The Red List of *Acer*

revised and extended

Dan Crowley, Megan Barstow, Malin Rivers & Yvette Harvey-Brown

BOTANIC GARDENS CONSERVATION INTERNATIONAL
GTA GLOBAL TREE ASSESSMENT
GTSG GLOBAL TREE SPECIALIST GROUP
IUCN SSC Species Survival Commission
Global Trees Campaign
The Maple Society

BOTANIC GARDENS CONSERVATION INTERNATIONAL

BOTANIC GARDENS CONSERVATION INTERNATIONAL (BGCI) is the world's largest plant conservation network, comprising more than 500 botanic gardens in over 100 countries, and provides the secretariat to the IUCN/SSC Global Tree Specialist Group. BGCI was established in 1987 and is a registered charity with offices in the UK, US, China and Kenya.

THE IUCN/SSC GLOBAL TREE SPECIALIST GROUP (GTSG) forms part of the Species Survival Commission's network of over 7,000 volunteers working to stop the loss of plants, animals and their habitats. SSC is the largest of the six Commissions of IUCN – The International Union for Conservation of Nature. It serves as the main source of advice to the Union and its members on the technical aspects of species conservation. The aims of the IUCN/SSC Global Tree Specialist Group are to promote and implement global red listing for trees and to act in an advisory capacity to the Global Trees Campaign.

THE GLOBAL TREES CAMPAIGN (GTC) is undertaken through a partnership between BGCI and Fauna & Flora International (FFI). GTC's mission is to prevent all tree species extinctions in the wild, ensuring their benefits for people, wildlife and the wider environment. GTC does this through provision of information, delivery of conservation action and support of sustainable use, working with partner organisations around the world.

THE MAPLE SOCIETY is a charitable international organisation providing education and information about maple identification, propagation and cultivation. It supports international collaboration in the scientific study and conservation of maple species; promotes the aesthetic and cultural appreciation of maples and addresses the commercial interests of maple growers.

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Contents

Acer tonkinense *(Dan Crowley)*

Foreword

I am one of those people who believes that trees, plants, yes, all living beings for that matter have an intrinsic value regardless of what humans think of them. But more and more we live in a world of ecosystem services where the value of a living being, or a species, is directly linked to the (possible) value it may have to humans or for mankind. I think this is a regrettable development, but I do understand that it is an easier way of selling the importance of biodiversity to the general public. That said, there seems to be no major problem for maples. Figure 6 in this publication shows that 61% of all *Acer* species have an identified use. Of course, use or not, there is absolutely no reason or justification for any *Acer* species to decline in IUCN Red List category, let alone go extinct. On the contrary, we are obliged to take action and to ensure that conservation plans are drawn up for all 36 threatened *Acer* species and that *in situ* conservation action for these species is effectively implemented and monitored. We owe it not only to ourselves and the generations to come but even more to those wonderful maple trees themselves! And so, you can see that a published Red List is in any case an important tool to convince people of the importance of biodiversity and that it is worth preserving, protecting and improving that biodiversity.

This publication also fits perfectly in a remarkable initiative, the Global Tree Assessment (globaltreeassessment.org). The Global Tree Assessment aims to assess the conservation status of every known tree species by the year 2020! Forty-five percent of all the world's trees are still lacking an assessment of extinction risk. In other words, this is an extremely ambitious project that deserves and needs our full support. It gives me great pleasure that the genus *Acer* can be deleted from the "to-assess-list".

Acer forrestii *(Dan Crowley)*

I write this foreword on a sunny day in early February. It is way too warm for the time of year and *Acer rubrum* is in full bloom! Again, records for early flowering times of many taxa are broken. Again, we are faced with perhaps the biggest challenge for us all and especially for trees: climate change. After all, trees are by definition rooted in the ground and need a lot of time to move to where they might feel better. And time is just a factor that plays in their disadvantage because global warming goes surprisingly fast. It was ten years ago that the first Red List of Maples was published and that makes comparisons possible. I wonder what the 2030 Red List of Maples will look like. Have we done well? Has the number of threatened *Acer* species decreased? Or has climate change caught up with us and are we seeing an increase in the number of endangered species? I thumb for the first.

But now, dear reader, I am obliged to lay down the pen. The sun, birds, bulbs, early perennials and rhododendron and of course also the maple trees call on me: go outside, come and admire us and enjoy! Because in the end there is one ecosystem service that stands out for me: that of respect, admiration and wonder for all living things around us!

Koen Camelbeke

Acknowledgements

To achieve an evaluation of conservation assessments for *Acer*, many specialists have contributed their knowledge and shared their expertise about this fascinating group of species and the habitat in which they grow. Without their generous assistance, we would have been unable to complete this global *Red List of* Acer, and everyone's contributions are gratefully acknowledged.

We would also like to thank the many contributors and reviewers for their work to produce these assessments: Adil Güner, Agustin Coello-Vera, Alexander Sennikov, Angelino Carta, Angelo Troìa, Anthony Aiello, Antoaneta Petrova, Antoni Buira, Brett Wilson, Bryony Smart, Charalambos Christodoulou, Chiara Montagnani, Chung Shih-Wen, Douglas Justice, Danka Caković, Dao Zhilin, David Allen, David Kikodze, Deepu Sivadas, Diana Jerome, Douglas Gibbs, Emily Beech, Faruk Bogunić, Gene-Sheng Tung, Gergely Király, Igor Boršić, Ikuyo Saeki, Ioannis Bazos, Jean Linsky, Jean Stephan, Kang Wang, Keith Rushforth, Lillian Chua, Lulezim Shuka, Mariana García, Mark Watson, Mojgan Mohtashamian, Nattee Muangyen, Pablo García Murillo, Pere Fraga i Arquimbau, Phetlasy Souladeth, Rachun Pooma, Sara Oldfield, Sengthong Soulinnaphou, Simone Orsenigo, Sivadas Deepu, Sungwon Son, Tiago Monteiro-Henriques, Tinatin Barblishvili, Veo Dalavong, Vlado Matevski, Vongxana Mouaxayvaneng, Wattana Tanming, Weibang Sun, William McNamara, Xiangying Wen, Yalma Luisa Vargas Rodríguez and Yousheng Chen.

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The provision of photographs is also gratefully acknowledged with credits given alongside each image.

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We thank Westonbirt, The National Arboretum, UK for their in kind support of this work.

IUCN Red List Categories

- **EX** Extinct
- **EW** Extinct in the Wild
- **CR** Critically Endangered
- **EN** Endangered
- **VU** Vulnerable
- **NT** Near Threatened
- **LC** Least Concern
- **DD** Data Deficient
- **NE** Not Evaluated

Acer pycnanthum *(Michael S. Dosmann)*

Acer cappadocicum *(Hugh Angus)*

Executive summary

Acer pycnanthum *(Michael S. Dosmann)*

The genus *Acer* is largely native to the Northern Hemisphere, where it forms components of diverse woodland ecosystems in temperate parts of Europe, northern Africa, Asia and North and Central America. It also occurs in subtropical and tropical regions, with one species that extends into the Southern Hemisphere. Many *Acer* species are of great horticultural value. They are also important timber species with several utilised commercially. Members of the genus are the source of maple syrup.

Expanding and updating The Red List of Maples, published in 2009, The Red List of *Acer* contains IUCN Red List assessments for 158 species of *Acer*, including 36 species, or 23% of species, threatened with extinction.

China holds the greatest diversity of *Acer* species. Nearly two thirds of the genus are native to the region, however a quarter of the species there are threatened with extinction with urban development being identified as the primary threat. Thailand has seven *Acer* species and has the highest proportion of threatened species. These are impacted by threats including habitat loss from firewood extraction, increased tourism and forest fires. The greatest threat to members of the genus is urban development, while those of agriculture and deforestation are also highly significant.

Currently 137 species of *Acer* are held in *ex situ* collections, including 22 threatened species. Though 87% of all *Acer* species are held in *ex situ* collections, only 61% of threatened species are, falling short of Target 8 of the Global Strategy for Plant Conservation which states that at least 75% of threatened species should be held in *ex situ* collections. How many of these are represented by plants of documented wild origin is not known. Further work is required to establish this.

The Red List of Acer identifies those *Acer* species most at risk of extinction in the wild, highlighting the need to target conservation action to some 36 threatened species. A diverse array of conservation actions will be required to protect the species from the number of threats affecting the group.

PART 1

Background

The maple genus, *Acer* L., is one of the largest woody plant genera in the Northern Hemisphere, comprising evergreen and deciduous tree species that display a typical pattern of disjunction across temperate parts of Europe, northern Africa, Asia and North and Central America. It is at its most diverse in eastern Asia, with over 100 species native to the region. Species also occur in sub-tropical and tropical regions with one that extends into the Southern Hemisphere, *Acer laurinum.* The genus is a member of the soapberry family, Sapindaceae, having previously been treated as one of two genera in the maple family, Aceraceae, along with *Dipteronia* which contains two species from China.

Many maples are of great horticultural value. They are notable for their diversity of leaf shape and colour, fruits and bark. *Acer palmatum* and its relatives in Japan are among the most popular, with over 1,000 named selections made from this group. There are also several well-known cultivars of members of section *Macrantha*, the so-called snakebark maples, while the paperbark maple, *Acer griseum*, is widely regarded as one of the most attractive of the genus.

Several species are also important timber trees, with a number of species utilised commercially and the North American *Acer saccharum* and some of its relatives are renowned for their use to make maple syrup. The maple leaf is iconic and in Canada is a national emblem, prominent on the national flag.

Acer species are components of diverse woodland ecosystems and various species grow sympatrically across the range of the genus. Some species, such as *Acer pseudoplatanus*, are prominent forest overstorey trees, while others, such as *Acer campestre*, are understorey trees.

Red List	Year published
The Red List of Endemic Trees & Shrubs of Ethiopia and Eritrea	2005
The Red List of Trees of Guatemala	2006
The Red List of Magnoliaceae	2007
The Red List of Oaks	2007
The Red List of Maples	2009
The Red List of Trees of Central Asia	2009
The Red List of Mexican Cloud Forest Trees	2011
The Red List of Rhododendrons	2011
A Regional Red List of Montane Tree Species of the Tropical Andes	2014
The Red List of Betulaceae	2014
The Red List of Magnoliaceae – revised and extended	2016
The Red List of Theaceae	2017
The Red List of US Oaks	2017
The Red List of *Fraxinus*	2018
The Red List of *Nothofagus*	2018
The Red List of *Tovomita*	2019
European Red List of Trees	2019
The Red List of *Acer* – revised and extended	2020

Table 1. Red List reports produced by Botanic Gardens Conservation International in partnership with Fauna & Flora International, the Global Tree Specialist Group and others

Acer saccharum *(©2020 The Morton Arboretum. All rights reserved.)*

Box 1: Global Tree Assessment (GTA)

There are about 60,000 tree species globally, but forty-five percent of all the world's trees are still lacking an assessment of extinction risk.

The Global Tree Assessment aims to provide conservation assessments of the world's tree species by 2020.

Despite the importance of trees, many are threatened by over-exploitation and habitat destruction, as well as by pests, diseases, drought and their interaction with global climate change. In order to estimate the impact of such threats to trees there is an urgent need to conduct a complete assessment of the conservation status of the world's tree species – the Global Tree Assessment.

The Global Tree Assessment, led by BGCI and the IUCN SSC Global Tree Specialist Group, prioritises the tree species at greatest risk of extinction. The Global Tree Assessment provides information to ensure that conservation efforts are directed at the right species so that no tree species becomes extinct. www.globaltreeassessment.org.

