Rhododendron in New Zealand and global *ex situ* conservation

American Rhododendron Society

Marion MacKay, Massey University, 6 May 2021

MASSEY UNIVERSITY

- Pukeiti *Rhododendron* Garden
- *Rhododendron* collections in New Zealand and the New Zealand *ex situ* conservation project
- Global Conservation Consortium for *Rhododendron*
- What can collection owners do?

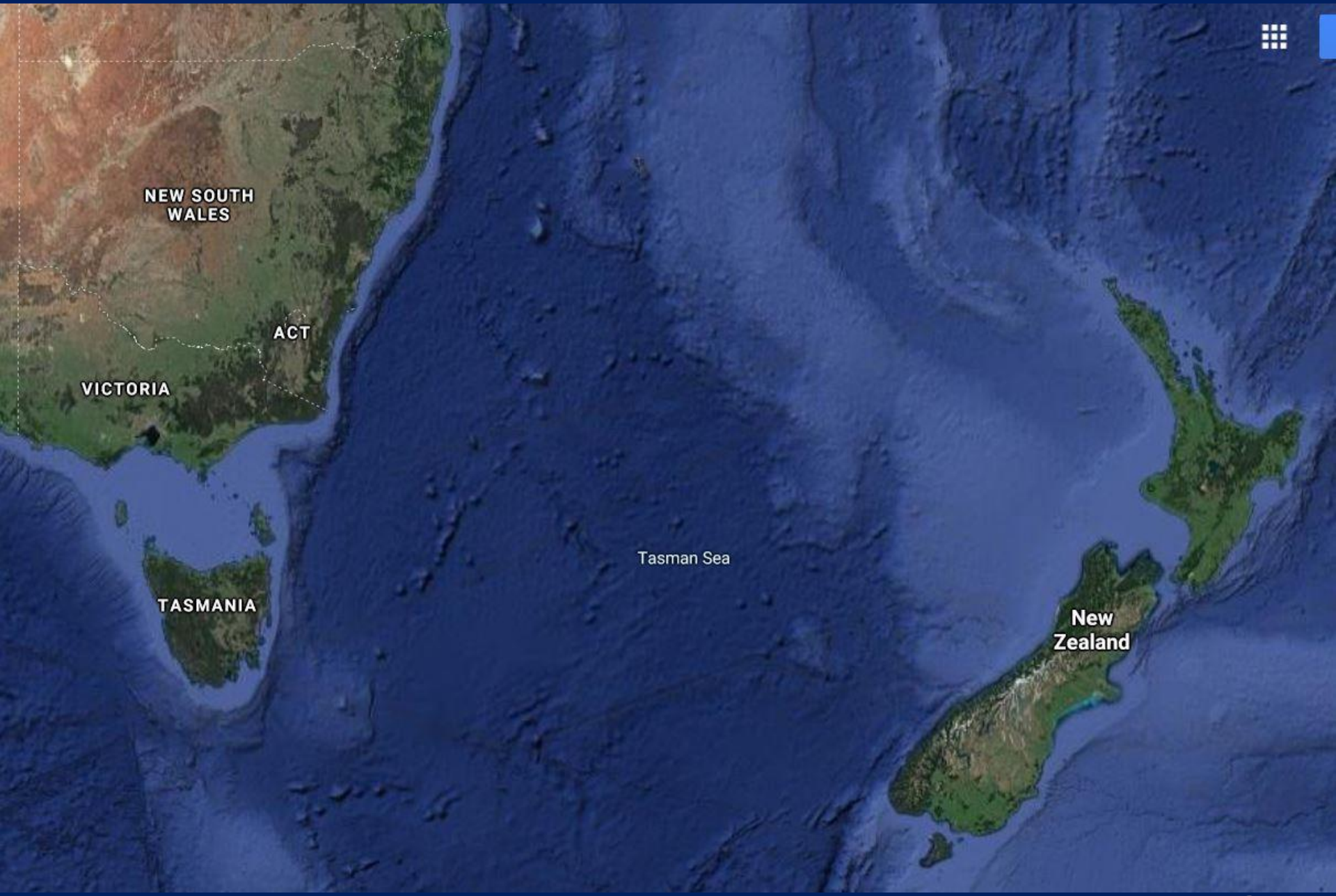


Image: Google Earth

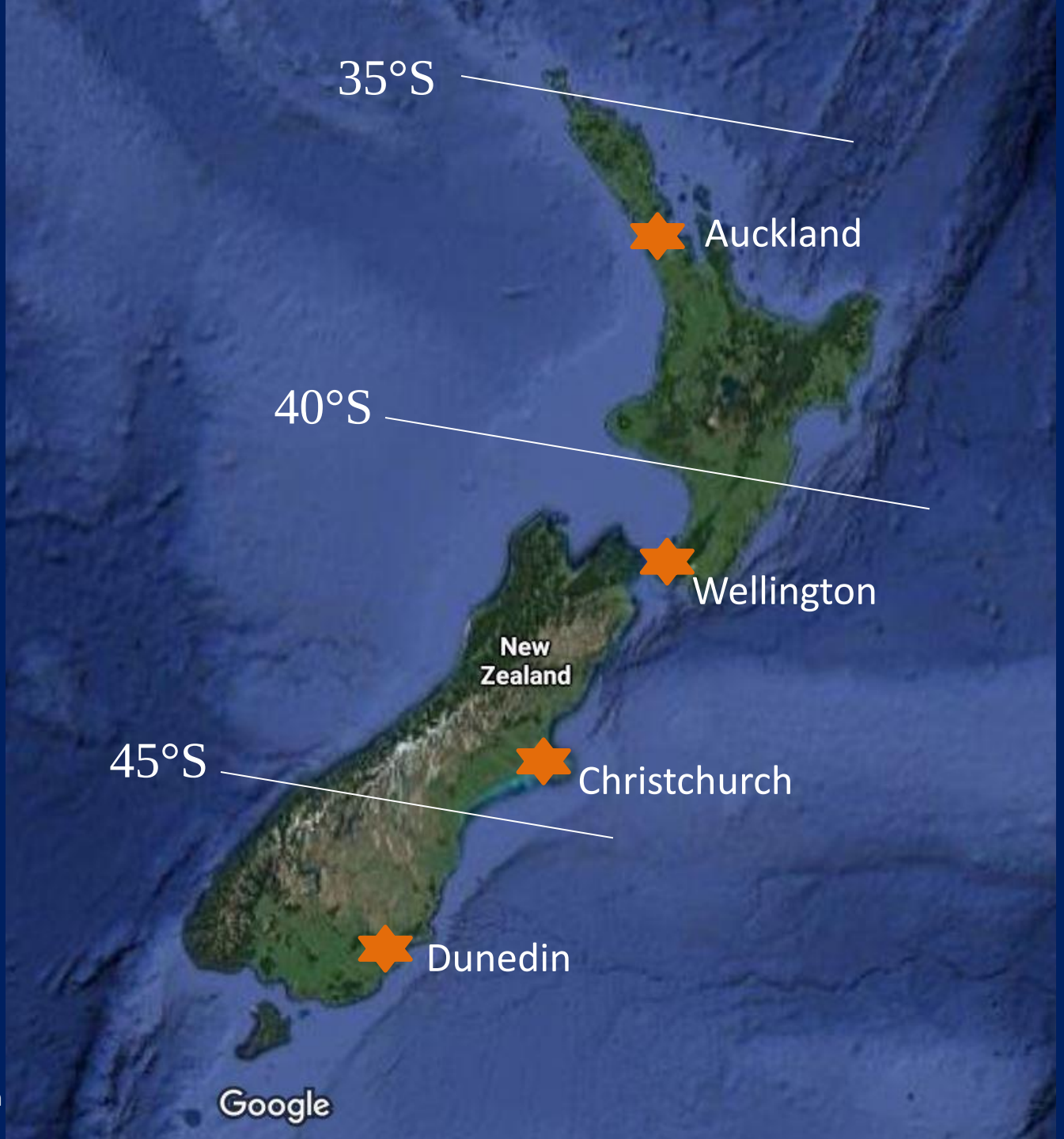


Image: Google Earth

https://www.reddit.com/r/MapPorn/comments/4tex3b/australia_and_new_zealand_compared_to_north/

Mt Ruapehu

Orakei Korako thermal area, Waikato


Orakei Korako thermal area


Jack’s Pass, Hanmer

Waiau river and valley


Kairakau beach


Paki paki wetland


Elingamita johnsonii


Pennantia baylisiana


Clianthus maximus


Pittosporum kirkii

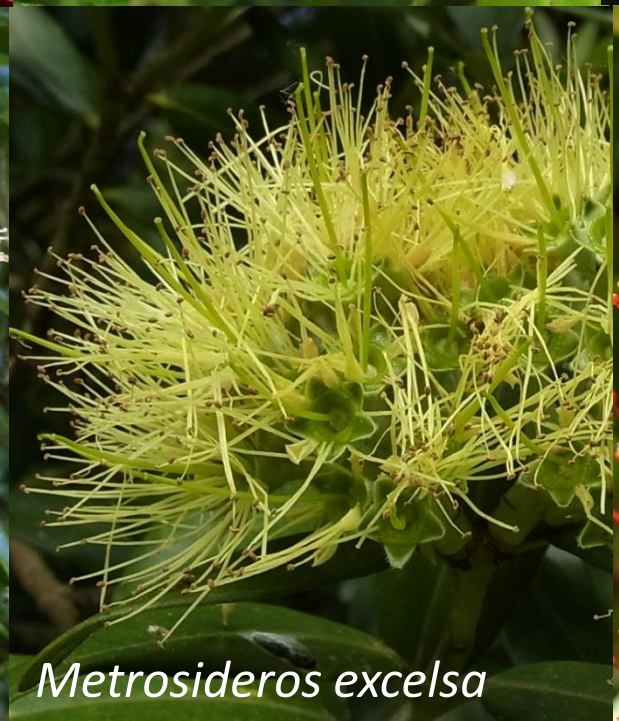

Pittosporum cornifolium


Metrosideros carminea


Metrosideros colensoi


Lophomyrtus bullata


