Global Survey of

Ex situ Maple Collections

Botanic Gardens Conservation International

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BGCI

Plants for the Planet

Contents

Acknowledgements

Many botanic gardens around the world have freely contributed data to the survey (Annex 4), and their contributions are gratefully acknowledged. BGCI would also like to acknowledge the assistance of the following organisations in the promotion of the survey and the collection of data: American Public Gardens Association, Chinese Academy of Science (CAS) Botanic Gardens Committee, European Botanic Garden Consortium. BGCI would also like to acknowledge the assistance of Mitsubishi Corporation for their support of the Japanese component of the survey.

Cover image: *Acer pentaphyllum*, Muli, Sichuan, China (© Yousheng Chen)

Summary

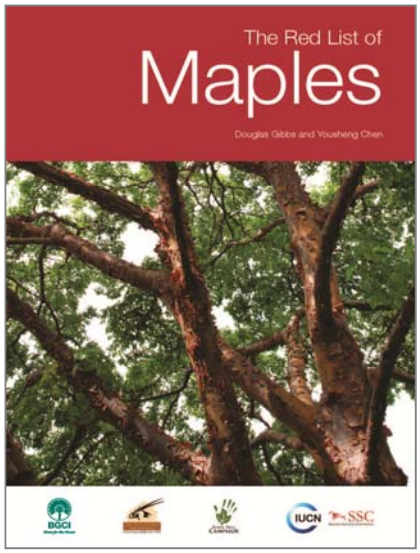
In 2009, BGCI and FFI jointly published *The Red List of Maples* under the partnership of the Global Trees Campaign. The report called for action to ensure that the 26 taxa listed in the report as Critically Endangered or Endangered were conserved. The first stage of this action is to establish which of these very threatened taxa are held in *ex situ* collections around the world by carrying out a global survey.

The survey identified 4,405 maple records[1] from 228 institutions in 37 countries. However, only 223 *ex situ* records representing just 16 of the most threatened maples were located. This means that many of the Critically Endangered or Endangered taxa are currently not known to cultivation and therefore at great risk of extinction if threats that they are facing in the wild are not addressed.

The report concludes by making a call for further information to fill gaps in our knowledge of collections and by making a series of recommendations based on the results of the survey including: the strengthening of existing *ex situ* collections, establishing new collections, implementing restoration and reintroduction activities, involving local communities and organisation in conservation activities, developing public awareness programmes and enhancing BGCI's *PlantSearch* database. The report also calls for further information to fill gaps in our knowledge of *ex situ* collections.

[1] For the purposes of this survey, a record is the presence of a single living *Aceraceae* (maple) taxon within an institution and may include multiple accessions and/or individuals.

Introduction

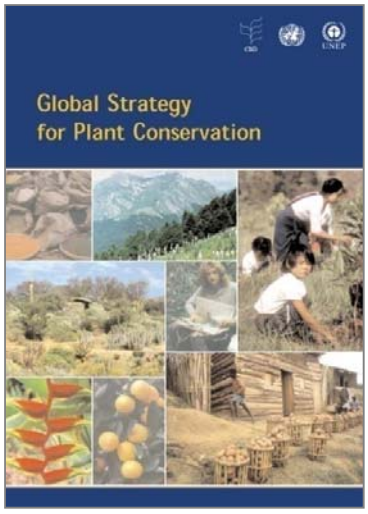


The Red List of Maples was published jointly by Botanic Gardens Conservation International (BGCI) and Fauna & Flora International (FFI) in December 2009, under the partnership of the Global Trees Campaign. Electronic copies of the report are available from the BGCI website (www.bgci.org).

Maples (Aceraceae) are an important and popular Family of trees and shrubs with around 200 taxa, excluding naturally occurring hybrids and cultivars. Aceraceae includes two genera (*Acer* and *Dipteronia*) which are generally restricted to the northern temperate regions, although a few can be found in tropical montane regions and one (*Acer laurinum*) extends in to the southern hemisphere. Of the 191 taxa evaluated against the IUCN Red List Categories and Criteria, 83 taxa have been identified to be in danger of extinction if the threats that they face are not addressed.

Based on the information presented in the Red List report, urgent attention is required for the 26 taxa considered to be at most risk of extinction (Endangered or Critically Endangered) according to the IUCN Red List Categories and Criteria.