Acer griseum *(Anthony S. Aiello)*

Some species, including *A. sikkimense*, grow as epiphytes. Others, including *Acer macrophyllum* and *A. circinatum* support diverse communities themselves. Members of the genus also have varying leaf forms, from simple and entire, to palmately or pinnately compound and serrate.

Published in 2009, *The Red List of Maples* assessed 123 species, estimating that 28% (including *Dipteronia*) were threatened with extinction. However, these assessments are now 11 years old, and were never published on the IUCN Red List of Threatened Species (ww.iucnredlist.org). Additionally, since the time of the report there has been significant taxonomic updates in the genus, new species have been discovered and new threats revealed. Furthermore, following IUCN protocol, species assessments should be updated every 5 to 10 years; an update to *The Red List of Maples* is now due.

The Red List of Acer readdresses the need to evaluate the conservation status of *Acer* species and to contribute towards both Target 2 of the Global Strategy for Plant Conservation and the Global Tree Assessment (Box 1). It identifies those species most at risk of extinction in the wild and enables the direction of conservation effort towards these species. Prioritising the most at risk tree species is the first step in safeguarding threatened trees species as part of the Global Trees Campaign. This programme is a partnership between BGCI and Fauna & Flora International and over the last twenty years 17 tree Red List publications (Table 1) have been produced which have guided the conservation of many at risk species. *The Red List of* Acer will now inform these efforts for *Acer*.

Methods

Acer yui *(Anthony S. Aiello)*

Taxonomic scope and concepts

This publication includes Red List assessments for all species in the genus *Acer*. Though some molecular studies have found *Dipteronia* to be nested within *Acer*, this is not currently widely accepted and the two are treated as separate genera here. The taxonomic concepts followed are those broadly reflected in accounts published in regional floras within the last two decades, as there is no widely accepted single treatment of the genus. Some taxonomic updates made since 2015 are included after consultation with taxonomic experts.

As followed here, the genus consists of 158 species. Infraspecific taxa were not included, as the IUCN Red List of Threatened Species only accepts infraspecific conservation assessments if a species has also been assessed. Plant authority names follow those from The International Plant Names Index (IPNI, 2019).

Conservation assessment methods

For each species, information was collected on geographic distribution, population data, population trends, habitat and ecology, use and trade, threats, and conservation measures (in place and required). Information for the assessments was collated from published and unpublished sources including national and regional floras, scientific papers, published and unpublished reports, herbarium records, and expert knowledge. National red lists were consulted when available. For a full list of references used for each species, see the individual species red list assessment available online at the IUCN Red List website (www.iucnredlist.org). A Red List category was then assigned to each species, using all the available information, a conservation category and criteria, based on the collated information using the 2001 IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2012).

Species are assigned one of eight categories (Figure 1): Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC) and Data Deficient (DD). Critically Endangered, Endangered and Vulnerable are the three threatened categories. Taxa that do not qualify for a threatened category, but are close to qualifying for or are likely to qualify for a threatened category in the near future, can be assigned to the category Near Threatened. Least Concern is used for species that are assessed but are not considered threatened including widespread species and rare but stable species. The use of the category Data Deficient may be assigned to poorly known taxa. Species not yet evaluated are Not Evaluated (NE). In this report NT and LC are grouped as "Not threatened".

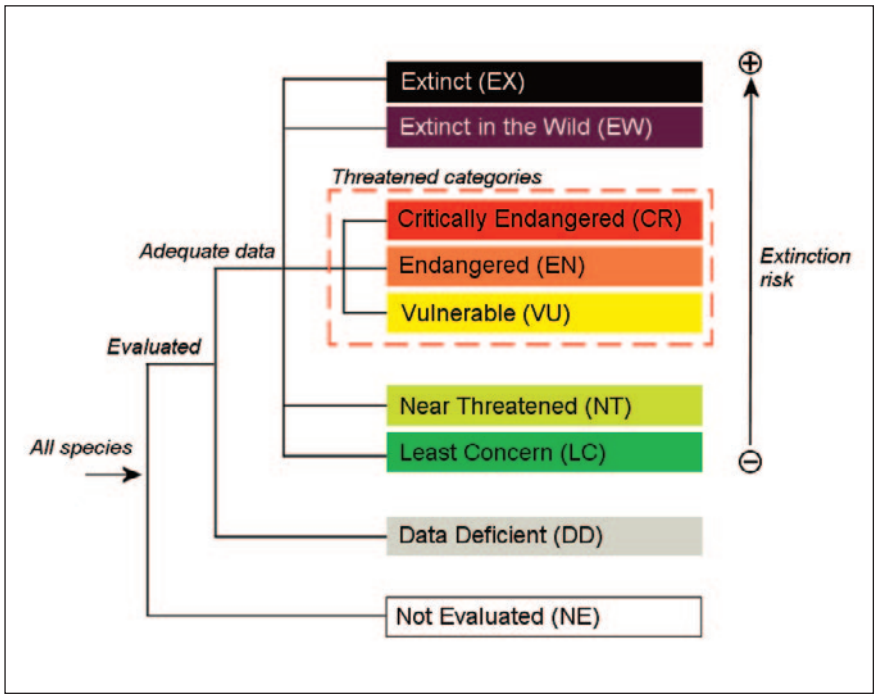

Figure 1. Structure of the IUCN Red List Categories (version 3.1) (Credit: IUCN)

In order to assess whether a species belongs to a threatened category (CR, EN, VU) the species are evaluated in relation to five criteria: A) Population reduction; B) Geographic range; C) Small population size and decline; D) Very small or restricted population; and E) Quantitative analysis. The criteria are based on a set of thresholds and subcriteria. Extensive guidelines are available to facilitate the process for the conservation assessors (IUCN Standards and Petitions Subcommittee, 2019). Assessors evaluate taxa using all five criteria, but a taxon only needs to fulfil one of the five criteria to qualify for a threatened category. When several criteria are met resulting in different status assessments, the precautionary principle is applied and the most threatened category should be assigned (IUCN, 2012). It is recommended that species on the list are re-evaluated at least once every 5-10 years (IUCN, 2012). Once completed and reviewed the assessments are sent to the IUCN Red List for publication on the IUCN Red List of Threatened Species (IUCN, 2019).

Box 2: Global Conservation Consortium for *Acer*

GLOBAL CONSERVATION CONSORTIUM
ACER

At least one in five tree species are threatened in the wild, with many in urgent need of conservation action. To address this, Botanic Gardens Conservation International (BGCI) is establishing Global Conservation Consortia to mobilise institutions and experts worldwide. These will develop comprehensive conservation strategies for genera that are technically challenging to manage and deliver *in situ* and *ex situ* conservation actions.

With many *Acer* species producing seeds that cannot be stored long-term by conventional means, the Global Conservation Consortium for *Acer* (GCCA) is being established to ensure that no *Acer* species becomes extinct and all are effectively conserved both *in situ* and *ex situ* in living collections. Lead by the University of British Columbia Botanical Garden, Vancouver, the GCCA works to achieve the following objectives:

- Establish and foster a network of experts
- Identify and prioritise species of greatest conservation concern
- Establish and manage coordinated *ex situ* collections of high conservation value
- Undertake and facilitate applied research (e.g. conservation biology, population genetics, population structure, taxonomy)
- Ensure that threatened species are conserved *in situ*
- Build capacity to empower and mobilise in-country partners in diversity centres
- Increase public awareness and engagement

For more information and updates on the GCCA please visit: https://www.bgci.org/our-work/projects-and-case-studies/a-global-conservation-consortium-for-acer/

All assessments in this report are completed on a global scale.

Review and evaluation

Wherever possible, expert opinions were sought for all species assessed. Sometimes experts carried out the conservation assessment for their own species (assessors), and sometimes they contributed data for the conservation assessment to be carried out (contributors). In accordance with IUCN Red List Regulations, all assessments were also reviewed by a member of the Global Tree Specialist Group (reviewer).

For full details of the assessors, contributors and reviewers see the IUCN Red List of Threatened Species website (www.iucnredlist.org).

Red list report format

This report lists all species with their authors, country distribution and the conservation assessment ratings. The threatened species are also listed with the rationale for the conservation assessment. All other information (including synonyms, full distribution information, habitat, ecology, conservation measures, threats and uses) are listed on the website for the IUCN Red List of Threatened Species (www.iucnredlist.org).

The threatened (Critically Endangered, Endangered and Vulnerable) species are listed alphabetically in Part 2A.

The Near Threatened species are listed alphabetically in Part 2B. Data Deficient species are listed alphabetically in Part 2C. The Least Concern species are listed alphabetically in Part 2D.

Case studies

Case study 1: *Acer griseum* conservation project

By Anthony S. Aiello

Acer griseum *(Anthony S. Aiello)*

Although it is widely cultivated for its various ornamental characteristics, *Acer griseum* (paperbark maple) is threatened in its native habitat in China. The species was previously assessed as Endangered (Gibbs and Chen, 2009) and in China the species is considered Vulnerable (MEPC and CAS, 2013). As far as can be determined, there have been a limited number of introductions into Western cultivation. With this in mind, the Morris, Morton, and Arnold Arboreta, and the Beijing Botanical Garden initiated the Paperbark Maple Conservation Project to determine whether the diversity of cultivated plants in the U.S. and U.K. accurately reflects the genetic diversity of plants in the wild, or if further efforts are needed to conserve this species.

From 2014 through 2016 cultivated trees were sampled across North America and in the U.K. The sampling focused on older trees of known origin, more recent wild collections, and nursery trees that form the seed source of the large numbers of plants currently sold across the U.S.

During September of 2015, a North America-China Plant Exploration Consortium (NACPEC) expedition sampled wild populations of paperbark maple across its native range in central China. The locations stretched from Gansu south to Sichuan and Chongqing, into Shaanxi, and north into Henan and Shanxi. Among these provinces the subpopulations are disjunct from each other, and plants are often scarce within a given area based on work conducted by a group of researchers at the Chinese Academy of Forestry, Beijing. On this expedition the group visited nine localities of paperbark maple in five provinces, resulting in 66 trees sampled, along with two seed collections. Additional samples were obtained from Gansu, Hubei, and Hunan provinces.

Based on our as-yet unpublished molecular data, the vast majority of cultivated and commercially available trees are derived from a 1901 E.H. Wilson seed collection from Hubei Province. As far as conservation value, the cultivated trees represent only one of several remaining Chinese populations. As a result, there is little genetic diversity among the plants within the U.S. or Europe, representing a minimal amount of *ex situ* conservation value.

Many of the wild populations are located on land that has some level of conservation status - either provincial or national – and the aim of the most recent phase of the project is to create *ex situ* groups of trees, to be grown in China, the U.S, and Europe, to help preserve those trees in un-protected areas. Because of low seed viability, propagation efforts have been through grafting and have focused on two un-protected Chinese wild populations, one in rural Chongqing Municipality and one in Henan Province.

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CASE STUDY 2: THE MAPLE SOCIETY

The Maple Society is a charitable (non-profit) international organisation, founded in the 1980s to provide public education and the sharing of information about maple identification, propagation and cultivation; support international collaboration in the scientific study and conservation of maple species; promote the aesthetic and cultural appreciation of maples and address the commercial interests of maple growers. The Maple Society, in partnership with its North American Branch, founded in 2002, has built an international membership that includes many internationally renowned experts in the genus *Acer*, some of whom were closely involved in the production of *The Red List of Maples* in 2009.