Metrosideros perforata


Metrosideros excelsa


Metrosideros fulgens


Earina mucronata


Caladenia alata


Thelymitra longifolia


Corybas rivularis


Aporostylis bifolia


Pterostylis patens


Celmisia incana


Celmisia glandulosa
var. *latifolia*


Celmisia hookeri
© Marion MacKay
Fantails Publishing


Celmisia spectabilis


C. gracilenta


Celmisia major var. *brevis*


Ourisia vulcanica


Parahebe hookeri


Gentiana bellidifolia

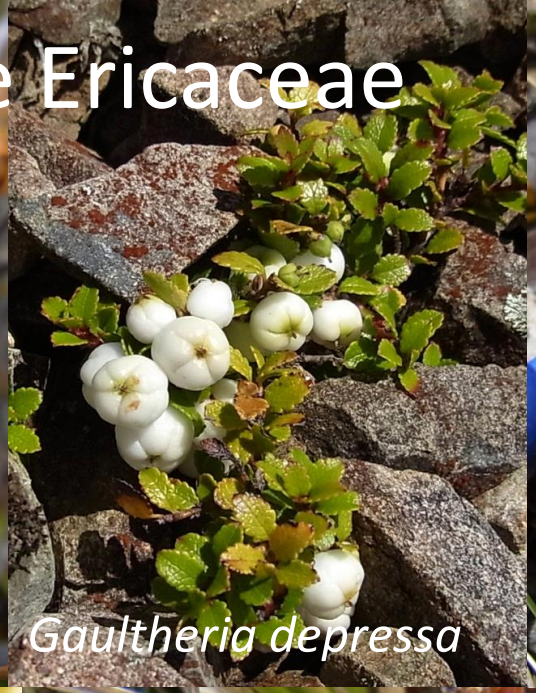

Euphrasia cuneata


Myosotis eximea


Wahlenbergia pygmaea

Alpine Ericaceae


Dracophyllum recurvum


Gaultheria depressa


Gaultheria colensoi


Dracophyllum sp.


Epacris alpina


Pentachondra pumila

Ericaceae

Cyathodes juniperina

Cyathodes juniperina

Dracophyllum latifolium

- Pukeiti *Rhododendron* Garden

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- What can collection owners do?

400m altitude
4m of rainfall
Summer average maximum 20C
Winter average minimum 5C