Some of these threatened maples are reduced to a handful of individuals in the wild and it would be a tragedy if such species are needlessly lost. It is clearly important that all Critically Endangered (CR) and Endangered (EN) taxa are represented in well-managed *ex situ* collections as an insurance policy for the future and in support of Target 8 of the *Global Strategy for Plant Conservation* (GSPC).



Global Strategy for Plant Conservation, Target 8:

60% of threatened plant species in accessible ex situ *collections, preferably in the country of origin, and 10% of them included in recovery and restoration programmes*

At the same time habitat protection and restoration should be reviewed and mechanisms put in place for local people to be involved in and benefit from the *in situ* conservation and management of these globally important trees.

Methods

An international survey of *ex situ* collections of globally threatened maples (Aceraceae), building on information held within BGCI's *PlantSearch* Database, was undertaken by BGCI. The results of the survey have enabled us to identify precisely which Critically Endangered (CR) and Endangered (EN) species are currently held in *ex situ* collections. From this information, the gaps and the opportunities have been identified in order to develop a prioritised plan for the long term integrated conservation of the most threatened maples.

All BGCI's institutional members were invited to participate in the survey; however participation in the survey was not limited to BGCI members. Awareness of and invitations to participate in the survey was promoted through BGCI's website (www.bgci.org) and a range of networks, organisations and events including: American Public Gardens Association (APGA), Chinese Academy of Science (CAS) Botanic Gardens Committee, European Botanic Garden Consortium, The Japanese Association of Botanical Gardens.

An important component of the Global Survey of *Ex situ* Maple Collections was to access information on species held in botanic garden collections in China by working closely with the Chinese Academy of Science (CAS) Botanic Gardens Committee and other gardens in China.

The survey also benefited greatly from the work of APGA North American Plant Collections Consortium (NAPCC) which carried out an extensive survey of collections in North America.

The survey primarily focussed on collecting data on the Critically Endangered (CR) and Endangered (EN) taxa since these are of the highest conservation priority. Information on other maples was also collected when possible. However, information on maple hybrids and cultivars was not collected or included in this survey.

The survey of *ex situ* collections was carried out via through a range of methods, including:

- Analysis of data held in BGCI's *PlantSearch* database (www.bgci.org/plant_search.php)
- Completion of an online form or submission of a downloaded survey form
- Through direct contact with botanic gardens and networks holding maple collections
- Data collected from online databases of living collections:
  - The multisite BG-BASE search facility maintained by Royal Botanic Garden Edinburgh (rbg-web2.rbge.org.uk/multisite/multisite3.php)
  - Database of Asian Plants in Cultivation maintained by Quarryhill Botanical Garden and California Academy of Sciences (research.calacademy.org/research/botany/quarryhill/index.asp)

In addition to the presence or absence of a maple from a collection, the following closed questions were also asked:

- Is this maple from a known wild source or from horticultural/unknown origin?
  - horticultural or unknown source
  - of known wild provenance
- What is the approximate size of the collection?

- 1 individual
- 2 to 10 individuals
- 11 to 30 individuals
- 31 to 50 individuals
- more than 51 individuals

- Is this maple collection part of a restoration or reintroduction programme?
  - no
  - Reclamation
  - Rehabilitation
  - Ecosystem restoration
  - Translocation
  - Re-inforcement/Supplementation
  - Conservation/Benign Introduction

The resulting submissions were cross-checked with the published *Red List of Maples* and accepted synonyms.

Although efforts were made to limit their impact on the final results, the survey has inherent limitations which mean that it can never be considered to be truly exhaustive and final. Surveys, such as this one, can be limited by issues of non-stable taxonomy, unclear synonymy, correct identification of specimens, the degree of participation by collection holders in the survey and the dynamic nature of *ex situ* collections which evolve and change over time. A number of maples were assessed at the infra-specific level, however institutions did not always record infra-specific taxonomy therefore these taxa are under-represented in the survey.

Also, important additional maple specimens may be held in private collections which are not covered by this survey.

Results

General findings

The survey identified 4,405 maple records[1], from 228 institutions in 37 countries. Of the 4,405 records included in the analysis, just 223 records (5%) of the most threatened maples (CR and EN) were identified.

