

**Global Survey of
Ex situ Magnoliaceae Collections**



Botanic Gardens Conservation International

June 2008



Contents

Summary	2
Introduction	3
Methods.....	4
Results.....	6
<i>General findings</i>	6
Major gaps in <i>ex situ</i> collections	7
<i>Ex situ</i> collections representativeness.....	8
<i>Regional Analysis</i>	9
Recommendations and the way forward	11
Annex 1 Very threatened Magnoliaceae collection count.....	13
Annex 2 Priority List for new <i>ex situ</i> collections	16
Annex 3 Ranked botanic garden collections	18
Annex 4 Participating institutions	19

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, Asociación Mexicana de Jardines Botánicos (AMJB), Caribbean Botanic Gardens for Conservation, Chinese Academy of Science (CAS) Botanic Gardens Committee, European Consortium, Korean Association of Botanic Gardens, National Botanic Gardens of Ireland, National Council for the Conservation of Plants and Gardens (NCCPG) (UK), PlantNetwork (UK), Red Nacional de Jardines Botánicos de Colombia, Red Nacional de Jardines Botánicos de Cuba, The Japanese Association of Botanical Gardens. BGCI would also like to acknowledge the assistance of Mitsubishi Corporation for their support of the Japanese component of the survey.

Cover image: *Magnolia stellata* © scott.zona (www.flickr.com/photos/12017190@N06/1214973133/)

Summary

In 2007, BGCI and FFI jointly published *The Red List of Magnoliaceae* under the partnership of the Global Trees Campaign. The report called for action to ensure that the 89 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 2,274 Magnoliaceae records¹ from 238 institutions in 47 countries. However, only 362 *ex situ* records representing the 37 of the most threatened Magnoliaceae were located. This means that more than half 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.

Although there is more work to be done, the work of the Chinese botanic gardens and in particular the South China Botanic Garden (Chinese Academy of Sciences) has helped ensure that the Chinese Magnoliaceae are particularly well represented in *ex situ* collections.

The region of most concern is Latin America and the Caribbean, where many of endemic Magnoliaceae are not currently found in *ex situ* collections. In particular Colombia, the second richest Magnoliaceae country in the world after China, has 23 very threatened taxa which are only found in the wild.

The report concludes by making a series of recommendations based on the results of the survey including: the strengthening of existing *ex situ* collections, establishing new collections, developing propagation protocols, implementing restoration and reintroduction activities, involving local communities and organisation in conservation activities, developing public awareness programmes, enhancing BGCI's PlantSearch database and the sharing of knowledge and experiences between experts around the world.

BGCI is already working with a number of partners in the two main regional centres of Magnoliaceae diversity, China and Latin America, to address some of these conservation priorities.

¹ For the purposes of this survey, a record is the presence of a single Magnoliaceae taxon within a collection and may include multiple accessions and/or individuals.

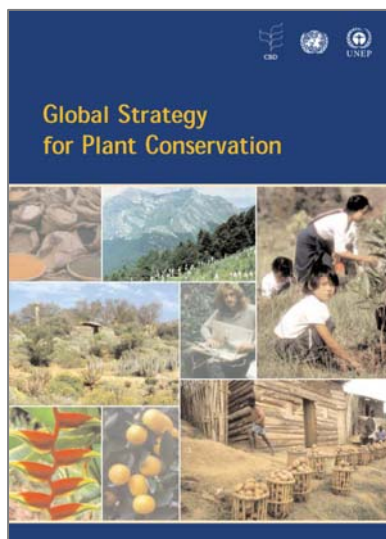
Introduction

The Red List of Magnoliaceae was published jointly by Botanic Gardens Conservation International (BGCI) and Fauna & Flora International (FFI) in April 2007, under the partnership of the Global Trees Campaign. Electronic copies of the report are available from the BGCI website (www.bgci.org).

The report identified 131 wild magnolias as being in danger of extinction, out of a global total of 245 taxa. Based on the information presented in the Red List report, urgent attention is required for the 89 taxa considered to be at most risk of extinction (Endangered or Critically Endangered) according to the IUCN Red List Categories and Criteria.

In addition to the 89 taxa considered to be at most risk in *The Red List of Magnoliaceae*, 2 newly identified species in Colombia have since been assessed (*Magnolia coronata* CR D1 and *M. jardinensis* EN A2acd) and have been included in this survey.

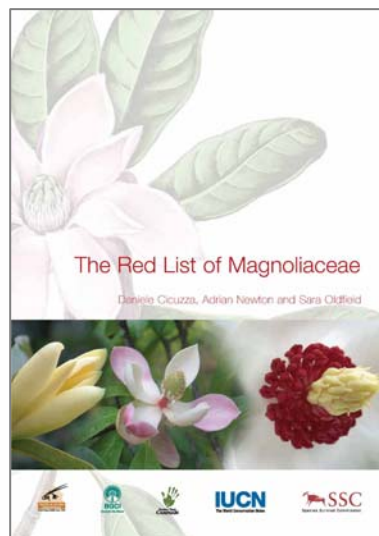
Some of these threatened *Magnolias* are reduced to a handful of individuals in the wild and it would be a tragedy if such species are needlessly lost. It is clearly important that all Critically Endangered (CR) and Endangered (EN) taxa are represented in well-managed *ex situ* collections as an insurance 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 Magnoliaceae taxa, 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 Magnoliaceae; the preliminary results have already informed some of BGCI's projects with threatened taxa.