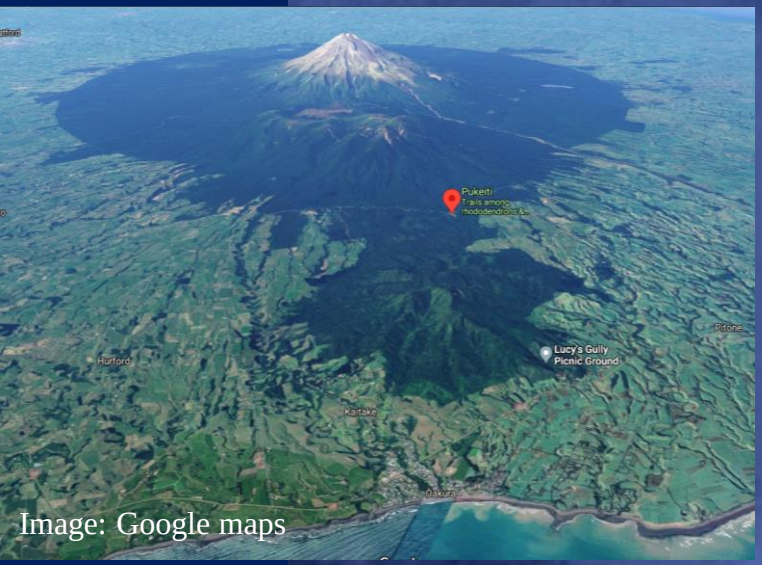


Image: Google maps

Pukeiti Gardens

New Zealand

Google

Image: Google Earth

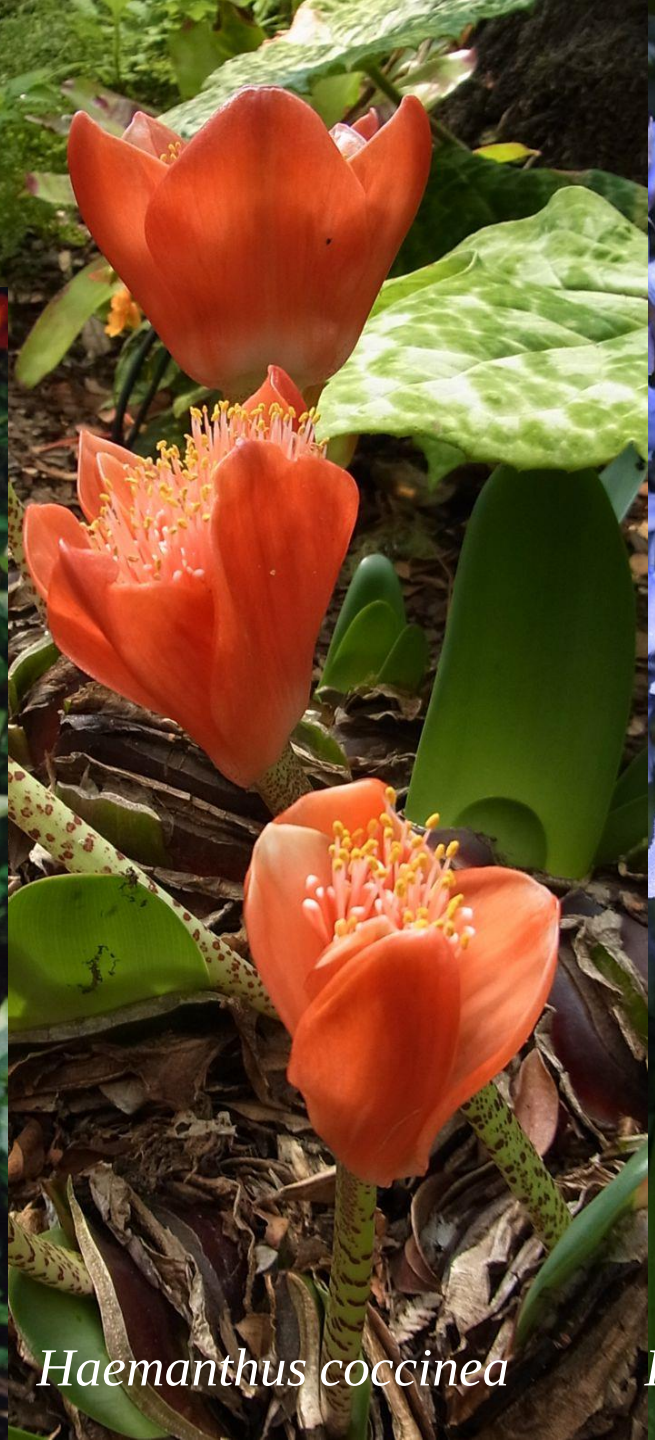

Image: Peter Catt

Pukeiti Gardens, Taranaki

Pukeiti

Gardens

Meconopsis betonicifolia



Haemanthus coccinea

Hyacinthoides non-descripta

Dimorphanthera kempteriana ex George Argent at Edinburgh

Dimorphanthera alpina – collected in PNG by Graham Smith

Rhododendron dalhousiae Least Concern (LC), Bangladesh, Bhutan, China, India, Nepal


Rhododendron sinogrande
Least Concern (LC),
China, India, Myanmar

Rhododendron elliottii KW20303, Vulnerable (VU). India

Vireya

Rhododendron fallacinum Least Concern. Borneo

Vireya

Rhododendron goodenoughii
Data Deficient. Goodenough Island, PNG

Rhododendron acrophilum Critically Endangered (CR). Philippines

Rhododendron apoanum Vulnerable. Philippines

Vireya

Rhododendron rousei Vulnerable. Sibuyan Island, Philippines

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NZ *Rhododendron* Conservation Project

- Aim: to manage the 'New Zealand' *Rhododendron* collection so that it contributes to global *ex situ* conservation

- Collaboration among Pukeiti *Rhododendron* Trust, Massey University, NZ *Rhododendron* Association, Taranaki Regional Council

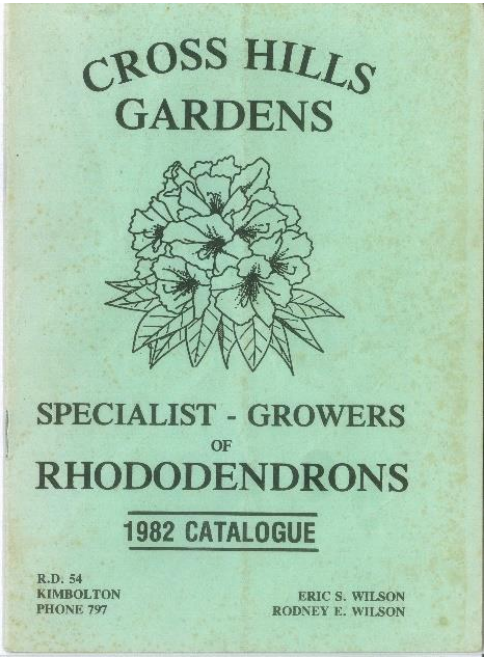
- Project team: Marion MacKay, Sue Davies, Doug Thomson, Graham Smith, Andrew Brooker, Peter Catt (and several associates)

NZ *Rhododendron* Conservation Project

- Programme
  - Record and analyse the ‘New Zealand’ collection
  - Propagate and distribute scarce material
  - Develop a New Zealand network of collections
  - Increase holdings of wild source accessions
  - Participate in international conservation efforts

NZ *Rhododendron* Conservation Project

- Stage One: Record and analyse
  - Acquire collection lists, or do field recording (~ 30 NZ collections)
  - Search old NZ records (e.g. Pukeiti and NZRA going back to 1950s), nursery catalogues, plant lists
  - Search international records for comparison (e.g. BGCI, RBGE, RSF sales, ARS seed lists)



