI records) and *R. rugosum* (LC, 7 BGCI records). Plants are established on the Pukeiti site and distributed to partner sites. In the years 2024 and 2025, multiple plants of 30 *Vireya* taxa, including 7 red-listed taxa, were distributed, while multiple plants of 81 non-*Vireya* taxa, including 28 red-listed taxa, were also distributed. Overall, some 900 plants have been distributed to partner sites.

Collections network

As rhododendrons require diverse environments for growth, a single site, such as Pukeiti Gardens, cannot cultivate them all: climatic conditions there will not suit some species. Therefore, a network of sites was needed to hold all the species, and the relevant KPI was to establish four partner sites. There are now 13 partner sites (Fig. 5). The key site is Pukeiti Gardens in Taranaki province (Fig. 6), while the other sites are spread throughout the country. Each partner site is visited once a year and plants are distributed as part of this annual visit (Bublitz, 2021). There is a Memorandum of Understanding in place between the Project and each site.

The National Collection

The collections network will house the National Collection, a metacollection (Griffith *et al.*, 2020; Westwood *et al.*, 2020; Blackmore, 2024) for which the range of accessions and diversity of *Rhododendron* species will be

managed across the participating sites. This metacollection should

- hold all species that are in NZ, on climate-matched sites
- hold groups of particular interest, such as the *Vireya* collection, red-listed species (prioritising those that are scarce in collections) and any species that are uncommon in NZ. For example, *R. subansiriense* (CR, 5 BGCI records), which is only at Pukeiti Gardens, is a higher priority than *R. annae* (NT, 23 BGCI records), which is on two NZ sites, and both are higher priorities than *R. dichroanthum* (VU in 2018, now NT, 22 BGCI records) and *R. smirnowii* (VU, 97 BGCI records), which are on many sites
- hold each species on at least three sites, thereby achieving duplication
- achieve at least three different wild-sourced accessions of each red-listed species, as having diverse wild material in collections is a key principle of ex situ conservation (Blackmore *et al.*, 2011; Rae, 2011; MacKay, 2019). The current data suggest that for most species the necessary diversity of wild accessions is lacking. This is a common problem (Hu *et al.*, 2024b; MacKay, 2019), and more wild material will be acquired by purchasing seed from overseas and by supporting collecting trips such as those to India in 2015 (Anon, 2015) and 2025 (Thomson, 2025).

Communication and external relations

An important part of the strategy is to communicate the goals and activities of the Project to the participating institutions and the botanical community. There were several KPIs for this aspect. One was to publish two