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, Asociación Mexicana de Jardines Botánicos (AMJB), Caribbean Botanic Gardens for Conservation, Chinese Academy of Science (CAS) Botanic Gardens Committee, European Consortium, Korean Association of Botanic Gardens, National Council for the Conservation of Plants and Gardens (NCCPG) (UK), PlantNetwork (UK), Red Nacional de Jardines Botánicos de Colombia, Red Nacional de Jardines Botánicos de Cuba, The Japanese Association of Botanical Gardens, 3rd Global Botanic Gardens Congress (Wuhan, China).

An important component of the Global Survey of *Ex situ* Magnoliaceae 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. All known *ex situ* collections in China were individually invited to contribute to the survey, 5 of which were also visited by BGCI, resulting in detailed information about Magnoliaceae collections being received from 32 Chinese botanic gardens.

However, the survey not only focused on the botanic gardens within the regions of Magnoliaceae diversity (China and Latin America), but also included important *ex situ* collections and centres of horticultural excellence outside the natural ranges of the most threatened species, such as those found in Australasia, Europe, and 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. Although information on all Magnoliaceae taxa was collected, the lesser threatened taxa are likely to be under-reported as a result of the surveys focus.

Magnolia hybrids and cultivars were not included at any stage of the survey, since the survey aimed at evaluating the value of *ex situ* collections towards the long term conservation of wild populations.

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 Magnoliaceae 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 Magnoliaceae from a collection, the following closed questions were also asked:

- Is this Magnoliaceae 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 Magnoliaceae 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 Magnoliaceae* 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.

Results

General findings

The survey identified 2,781 *Magnolia* records¹, from 238 institutions in 47 countries. However, 507 records were unable to be matched to accepted names due to unclear synonymy, incorrect or incomplete names. Of the 2,274 records ultimately included in the analysis, 362 records of the most threatened Magnoliaceae taxa (CR and EN) were identified.

The 362 records represent 37 of the most threatened (CR and EN) Magnoliaceae:

Critically Endangered:

Magnolia coriacea, *M. grandis*, *M. hebecarpa*, *M. lacei*, *M. megaphylla*,
M. omeiensis, *M. ovoidea*, *M. phanerophlebia*, *M. polyhypsophylla*, *M.*
sinica, *M. sirindhorniae*, *M. wolfii*, *M. zenii*

Endangered:

Magnolia aenea, *M. angustiblonda*, *M. aromatica*, *M. caricifragrans*,
M. crassipes, *M. dawsoniana*, *M. dealbata*, *M. decidua*, *M. gilbertoi*, *M.*
hernandezii, *M. ingrata*, *M. jardinensis*, *M. kachirachirai*, *M. minor*, *M.*
nitida var. *lotungensis*, *M. schiedeana*, *M. sharpii*, *M. shiluensis*, *M.*
silvioi, *M. stellata*, *M. tamaulipana*, *M. ventii*, *M. wilsonii*, *M.*
yarumalensis

Several of the most threatened taxa are found very widely in *ex situ* collections. The Japanese *Magnolia stellata* (EN) is the most commonly found very threatened *Magnolia* and is recorded in 107 collections. Also, *Magnolia zenii* (CR) is found in 40 collections and *Magnolia wilsonii* (EN) is found in 60 collections. *Magnolia aromatica*, *M. dawsoniana*, *M. dealbata* and *M. nitida* var. *lotungensis* are all found in between 10 and 28 collections worldwide. *Magnolia dawsoniana*, *M. stellata*, *M. wilsonii* and *M. zenii* are all known to the UK horticultural industry and no doubt also to the industry in other countries. However, how well these species as well as other Magnoliaceae are represented in terms of genetic diversity outside their native range is not known. Further details of the collections of the most threatened Magnoliaceae taxa are given in Annex 1 and summarised in Table 1.

Of the 37 (CR or EN) taxa found in collections, 19 are only found in one or two collections and therefore should still be considered a priority for new *ex situ* collections: *Magnolia coriacea*, *M. hebecarpa*, *M. phanerophlebia*, *M. polyhypsophylla*, *M. sirindhorniae*, *M. wolfii*, *M. angustiblonda*, *M. caricifragrans*, *M. gilbertoi*, *M. ingrata*, *M. jardinensis*, *M. kachirachirai*, *M. minor*, *M. sharpii*, *M. shiluensis*, *M. silvioi*, *M. tamaulipana*, *M. ventii*, *M. yarumalensis*.

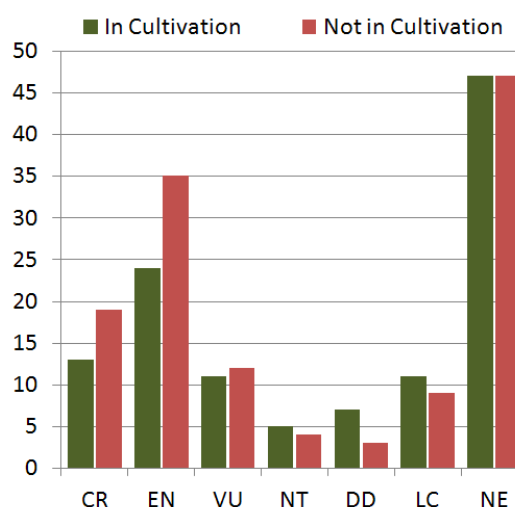
Target 8 of the GSPC calls for *ex situ* collections to be held where possible in the country of origin. Of the 37 CR and EN taxa currently found in cultivation, only three species (*Magnolia sirindhorniae* (Thailand), *M. sharpii* (Mexico) and *M. tamaulipana* (Mexico)) are not found in cultivation in their

¹ For the purposes of this survey, a record is the presence of a single Magnoliaceae taxon within a collection and may include multiple accessions and/or individuals.

country of origin, according to the results of this survey (see Annex 1). Efforts should be made to ensure that new *ex situ* collections of these Magnoliaceae are developed in their countries of origin.