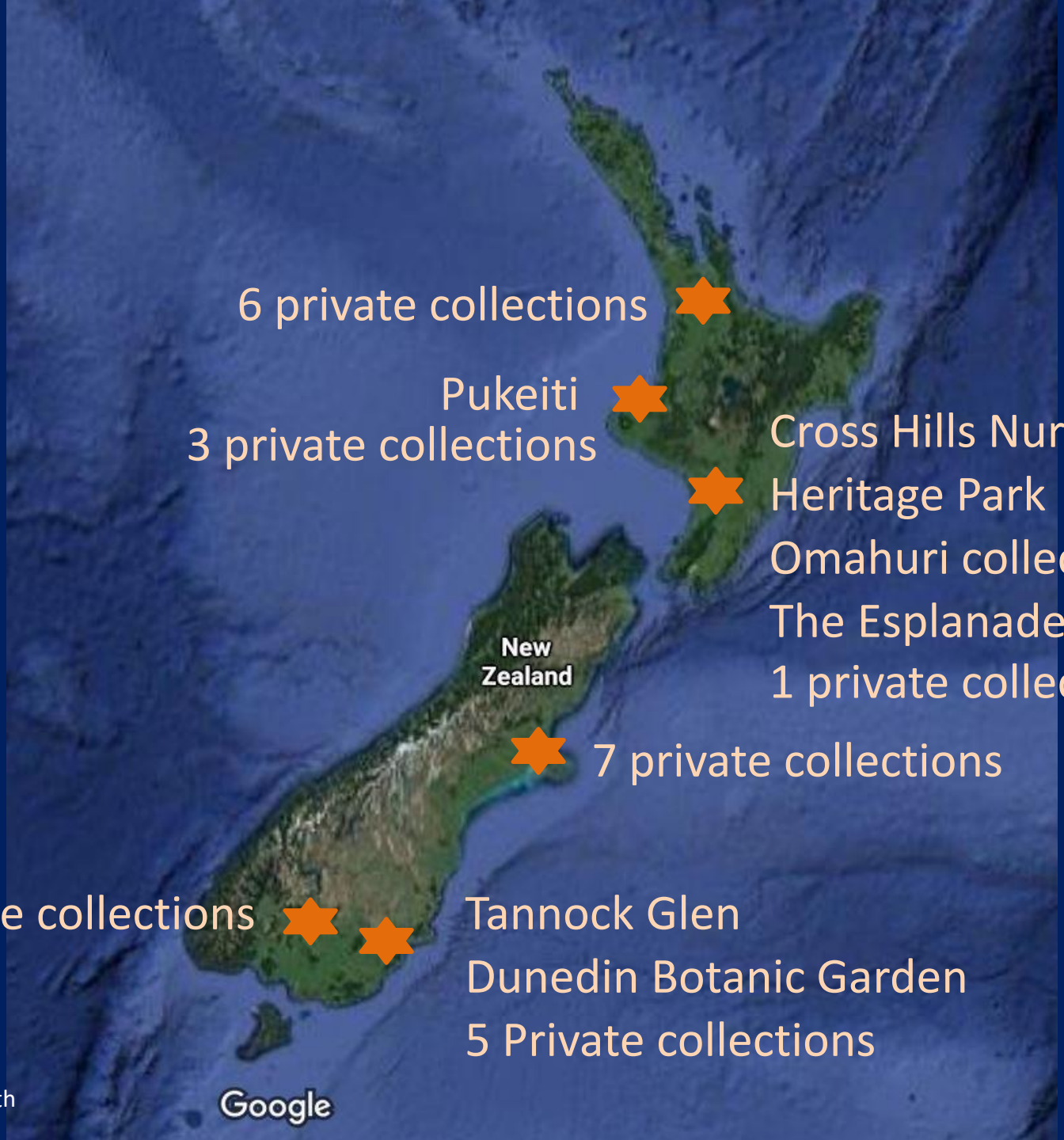


Image: Google Earth


Cross Hills Garden, Kimbolton

Heritage Park, Kimbolton

Rhododendron griffithianum

Rhododendron Medusa

Rhododendron Graham


Omahuri Garden, Palmerston North


The Esplanade,
Palmerston North

Tannock Glen, Dunedin


Dunedin Botanic Garden


Private Collection, Dunedin

NZ *Rhododendron* Conservation Project

Biodivers Conserv (2017) 26:189–208
DOI 10.1007/s10531-016-1237-0

ORIGINAL PAPER

A model for determining ex situ conservation priorities in big genera is provided by analysis of the subgenera of *Rhododendron* (Ericaceae)

Marion MacKay[1] · Susan E. Gardiner[2]

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RESEARCH ARTICLE

http://dx.doi.org/10.3767/000651916X693275

Analysis of geographic and taxonomic groups informs conservation of *Rhododendron* subgenus *Vireya* (*Ericaceae*)

M. MacKay[1], G. Smith[2], S.E. Gardiner[3]

Key words
botanic gardens
Malesian flora
Red List
Schistanthe
Target 8
threatened species
Vireya

Abstract Although *Rhododendron* subg. *Vireya*, comprising 400 taxa, is one of the largest plant genera in South-east Asia, with taxa found throughout the region, it has a significant conservation problem, with conservation status assessments in 2011 and 2015 placing 201 taxa in an IUCN Red List threat category. Plant conservation is driven by the Global Strategy for Plant Conservation, with Target 8 requiring 75 % of threatened plant taxa to be conserved in *ex situ* collections, by 2020. To date there has been limited analysis of conservation priorities for subg. *Vireya*, or any consideration of how its geographic characteristics, complex taxonomy, and existing *ex situ* collections might influence priorities. We analyse the IUCN Red List status of geographic origins and taxonomic sections within *Rhododendron* subg. *Vireya*, then determine the representation of those groups in cultivation in New Zealand and selected international collections. Using a set of 'Red List' and 'not in cultivation' factors, our analysis shows that geographic origins New Guinea, Sumatra and Sulawesi, and taxonomic sections *Schistanthe*: malesia, *Schistanthe*: euvireya, and *Hadranthe* (*Phaeovireya*) should have priority for both *in situ* and *ex situ* conservation. Of the 400 taxa, 245 (61 %) are in cultivation, and of the 201 Red List taxa, 80 (40 %) are in cultivation. Wild-source material is held for 218 taxa, including 66 Red List taxa. These analyses provide baseline data for development of a conservation strategy for *Rhododendron* subg. *Vireya*, and we propose six actions that should be included in that strategy.

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RESEARCH ARTICLE

ISSN (Online) 2212-1676
https://doi.org/10.3767/blumea.2017.62.02.05

Geographic analysis of Red List *Rhododendron* (*Ericaceae*) taxa by country of origin identifies priorities for *ex situ* conservation

M.B. MacKay[1], S.E. Gardiner[2]

Key words
botanical gardens
Malesian flora
plant collections
Target 8
threatened species

Abstract A Red List assessment is insufficient to determine priorities for *ex situ* conservation in large genera such as *Rhododendron*, where there may be hundreds of taxa in any one Red List category. We have utilised an analysis of the geographic origins of 1215 taxa of *Rhododendron* (*Ericaceae*) as a method to prioritise Red List taxa for *ex situ* conservation. This analysis includes descriptions of distribution and endemism by country of origin, analysis of the incidence of the 715 Red List taxa by country of origin, and determination of the extent to which taxa from each country of origin are in cultivation. We determined that of 30 countries of origin and a 'Europe' aggregate, 24 origins contain Red List taxa. Of those 24 origins, 17 origins and 'Europe' have greater than 75 % of Red List taxa 'in cultivation', as defined in this study, so that Target 8 of the Global Strategy for Plant Conservation has theoretically been met. However, for some of these origins the number of each taxon held 'in cultivation' is very low and genetic diversity is likely to be poor. The remaining six countries of origin have less than 75 % of Red List *Rhododendron* taxa recorded 'in cultivation' (Indonesia (28 %), Papua New Guinea (29 %), Malaysia (59 %), China (60 %), Japan (62 %) and Solomon Islands (0 %)). Analysis of a set of Red List factors and 'not in cultivation' factors reveals that Red List taxa from Indonesia, China and Papua New Guinea should take priority for *ex situ* conservation.