The 223 records represent 16 of the 26 most threatened (CR and EN) maples:

Critically Endangered:

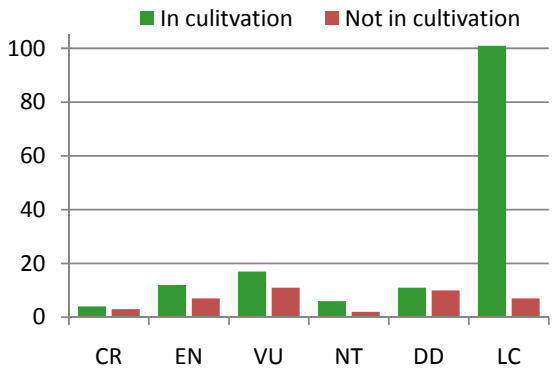
Acer buergerianum var. *formosanum, A. paihengii, A. pentaphyllum, A. yangbiense*

Endangered:

Acer griseum, A. miyabei subsp. *miyabei, A. miyabei* var. *shibatai, A. oblongum* var. *itoanum, A. pauciflorum, A. sino-oblongum, A. skutchii, A. sutchuenense, A. sycopseoides, A. tenellum* var. *tenellum, A. yui, Dipteronia dyeriana*

Table 1. Summary results – the number of maples in or not in cultivation

	In Cultivation	Not in Cultivation	Total
CR	4	3	7
EN	12	7	19
VU	17	11	28
NT	6	2	8
DD	11	10	21
LC	101	7	108
Total	151	40	191



With 16 of the most threatened taxa present in *ex situ* collections to some extent, means 3 CR taxa and 7 EN taxa are currently unknown to horticulture. Therefore if the wild populations disappear, then there are no secure *ex situ* collections available to return the species to the wild or prevent the taxa from becoming extinct.

Of the 16 (CR or EN) taxa found in collections, 5 are only found in one or two collections and therefore should still be considered a high priority for new *ex situ* collections: *Acer yangbiense* (CR), *A. miyabei* var. *shibatai* (EN), *A. sutchuenense* (EN), *A. sycopseoides* (EN), *A. yui* (EN),

[1] For the purposes of this survey, a record is the presence of a single living *Aceraceae* (maple) taxon within an institution and may include multiple accessions and/or individuals.

Collections in the country of origin

Target 8 of the GSPC calls for *ex situ* collections to be held where possible in the country of origin. Of the CR and EN taxa currently found in cultivation, only thirteen taxa are found in cultivation in their country of origin, according to the results of this survey:

Critically Endangered collections in country of origin:

- *Acer pentaphyllum* (1 record in China)
- *A. yangbiense* (1 record in China)

Endangered collections in country of origin:

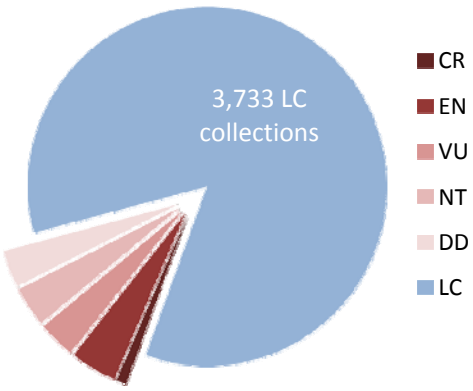
- *Acer griseum* (3 records in China)
- *A. miyabei* var. *shibatai* (1 record in Japan)
- *A. oblongum* var. *itoanum* (3 records in Japan)
- *A. pauciflorum* (2 records in China)
- *A. sino-oblongum* (3 records in China)
- *A. skutchii* (1 record in Mexico)
- *A. sutchuenense* (1 record in China)
- *A. sycopseoides* (1 record in China)
- *A. tenellum* var. *tenellum* (1 record in China)
- *A. yui* (1 record in China)
- *Dipteronia dyeriana* (3 records in China)

Urgent efforts should be made to ensure that new *ex situ* collections of all other very threatened maples (13 taxa) are developed in their countries of origin as soon as possible, as well as duplicating and strengthening existing collections.

Collection balance

The most obvious characteristic of the global *ex situ* collections of maples is that currently 85% of the known 4,405 known collections are of 101 Least Concern taxa. This means that relatively few known collections (672 collections) exist of the 83 threatened taxa (Data Deficient to Critically Endangered) despite their importance to conservation.