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

	In Cultivation	Not in Cultivation	Total
CR	13	19	32
EN	24	35	59
VU	11	12	23
NT	5	4	9
DD	7	3	10
LC	11	9	20
NE	47	47	94
Total	118	129	247



Major gaps in *ex situ* collections

With 37 of the most threatened taxa present in *ex situ* collections to some extent, means 19 CR taxa and 35 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.

The most significant region of Magnoliaceae distribution with taxa absent from *ex situ* collections is Latin America and Caribbean (Table 2) with 18 CR and 28 EN taxa from this region required urgent action to bring them in to cultivation. Compared to only one CR and 6 EN Asian Magnoliaceae taxa being absent from *ex situ* collections.

Table 2. Number of species absent from *ex situ* collections in the country of origin

Critically Endangered

Country	No. of taxa	Country	No. of taxa
Colombia	9	Mexico	1
Cuba	8	Venezuela	1
India	1		

Endangered

Country	No. of taxa	Country	No. of taxa
Brazil	1	Haiti	3
China	1	Honduras	1
Colombia	14	India	2
Costa Rica	1	Mexico	1
Dominican Republic	3	Panama	3
Ecuador	1	Philippines	1
El Salvador	1	Puerto Rico	2
Guatemala	1	Viet Nam	2

N.B. Species which occur in 2 countries are counted twice in table above i.e. *Magnolia chimantensis* (CR) Colombia & Venezuela; *M. allenii* (EN) Costa Rica & Panama; *M. striatifolia* (EN) Colombia & Ecuador; *M. domingensis* (EN) Dominican Republic & Haiti; *M. guatemalensis* subsp. *hondurensis* (EN) El Salvador & Honduras.

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 Magnolias 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 3) 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 restoration and reintroduction activities.

Table 3. 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	73	7	3
EN	260	22	12
VU	199	7	4
NT	105	3	1
DD	244	10	4
LC	457	16	9
NE	511	27	8

Species collections that are known to be based on wild collected material of the very threatened Magnolias include:

Critically Endangered:

Magnolia polyhypsophylla (1 record), *M. sinica* (1 record), *M. wolfii*, *M. zenii* (5 records)

Endangered:

Magnolia caricifragrans (1 record), *M. dawsoniana* (2 records), *M. dealbata* (2 records), *M. decidua* (1 record), *M. gilbertoi* (1 record), *M. hernandezii* (4 records), *M. jardinensis* (1 record), *M. sharpii* (1 record), *M. silvioi* (1 record), *M. stellata* (5 records), *M. wilsonii* (2 records), *M. yarumalensis* (1 record)

Regional Analysis

China

China is the centre of the diversity of Magnoliaceae with 91 taxa native to the country, of which 10 are Critically Endangered and 13 Endangered according to *The Red List of Magnoliaceae*.

Twenty-two of the 33 most threatened Magnoliaceae taxa in China are already found in the *ex situ* collections of the Chinese botanic gardens. *Magnolia multiflora* (EN B1ab(iii)) being the only very threatened Chinese Magnoliaceae (CR or EN) not currently found in *ex situ* collections. The following four species are only known from single collections and therefore their representation in additional collections would be a priority:

Critically Endangered:

- *Magnolia hebecarpa* CR B2ab(i,ii,iii,v)

Endangered:

- *Magnolia angustiolonga* EN B1ab(i,iii)
- *Magnolia ingrata* EN B1ab(i,ii,iii)+2ab(i,ii,iii)
- *Magnolia ventii* EN B2ab(i,ii,iii); D

The South China Botanic Garden (Chinese Academy of Sciences) in Guangzhou is the richest collection of Magnoliaceae in the World (see Annex 3), with taxa from Bhutan, Cambodia, Canada, China, India, Indonesia, Japan, Malaysia, Mexico, Myanmar, Nepal, Philippines, Thailand and Viet Nam. This survey was able to identify 86 Magnoliaceae taxa in the collection although the collection also includes many cultivars and hybrids. A significant proportion of the collection represent some of the most threatened taxa (10 CR and 13 EN) making this collection the greatest concentration of highly threatened Magnolias. Spread over 12 hectares, the collection of approximately 100,000 individuals has been used as a source of material which has been distributed to over 50 institutions across China and internationally.

Although China has managed to bring in to *ex situ* collections nearly all of the very threatened Magnoliaceae, there is still a great urgency for more work to be done in support of *in situ* conservation activities, for example:

- *Magnolia hebecarpa* is distributed in forest fragments and along rivers at 300-1200m altitude in Pingbian County, Yunnan Province with an estimated 50-100 mature individuals remaining.

Latin America and the Caribbean

The greatest number of the most threatened (CR and EN) Magnoliaceae which are not currently in cultivation are endemic to Latin America and the Caribbean; with Colombia displaying the highest concentration (see Table 2). In total, 9 Critically Endangered and 14 Endangered Colombian Magnoliaceae are not currently found in *ex situ* collections. Of the Colombian Magnoliaceae which are found in *ex situ* collections, all are exclusively found in Colombian collections and nowhere else.