Published on 15 August 2017

Taylor & Francis

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New Zealand collections of Rhododendron as a resource for ex situ conservation

M. B. MacKay, G. F. Smith & S. E. Gardiner

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NZ *Rhododendron* Conservation Project

- Stage One: analysis (international)
- Priorities for *ex situ* conservation globally
  - Subgenera *Vireya* and *Azaleastrum*
  - Within subgenus *Vireya*: New Guinea, Sumatra, Sulawesi, and *Schistanthe*: *malesia*, *Schistanthe*: *euvireya*, *Hadranthe (Phaeovireya)*
  - Indonesia, China, Papua New Guinea are priority countries of origin

  - 1386 taxa, 1017 cultivated, 566 in New Zealand

NZ *Rhododendron* Conservation Project

- Stage One: analysis (New Zealand)
  - 566 taxa cultivated in NZ
  - Another ~90 taxa have been in NZ, now not found
  - 244 Red List taxa in NZ (447 cultivated globally, of 730 total)

  - Vireya ~120 taxa (~170 cultivated globally, of 407)
  - Maddenia, 38 of the 49 taxa in cultivation (of 59)
  - Wild source material, 230 taxa in NZ (811 in cultivation globally)

New Zealand collections: many species

Rhododendron decorum LC.. China, Myanmar BGCI=84


Rhododendron fortunei LC, China , Myanmar
BGCI=105

Rhododendron campylocarpum LC,
Bhutan, China, India, Myanmar, Nepal

BGCI=41


Rhododendron serotinum LC, China, Laos, Vietnam
BGCI=19

Rhododendron sikayotaisanense RV73101

Not Evaluated (NE), Taiwan

BGCI=1

New Zealand collections: rare species

Rhododendron auritum
Critically Endangered, China. BGCI=12

Rhododendron griersonianum
Critically Endangered, China. BGCI=22

Rhododendron orbiculare
Vulnerable, China BGCI=53

R. degronianum ssp. *heptamerum* var. *kyomaruense* EN, Japan
BGCI=3

Rhododendron niveum
VU, Bhutan, China India. BGCI=27

Rhododendron subansariense
Critically Endangered, India
BGCI=5

Rhododendron suoilenhensis AC431
Data Deficient, Vietnam. BGCI=0


Rhododendron taxifolium
Critically Endangered, Philippines
BGCI=8


Rhododendron album
Vulnerable, Indonesia (Java)
BGCI=4

New Zealand collections: vireya

Rhododendron aequabile
Least Concern, Indonesia (Sumatra)

Rhododendron adinophyllum
Least Concern, Indonesia (Sumatra)

Rhododendron christi Least Concern, PNG and Papua BGCI=10

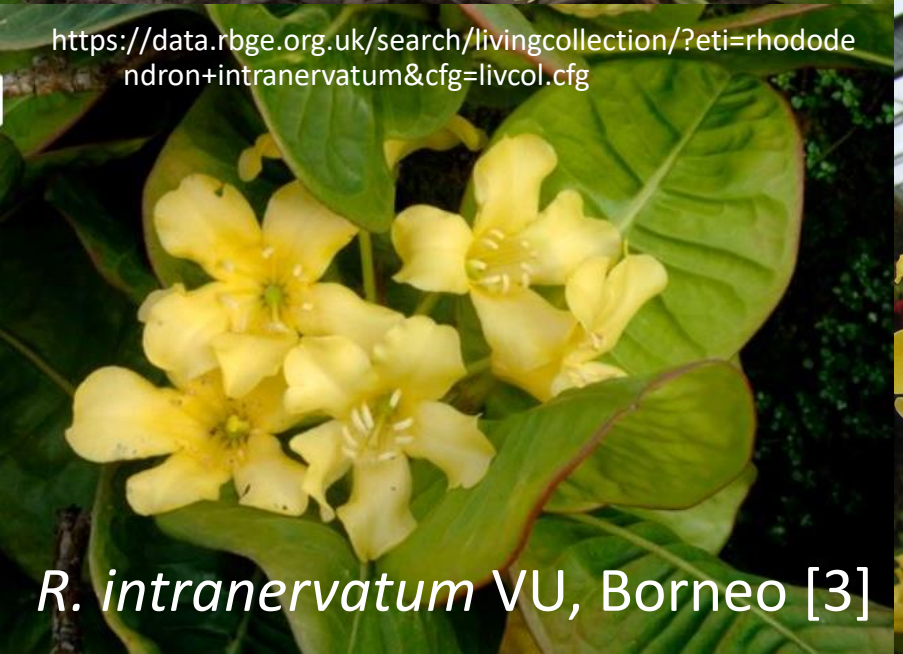
Rhododendron searleanum Least Concern, PNG BGCI=4

Rhododendron yongii Least Concern, Borneo BGCI=5


Rhododendron armitii Least Concern, PNG
BGCI=5


R. javanicum ssp. *moultonii*
DD, Borneo BGCI=1


R. perakense LC, Malaysia BGCI=3


https://data.rbge.org.uk/search/livingcollection/?eti=rhododendron+intranervatum&cfg=livcol.cfg
R. intranervatum VU, Borneo [3]


R. retivenium LC, Borneo BGCI=3

New Zealand collections: maddenia

- 38 of 49 the taxa in cultivation globally (59 total)

R. coxianum CR, India BGCI=3

R. excellens VU, China, Vietnam [17]

R. ciliipes K56, Data Deficient (DD), China, Myanmar BGCI=6

BGCI=12

R. nuttallii Near Threatened (NT),
China, India, Myanmar, Vietnam

R. dalhousiae var. *rhabdotum* VU,
Bhutan, China India BGCI=6


R. megacalyx LC, China, India, Myanmar
BGCI=7

R. lindleyi LC, Bangladesh, Bhutan, China, India, Myanmar, Nepal BGCI=18

R. burmanicum LC, Myanmar. BGCI=81

R. parryae Fischer 146, Least Concern (LC), India. BGCI=7

BGCI=22

R. formosum Ten Tashi (wild) CR, India

Ling Hu, PhD student, maddenia

Image: Peter Catt

New Zealand collections: wild


R. hellwigii, LC, PNG
Kores seed, Finnisterre mountains BGCI=7

R. macgregoriae LC, PNG

Red & yellow, G. Smith.

Orange, F. Jury.