The activities of the Society include national and international meetings and conferences, regional guided visits to gardens and arboretums, and expert led national / international maple study days focussing on a range of maple topics. A quarterly newsletter, containing a combination of scholarly articles and those of more general interest, is published and distributed to all members. In addition to its website and social media presence, The Maple Society has an *Acer* discussion forum, hosted by the University of British Columbia, which can be accessed directly at forums.botanicalgarden.ubc.ca/forums/maples.9/.

The Maple Society and its North American Branch jointly provide an annual grant to encourage the identification, protection and conservation of maples in the wild. Projects that have received support in the last few years include those on establishing the genetic diversity of *Acer griseum* in cultivation and the wild, the documentation and characterisation of *Acer* species in northern Viet Nam and the conservation of Mexican and Guatemalan sugar maple relatives, *A. skutchii* and *A. binzayedii*. The sixth triennial International Maple Symposium, held in Roscoff in 2017, hosted a joint workshop with BGCI to work towards updating IUCN Red List assessments for maple species and the Society is pleased to support the publication of the updated *Red List of* Acer. This meeting also saw the presentation of a new Japanese maple cultivar classification system, devised by Cor van Gelderen, which the Society is endorsing. The next international triennial meeting will be hosted by the North American Branch and will be held in October 2020 at the JC Raulston Arboretum, Raleigh, NC, U.S.A.

In 2020 the Society is working with taxonomic experts in the genus to produce a checklist of accepted species names, while also developing an updated checklist of cultivar names in tandem with a new mode of registering cultivars through the Society in its official role of cultivar registrar.

Acer skutchii *(Yalma Luisa Vargas Rodríguez)*

Acer sikkimense *(Dan Crowley)*

Further, and for the first time, the Society is bringing together both new and historical maple information, both scientific and horticultural, and making it freely available, as far as possible, on its website as part of its Open Science Initiative.

For more information on the Maple Society and its work, visit www.maplesociety.org.

Case study 3: sugar maples

Maple syrup is a luxury food item that is often used as a condiment for pancakes and waffles. The syrup is produced by tapping the trees in late winter or early spring, collecting the sap and then removing water to concentrate the liquid. Native North Americans were the first to produce maple syrup from a range of maples but primarily from the Sugar Maple (*Acer saccharum*), the Black Maple (*Acer nigrum*) and the Manitoba Maple (*Acer negundo*). Early European settlers adopted the practice, traditionally using a batch method to boil sap in large kettles over open fires (Perkins and van den Berg, 2009). The development of modern practices, such as vacuum tubing systems and reverse osmosis units, have significantly sped up the process and efficiency (Farrell and Chabot, 2012).

Although a sweet sap can be collected from the majority of *Acer* species, the most commercially important species are the Sugar Maple (*Acer saccharum*), the Black Maple (*Acer nigrum*) and the Red Maple (*Acer rubrum*). The commercial production of maple products in North America is concentrated in north eastern United States and south eastern Canada.

Canada is the global maple syrup leader, producing over 70% of the world's maple syrup, with 91% being produced in the province of Quebec alone (Agriculture and Agri-Food Canada, 2019). Canada is also the world's largest exporter of maple products, with exports valued at $406 million in 2018. In 2018, 62% of Canadian exports went to the United States, 11% to Germany and 5% to Japan, with the other export destinations accounting for 22% of total exports (Agriculture and Agri-Food Canada, 2019). Global demand for maple syrup has been on the rise (per capita consumption of maple syrup in the United States has grown by 155% over the past 35 years) which has been attributed to a growing demand for locally produced and healthy foods (Farrell and Chabot, 2012).

Acer saccharum *(©2020 The Morton Arboretum. All rights reserved.)*

The production of maple syrup is dependent on climatic factors (e.g. sugar content and sap flow). Rapp *et al*. (2019), predict that climate change will have a signficant impact on syrup yield across most of the range of *A. saccharum* and by 2100, maple syrup season may begin one month earlier than it did between the years 1950 and 2017. It is therefore of great importance that management practices are developed to enable syrup producers to adapt to the effects of climate change.

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Red list results

Threat status of *Acer*

All species in the genus *Acer* published before February 2020 are assessed in this report. Globally, 36 species are listed as threatened (Critically Endangered, Endangered or Vulnerable) and 113 species are not threatened (Near Threatened or Least Concern). The percentage of threatened species is 22.8%. Nine species are assessed as Data Deficient, which may or may not be threatened, but no conclusion could be reached due to inadequate information.

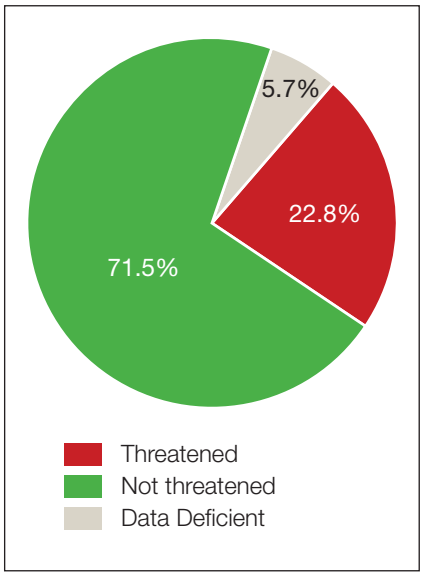


Figure 2. Summary of threat status of Acer

IUCN Red List category	Number of species
Extinct	0
Extinct in the Wild	0
Critically Endangered	7
Endangered	14
Vulnerable	15
Near Threatened	5
Least Concern	108
Data Deficient	9
Total	**158**

Table 2: The number of Acer *species in each IUCN Red List category*

Criteria used

The majority of the threatened *Acer* (75%) are assessed using Criterion B (Table 3), indicating these species are threatened due to their restricted range. The remaining threatened species are assessed using Criterion A (14%), C (11%) and D (11%). No species are assessed under criterion E.

IUCN Red List Criteria	Number of species
Criterion A	5
Criterion B	27
Criterion C	4
Criterion D	4
Criterion E	0

Table 3: The number of threatened Acer *conservation assessments using the five different Red List Criteria*

Acer campbellii *(Christophe Crock)*

Acer diabolicum *(Dan Crowley)*

Country analysis

The 158 *Acer* species are found in 84 countries across both temperate and tropical biomes. The centres of diversity are in East Asia. Eighty-six (54%) of *Acer* species are single country endemics. The threatened species of *Acer* are found in China, Guatemala, Hong Kong, India, Islamic Republic of Iran, Japan, Republic of Korea, Lao People's Democratic Republic, Mexico, Myanmar, Thailand, Turkey and Viet Nam (Figure 3).

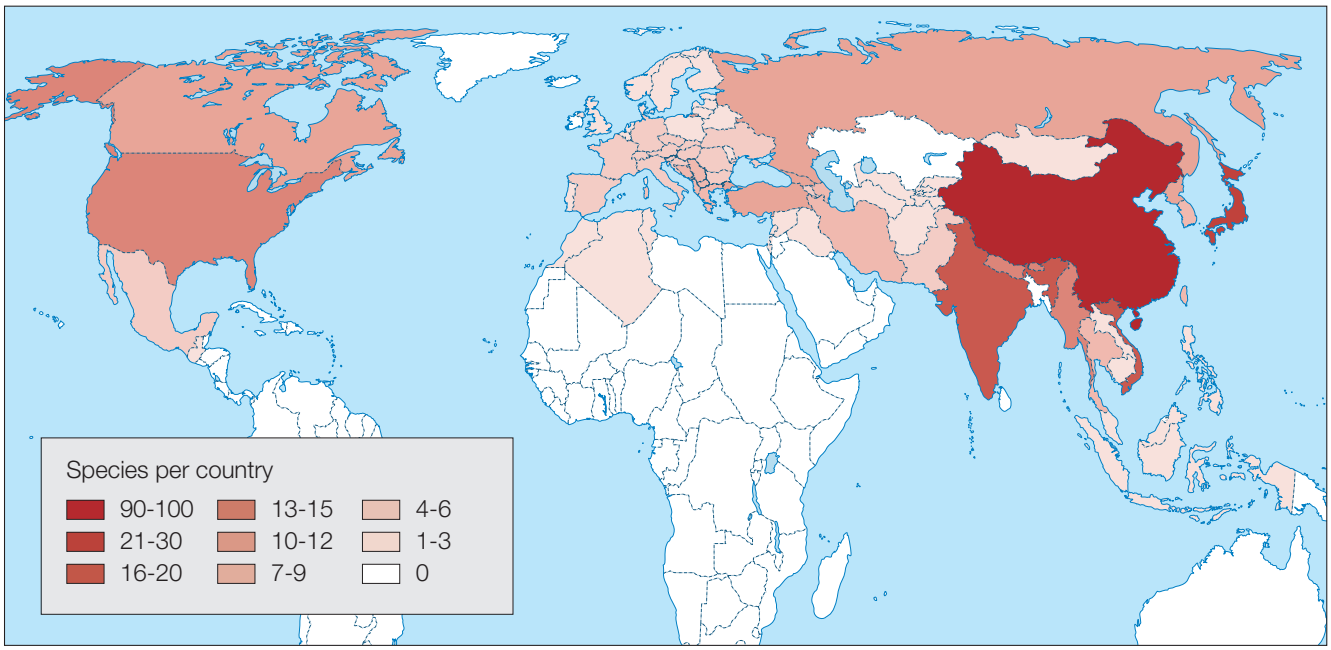
Species	Species	Threatened Species	% Threatened Species
Afghanistan	3	0	0
Albania	8	0	0
Algeria	2	0	0
Andorra	4	0	0
Armenia	5	0	0
Austria	4	0	0
Azerbaijan	7	0	0
Belarus	2	0	0
Belgium	2	0	0
Bhutan	11	0	0
Bosnia and Herzegovina	7	0	0
Bulgaria	6	0	0
Cambodia	1	0	0
Canada	10	0	0
China	92	23	25
Corsica	2	0	0
Croatia	6	0	0
Cyprus	1	0	0
Czech Republic	4	0	0
Democratic People's Republic of Korea	9	0	0
Denmark	1	0	0
Estonia	1	0	0
Finland	1	0	0
France	5	0	0
Georgia	10	0	0
Germany	5	0	0
Greece	9	0	0
Guatemala	2	1	50
Hong Kong	2	1	50
Hungary	5	0	0
India	20	2	10
Indonesia	1	0	0
Iraq	2	0	0
Islamic Republic of Iran	7	1	14
Israel	2	0	0
Italy	6	0	0
Japan	28	3	11
Kyrgyzstan	2	0	0
Lao People's Democratic Republic	3	1	33
Latvia	1	0	0
Lebanon	3	0	0

Species	Species	Threatened Species	% Threatened Species
Liechtenstein	2	0	0
Lithuania	1	0	0
Luxembourg	2	0	0
Malaysia	1	0	0
Mexico	5	2	40
Moldova	3	0	0
Monaco	2	0	0
Mongolia	2	0	0
Montenegro	8	0	0
Morocco	3	0	0
Myanmar	14	1	7
Nepal	13	0	0
Netherlands	2	0	0
North Macedonia	7	0	0
Norway	1	0	0
Pakistan	6	0	0
Philippines	1	0	0
Poland	3	0	0
Portugal	3	0	0
Republic of Korea	11	2	18
Romania	5	0	0
Russian Federation	11	0	0
Turkey	10	2	20
San Marino	2	0	0
Serbia	9	0	0
Spain	6	0	0
Slovakia	4	0	0
Slovenia	5	0	0
State of Palestine	1	0	0
Sweden	2	0	0
Switzerland	5	0	0
Syrian Arab Republic	2	0	0
Taiwan, Province of China	9	0	0
Tajikistan	3	0	0
Thailand	7	3	43
Timor-Leste	1	0	0
Tunisia	2	0	0
Turkmenistan	2	0	0
Ukraine	5	0	0
United Kingdom	1	0	0
United States	13	0	0
Uzbekistan	2	0	0
Viet Nam	19	4	21