During a planning workshop held in February 2008 in Bogotá Colombia, the Colombia Network of Botanic Gardens (Red Nacional de Jardines Botánicos de Colombia) discussed the current conservation and collection status of Magnoliaceae in Colombia. Whilst the network agreed that urgent action is required in order to ensure that all the threatened Magnoliaceae are conserved, the following threatened taxa grow in areas where due to the current security situation it is not safe to work:

- *Magnolia calimaensis* CR B1ab(i,iii)
- *Magnolia narinensis* CR B1ab(i,iii)
- *Magnolia calophylla* EN B1ab(iii)
- *Magnolia magnifolia* EN B1ab(iii)
- *Magnolia striatifolia* EN B1ab(i,iii)

The security situation which currently prevents field work in Colombia is often connected with the production of coca (*Erythroxylum* spp.) which is closely linked with habitat loss and therefore places further strain on already threatened populations.

Cuba also has a significant number of Critically Endangered taxa which are currently are not held in *ex situ* collections anywhere including Cuba. One of the most significant challenges facing the *ex situ* conservation of Cuban Magnoliaceae is that the species tend to occur in montane and cloud forest ecosystems, therefore requiring very different conditions to those that are found in botanic gardens in Cuba.

Recommendations and the way forward

Whilst there is a great need to conserve all the threatened Magnoliaceae, there is a significant number of the most at threat (CR and EN) Magnoliaceae 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.** Many very threatened Magnoliaceae are found in one or two collections; many other collections contain a small number of individuals or single specimens. It is important that all of the very threatened Magnoliaceae 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 Magnoliaceae priority list).
- **Establish *ex situ* collections of taxa which are currently not in cultivation.** Efforts should focus on Latin America and Caribbean where the greatest number priority taxa absent from collections are found (see Annex 2 for the Magnoliaceae priority list). Due to legislation governing the international movement of plant material, combined with the in-country recommendation of the GSPC Target 8, these new *ex situ* collections should be developed within the country of origin.
- **Research and develop propagation protocols.** Researchers in China and Colombia have found their efforts to propagate Magnolias limited by poor germination and establishment rates. Therefore research is urgently required to understand seed production and propagation in all threatened taxa in order to support of the establishment of *ex situ* collections and associated restoration and reintroduction activities.
- **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. Also, some taxa occur in highly defined ecological niches which will limit their potential for inclusion in *ex situ* collections, for example the Cuban Cloud Forest Magnolias, and therefore reinforce the importance of their *in situ* conservation.
- **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 Magnolias 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 Magnolias 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 (e.g. BG-BASE Portal hosted by RBG Edinburgh), the synonymised working list of known plant species (GSPC Target 1 Output, when available), as well as linking other databases (e.g. Encyclopedia of Life) back to *PlantSearch* database. An enhanced and more extensive *PlantSearch* database would be a significant tool when carrying out similar surveys to this one in the future and as an integral component of planning *ex situ* and *in situ* conservation activities by individual botanic gardens.

- ***Promote the sharing of knowledge and experiences between experts working on Magnoliaceae conservation in different regions.*** There are 2 main centres of Magnoliaceae diversity, China and Colombia. However, exchange of knowledge and experience between these two regions is very limited due to geographic separation and language. Opportunities which address this should be developed and capitalised upon.

Annex 1 Very threatened Magnoliaceae 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			
<i>Magnolia cacuminicola</i> spp. <i>bissei</i>	0	0	Cuba
<i>Magnolia cacuminicola</i> spp. <i>cacuminicola</i>	0	0	Cuba
<i>Magnolia calimaensis</i>	0	0	Colombia
<i>Magnolia cararensis</i>	0	0	Colombia
<i>Magnolia cespidesii</i>	0	0	Colombia
<i>Magnolia chimantensis</i>	0	0	Colombia, Venezuela
<i>Magnolia coriacea</i>	2	0	China
<i>Magnolia coronata</i>	0	0	Colombia
<i>Magnolia cristalensis</i> spp. <i>baracoana</i>	0	0	Cuba
<i>Magnolia cristalensis</i> spp. <i>cristalensis</i>	0	0	Cuba
<i>Magnolia cristalensis</i> spp. <i>moana</i>	0	0	Cuba
<i>Magnolia cubensis</i> spp. <i>acunae</i>	0	0	Cuba
<i>Magnolia cubensis</i> spp. <i>cacuminicola</i>	0	0	Cuba
<i>Magnolia cubensis</i> spp. <i>cubensis</i>	0	0	Cuba
<i>Magnolia espinalii</i>	0	0	Colombia
<i>Magnolia grandis</i>	5	2	China
<i>Magnolia hebecarpa</i>	1	0	China
<i>Magnolia katiorium</i>	0	0	Colombia
<i>Magnolia lacei</i>	4	1	China
<i>Magnolia megaphylla</i>	8	1	China
<i>Magnolia narinensis</i>	0	0	Colombia
<i>Magnolia omeiensis</i>	5	0	China
<i>Magnolia ovoidea</i>	3	0	China
<i>Magnolia pacifica</i> spp. <i>pugana</i>	0	0	Mexico
<i>Magnolia phanerophlebia</i>	2	0	China
<i>Magnolia pleiocarpa</i>	0	0	India
<i>Magnolia polyhypsophylla</i>	1	0	Colombia
<i>Magnolia sinica</i>	2	1	China
<i>Magnolia sirindhorniae</i>	0	1	Thailand
<i>Magnolia virolinensis</i>	0	0	Colombia
<i>Magnolia wolfii</i>	1	0	Colombia
<i>Magnolia zenii</i>	15	25	China