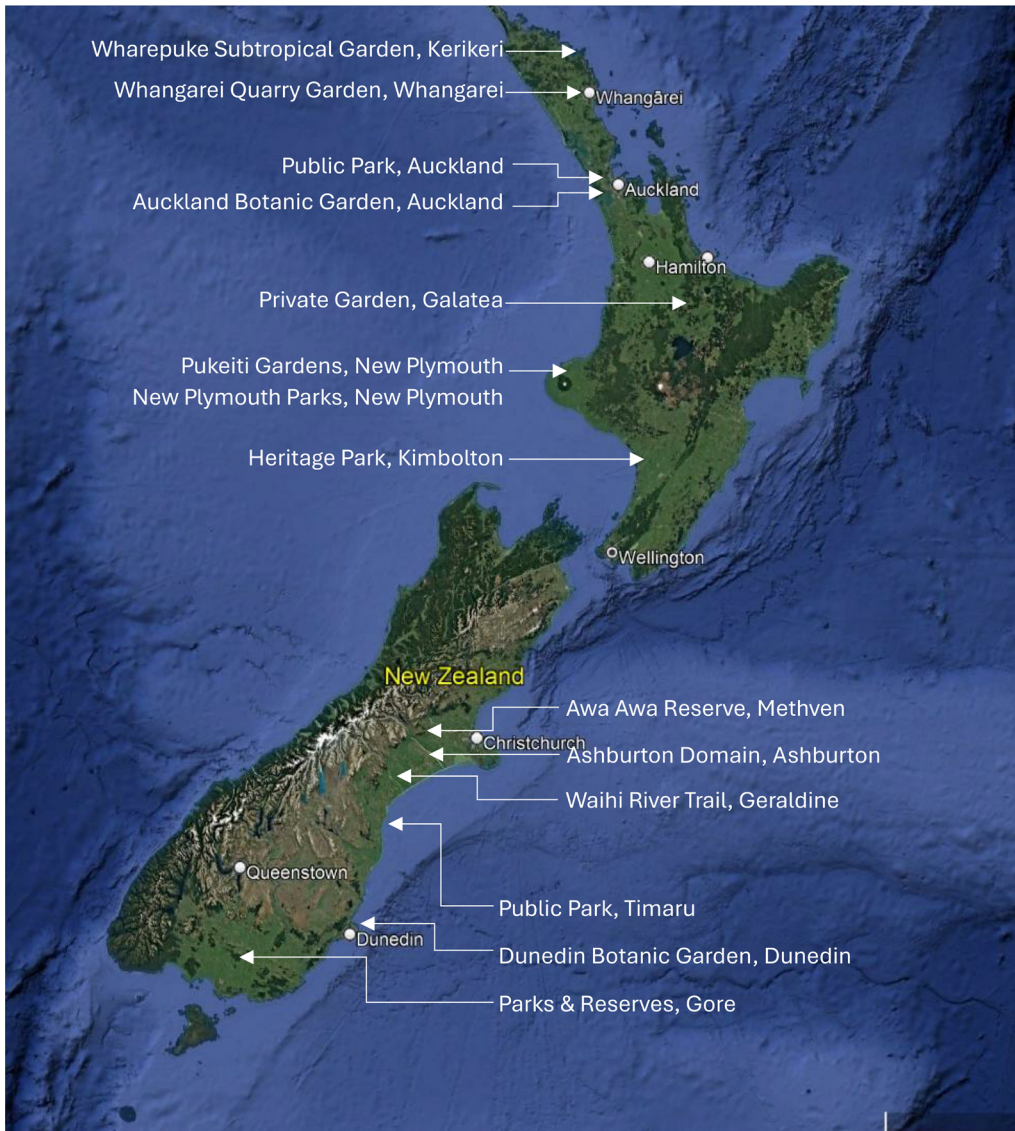


Fig. 5 Map of NZ showing locations of Pukeiti Gardens and the 13 partner sites in the metacollection. Map accessed from Google Earth. Graphics: Marion MacKay.

articles per year. Ten peer-reviewed and 42 non-peer-reviewed articles have been published since 2016, most of which are listed in PRT (2023). Over the same period, nine international oral presentations (KPI = 3) and eighteen domestic oral presentations (KPI = 5) have been given to a range of industry and scientific audiences (also listed in PRT (2023)).

With respect to external relations, we have aspired to participate in international conservation, renew international contacts and develop a collaboration with Chinese associates. Over the years, team members have attended conventions in Germany (Thomson, 2018), Australia (Brooker, 2023b; Gardiner, 2023) and the USA (Brooker, 2023a, 2024, 2025). In 2024 and 2026 delegations



Fig. 6 Pukeiti Gardens holds New Zealand's largest *Rhododendron* collection. **A** View towards the covered area that houses the *Vireya* collection. **B** View of the outdoor grounds that houses the rest of the collection. Photos: Marion MacKay.

visited the Kunming Botanical Institute in China (Bailey, 2024), where they met with the Director and visited sites of interest in Yunnan.