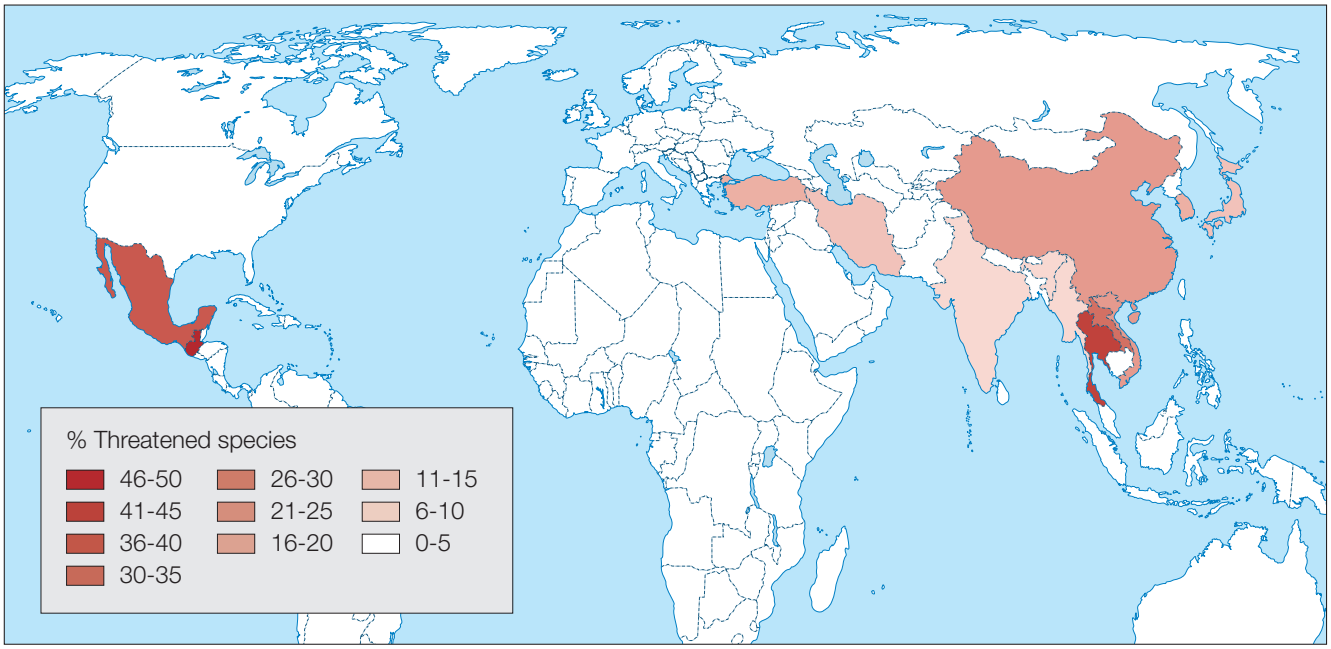
Figure 3. The percentage of Acer *species for each country that are threatened*

Acer tschonoskii *(Philippe de Spoelberch)*

Acer caudatum *(Dan Hinkley)*



Acer *species richness per country*



The percentage of threatened Acer *per country*

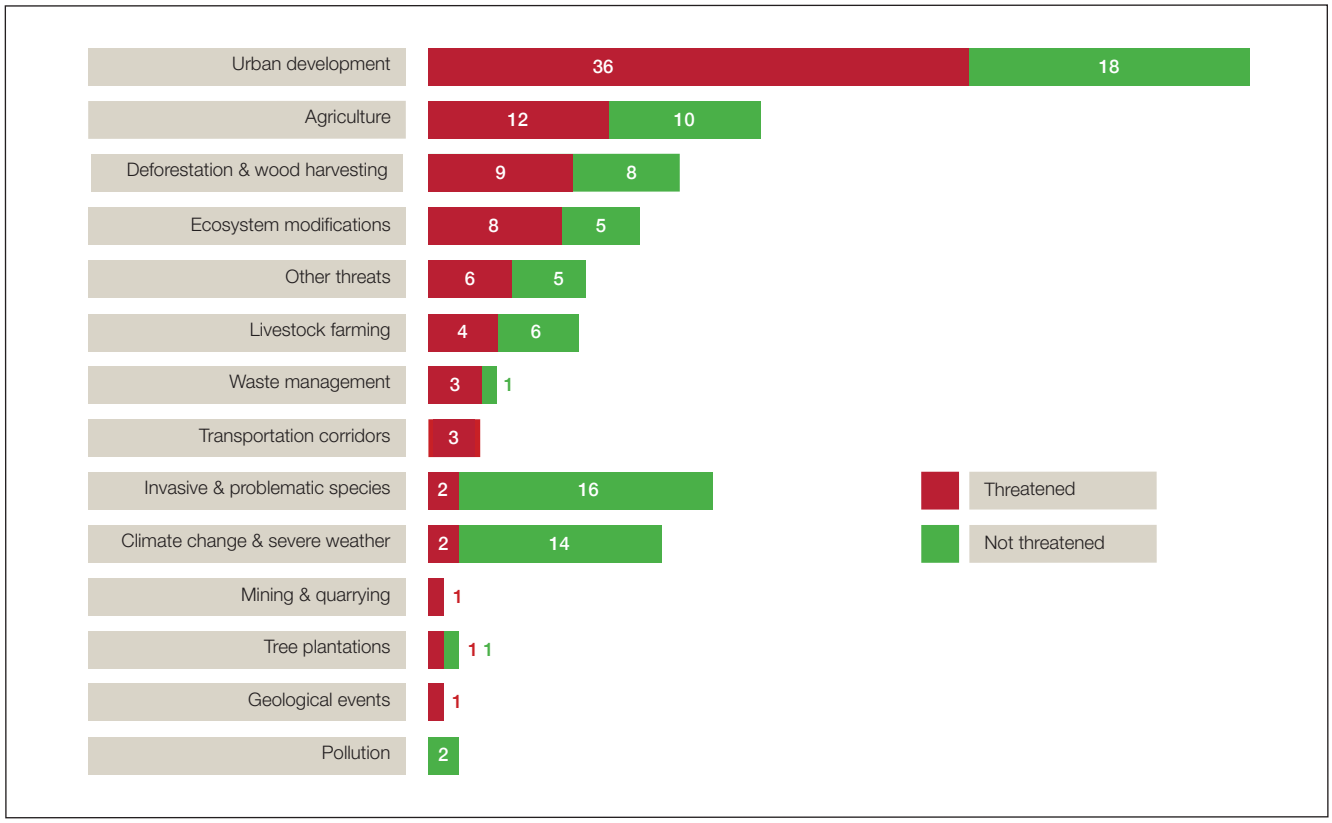


Figure 4. Threats to threatened and not threatened Acer *species*

MAJOR THREATS TO *ACER*

The primary threat to *Acer* species, affecting over a third of all species, is loss of habitat from urban development and agriculture (Figure 4). China, the country with the highest diversity of *Acer* species, has experienced significant urban expansion in the last century. Between 1981 and 2011, China's built up area increased nearly fivefold (Ministry of House & Urban-Rural Development PRC, 2012). The threat of deforestation and harvesting to numerous species is also significant, impacting a quarter of all threatened *Acer* species.

POPULATION TRENDS

Twenty percent of *Acer* species (32 species) are experiencing population decline, whilst 13% of species (20 species) have a population considered stable. For the majority of species (106 species), population trends are unknown (Figure 5). No species had an increasing population.

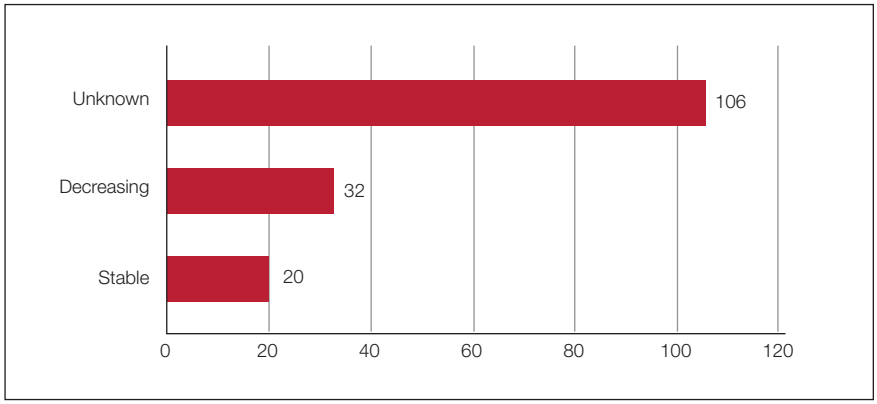


Figure 5: Population trends of Acer *species*

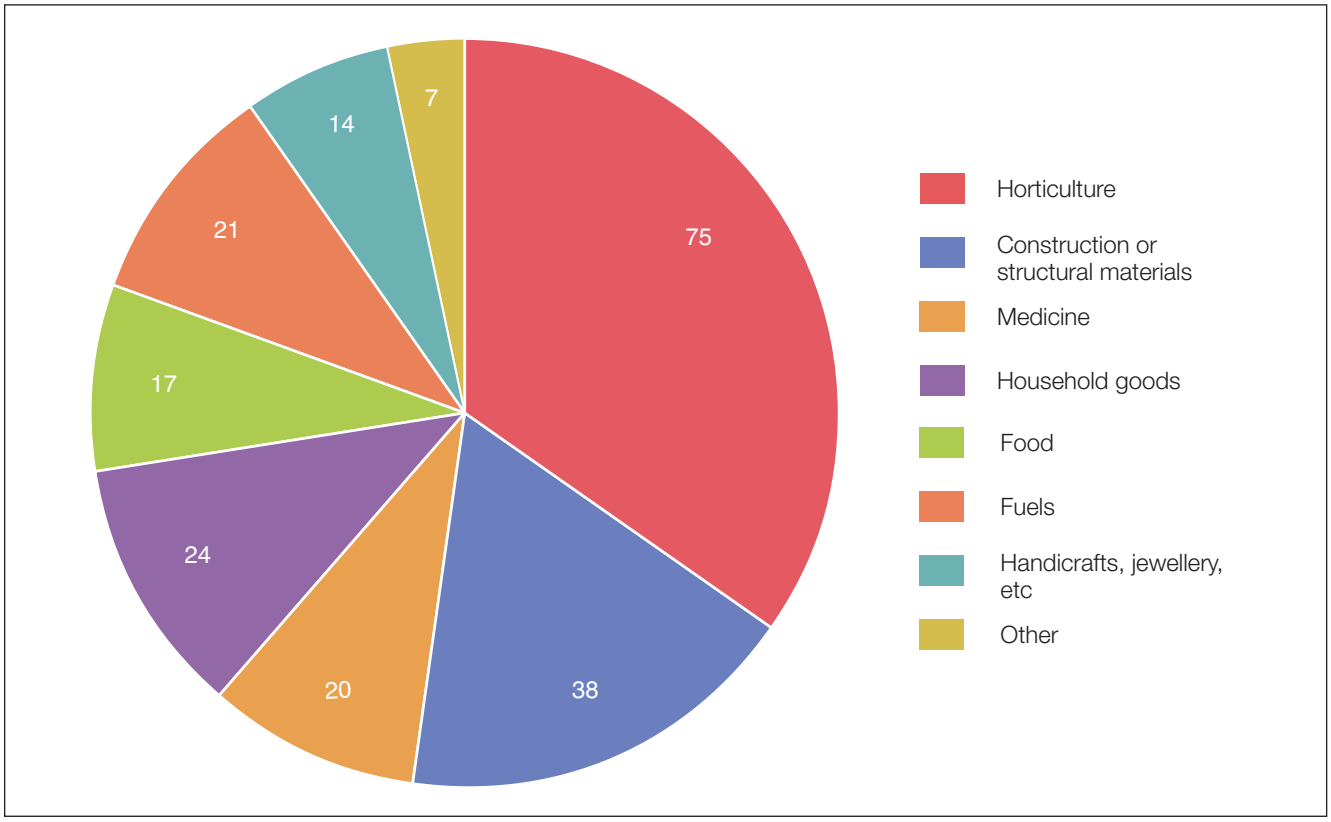


Figure 6: The recorded uses of Acer *species*

Uses

A high proportion of *Acer* species have an identified use (61%). Seven uses of *Acer* are recorded. They have a significant ornamental value with 48% of species being used in horticulture (Figure 6). They are used for timber, which can be used in construction and the manufacture of household goods and handicrafts. Sugar maples are used in the production of maple syrup. For more information on the sugar maples of North America see Case Study 3.