Species	Number of collections		Country of origin
	in country of origin	not in country of origin	
Endangered taxa			
<i>Magnolia aenea</i>	3	0	Viet Nam, China
<i>Magnolia allenii</i>	0	0	Costa Rica, Panama
<i>Magnolia angustiblonda</i>	1	0	China
<i>Magnolia arcabucoana</i>	0	0	Colombia
<i>Magnolia argyothricha</i>	0	0	Colombia
<i>Magnolia aromatica</i>	8	2	Viet Nam, China
<i>Magnolia calophylla</i>	0	0	Colombia
<i>Magnolia caricifragrans</i>	1	0	Colombia
<i>Magnolia chocoensis</i>	0	0	Colombia
<i>Magnolia colombiana</i>	0	0	Colombia
<i>Magnolia crassipes</i>	3	1	China
<i>Magnolia cubensis</i> spp. <i>cubensis</i>	0	0	Cuba
<i>Magnolia dawsoniana</i>	2	26	China
<i>Magnolia dealbata</i>	2	14	Mexico
<i>Magnolia decidua</i>	3	2	China
<i>Magnolia domingensis</i>	0	0	Dominican Rep., Haiti
<i>Magnolia ekmanii</i>	0	0	Haiti
<i>Magnolia emarginata</i>	0	0	Haiti
<i>Magnolia georgii</i>	0	0	Colombia
<i>Magnolia gilbertoi</i>	1	0	Colombia
<i>Magnolia guatapensis</i>	0	0	Colombia
<i>Magnolia guatemalensis</i> spp. <i>guatemalensis</i>	0	0	Guatemala
<i>Magnolia guatemalensis</i> spp. <i>hondurensis</i>	0	0	El Salvador, Honduras
<i>Magnolia gustavii</i>	0	0	India
<i>Magnolia hamorii</i>	0	0	Dominican Republic
<i>Magnolia henaoui</i>	0	0	Colombia
<i>Magnolia hernandezii</i>	4	0	Colombia
<i>Magnolia ingrata</i>	1	0	China
<i>Magnolia irwiniana</i>	0	0	Brazil
<i>Magnolia jardinensis</i>	1	0	Colombia
<i>Magnolia kachirachirai</i>	2	0	China
<i>Magnolia lenticellata</i>	0	0	Colombia
<i>Magnolia magnifolia</i>	0	0	Colombia
<i>Magnolia mahechae</i>	0	0	Colombia
<i>Magnolia minor</i>	1	0	Cuba
<i>Magnolia morii</i>	0	0	Panama
<i>Magnolia multiflora</i>	0	0	China

Species	Number of collections		Country of origin
	in country of origin	not in country of origin	
<i>Magnolia nana</i>	0	0	Viet Nam
<i>Magnolia nitida</i> var. <i>lotungensis</i>	18	6	China
<i>Magnolia pacifica</i> spp. <i>pacifica</i>	0	0	Mexico
<i>Magnolia pallescens</i>	0	0	Dominican Republic
<i>Magnolia pealiana</i>	0	0	India
<i>Magnolia phuthoensis</i>	0	0	Viet Nam
<i>Magnolia portoricensis</i>	0	0	Puerto Rico
<i>Magnolia pulgarensis</i>	0	0	Philippines
<i>Magnolia santanderiana</i>	0	0	Colombia
<i>Magnolia schiedeana</i>	1	4	Mexico
<i>Magnolia sharpii</i>	0	2	Mexico
<i>Magnolia shiluensis</i>	2	0	China
<i>Magnolia silvioi</i>	1	0	Colombia
<i>Magnolia sororum</i> spp. <i>sorum</i>	0	0	Panama
<i>Magnolia splendens</i>	0	0	Puerto Rico
<i>Magnolia stellata</i>	4	103	Japan
<i>Magnolia striatifolia</i>	0	0	Colombia, Ecuador
<i>Magnolia tamaulipana</i>	0	1	Mexico
<i>Magnolia urraoensis</i>	0	0	Colombia
<i>Magnolia ventii</i>	1	0	China
<i>Magnolia wilsonii</i>	4	56	China
<i>Magnolia yarumalensis</i>	1	0	Colombia

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 <i>ex situ</i> collections:	
<i>Magnolia cacuminicola</i> subsp. <i>bissei</i>	Cuba
<i>Magnolia cacuminicola</i> subsp. <i>cacuminicola</i>	Cuba
<i>Magnolia calimaensis</i> ¹	Colombia
<i>Magnolia cararensis</i>	Colombia
<i>Magnolia cespedesii</i>	Colombia
<i>Magnolia chimantensis</i>	Colombia, Venezuela
<i>Magnolia coronata</i>	Colombia
<i>Magnolia cristalensis</i> subsp. <i>baracoana</i>	Cuba
<i>Magnolia cristalensis</i> subsp. <i>cristalensis</i>	Cuba
<i>Magnolia cristalensis</i> subsp. <i>moana</i>	Cuba
<i>Magnolia cubensis</i> subsp. <i>acunae</i>	Cuba
<i>Magnolia cubensis</i> subsp. <i>cacuminicola</i>	Cuba
<i>Magnolia cubensis</i> subsp. <i>cubensis</i>	Cuba
<i>Magnolia espinalii</i>	Colombia
<i>Magnolia katorum</i>	Colombia
<i>Magnolia narinensis</i> ¹	Colombia
<i>Magnolia pacifica</i> subsp. <i>pugana</i>	Mexico
<i>Magnolia pleiocarpa</i>	India
<i>Magnolia virolinensis</i>	Colombia
CR taxa currently in very few <i>ex situ</i> collections and therefore still a priority for new collections:	
<i>Magnolia coriacea</i>	China
<i>Magnolia hebecarpa</i>	China
<i>Magnolia phanerophlebia</i>	China
<i>Magnolia polyhypsophylla</i>	Colombia
<i>Magnolia sirindhorniae</i> ²	Thailand
<i>Magnolia wolfii</i>	Colombia
Endangered (EN) taxa currently absent from <i>ex situ</i> collections:	
<i>Magnolia allenii</i>	Costa Rica, Panama
<i>Magnolia arcabucoana</i>	Colombia
<i>Magnolia argyothricha</i>	Colombia
<i>Magnolia calophylla</i> ¹	Colombia
<i>Magnolia choacoensis</i>	Colombia
<i>Magnolia colombiana</i>	Colombia
<i>Magnolia domingensis</i>	Dominican Republic, Haiti
<i>Magnolia ekmanii</i>	Haiti
<i>Magnolia emarginata</i>	Haiti
<i>Magnolia georgii</i>	Colombia