Data and analysis

The Project is underpinned by data analysis, which informs its priorities and direction. As well as the twenty NZ collections and the ten international datasets contained in MacKay *et al.* (2018), it makes use of historical data on the collections at Pukeiti Gardens (Smith, 2021) and Eastwoodhill Arboretum (MacKay, 1996). These data show which species have been present in NZ in the past, and which do not appear in any current collection listing. A set of 300 NZ nursery catalogues, some going back to the 1960s, was used to find historical sales offerings in the nursery trade. Google searches were used to locate current sales offerings.

Data analysis guides acquisition of accessions, prioritisation of taxa and location in the network. For example, *R. prunum* (VU, 2 BGCI records) presently has zero collection listings in NZ, but it was sold by a commercial nursery in 2007 and by Dunedin Rhododendron Group in 2000. So it could be out there somewhere, and

it is on our search list. Propagation of this species is a high priority because it cannot be imported into NZ. A converse example is *R. macabeum* (EN, 40 BGCI records), which is a relatively low priority in our programme because we have many accessions on many sites and it is secure in our collections. Furthermore, seed of this species can be imported into NZ. A combination of the Red List assessment, international priorities as per the analyses, presence in NZ collections (and internationally), our climatic advantages for certain groups, and prior and current commercial availability is used to inform the priorities set for the search, propagation and placement of plants in the National Collection.

Biosecurity

Biosecurity is an important element of data analysis in this project. Importation of seed or plants into NZ is only permitted if the species is listed on the PBI maintained by the New Zealand Ministry of Primary Industries (MPI). The PBI (MPI, undated) lists about 29,000 taxa of exotic plants deemed to be present in NZ in July 1998 when the Hazardous Substances and New Organisms Act (1996) was enacted. The PBI lists 403 *Rhododendron* taxa; however, it is now acknowledged to be

incomplete (Carver *et al.*, 2007; Dawson, 2010; Dickson, 2009). Indeed, the MacKay dataset suggests there are some 230 *Rhododendron* species that have been in NZ since before July 1998, but which are not on the PBI. For example, *R. fallacinum* (LC, 5 BGCI records) has been in NZ since 1979 and *R. luraluense* (EN, 7 BGCI records) since 1984. Both have been commercially available, but neither is on the PBI. These species are already present in NZ, but seed is not allowed across the border because they were omitted from the PBI, and theoretically a garden could be prosecuted for having those species in its collection.

At the start of the Project, it became clear that the issue of the incomplete PBI needed to be tackled. This became known as the Section 26 work (MacKay, 2024) and involves two steps. First, a statutory declaration of ‘not new’ (that is, already in NZ) by the New Zealand Environmental Protection Authority (EPA), under Section 26 of the Hazardous Substances and New Organisms Act (1996), is required for each species. Then, the PBI needs to be amended, which is a separate step controlled by the NZ MPI.

At the same time as this work for the Project was initiated, a national project addressing the same issue for all ornamental plants was set up by the RNZIH (Dawson, 2022). A collaboration was developed, with two key goals: first, to collate evidence on species in cultivation that were not on the PBI, to verify that each species name was taxonomically correct and to register those species on the BiotaNZ database (BiotaNZ, undated); second, to make Section 26 applications for a series of species which had the required body of evidence.

The KPI for the Project was to have 100 species put through the Section 26 process and declared ‘not new’. Making a Section 26 application is complex. Taxonomy must

be precise, and the case for presence in NZ must be proved with evidence, published or unpublished, that demonstrates cultivation in NZ prior to 29 July 1998. Data is entered into the EPA application form (Figs 7 & 8), and documents containing evidence are placed in appendices. When EPA assessors are satisfied that the case is sufficiently supported, the form is sent to external reviewers from New Zealand’s MPI and Department of Conservation. Once the statutory declaration of ‘not new’ has been made, the application and the EPA decision documents are published on the EPA website. The first application, for 40 *Vireya* species, consisted of 338 pages and was approved in July 2022 (MacKay & Dawson, 2022). Between 2022 and 2024, four further applications were made for 112 *Rhododendron* taxa, and these have also been successfully declared ‘not new’.