BGCI=18


Had KW20839, KC0106, CNW834,
None presently found
R. edgeworthii LC, Bhutan, India, China
BGCI=39

Rhododendron taxifolium, Philippines, Critically Endangered

36. *Rhododendron taxifolium*

Name	*Rhododendron taxifolium*
Authority	Merr. (1926)
Reference for name	Argent (2015 pp242) Gibbs et al. (2011 p92) Chamberlain et al. (1996 p63) Plants of the World online (POTWO) at http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:333461-1
Synonyms	None in Argent (2015) or at POTWO
Origin	Philippines
Biological characteristics	Dwarf evergreen shrub to 1m, with narrow, almost needle-like leaves and white campanulate flowers. Full description is found in Argent (2015 pp242-243). A 2006 description is found in the Edinburgh monographs at https://data.rbge.org.uk/service/factsheets/Edinburgh_Rhododendron_Monographs.xhtml
First year recorded in NZ.	1996
Herbarium samples from NZ sites	No plant specimens in current online records of the Australasian Virtual Herbarium Te Papa image specimen SP089660, Fayaz 2010
Evidence Blue = public domain documents provided in Appendix Two Green = non-public domain documents provided in Appendix Three Yellow = sales offering	1996: Pukeiti had accession 1996-267 which was alive in 2001 (PRT 2001c p16) and in 2005 (PRT 2005a p37). 1997: Pukeiti had accession 1997-130 [Argent] which was alive in 2001 (PRT 2001c p17) and in 2005 (PRT 2005a p45). 1998: Offered for sale by PPM (PRT 1998a p30). 1998 January: Binney offers plants for sale, ex RBGE, to Pukeiti (Binney 1998a). 1998 March: Plant donated to Pukeiti by D. Binney on 30 March 1998 (PRT 1998b). 1998: 1 May 1998, *R. taxifolium* Mt Pulag in the nursery at Pukeiti (PRT 1998c p3) and *R. taxifolium* RBGE, Pukeiti accession 1992-2826, in the nursery at Pukeiti (PRT 1998c p4, p5). 1998: Pukeiti has accession 1998-101 given by Binney in Sept 1998, [Mt Pulag, Philippines] (PRT 1998d) and was alive in 2005 (PRT 2005a p45). 1998 November: growing at Pukeiti (Smith 1999 p6). 1999: Offered for sale by Brown's nursery (Gaddum 1999b p24). 2000: In the Binney, Cullinane, Currie, Pukeiti collections (Smith EW 2000 p7). 2000: Offered for sale by PPM (PRT 2000a p4). 2001: Accessions 1996-267, 1997-130, 1998-101 are alive at Pukeiti (PRT 2001c p10,16,17). 2001: Pukeiti accession 2001-130 [Binney, ex Argent wild collected Mt Pulag, Philippines] which was alive in 2008 (PRT 2008b p6). 2001: In the Clark collection in Dunedin (Clark 2001 p49). 2001: Offered for sale by Brown's Nursery (Gaddum 2001 p236). 2003: Growing at Pukeiti (Smith 2003a p12). 2005: Pukeiti accession 1996-267 was alive in 2005 (PRT 2005a p43) as were accessions 1997-130 and 1998-101 (PRT 2005a p45). 2008: Offered for sale by PPM (PRT 2008a p3). 2012: Offered for sale by PPM (PRT 2012 Plant List p6). 2015: Photographed in collection 114 (MacKay, Unpublished collections data). 2016: In the Pukeiti collection (TRC 2016 p21). 2017: In the Pukeiti collection (TRC 2017 p25). 2021: Name added/updated in the Ngā Tipu o Aotearoa – Plant Names Database: https://nzflora.landcareresearch.co.nz/default.aspx?selected=NameDetails&TabNum=0&NameId=C957193B-4857-4E2D-813A-27B93F33BF6C
Cultivated Forms	None in Argent (2015)
Subspecies and botanical varieties	None in Argent (2015) or at POTWO
References	See Appendix Two

R. taxifolium Merr. (1926)

Pukeiti 2001130 [Binney ex Argent RBGE]
An Auckland collection

Whole plant (Auckland) October 2009
Leaves and flowers 12 December 2015
(Images: M. MacKay)

NZ *Rhododendron* Conservation Project

- Programme
  - Propagate and distribute scarce material
  - Develop a New Zealand network of collections
  - Increase holdings of wild source accessions
  - Participate in international conservation efforts

- Pukeiti *Rhododendron* Garden
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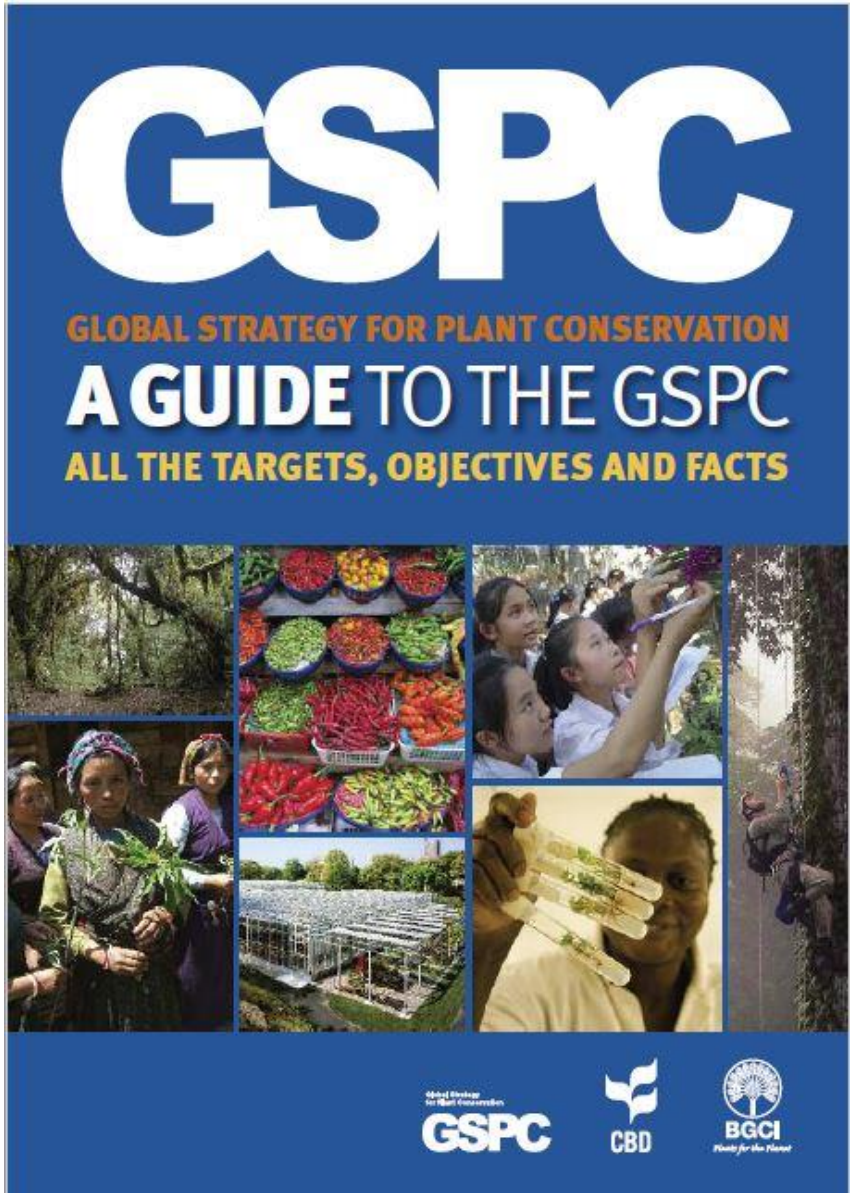
- Global Conservation Consortium for *Rhododendron*
- What can collection owners do?