<i>Magnolia guatapensis</i>	Colombia
<i>Magnolia guatemalensis</i> subsp. <i>guatemalensis</i>	Guatemala
<i>Magnolia guatemalensis</i> subsp. <i>hondurensis</i>	El Salvador, Honduras
<i>Magnolia gustavii</i>	India
<i>Magnolia hamorii</i>	Dominican Republic
<i>Magnolia henaoui</i>	Colombia
<i>Magnolia irwiniana</i>	Brazil
<i>Magnolia lenticellata</i>	Colombia
<i>Magnolia magnifolia</i> ¹	Colombia
<i>Magnolia mahechae</i>	Colombia
<i>Magnolia morii</i>	Panama
<i>Magnolia multiflora</i>	China
<i>Magnolia nana</i>	Viet Nam
<i>Magnolia pacifica</i> subsp. <i>pacifica</i>	Mexico
<i>Magnolia pallescens</i>	Dominican Republic
<i>Magnolia pealiana</i>	India
<i>Magnolia phuthoensis</i>	Viet Nam
<i>Magnolia portoricensis</i>	Puerto Rico
<i>Magnolia pulgarensis</i>	Philippines
<i>Magnolia santanderiana</i>	Colombia
<i>Magnolia sororum</i> subsp. <i>sorum</i>	Panama
<i>Magnolia splendens</i>	Puerto Rico
<i>Magnolia striatifolia</i> ¹	Colombia, Ecuador
<i>Magnolia urraoensis</i>	Colombia
EN taxa currently in very few ex situ collections and therefore still a priority for new collections:	
<i>Magnolia angustoblonda</i>	China
<i>Magnolia caricifragrans</i>	Colombia
<i>Magnolia gilbertoi</i>	Colombia
<i>Magnolia ingrata</i>	China
<i>Magnolia jardinensis</i>	Colombia
<i>Magnolia kachirachirai</i>	China
<i>Magnolia minor</i>	Cuba
<i>Magnolia sharpii</i> ²	Mexico
<i>Magnolia shiluensis</i>	China
<i>Magnolia silvioi</i>	Colombia
<i>Magnolia tamaulipana</i> ²	Mexico
<i>Magnolia ventii</i>	China
<i>Magnolia yarumalensis</i>	Colombia

¹ Due to security situation in Colombia, new collections of these taxa from the wild are not currently possible.

² 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 *Magnoliaceae* as determined by assigning a score for each taxa within the collection, according to the Red List Category (CR – 10 points, EN – 7 points, VU – 5 points, NT – 3 points, DD – 2 points, LC – 1 points, NE – 0 points). The number of most threatened taxa (CR and EN) in each collection is also given in the table.

	Botanic garden	No. of CR & EN taxa	Collection Score
1	South China Botanical Garden, China	23	268
2	Kunming Botanical Garden, China	15	184
3	Shenzhen Fairy Lake Botanical Garden, China	14	178
4	San Francisco Botanical Garden Society, United States	9	144
5	Biological Resource Station of Emeishan in Sichuan Province, China	8	101
6	Stichting Arboretum Wespelaar, Belgium	6	94
7	Crown Estate Commissioners, United Kingdom	6	86
8	Royal Botanic Gardens, Kew, United Kingdom	6	85
9	Quarryhill Botanical Garden, United States	8	83
10	Royal Botanic Gardens, Melbourne, Australia	6	82
11	The Sir Harold Hillier Garden and Arboretum, United Kingdom	5	81
12	Shanghai Botanic Garden, China	6	79
13	The Arnold Arboretum, United States	4	64
14	Conservatoire Botanique National de Brest, France	4	63
15	The Royal Horticultural Society's Garden, Rosemoor, United Kingdom	4	62
16	Arboretum Bokrijk, Belgium	3	61
17 =	National Botanic Gardens, Ireland	4	59
17 =	The Royal Horticultural Society's Garden, Wisley, United Kingdom	3	59
19	Botanic Gardens of Adelaide, Australia	3	58
20	Arboretum Freiburg-Guenterstal im Staedtischen Forstamt, Germany	3	56
21	Hergest Croft Gardens, United Kingdom	3	55
22	Beijing (Northern) Botanical Garden, China	3	53
23 =	Fuzhou Botanical Garden, China	4	52
23 =	The Scott Arboretum of Swarthmore College, United States	4	52
23 =	Xishuangbanna Tropical Botanical Garden, China	3	52
26 =	Nanjing Botanic Garden Mem. Sun Yat-Sen, China	3	50
26 =	Wentworth Castle Gardens, United Kingdom	4	50
28	Westonbirt Arboretum, United Kingdom	4	49
29	Lushan Botanical Garden, China	2	48
30	Royal Botanic Garden Edinburgh, United Kingdom	3	44