Once the ‘not new’ declarations are complete, applications are made to the MPI for the two stages that lead to a listing on the PBI. First, the species has to be put into the ‘requires assessment’ category. This stage is presently under way. However, the species still cannot be imported until a Health Standard for importation is determined. The second stage involves a review of the existing Health Standard for importation of seed, to determine if that existing standard is sufficient for the ‘not new’ species, or if some amendment is required. The long-term goal is to achieve ‘not new’ status and PBI listing for all *Rhododendron* species that are in cultivation in NZ, so that we can import additional genetic diversity to add to the National Collection.

Research

Our KPI for research was to support one research activity each year. The first research collaboration determined that two Australian

Name	<i>Rhododendron acrophilum</i> GBIF , POWO
Authority	Merr. & Quisumb. (1954)
Synonyms	None in Argent (2015, p. 243), GBIF, or POWO
Name notes	Argent (2015, p. 243) and Chamberlain et al. (1996, p. 6) give the publication year as 1953, while GBIF and POWO give it as 1954.
Origin	Philippines
Biological characteristics	Evergreen shrub to 1 m, with broad funnel-shaped orange flowers with a yellow throat. Full description found in Argent (2015, pp. 243-244). A 2006 description is found in the Edinburgh Rhododendron Monographs .
Evidence Blue = public domain documents provided in Appendix One Green = non-public domain documents provided in Appendix Two Yellow = sales offering	1994 : George Argent of Edinburgh Botanic Garden sent seeds to Graham Smith of Pukeiti (Argent 1994, pp. 1-2). 1997 : Imported by Pukeiti from Edinburgh Botanic Garden under NZ permit 34928 (The Scottish Office 1997, pp. 2-3). 1997 : Pukeiti had accession 1997-106 [Argent M19] which was alive in 2001 (PRT 2001c, p. 17) and in 2005 (PRT 2005a, p. 38). 2000 : In the Binney collection (Smith EW 2000, p. 4). 2001 : Accession 1997-106 [Argent M19] is alive at Pukeiti (PRT 2001c, p. 17). 2005 : Accession 1997-106 is alive at Pukeiti (PRT 2005a, p. 38). 2008 : Pukeiti had accessions 2003-187 [R. Currie, cutting], 2007-126 [R. Currie, cutting], and 2008-115 [R. Currie, seedling] which were alive in 2008 (PRT 2008b, p. 1). 2012 : Offered for sale by PPM in 2012 (PRT 2012a Plant List, p. 4). 2021: Name added/updated on BiotaNZ .
Evidence notes	An herbarium sample of the Argent M19 accession is held at Edinburgh Botanic Garden at https://data.rbge.org.uk/search/herbarium/?cfg=fulldetails.cfg&specimen_num=324176
Cultivated Forms	None in Argent (2015)
Subspecies and botanical varieties	None in Argent (2015), GBIF , or POWO

Fig. 7 Example data table for a species in an application (APP204574) to the New Zealand Environmental Protection Authority (EPA) under Section 26 of the New Zealand Hazardous Substances and New Organisms Act (1996), collating evidence that the species has been present in NZ since before July 1998 and seeking a declaration of ‘not new’ in NZ. (References cited in this data table are not listed in the references for this article, but are provided to the EPA in an appendix document.)



Fig. 8 *R. acrophilum* (CR) at Pukeiti Gardens. Cultivated in New Zealand since 1994 from material from RBGE, but only at Pukeiti Gardens. Four sites globally in 2017; nine in 2026. Photo: Marion MacKay.

species, *R. lochiae* F. Muell (1887) (syn. *R. notiale* Craven (1996)) and *R. viriosum* Craven (2002), are indeed separate species (Gardiner *et al.*, 2019).