Acer forrestii *(Dan Hinkley)*

Ex situ survey of *Acer*

An *ex situ* survey allows us to assess the coverage of species within botanic gardens, arboreta and seed banks. *Ex situ* collections provide an important back up to protect species from extinction. Using BGCI's PlantSearch database (Box 3), we analysed the presence of *Acer* collections in botanic gardens, arboreta and seed banks across the world. A number of *Acer* species are planted extensively as ornamental due to their attractive autumn foliage.

For this *ex situ* survey to inform conservation action, cultivar and hybrid records (downloaded 22.01.2020) were excluded in this analysis; infraspecific records were included and assigned to their appropriate species. Collections held under homotypic synonyms were also included in the analysis. In total there are 8218 records of *Acer* species in collections, from 476 institutions in 54 countries (Table 4) (see Appendix 2 for a full list of institutions).

	2020 *ex situ* survey
Number of records	8218
Number of institutions	476
Number of countries	54

Table 4. Summary statistics for the Acer ex situ *survey*

Acer pseudosieboldianum
(©Arboretum Wespelaar – Koen Camelbeke)

Box 3: PlantSearch

BGCI's PlantSearch database is the only global database of plants in cultivation. It is available online, and it is free to contribute to and access. PlantSearch connects around 2,000 researchers and horticulturists to collections every year. Locations and gardens are not publicly revealed and requests can be made via blind email messages. PlantSearch is an easy way for *ex situ* collection holders to contribute to broader *ex situ* assessments, such as this survey. By uploading a taxa list to PlantSearch, collection holders can connect their collections to the global botanical community and find out the conservation value of their taxa, including the number of locations each taxon is known from globally and its current global conservation status. It is important for institutions with *ex situ* collections to share accurate data and keep it updated, and PlantSearch relies on collection holders to upload up-to-date taxa lists on an annual basis to ensure accuracy and enhance usability of the data.

www.bgci.org/plant_search.php

Species found in *ex situ* collections

Eighty-seven percent (137 species) of *Acer* species are in *ex situ* collections. Of the threatened species, 61% (22 species) are in *ex situ* collections. Currently only three Critically Endangered *Acer* species are recorded from *ex situ* collections (Figure 7). The 14 threatened species currently not in *ex situ* collections should be brought into collections as a priority (Table 5).

Acer tenellum *(Hugh Angus)*

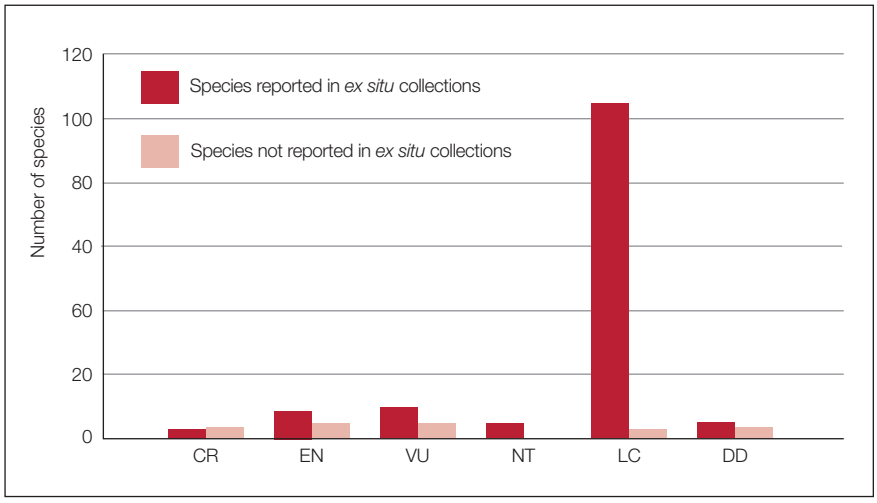


Figure 7. Presence and absence of Acer *species in* ex situ *collections per IUCN Red List Category*

Species	*Ex situ* collections	Red List Category
Acer binzayedii	0	CR
Acer hilaense	0	CR
Acer shihweii	0	CR
Acer undulatum	0	CR
Acer gracilifolium	0	EN
Acer leipoense	0	EN
Acer mazandaranicum	0	EN
Acer oligocarpum	0	EN
Acer paihengii	0	EN
Acer chunii	0	VU
Acer confertifolium	0	VU
Acer crassum	0	VU
Acer osmastonii	0	VU
Acer poliophyllum	0	VU

Table 5. Threatened Acer *species not found in* ex situ *collections*

Species	*Ex situ* collections	Red List Category
Acer saccharum	424	LC
Acer tataricum	398	LC
Acer palmatum	373	LC
Acer negundo	325	LC
Acer rubrum	269	LC

Table 6. Acer *species with the largest numbers of* ex situ *collections*

Left: Acer japonicum, *Right:* Acer monspessulanum *(©Arboretum Wespelaar – Koen Camelbeke)*

Target 8 of the Global Strategy for Plant Conservation calls for 75% of threatened plants to be held in *ex situ* collections (CBD, 2012), therefore *Acer* with 61% of threatened species in *ex situ* collections falls below this target. *Acer* does perform better than trees on average, where a study in 2015 (Rivers *et al*., 2015) show that only a quarter of threatened trees are found in *ex situ* collections.

Number of *ex situ* collections

Many *Acer* species are well represented in *ex situ* collections (Table 6), while others are found in fewer than ten collections, for example *Acer kwangnanense* (Endangered) is found in just one collection. Small numbers of *ex situ* collections are unlikely to capture the full genetic diversity of a wild population. Additionally, the occurrence of a species in a single collection, at one institution does not give protection for threatened taxa against stochastic events. *Ex situ* collections for *Acer* should be diverse and held at multiple institutions, for greatest conservation impact.

Although *Acer* species are widely represented in *ex situ* collections, analysis on their provenance needs to be undertaken to determine whether the material is genetically representative. As much genetic variation as possible must be captured within *ex situ* collections, to ensure enough evolutionary potential to allow adaption to changing conditions and its suitability for recovery and restoration programmes.

Conclusions and Recommendations

Acer circinatum *(Daniel Mosquin)*

The Red List of Acer aims to inspire and encourage conservation action by prioritising those species most at risk of extinction. This publication also directly contributes to the Global Strategy for Plant Conservation Target 2, which calls for "an assessment of the conservation status of all known plant species, as far as possible, to guide conservation action" by 2020 (CBD, 2012). This Red List also contributes to the Global Tree Assessment, an initiative to assess the conservation status of all the world's tree species by 2020 (Box 1). The Global Tree Assessment, led by BGCI and the IUCN SSC Global Tree Specialist Group, provides information to ensure that conservation efforts are directed at the right species so that no tree species becomes extinct.

Of both economic and cultural significance, many *Acer* species are valued for their timber and the sugar maples of North America are the source of maple syrup. Hundreds of horticultural selections, derived from numerous species, are grown in gardens around the world for their ornamental qualities. The autumn foliage of maples is eagerly anticipated around the world, so much so that in Japan an autumn foliage forecast map is produced each year. It is therefore of great importance that species of *Acer* are conserved.

Recommendations

Ensure threatened species of *Acer* are protected both *in situ* and *ex situ*

- The threatened species that are not currently found in *ex situ* collections should be brought into collections as a priority.
- An analysis of the provenance and genetic diversity present within *Acer ex situ* collections is needed to determine the conservation value of existing *ex situ* collections.
- Assess the extent to which *Acer* species are contained within protected areas and the potential to expand these sites to include more species where possible.
- Develop integrated conservation action plans for the most threatened species.

Increase understanding of *Acer* species in a changing world

- It would be valuable to further survey populations of *Acer* which are threatened and Data Deficient. Surveys in China, where there is a high number of threatened and Data Deficient species, would be particularly beneficial.
- It is essential to monitor the species of *Acer* assessed as Least Concern and Near Threatened as they may be experiencing slow decline. It should be ensured that this rate does not change and these populations are maintained.

Raise awareness, build local capacity and mobilise action.

- Use local nurseries to produce material for both conservation action and to ease the pressure on local wild populations.
- Build capacity in horticulture, propagation and conservation techniques to empower local partners and communities.

The Red List of Acer provides a baseline for the status of *Acer* species worldwide. It aims to provide information to prioritise conservation action to protect threatened *Acer* species from extinction. Equally, it aims to inspire action to improve the conservation status of these species and promote the importance of this iconic group of trees.

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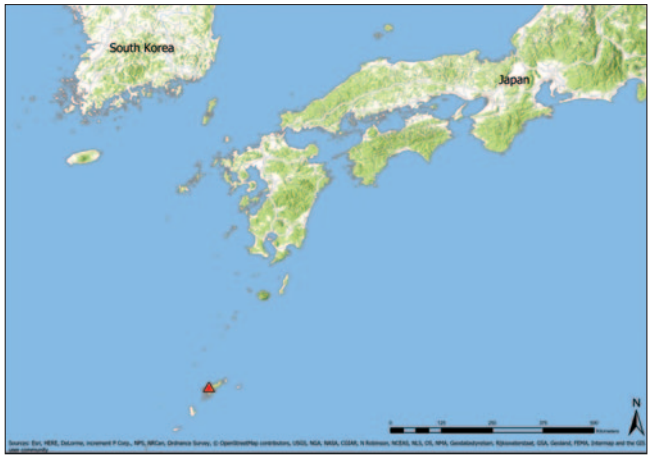
PART 2

A. *ACER* SPECIES EVALUATED AS THREATENED

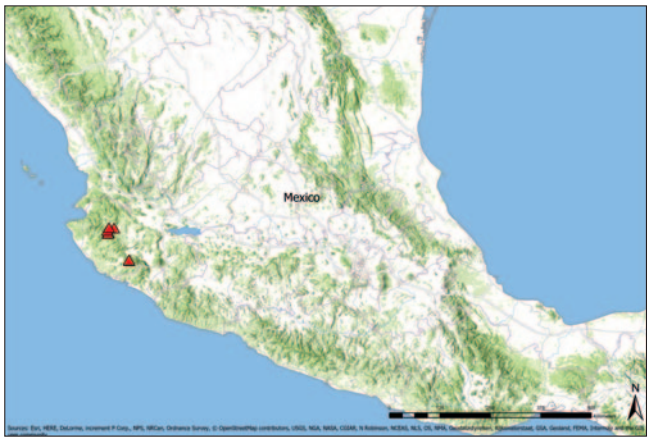
Acer amamiense T.Yamaz.
CR D
Japan
This Japanese tree species is endemic to Amami Oshima island, one of the Ryukyu Islands, Japan. The occurrence of this species is restricted to a small part of Amami Oshima island, which is only 712 km^2 in size and there are only ten known individuals. This species is therefore assessed here as Critically Endangered.