Global Strategy

- Convention on Biodiversity
- Global Strategy for Plant Conservation (GSPC), 2002
  - 16 targets
  - Led by Botanic Gardens Conservation International (BGCI), London
- https://www.bgci.org/resources/bgci-tools-and-resources/global-strategy-for-plant-conservation/



Global Strategy - Targets

- Plant diversity is documented
  - Target 1: Online flora of all known plants
  - Target 2: Assessment of the conservation status of all plants

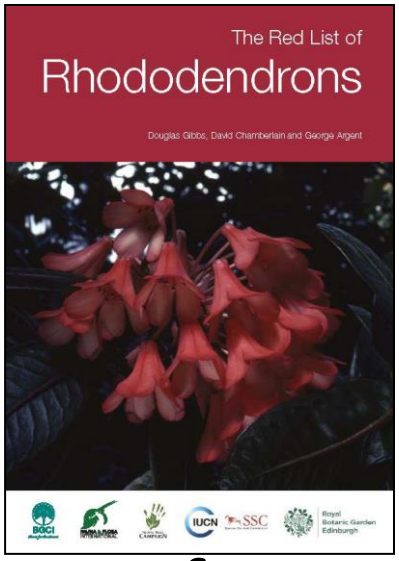
- Plant diversity is effectively conserved
  - Target 7: At least 75% of all known plants conserved *in situ*
  - Target 8: At least 75% of threatened plant species in *ex situ* collections, with 20% available for restoration and recovery

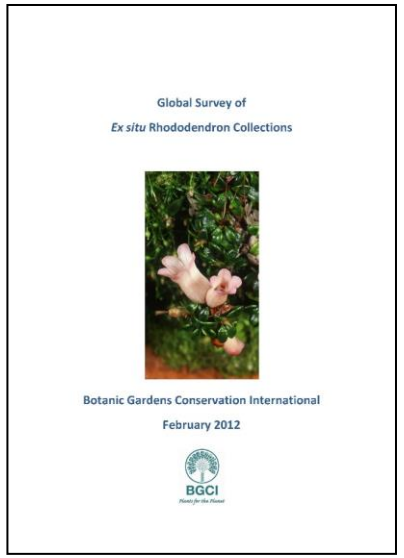
- Plant diversity is used in sustainable and equitable manner
- Education and awareness of plant diversity
- Develop the capacity needed to implement the strategy

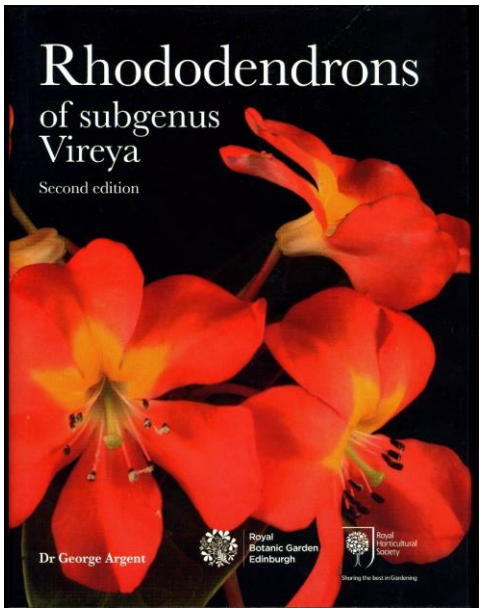
https://www.bgci.org/resources/bgci-tools-and-resources/global-strategy-for-plant-conservation/

Global Strategy: *Rhododendron*

- Red List assessment (T2)
- *Ex situ* survey (T8)
- Updated Red List assessment for Vireya by Argent in 2015
- Limited NZ data, no data from Rhodo Species Botanical Garden







Global Data

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Target 8
threatened species

Abstract A Red List assessment is insufficient to determine priorities for *ex situ* conservation in large genera such as *Rhododendron*, where there may be hundreds of taxa in any one Red List category. We have utilised an analysis of the geographic origins of 1215 taxa of *Rhododendron* (*Ericaceae*) as a method to prioritise Red List taxa for *ex situ* conservation. This analysis includes descriptions of distribution and endemism by country of origin, analysis of the incidence of the 715 Red List taxa by country of origin, and determination of the extent to which taxa from each country of origin are in cultivation. We determined that of 30 countries of origin and a 'Europe' aggregate, 24 origins contain Red List taxa. Of those 24 origins, 17 origins and 'Europe' have greater than 75 % of Red List taxa 'in cultivation', as defined in this study, so that Target 8 of the Global Strategy for Plant Conservation has theoretically been met. However, for some of these origins the number of each taxon held 'in cultivation' is very low and genetic diversity is likely to be poor. The remaining six countries of origin have less than 75 % of Red List *Rhododendron* taxa recorded 'in cultivation' (Indonesia (28 %), Papua New Guinea (29 %), Malaysia (59 %), China (60 %), Japan (62 %) and Solomon Islands (0 %)). Analysis of a set of Red List factors and 'not in cultivation' factors reveals that Red List taxa from Indonesia, China and Papua New Guinea should take priority for *ex situ* conservation.

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New Zealand collections of Rhododendron as a resource for ex situ conservation