No. of collections by RDL Category



Ex situ *collections representativeness*

The survey attempted to gauge how representative the *ex situ* collections are by requesting information on the size of the collection and whether the collection is derived from known wild sources or not.

It is likely that many of the collections of the very threatened maples are based on wild collected material simply because of their rarity they are not available via the traditional horticultural sources. However, relatively little information about the source of the material and the size of the collections was submitted (See Table 2) and it is difficult to draw conclusions about how representative the known *ex situ* collections are and their value to restoration and recovery action. Even if the collections are based on wild collected material, it does not guarantee that the associated documentation linking the collections to their sources exists or is at a level which supports their value to future restoration and reintroduction activities.

Table 2. Number of records by RDL category and source of material

	Unknown or horticultural source	Known wild source	
	No. of collections	No. of collections	No. of species
CR	31	8	3
EN	162	22	8
VU	122	25	10
NT	140	17	4
DD	113	32	8
LC	3187	546	94

Collections that are known to be based on wild collected material of the very threatened maples include:

Critically Endangered:

Acer buergerianum var. formosanum (1 record), *A. pentaphyllum* (6 records), *A. yangbiense* (1 record)

Endangered:

Acer griseum (6 records), *A. miyabei subsp. miyabei* (6 records), *A. pauciflorum* (1 record), *A. sino-oblongum* (4 records), *A. skutchii* (1 record), *A. sycopseoides* (1 record), *A. yui* (1 record), *Dipteronia dyeriana* (2 records).

Recommendations and the way forward

Whilst there is a great need to conserve all the threatened maples, there is a significant number of the most at threat (CR and EN) maples which are currently absent from representative *ex situ* collections and integrated conservation activities to demand that efforts currently focus on these taxa over the Vulnerable (VU), Near Threatened (NT) and the Data Deficient (DD) taxa.

With these very threatened taxa in mind the report recommends the following actions:

- ***Strengthen and develop existing* ex situ *collections to ensure that they are representative, accessible and safe.*** Several of the very threatened maples are found in one or two collections; other collections contain a small number of individuals or single specimens. It is important that all of the very threatened maples are held in at least 2 secure *ex situ* collections that are representative of the natural diversity of the taxa and located when possible in the country of origin (see Annex 2 for the priority list).
- ***Establish* ex situ *collections of taxa which are currently not in cultivation.*** Efforts should be made to bring taxa in to cultivation to ensure that if the threats facing wild populations continue, the taxa will be safe in *ex situ* collections. Where possible these new *ex situ* collections should be developed within the country of origin.
- ***Develop and implement restoration and reintroduction activities for the most threatened taxa.*** There are a number of taxa which are well known to science and are under extremely high risk of extinction, these taxa should be the focus of concerted conservation efforts to strengthen and conserve the remaining wild populations by appropriate methods.
- ***Involve local communities and organisations in conservation activities.*** As with all successful conservation activities, the involvement of the local communities and organisations is critical to the long term conservation of threatened species, and should be encouraged and supported from the earliest stages of planning conservation activities.
- ***Develop public awareness and understanding programmes in regions where maples are at most threat.*** To support current conservation efforts and develop new opportunities, public awareness and understanding programmes need to be developed and implemented as an integral component of conservation activities. This includes both areas where maples naturally occur and are utilised, as well as regions where they are of horticultural importance.
- ***Enhancing BGCI's* PlantSearch *database to include more botanic gardens and explore the possibility of including additional information.*** Currently the number of botanic gardens contributing information to the *PlantSearch* database is limited, as is the quality of the information included. This can be improved through reviewing and cleaning the current *PlantSearch* dataset and by implementing a new upload mechanism to facilitate a more efficient method for institutions to contribute their data whilst maintaining the required standards. If new data can include details such as whether or not the accessions are based on wild collected material, then this would add significant value to the data.

  Additional functionality will add value to the *PlantSearch* database, such as dynamically linking to existing online databases of living collections, the synonymised working list of known plant species, as well as linking other databases back to *PlantSearch* database. An enhanced and more extensive *PlantSearch* database would be a significant tool when carrying out surveys and planning conservation activities by individual botanic gardens.

Annex 1 Very threatened maple collection count

The number of collections which include the very threatened taxa (CR and EN) is given, noting whether the collection is in the country of origin for the taxa.