Acer amamiense *(Dan Crowley)*

Acer amamiense *(Hugh Angus)*

Acer binzayedii Vargas-Rodriguez
CR B1ab(i,ii,iii,v)+2ab(i,ii,iii,v)
Mexico
Acer binzayedii is a deciduous tree species, 20–30 m in height. The species is assessed as Critically Endangered. It is found in only two subpopulations in western Mexico and in total occupies less than 2 ha of remnant cloud forest. The species has a restricted distribution and only 90 mature individuals of the species have been observed but the total population is unlikely to be much larger. The population also suffers from low genetic diversity and there are only small numbers of seedlings and saplings; reducing the species regeneration potential. The species is further threatened by cattle grazing, logging and forest fires. The species is found within one protected area but more *in situ* and *ex situ* conservation efforts are required to reduce the extinction risk to this species.

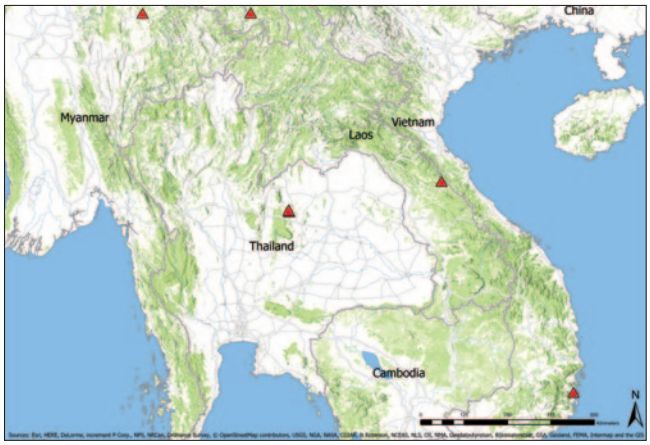


Acer calcaratum Gagnep.

VU A2c

China; Lao People's Democratic Republic (?); Myanmar (?); Thailand; Viet Nam

This small tree is found in subtropical montane forest of Thailand, Viet Nam and near the border in the very south of Yunnan, China. It is also, possibly found, in Lao PDR and Myanmar, but more identification and collection is needed. The distribution of the species is disjunct. The population is described as scattered, but no further population details are known. The threats are not fully understood, but the region suffered from significant habitat destruction and collection of firewood which will impact the species. There is also habitat loss in north east Thailand from over tourism. It is thought these threats have contributed to a decline of over 30% in the last three generations of the species. More information is needed on the localities of the species. It is assessed as Vulnerable.



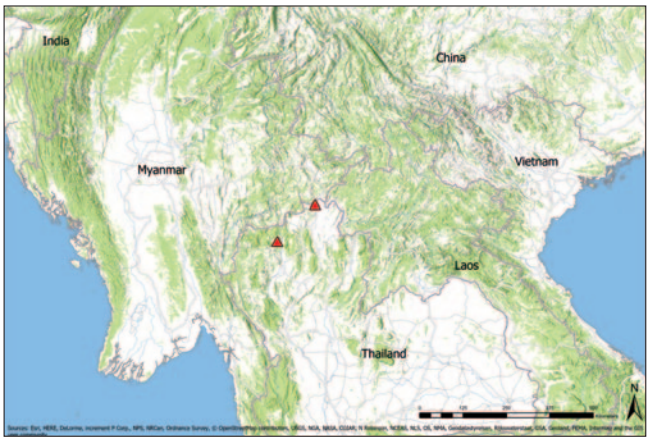
Acer calcaratum *(Hugh Angus)*

Acer chiangdaoense Santisuk

EN B1ab(iii)

Thailand

This species is considered endemic to Thailand. The species has a restricted geographic range, with an extent of occurrence estimated to be no larger than 1,306 km^2. In this range, forest cover is estimated to cover only 174 km^2. The species is known from fewer than five locations and its habitat is threatened by forest fires. The species is assessed as Endangered.



Acer chunii W.P.Fang

VU B2ab(iii)

China

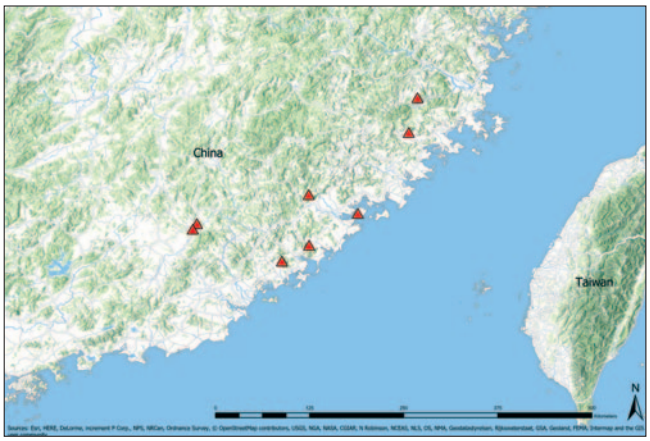
Acer chunii is a small, deciduous maple native to parts of Fujian, Guangdong and Sichuan in China. It is represented by three subpopulations with disjunct distributions. Its extent of occurrence (EOO) exceeds 100,000 km^2 but the area of occupancy is less than 2,000 km^2, and the species is understood to be declining and is threatened with habitat loss in at least parts of its range. Therefore this species listed as Vulnerable.

Acer confertifolium Merr. & F.P.Metcalf

VU A2c

China

Acer confertifolium is a shrub or small tree with a limited distribution in south-east China at relatively low elevations. It has an extent of occurrence (EOO) of at least 21,568 km^2, though it is under threat from habitat loss due to increased urbanization. The population is thought to have declined by at least 30% in the last three generations (60 years), therefore the species is listed here as Vulnerable.

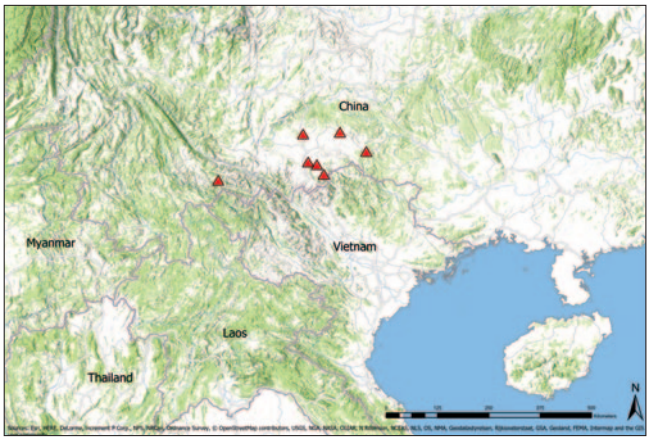


Acer crassum Hu & W.C.Cheng

VU B1ab(iii)

China

This evergreen maple species is found in a small area of fewer than ten locations, in south-east Yunnan, with an area of occupancy of 19,896 km^2. It is under pressure from ongoing deforestation, probably due to expanding agriculture. It is assessed as Vulnerable.



Acer divergens K.Koch & Pax ex Pax

VU B1ab(iii)

Turkey

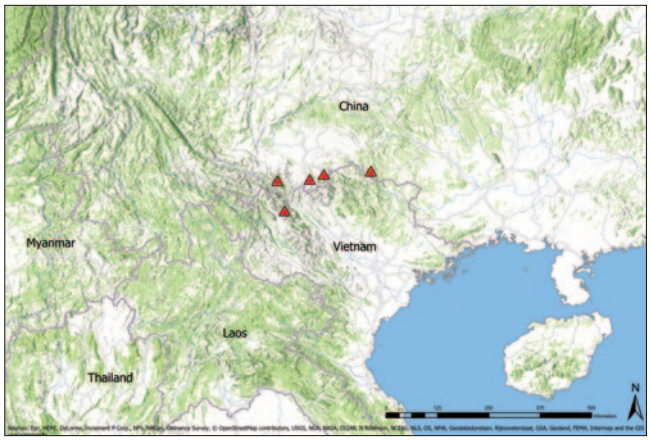
This species is a shrub or small tree endemic to northeastern Turkey. It occurs in 1–2 locations in the Çoruh Valley on dry slopes in shrubby vegetation with an extent of occurrence (EOO) of 9,600 km^2. The population is now under threat from the construction of a series of dams along the river. It is therefore here assessed as Vulnerable.

Acer fenzelianum Hand.-Mazz.

VU B1ab(iii)

China; Viet Nam

This tree species is found in northern Viet Nam and southern China. It is found in four locations and has a very restricted distribution with an extent of occurrence (EOO) of up to 8,081 km^2. The main threat to this species is deforestation for timber and cardamom production, leading to a continuing decline in the extent and quality of habitat. The species is therefore listed as Vulnerable.



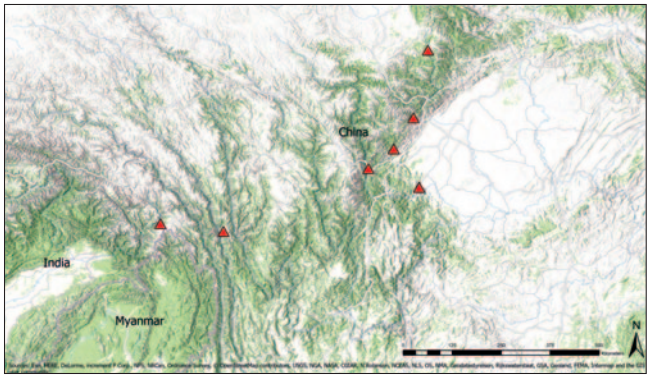
Acer fenzelianum *(©Jan De Langhe – Arboretum Wespelaar/Ghent UBG)*

Acer fulvescens Rehder

VU B2ab(iii)

China

Acer fulvescens is found in forests in Sichuan and south-east Xizang between 1,800–3,200. It has an estimated extent of occurrence (EOO) of at least 113,000 km^2. It has a known area of occupancy of 28 km^2, in an area of no more than 10 locations. In parts of its range it is under threat of habitat loss and is declining. It is assessed as Vulnerable.



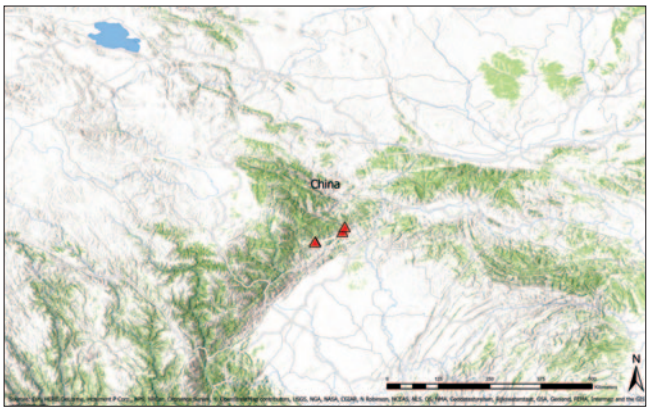
Acer fulvescens *(©Jan De Langhe – Arboretum Wespelaar/Ghent UBG)*

Acer gracilifolium W.P.Fang. & C.C.Fu

EN B1ab(iii)+2ab(iii)

China

Acer gracilifolium is a small, evergreen maple native to parts of Gansu and Sichuan provinces, China. It is known from at least two localities and is severely fragmented. It has an extent of occurrence (EOO) of 278 km^2 and a known area of occupancy (AOO) of 12 km^2. It is threatened with habitat loss. This species is assessed as Endangered.