Annex 4 Participating institutions

The following 238 institutions from 47 countries are thanked for their contribution of data to this report:

Amani Botanical Garden, United Republic of Tanzania; Arboretum at the University of California, Santa Cruz, United States of America; Arboretum Bokrijk, Belgium; Arboretum Freiburg-Guenterstal im Staedtischen Forstamt Freiburg, Germany; Arboretum Kirchberg, Luxembourg; Arboretum Lesnicke mistrovske skoly, Czech Republic; Arborétum Mlyňany, Slovakia; Arboretum of Jiangxi Institute of Forestry Science, China; Arboretum of Wuhan University, China; Arboretum Oudenbosch, Netherlands; Arboretum SGGW w Rogowie, Poland; Arboretum Trompenburg, Netherlands; Arboretum 'Trsteno', Croatia; Arboretum Waasland, Belgium; Ballywalter Park, United Kingdom; Bangladesh Agricultural University Botanic Garden, Bangladesh; Baoji Botanical Garden, China; Bartlett Arboretum & Gardens, United States of America; Batsford Arboretum, United Kingdom; Beijing (Northern) Botanical Garden, China; Beijing Teaching Botanical Garden, China; Benmore Botanic Garden, United Kingdom; Bergius Botanic Garden, Sweden; Biological Resource Station of Emeishan in Sichuan Province, China; Birr Castle Demesne, Ireland; Botanic Garden of Eötvös Loránd University, Hungary; Botanic Gardens of Adelaide, Australia; Botanic Gardens of Toyama, Japan; Botanic Gardens Trust, Sydney, Australia; Botanical Garden - University of Oslo, Norway; Botanical Garden of Kawaguchi-City, Japan; Botanical Garden of the Anhui Institute of Biology, China; Botanical Garden of Vilnius University, Lithuania; Botanische Gärten der Universität Bonn, Germany; Botanische Tuinen, Netherlands; Botanischer Garten der C. v. O. Universität, Germany; Botanischer Garten der Friedrich-Schiller-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 des Saarlandes, Germany; Botanischer Garten der Universität Düsseldorf, 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 und Botanisches Museum Berlin-Dahlem, Germany; Botanischer Versuchs- und Lehrgarten, Germany; Botaniska Trädgårderna vid Uppsala Universitet, Sweden; Brisbane Botanic Gardens, Australia; Bristol Zoo Gardens, United Kingdom; Brookside Gardens, United States of America; Bukavu Arboretum/Garden, Rwanda; Cambridge University Botanic Garden, United Kingdom; Center for Plant Conservation - Bogor Botanic Gardens, Indonesia; Chanticleer, United States of America; Chicago Botanic Garden, United States of America; Cibodas Botanic Garden, Indonesia; Cincinnati Zoo and Botanical Gardens, United States of America; City of Leeds Botanic Gardens, United Kingdom; City of Liverpool Botanic Gardens, United Kingdom; Conservatoire Botanique National de Brest, France; Conservatoire et Jardins Botaniques de Nancy, France; Cornell Plantations, United States of America; Crown Estate Commissioners, United Kingdom; Cuc Phuong Botanic Garden, Viet Nam; Dashushan Botanical Garden, China; Davis Arboretum, United States of America; Dawyck Botanic Garden, United Kingdom; Denver Botanic Gardens, United States of America; Derreen Garden, Ireland; Dongfeng Forest Farm, China; Dunedin Botanic Garden, New Zealand; Dyffryn Gardens, United Kingdom; Fairchild Tropical Botanic Garden, United States of America; Fernhill Garden, Ireland; Forstbotanischer Garten, Germany; Forstbotanischer Garten Tharandt, Germany; Forstbotanischer Garten und Arboretum, Germany; Fota Arboretum and Gardens, Ireland; Fruit Spirit Botanical Garden, Australia; Fukuoka Municipal Botanical Garden, Japan; Fuzhou Botanical Garden, China; Gannan Arboretum of Jiangxi, China; George Brown Darwin Botanic Gardens, Australia; Glasgow Botanic Gardens, United Kingdom; Glenveagh Castle Garden, Ireland; Gore Public Gardens, New Zealand; Government College University Botanic Garden, Pakistan; Grugapark und Botanischer Garten der Stadt Essen, Germany; Guangxi Botanical Garden of Medicinal Plants, China; Guilin Botanical Garden, China; Guincho, United Kingdom; Hamamatsu City Flower Park, Japan; Hangzhou Botanical Garden, China; Hergest Croft Gardens, United Kingdom; Higashiyama Botanical Garden, Japan; Hortus Botanicus Catinensis, Italy; Howick Arboretum, United Kingdom; Hoyt Arboretum, United States of America; Hunan Forest Botanic Garden, China; Huntington Botanical Gardens, United States of America; Institute of Medicinal Plant Development, China; Istituto e Orto Botanico dell'Università di Pavia, Italy; Jardí Botànic de la Universitat de València, Spain; Jardim Botânico - Museu Nacional de História Natural, Portugal; Jardim Botânico da Ajuda, Portugal; "Jardín Botánico ""Dr. Faustino Miranda"", Mexico"; "Jardín Botánico ""Joaquin Antonio Uribe"", Colombia"; "Jardín Botánico ""Rey Netzahualcóyotl"", Mexico"; Jardín Botánico Cecon, Guatemala; Jardín Botánico de la Universidad Tecnológica de Pereira, Colombia; Jardín Botánico del Instituto de Biología (UNAM), Mexico; Jardín Botánico del Quindío, Colombia; Jardín Botánico Francisco Javier Clavijero, Mexico; Jardín Botánico 'José Celestino Mutis', Colombia; Jardín Botánico La Laguna, El Salvador; Jardín Botánico Nacional, Chile; Jardín Botánico Nacional de Cuba, Cuba; "Jardín Botánico-Histórico ""La Concepción"" de Málaga, Spain"; Jardin Botanique de la Ville de Lyon, France; Jardin Botanique de l'Universite Louis