Species	Number of collections		Country of origin
	in country of origin	not in country of origin	
Critically Endangered taxa			
Acer buergerianum var. *formosanum*	0	9	Taiwan
Acer leipoense	0	0	China
Acer paihengii	0	4	China
Acer pentaphyllum	1	24	China
Acer tenellum var. septemlobum	0	0	China
Acer undulatum	0	0	Turkey
Acer yangbiense	1	2	China
Endangered taxa			
Acer buergerianum var. yentangense	0	0	China
Acer crassum	0	0	China
Acer gracilifolium	0	0	China
Acer griseum	3	99	China
Acer kwangnanense	0	0	China
Acer miyabei subsp. miyabei	0	24	Japan
Acer miyabei var. shibatai	1	1	Japan
Acer oblongum var. itoanum	3	6	Japan
Acer oblongum var. omeiense	0	0	China
Acer pauciflorum	2	12	China
Acer poliophyllum	0	0	China
Acer sino-oblongum	3	21	China
Acer skutchii	1	7	Guatemala, Mexico
Acer sutchuenense	1	1	China
Acer sycopseoides	1	1	China
Acer tenellum var. tenellum	1	5	China
Acer tibetense	0	0	China
Acer yui	1	2	China
Dipteronia dyeriana	3	4	China, Viet Nam

Annex 2 Priority List for new *ex situ* collections

According to the results of the survey, the following taxa are a high priority for inclusion in *ex situ* collections:

Critically Endangered (CR) taxa currently absent from* ex situ *collections:	
Acer leipoense	China
Acer tenellum var. *septemlobum*	China
Acer undulatum	Turkey
CR taxa currently in very few* ex situ *collections and therefore still a priority for new collections:	
Acer paihengii[1]	China
Acer yangbiense	China

Endangered (EN) taxa currently absent from* ex situ *collections:	
Acer buergerianum var. *yentangense*	Spain
Acer crassum	China
Acer gracilifolium	China
Acer kwangnanense	China
Acer oblongum var. *omeiense*	Mexico
Acer poliophyllum	United States of America
Acer tibetense	Guatemala, Mexico
EN taxa currently in very few* ex situ *collections and therefore still a priority for new collections:	
Acer miyabei var. shibatai	China
Acer sutchuenense	Mexico
Acer sycopseoides	Mexico
Acer yui	
Dipteronia dyeriana	Spain

[1] Existing *ex situ* collections of these taxa are not in the country of origin.

Annex 3 Ranked botanic garden collections

The most significant botanic garden collections of maples as determined by assigning a score for each taxa within the garden's collection, according to the Red List Category (CR-10, EN-7, VU-5, NT-3, DD-2, LC-1, NE-0 points) with the wild sourced collections doubling the score. For example, a collection of CR maples will score 10 points, but if the collection is based on known wild source material then it will score 20. The number of the most threatened taxa (CR and EN) and the number of unique or rare collections (taxa occurring in fewer than 3 gardens) is also given for each garden in the table.

		Number of			
	Botanic garden	**unique or rare collections**	**CR & EN taxa**	**taxa**	**Collection Score**
1	The Arnold Arboretum of Harvard University, USA	1	6	69	207
2	University of British Columbia Botanical Garden, Canada	5	4	73	194
3	Quarryhill Botanical Garden, USA	4	5	51	192
3 =	The Morton Arboretum, USA	1	3	67	192
5	University of Washington Botanic Gardens, USA		5	63	174
6	Royal Botanic Garden Edinburgh, UK	1	2	73	171
7	The Sir Harold Hillier Garden and Arboretum, UK	6	4	83	167
8	Westonbirt Arboretum, UK	3	5	89	149
9	Rogów Arboretum of Warsaw University of Life Sciences, Poland	3	4	86	137
10	Howick Arboretum, UK		1	42	134
11	Royal Botanic Gardens, Kew, UK	2	5	79	132
12	The Dawes Arboretum, USA		4	58	131
13	Utrecht University Botanic Garden, Netherlands	3	3	82	128
14	Morris Arboretum, USA	1	2	49	127
15	Stichting Arboretum Wespelaar, Belgium	3	3	75	125
16	Royal Botanic Gardens, Melbourne, Australia	2	4	64	115
17	The Royal Horticultural Society, UK	1	4	67	112
18	RBG, Kew - Wakehurst Place, UK		3	66	109
19	Kunming Botanic Garden, China	2	3	22	96
20	The Holden Arboretum, USA		5	42	95
21	The RHS Garden, Rosemoor, UK		3	54	92
22	Hoyt Arboretum, USA		2	45	89
23	Atlanta Botanical Garden, USA		3	42	86
23 =	San Francisco Botanical Garden Society, USA		4	35	86
25	University of Copenhagen, Denmark		2	39	82
26	Arboretum Freiburg-Guenterstal im Staedtischen Forstamt Freiburg, Germany	1	3	53	81
26 =	Cornell Plantations, USA		2	40	81
28	Chicago Botanic Garden, USA	1	2	39	80
28 =	Zoologicka a Botanicka zahrada mesta Plzen, Czech Republic	1	3	45	80
30	Wuhan Botanical Garden, China	4	6	29	74