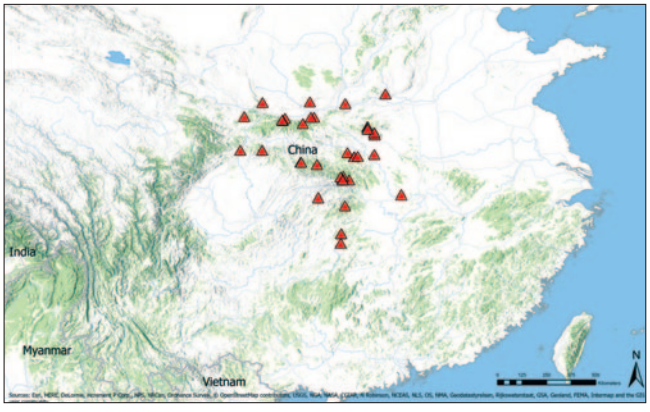


Acer griseum (Franch.) Pax

EN B2ab(iv,v); C2a(i); D

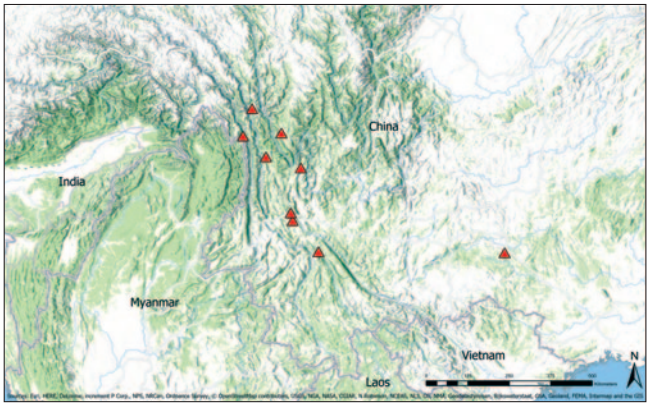
China

Acer griseum is endemic to China, where it is found over a wide native range. Despite this, the species has an area of occupancy of just 156 km^2, the population is severely fragmented and subject to ongoing decline. Most subpopulations contain fewer than 10 individuals with only one site boasting up to 100 individuals. Overall population size is not expected to exceed 250 trees. There are concerns that there is a lack of regeneration and recruitment of the species which could result in decline in the future. The species is found in *ex situ* collections and protected areas however in the latter the species may be at risk from being out competed by surrounding species. The Paperbark Maple is assessed as Endangered. It is recommended that greater genetic diversity is introduced into *ex situ* collections.

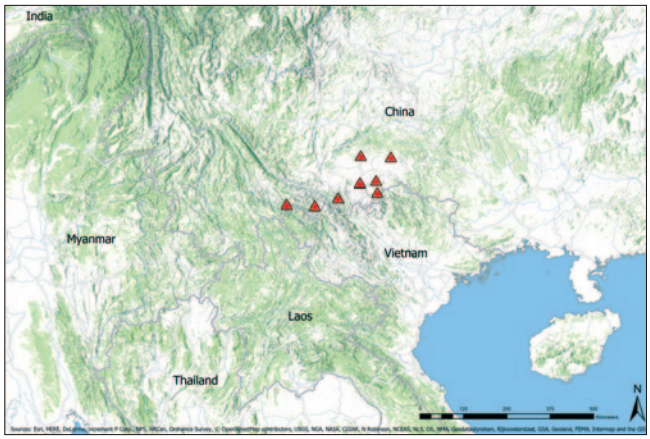


Acer hilaense Hu & W.C.Cheng
CR B1ab(iii)+2ab(iii)
China
Acer hilaense is an evergreen maple native to west Yunnan, China. Specimens have only been collected once, in 1938, and it has not been seen since. If the species still exists, the area of occupancy and extent of occurrence is small (4 km^2). The collection locality is now degraded due to urbanisation and has been widely explored, though reportedly this species has not specifically been looked for. It has been suggested that it could be Extinct in the Wild, though it is said to be grown as an ornamental in Yunnan. It is assessed as Critically Endangered, Possibly Extinct.

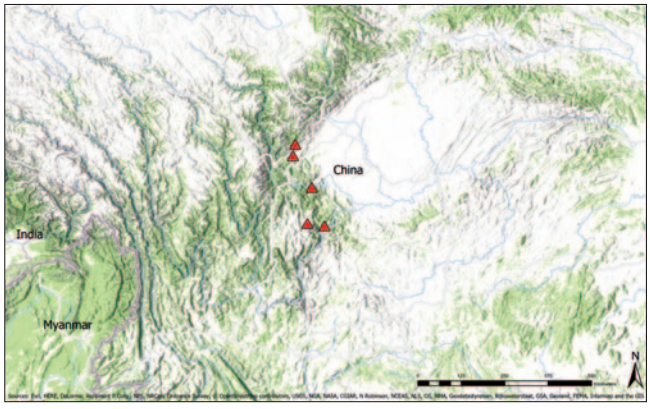
Acer kungshanense Fang & C.Y.Chang
VU B2ab(iii)
China
Acer kungshanense is a large, deciduous maple that is found in valleys within mixed forests between 2,000–3,200 m asl in northwest and southern Yunnan. It has a large extent of occurrence (EOO), though with a disjunct distribution, and a small area of occupancy (AOO). It is subject to decline due to urbanization and has fewer than 10 locations. It is assessed as Vulnerable.



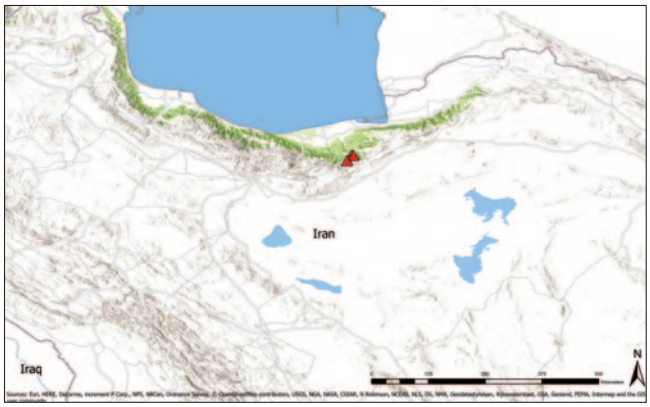
Acer kwangnanense Hu & W.C.Cheng
EN B2ab(iii)
China; Viet Nam (?)
Acer kwangnanense is a small, evergreen maple which occurs in southern China. It was thought that it might also be present in Viet Nam, though this appears unlikely. Parts of its range are reportedly degraded though the species was understood to be in some well protected areas. It has an area of occupancy (AOO) of less than 40 km^2 and has fewer than ten locations. It is severely fragmented and suitable habitat for the species is declining. It is assessed as Endangered.



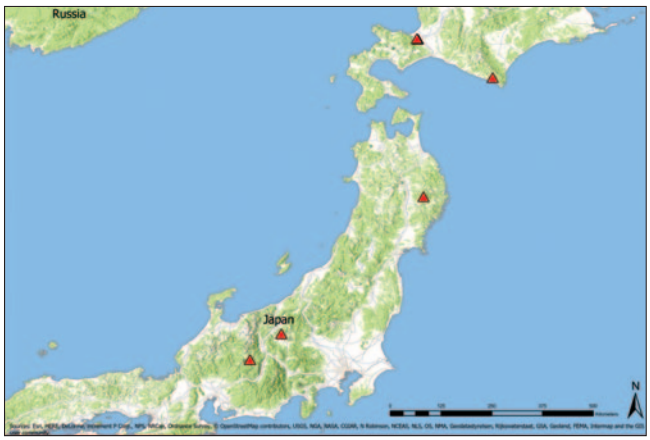
Acer leipoense W.P.Fang & Soong
EN A2c; B2ab(iii)
China
Acer leipoense is a small, deciduous maple with a restricted range in Sichuan Province, China. It is believed to have an extent of occurrence (EOO) of 6,177 km^2 and an area of occupancy (AOO) of 20 km^2, though there are no recent reports in parts of its range. There has been a decline in the population size of at least 50% over three generations, driven by urbanisation. Further studies into its status in the wild are recommended. Using currently available data the species is globally assessed as Endangered.



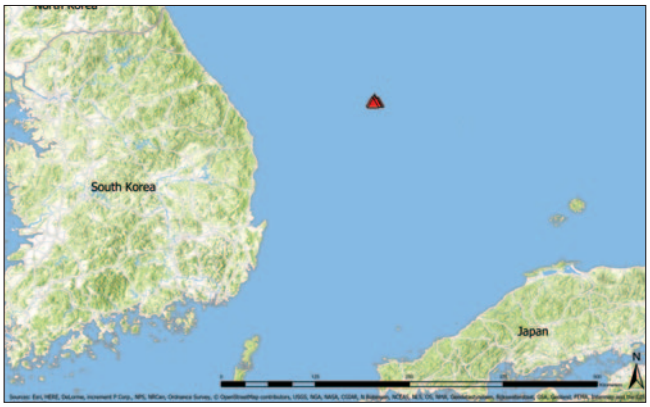
Acer mazandaranicum Amini, H.Zare & Assadi
EN B1ab(iii)+2ab(iii)
Islamic Republic of Iran
This species is a tall tree endemic to northern Iran. It has a restricted range with an area of occupancy (AOO) of only 12 km^2 and an extent of occurrence (EOO) of just 28 km^2. There is no information on the population size or trend but the species is at risk from habitat loss and degradation. It occurs in the Hyrcanian forest which is declining due to logging, increased occurrence of fire and invasive species, amongst other uses of the forest. The species is assessed as Endangered. It is recommended that more information is gathered on the species ecology and population.



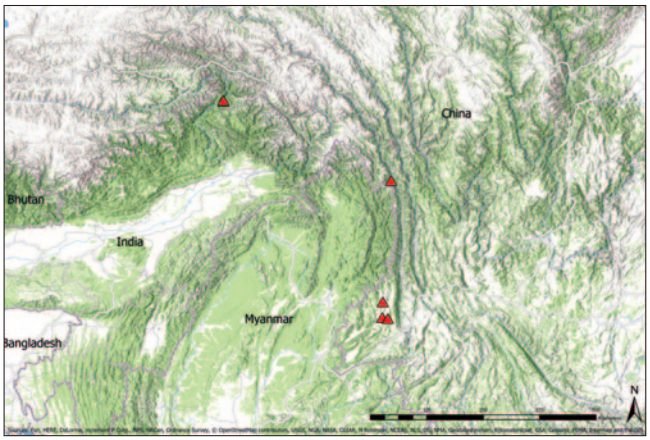
Acer miyabei Maxim.
VU C1+2a(i)
Japan
This tree species is native to Japan. It is comprised of two infraspecific taxa: *A. miyabe*i Maxim. subsp. *miyabei* f. *miyabei* and *A. miyabei* subsp. *miyabei* f. *shibatae* (Nakai) K. Ogata. It is assessed here as Vulnerable as it is thought that there are less than 10,000 mature individuals and that the largest subpopulations contain less than 1,000 mature individuals. There is at least a continuing decline in the number of mature individuals in three generations of the species.