The second research collaboration has been supported by the Sir Victor Davies Research Fund for PhD student Ling Hu of Massey University to study subsection *Maddenia* (Hu, 2024). Four pieces of research were completed through this collaboration:

- a study of the ploidy of *Maddenia* species (Hu *et al.*, 2023), with the aim of detecting polyploids. Polyploids are generated by various mechanisms in wild populations and can confound phylogenetic analysis. This research was preparation for the phylogenetic work
- an examination of seed quality and germination, comparing 'selfed' and

out-crossed plants, to determine if rare species can be 'selfed' to increase the number of plants in cultivation (Hu *et al.*, 2024a)

- an examination of the range of wild-sourced accessions in global cultivation (Hu *et al.*, 2024b), to determine the adequacy of ex situ collections and to direct further conservation action
- a phylogenetic analysis of *Maddenia* species, to examine species relationships and the conservation implications thereof.

A third research collaboration is pending a suitable postgraduate to undertake the work. PRT awarded a research scholarship to Associate Professor Jennifer Tate of Massey University to undertake further molecular analysis on subsection *Maddenia*.

Next steps

The Project has met its five-year targets for publication, propagation, biosecurity, development of the collections network, external relations and research. These activities will continue: there will, for example, be continued searches to find species that are scarce in NZ, and there will be further propagation of priority species. More work is needed on development of the National Collection, as we are yet to achieve sufficient duplication and genetic diversity of accessions across the metacollection.

One activity that will increase is the distribution of wild accessions to countries that do not have that material, where regulations allow. For example, in 2022 seed of *R. taxifolium* (CR), *R. rushforthii* (VU) and *R. suoilenhensis* (NT) were sent to Emu Valley in Tasmania. In addition, NZ holds wild-collected *Vireya* accessions from

collections made in the 1980s, which could be distributed to other sites. While such distribution is presently done on a small scale, we expect that this will increase.

The overall strategy remains unchanged since the Project review of 2023 (MacKay, 2023; PRT, 2023), although some operational changes have been made with respect to record keeping, propagation priorities and communication. However, as the strategy is underpinned by the global analysis, some changes may be made once that has been updated.

The global analysis needs to be updated because circumstances have changed since 2018. New species have been described (for example, Argent & Mambrasar, 2019; Mambrasar *et al.*, 2024), Red List assessments have been updated, as has the GSPC (Global Partnership for Plant Conservation, 2025). The update will follow the methods of the previous analysis (MacKay *et al.*, 2018). Preliminary work on this updated global analysis shows about 50 new species and changes in Red List assessments. This information will change species prioritisation internationally and for the Project. Once published, the new global analysis will be available to groups in other countries seeking to manage their collections as metacollections for conservation.

Conclusion

Plant conservation is an ongoing necessity, with ex situ conservation addressing a range of complex challenges (Oldfield, 2010; Heywood, 2017; Mounce *et al.*, 2017). Botanic gardens and plant collections have a key role to play (Mounce *et al.*, 2017; Westwood *et al.*, 2020; Blackmore, 2024). Justifiable action relies on sound baseline data (Heywood, 2017), but data and their aggregation are not enough. In 'big genera'

that are taxonomically complex, such as *Rhododendron* (Frodin, 2004; Ennos *et al.*, 2005; Moonlight *et al.*, 2024), analysis of the data is needed to identify priorities and inform action. Red List assessments (Gibbs *et al.*, 2011; Argent, 2015) and ex situ analysis (BGCI, 2012) have provided a foundation for subsequent analyses (MacKay *et al.*, 2016, 2017, 2018; MacKay & Gardiner, 2017a, 2017b), which have identified taxonomic groups that should be given priority. The update currently under way will similarly inform conservation action. In NZ we have used such analyses, along with the advantages of our geographic location, to determine our own Project strategy. The Project has been running for nine years, and our goal is to make best use of the collections in NZ by managing them as a metacollection, eventually integrating with other collections internationally to the global benefit of *Rhododendron* conservation.

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