Annex 4 Participating institutions

The following 228 institutions from 37 countries are gratefully thanked for their contribution of data to this report:

Agricultural Research Center of Northern Greece, Greece; Arboretum at the University of California, Santa Cruz, United States of America; Arboretum Bokrijk, Belgium; Arborétum Borová Hora TU Zvolen, Slovakia; Arboretum de la Sédelle, France; Arboretum Freiburg-Guenterstal im Staedtischen Forstamt Freiburg, Germany; Arboretum Groenendaal,, Belgium; Arboretum Kalmthout, Belgium; Arboretum Kirchberg, Luxembourg; Arboretum Lesnicke mistrovske skoly, Czech Republic; Arborétum Mlyňany, Slovakia; Arboretum of the Barnes Foundation, United States of America; Arboretum Oudenbosch, Netherlands; Arboretum Radigojno, Serbia and Montenegro; Arboretum Trompenburg, Netherlands; Arboretum Waasland, Belgium; Atlanta Botanical Garden, United States of America; Baoji Botanical Garden, China; Batsford Arboretum, United Kingdom; Bedgebury Pinetum, United Kingdom; Beijing Teaching Botanical Garden, China; Benmore Botanic Garden, United Kingdom; Bernheim Arboretum and Research Forest, United States of America; Betty Ford Alpine Gardens, United States of America; Bickelhaupt Arboretum, United States of America; Botanic Gardens of Adelaide, Australia; Botanic Gardens of Toyama, Japan; Botanic Gardens Trust, Sydney, Australia; Botanical Garden of Delft University of Technology, Netherlands; Botanical Garden of Guizhou, China; Botanical Garden of Kawaguchi-City, Japan; Botanical Garden of the V.L. Komarov Botanical Institute, Russian Federation; Botanical Garden of Vilnius University, Lithuania; Botanical Garden, Natural History Museum - University of Oslo, Norway; Botanische Gärten der Universität Bonn, Germany; Botanische Tuinen, Netherlands; Botanischer Garten der C. v. O. Universität, Germany; Botanischer Garten der J.W. Goethe-Universität, Germany; Botanischer Garten der Justus-Liebig Universität, Germany; Botanischer Garten der Philipps-Universität, Germany; Botanischer Garten der Ruhr-Universität Bochum, Germany; Botanischer Garten der Technischen Hochschule, Germany; Botanischer Garten der Universität Bern, Switzerland; Botanischer Garten der Universität des Saarlandes, Germany; Botanischer Garten der Universität Freiburg, Germany; Botanischer Garten der Universität Kiel, Germany; Botanischer Garten der Universität Osnabrück, Germany; Botanischer Garten der Universität Ulm, Germany; Botanischer Garten der Wilhelm-Pieck Universität, Germany; Botanischer Garten Dresden, Germany; Botanischer Garten Jena, Germany; Botanischer Versuchs- und Lehrgarten, Germany; Botanisches Institut und Botanischer Garten, Germany; Botaniska Trädgården vid Uppsala Universitet, Sweden; Brisbane Botanic Gardens, Australia; Bristol Zoo Gardens, United Kingdom; Brooklyn Botanic Garden, United States of