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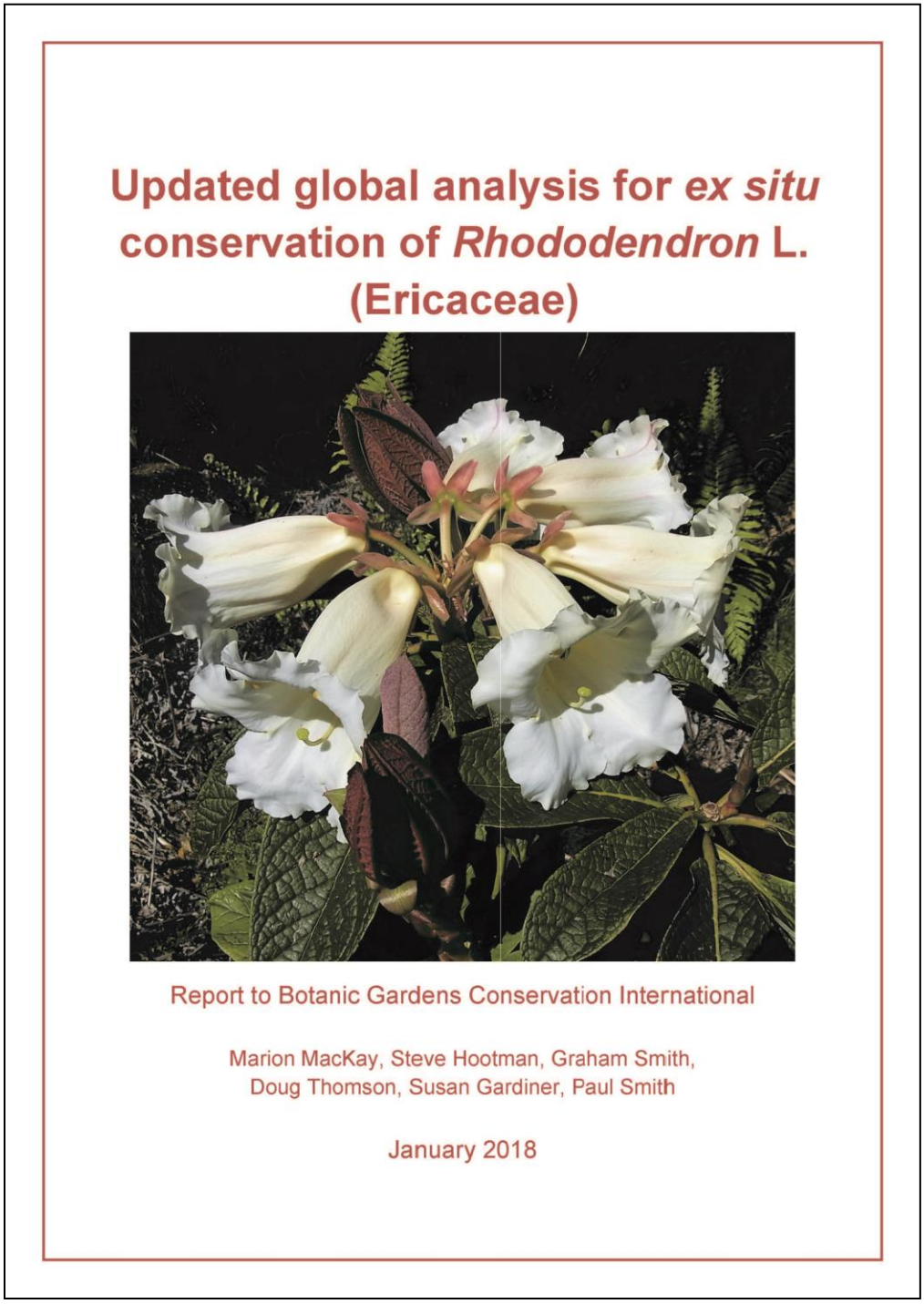
Global data

- 2018 Conservation Conference, Oak Spring Garden, USA
- Led by BGCI
- Global Analysis, with data from RSBG and others



Global data

- Edinburgh and the RSBG, assessment 2018

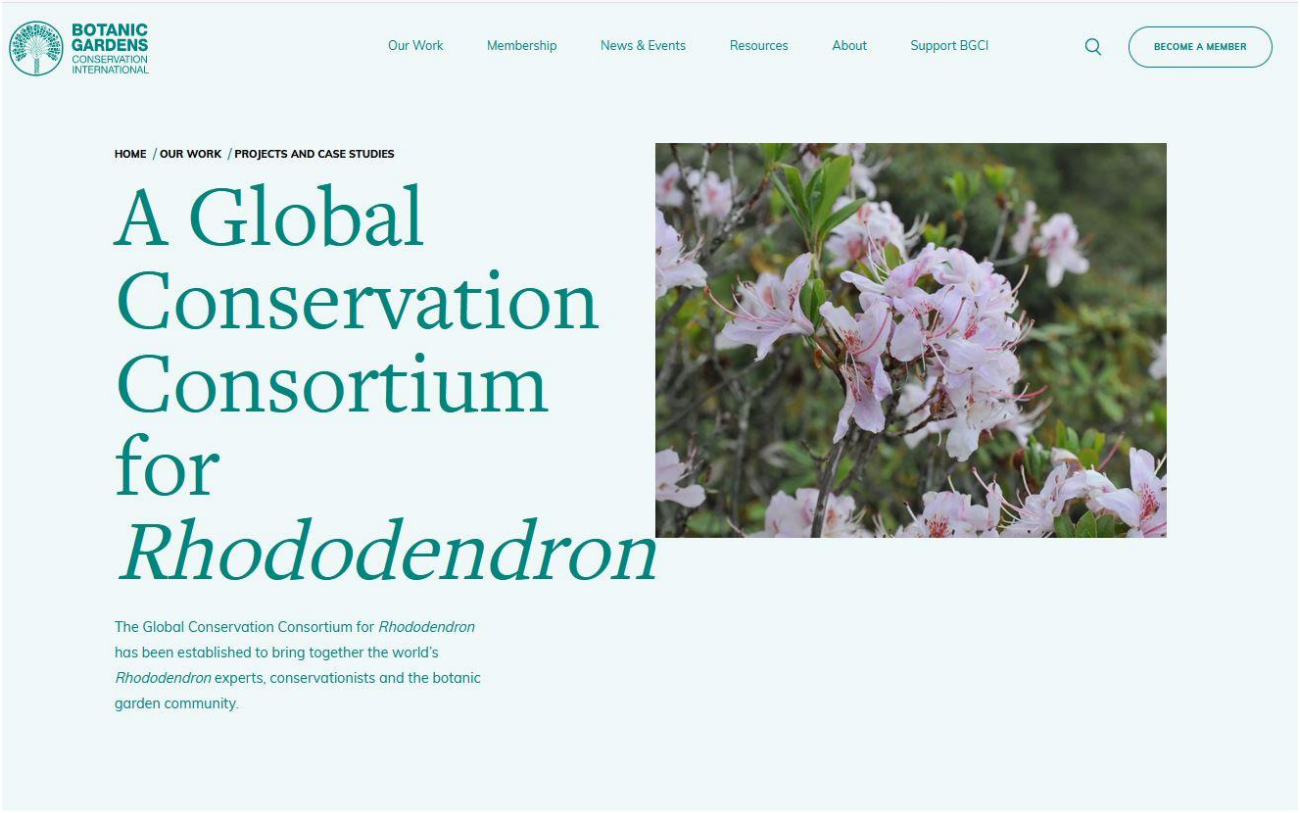
Examining the Significance of the *Rhododendron* Collection at the Rhododendron Species Botanical Garden (Federal Way, WA, USA)

M. B. MacKay and S. E. Hootman

Photos on page 60

Global Strategy: *Rhododendron*

- Global Conservation Consortium
- Leader: Alan Elliott, Edinburgh



https://www.bgci.org/our-work/projects-and-case-studies/a-global-conservation-consortium-for-rhododendron-gccr/

- Pukeiti *Rhododendron* Garden
- *Rhododendron* collections in New Zealand and the New Zealand *ex situ* conservation project
- Global Conservation Consortium for *Rhododendron*
- What can collection owners do?

Record your collection

- Verify identification of your collection

- Label your collection
  - Accession numbers
  - Long-life labels

- Record your collection
  - Source details

Combine your data

- By region, state, etc

- Spreadsheet?
- Database?

- Describe the overall resource


R. maxwellii LC, Borneo [7]


R. baenitzianum DD, PNG [4]

Analyse data, take action

- What range of taxa and Red List taxa are held in your collection/region/state?
- What wild source material do you have?
- Prioritise species that are scarce (Red List, or rare in cultivation in your region)
- Undertake propagation and distribution

- Pukeiti *Rhododendron* Garden
- *Rhododendron* collections in New Zealand and the New Zealand *ex situ* conservation project
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- What can collection owners do?