Pasteur, France; Jardin Botanique Henri Gaussen, France; Jardin Botanique National de Belgique/Nationale Plantentuin van België, Belgium; Jardin des Plantes, France; Jardin des Serres d'Auteuil, France; Jardins des Plantes de l'Université, France; Jardins des Plantes et Arboretum de Chevreloup, France; Julia & Alexander N. Diomides Botanic Garden, Greece; Kadoorie Farm and Botanic Garden, Hong Kong; Kagoshima Botanical Garden, Japan; Kanagawa Prefectural Ofuna Botanical Garden, Japan; Kilmacurragh Arboretum, Ireland; Kobe Municipal Arboretum, Japan; Kunming Botanical Garden, China; Kusatsu Aquatic Botanical Garden, Japan; Limbe Botanic Garden, Cameroon; Ljubljana University Botanic Garden, Slovenia; Logan Botanic Garden, United Kingdom; Longwood Gardens, United States of America; Lushan Botanical Garden, China; M.M. Grishko Central Botanical Garden, Ukraine; M.V. Lomonosov Moscow State University Botanical Garden, Russian Federation; Maijishan Arboretum and Botanic Garden, China; Maribor University Botanic Garden, Slovenia; 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 Congreve, Ireland; Mount Lofty Botanic Garden, Australia; Mount Usher Gardens, Ireland; Nanjing Botanic Garden Mem. Sun Yat-Sen, China; Nanjing Botanical Garden of Medicinal Plants, China; Nanyue Arboretum, China; National Botanic Garden of Wales, United Kingdom; National Botanic Gardens, Ireland; National Botanic Gardens of Latvia, Latvia; National Clonal Germplasm Repository USDA/ARS, United States of America; National Tropical Botanical Garden, United States of America; Natural History Museum of Denmark, Denmark; Neuer Botanischer Garten der Universität Göttingen, Germany; Niigata Prefectural Botanical Garden, Japan; North Carolina Botanical Garden, United States of America; Oekologisch-Botanischer Garten Universität Bayreuth, Germany; Orto Botanico Università degli Studi di Padova, Italy; Oxford University Botanic Garden, United Kingdom; Paignton Zoological and Botanical Gardens, United Kingdom; Palmengarten der Stadt Frankfurt, Germany; Parco Botanico del Cantone Ticino,, Switzerland; "Parco botanico friulano ""Cormor""", Italy"; Parque Botânico da Tapada da Ajuda, Portugal; Phipps Conservatory, Inc., United States of America; Plantentuin Universiteit Gent, Belgium; Premier Parks, New Zealand; Quail Botanical Gardens, United States of America; Quarryhill Botanical Garden, United States of America; Research Institute of Subtropical Forestry, China; Rimba Ilmu Botanic Garden, Malaysia; Ringve botaniske hage, Norway; Royal Botanic Garden Edinburgh, United Kingdom; Royal Botanic Gardens, Kew, United Kingdom; Royal Botanic Gardens, Melbourne, Australia; San Diego Wild Animal Park, United States of America; San Francisco Botanical Garden Society, United States of America; Sarah P. Duke Gardens, United States of America; Sentier de Découverte, France; Shanghai Botanic Garden, China; Shenzhen Fairy Lake Botanical Garden, China; Sir John Quicke, United Kingdom; South China Botanical Garden, China; Stichting Arboretum Wespelaar, Belgium; Stichting Rotterdamse Diergaarde 'Blijdorp', Netherlands; Swansea Botanical Complex, United Kingdom; The Arboretum of Guizhou Institute of Forestry, China; The Arboretum of Nanjing Forestry University, China; The Arboretum, University of Guelph, Canada; The Arnold Arboretum, United States of America; The Botanic Garden of Smith College, United States of America; The Hiroshima Botanical Garden, Japan; The Holden 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 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 Royal Horticultural Society's Garden, Wisley, 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; Tregothnan Estate, United Kingdom; United States Botanic Garden, United States of America; United States National Arboretum, United States of America; University Botanic Garden, United Kingdom; University of Helsinki Botanic Garden, Finland; University of Turku Botanical Garden, Finland; University of Washington Botanic Gardens, United States of America; University of West Hungary, Botanic Garden, Hungary; Utrecht University Botanic Garden, Netherlands; VanDusen Botanical Garden, Canada; Waimea Arboretum Botanical Garden, United States of America; Wentworth Castle Gardens, United Kingdom; Westonbirt Arboretum, United Kingdom; Xi'an Botanical Garden, China; Xiashi Arboretum, China; Xishuangbanna Tropical Botanical Garden, China.