America; Brookside Gardens, United States of America; Bukavu Arboretum/Garden, Rwanda; Cambridge University Botanic Garden, United Kingdom; Center for Plant Conservation - Bogor Botanic Gardens, Indonesia; Central Siberian Botanical Garden, Russian Federation; Chengdu Zoo, China; Chicago Botanic Garden, United States of America; Christchurch Botanic Gardens, New Zealand; City of Leeds Botanic Gardens, United Kingdom; Colonial Park and Randolf W. van der Goot Rose Garden, United States of America; Conservatoire Botanique National de Brest, France; Conservatoire et Jardins Botaniques de Nancy, France; Cornell Plantations, United States of America; Dashushan Botanical Garden, China; Davis Arboretum, United States of America; Dawyck Botanic Garden, United Kingdom; Denver Botanic Gardens, United States of America; Dinghushan Arboretum, China; Dunedin Botanic Garden, New Zealand; Fairchild Tropical Botanic Garden, United States of America; Forstbotanischer Garten, Germany; Forstbotanischer Garten Tharandt, Germany; Forstbotanischer Garten und Arboretum, Germany; Fukuoka Municipal Botanical Garden, Japan; Geo. P. Crosby Garden - Toledo Botanical Garden, United States of America; Grâdina Botanicâ a Universitatii, Romania; Grâdina Botanicâ a Universitatii din Bucuresti, Romania; Guilin Botanical Garden, China; Hamamatsu City Flower Park, Japan; Hangzhou Botanical Garden, China; Heilongjiang Forest Botanical Garden, China; Hergest Croft Gardens, United Kingdom; Higashiyama Botanical Garden, Japan; Highland Botanical Park, United States of America; Hof ter Saksen, Belgium; Hortus Botanicus Amsterdam, Netherlands; Hortus Botanicus Catinensis, Italy; Hortus Botanicus Lovaniensis, Belgium; Hortus Botanicus Reykjavicensis, Iceland; Howick Arboretum, United Kingdom; Hoyt Arboretum, United States of America; Hunan Forest Botanical Garden, China; Huntington Botanical Gardens, United States of America; Indiana University Arboretum Center, United States of America; Istituto ed Orto Botanico dell`Università di Ferrara, Italy; J.C.. Raulston Arboretum, United States of America; Jardí Botànic de Barcelona, Spain; Jardí Botànic de la Universitat de València, Spain; Jardí Botànic de Sóller, Spain; Jardim Botânico - Museu Nacional de História Natural, Portugal; Jardim Botanico da Ajuda, Portugal; Jardín Botánico Francisco Javier Clavijero, Mexico; Jardín Botánico Nacional, Chile; Jardin Botanique de la Ville de Lyon, France; Jardin Botanique de la Ville de Paris, France; Jardin Botanique de l'Universite Louis Pasteur, France; Jardin Botanique des Plantes Médicinales et Aromatiques, France; Jardin Botanique Henri Gaussen, France; Jardin Botanique National de Belgique/Nationale Plantentuin van Belgie, Belgium; Jardin des Plantes, France; Jardin des Serres d'Auteuil, France; Kagoshima Botanical Garden, Japan; Kanagawa Prefectural Ofuna

Botanical Garden, Japan; Kobe Municipal Arboretum, Japan; Komi Botanical Garden, Russian Federation; Kunming Botanic Garden, China; Kusatsu Aquatic Botanical Garden, Japan; Ljubljana University Botanic Garden, Slovenia; Longwood Gardens Library, United States of America; Lushan Botanical Garden, China; Luthy Memorial Botanical Garden, United States of America; M.V. Lomonosov Moscow State University Botanical Garden, Russian Federation; Maijishan Arboretum and Botanic Garden, China; Maribor University Botanic Garden, Slovenia; Maymont Foundation, United States of America; Mercer Arboretum and Botanic Gardens, United States of America; Milner Gardens and Woodland, Canada; Missouri Botanical Garden, United States of America; Montgomery Botanical Center, United States of America; Morris Arboretum, United States of America; Morris Arboretum Library, United States of America; Mount Auburn Cemetery and Arboretum, United States of America; Nanjing Botanic Garden Mem. Sun Yat-Sen, China; National Botanic Garden of Wales, United Kingdom; National Botanic Gardens of Ireland, Ireland; National Botanic Gardens of Latvia, Latvia; Natural History Museum of Denmark, Denmark; Neuer Botanischer Garten der Universität Göttingen, Germany; Nichols Arboretum, United States of America; Niigata Prefectural Botanical Garden, Japan; North Carolina Botanical Garden, United States of America; Oekologisch-Botanischer Garten Universität Bayreuth, Germany; Ogród Botaniczny Uniwersytetu Warszawskiego, Poland; Ogród Dendrologiczny w Przelewicach, Poland; Oklahoma Botanical Garden and Arboretum, United States of America; Orto Botanico dell'Universita, Italy; Orto Botanico Università degli Studi di Padova, Italy; Oxford University Botanic Garden, United Kingdom; Paignton Zoological and Botanical Gardens, United Kingdom; Parco botanico friulano "Cormor", Italy; Parque Botânico da Tapada da Ajuda, Portugal; Philodassiki Botanic Garden, Greece; Phipps Conservatory, Inc., United States of America; Plantentuin Universiteit Gent, Belgium; Planting Fields Arboretum, United States of America; Qinling National Botanical Garden, China; Quarryhill Botanical Garden, United States of America; Rancho Santa Ana Botanic Garden, United States of America; Rogów Arboretum of Warsaw University of Life Sciences, Poland; Royal Botanic Garden Edinburgh, United Kingdom; Royal Botanic Gardens, Kew, United Kingdom; Royal Botanic Gardens, Kew - Wakehurst Place, United Kingdom; Royal Botanic Gardens, Melbourne, Australia; Royal Tasmanian Botanical Gardens, Australia; Royal Veterinary and Agricultural University Arboretum, Denmark; San Diego Botanic Garden, United States of America; San Diego Wild Animal Park, United States of America; San Francisco Botanical Garden Society, United States of America; Sentier de Découverte, France; Shanghai Botanic Garden, China; Shenzhen Fairy Lake Botanical Garden, China; South China Botanical Garden, China; Staten Island Botanical Garden, United States of America; Station Alpine du Lautaret, France; Stichting Arboretum Wespelaar, Belgium; Stichting Botanische Tuin Kerkrade, Netherlands; Swansea Botanical Complex, United Kingdom; Tatton Garden Society/Quinta Arboretum, United Kingdom; The Arnold Arboretum of Harvard University, United States of America; The Botanic Garden of Smith College, United States of America; The Connecticut College Arboretum, United States of America; The Dawes Arboretum, United States of America; The Hiroshima Botanical Garden, Japan; The Holden Arboretum, United States of America; The John J Tyler Arboretum, United States of America; The Kyoto Botanical Garden, Japan; The Los Angeles County Arboretum & Botanic Garden, United States of America; The Makino Botanical Garden, Japan; The Morton Arboretum, United States of America; The New York Botanical Garden, United States of America; The Niagara Parks Commission - Botanical Gardens and School of Horticulture, Canada; The North Carolina Arboretum, United States of America; The Royal Horticultural Society, United Kingdom; The Royal Horticultural Society's Garden, Harlow Carr, United Kingdom; The Royal Horticultural Society's Garden, Hyde Hall, United Kingdom; The Royal Horticultural Society's Garden, Rosemoor, United Kingdom; The Scott Arboretum of Swarthmore College, United States of America; The Sir Harold Hillier Garden and Arboretum, United Kingdom; The Tree Register of the British Isles, United Kingdom; Thorp Perrow Arboretum, United Kingdom; Timaru Botanic Garden, New Zealand; Tokyo Metropolitan Jindai Botanical Garden, Japan; Tver State University Botanic Garden, Russian Federation; United States Botanic Garden, United States of America; United States National Arboretum, United States of America; Universite Montpellier 1, France; University of British Columbia Botanical Garden, Canada; University of Budapest Botanic Garden, Hungary; University of California Botanical Garden, United States of America; University of Copenhagen, Denmark; University of Helsinki Botanic Garden, Finland; University of Idaho Arboretum & Botanic Garden, United States of America; University of Washington Botanic Gardens, United States of America; University of Wisconsin Arboretum, United States of America; Utrecht University Botanic Garden, Netherlands; VanDusen Botanical Garden, Canada; Vytautas Magnus University, Lithuania; Wentworth Castle Gardens, United Kingdom; Westonbirt Arboretum, United Kingdom; Wuhan Botanical Garden, China; Xi'an Botanical Garden, China; Xiao-long-shan Arboretum, China; Xishuangbanna Tropical Botanical Garden, China; Zoologicka a Botanicka zahrada mesta Plzen, Czech Republic.