Acer okamotoanum Nakai
VU D1+2
Republic of Korea
This species is endemic to Ullong-do, an island east of mainland South Korea. The extent of occurrence is 18-28 km^2 and the area of occupancy is 28 km^2. The population is estimated to be fewer than 1,000 individuals. The main threats to the species are logging and forest conversion (past threats) and increasing tourism and associated increases in infrastructure (future threats). Stochastic events such as typhoons and other extreme weather are a real risk that may drive this species to become Critically Endangered in the near future, due to its restricted range and population size. The species therefore qualifies for Vulnerable.



Acer oligocarpum W.P.Fang & L.C.Hu
EN B2ab(iii)
China
Acer oligocarpum is a small, deciduous maple with a small, fragmented range in southwest China. Its population size is believed to be small and has reportedly experienced a decline. The species has a restricted and fragmented geographic range, with an extent of occurrence (EOO) of just over 50,000 km^2 and an area of occupancy (AOO) of at least 24 km^2. The species is threatened by urbanisation. It is assessed as Endangered.



Acer osmastonii Gamble

VU B2ab(iii)

India

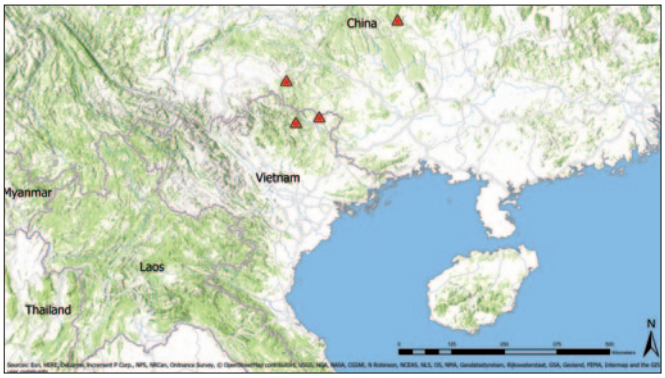
Acer osmastonii is a large tree species endemic to the Himalayas. There is little information on the population of this species but it is assumed to be small and in decline. There are threats to the species habitat from a growing human population putting pressure on forest hills for settlement space. The species is recorded from three states, where it is threatened and therefore currently the species is counted from three locations. The area of occupancy (AOO) of the species could also be small and below 500 km^2 however, the species has been poorly collected. Upon further collection both AOO and number of locations may be larger. Therefore, for this assessment of the species, higher estimates are taken as 500 to 2,000 km^2 for AOO and 5+ locations. The species is assessed as Vulnerable.

Acer paihengii W.P.Fang

EN B2ab(iii)

China; Viet Nam

Acer paihengii is an evergreen maple that has a restricted distribution in Yunnan, China, as well as northern Viet Nam, where its presence has recently been confirmed. It grows in mixed forests on limestone substrates, in association with members of Pinaceae, at least in part of its range. It has an extent of occurrence (EOO) of less than 20,000 km^2 and an area of occupancy (AOO) of less than 20 km^2 and has less than five locations. It is threatened with habitat loss in at least part of its range and is assessed as Endangered.

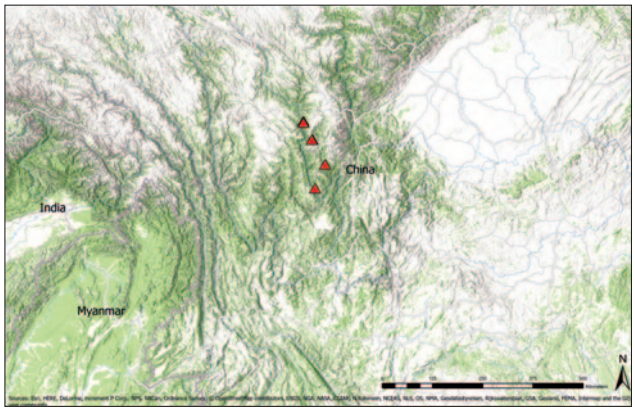


Acer pentaphyllum Diels

CR A4c

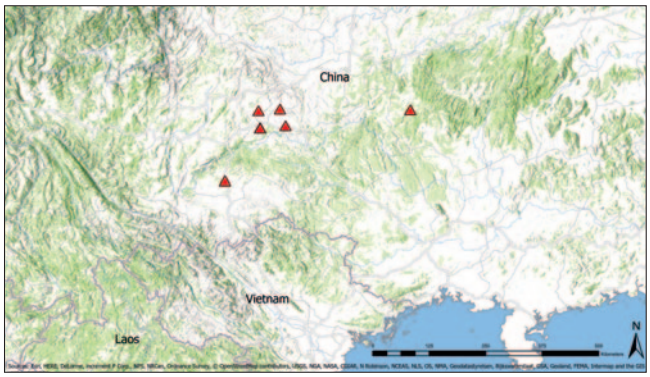
China

This species is endemic to Sichuan Province, China. It occurs at high altitudes and is only known from four sites. The overall population is estimated to contain only 500 individuals. There are multiple threats to the species due to a rapidly growing human population including overgrazing, overharvest for firewood and the construction of roads. There is potential that the construction of a dam, or the occurrence of fire, or a large landslide could destroy all individuals of the tree in one event. Regeneration in the wild is also poor but trees are producing viable seeds. The species has been propagated *ex situ* and seed collections from several trees have been made. Due to threats to the species and the potential loss of the species from Yajiang County it is estimated that the population will experience a decline of 80% over a three generation window and across one generation, 25% of the population has been lost. The species is assessed as Critically Endangered.

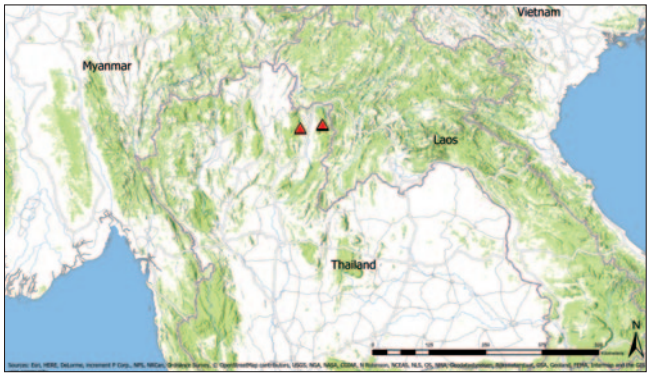


Acer pentaphyllum *(Christophe Crock)*

Acer poliophyllum W.P.Fang & Y.T.Wu
VU B2ab(i,ii,iii)
China
Acer poliophyllum is a small, evergreen maple native to parts of southern China, with a fragmented population. It has an extent of occurrence (EOO) of 23,764 km^2 and an area of occupancy (AOO) of 24 km^2, with the current herbarium record. It is threatened with habitat loss and is assessed as Vulnerable as it occurs in six locations.



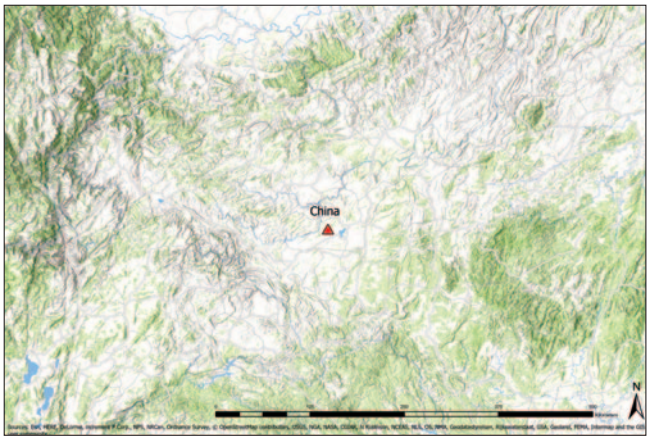
Acer pseudowilsonii Y.S.Chen
EN B1ab(iii)+2ab(iii)
Thailand
This is a tall tree endemic to Thailand. It is only known from two national parks, namely Doi Phu Kha National Park and Nanthaburi National Park in Nan province. The population size is not known however habitat quality and area is known to be declining in both National Parks. This occurs due to the expansion of tourist attractions and development of the road network. There is a further threat from fire. The species is known from very few herbarium records which give the species an extent of occurrence (EOO) of 162.9 km^2 and an area of occupancy (AOO) of 28 km^2. These measures are not anticipated to exceed the boundaries for a threatened category upon greater collection effort. The species is considered to be present in two locations as it is at risk in both National Parks. The species is assessed as Endangered. More information on the species population and rate of decline would be valuable.



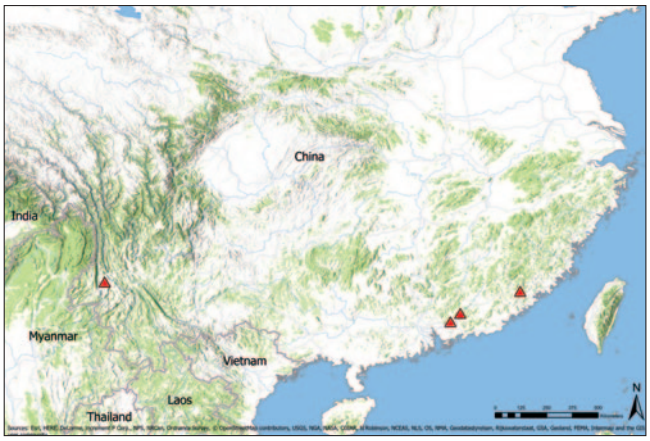
Acer pycnanthum K.Koch
VU C2a(i)
Japan
This Japanese tree species is restricted to discrete seepage and floodplain ecosystems in Gifu, Nagano and Aichi prefectures around Mount Ena but also found in Omachi City, Nagano prefecture. There are an estimated 1,500 mature individuals remaining distributed between approximately 60 localities. The size of individual subpopulations is typically small – often less than 20 individuals. These subpopulations are under threat from habitat loss to development and expansion of commercial forestry. It is assessed here as Vulnerable.

Acer pycnanthum *(Dan Crowley)*

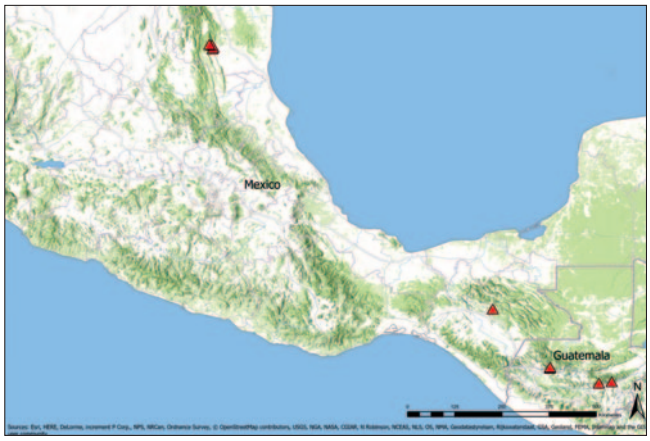
Acer shihweii F.Chun & W.P.Fang
CR B1ab(iii)+2ab(iii)
China
This species is known only from a single specimen collected in 1935 from Pingba, Guizhou, China. It is known from a single location, and the area of occupancy is 4 km^2, and the extent of occurrence will be less than 100 km^2. The Pingba region is affected by habitat conversion to agriculture, urbanisation and mining - leading to a decline in the extent and quality of the habitat. It is listed as Critically Endangered, Possibly Extinct.



Acer sino-oblongum F.P.Metcalf
EN B2ab(ii,iii)
China; Hong Kong
Acer sino-oblongum is an evergreen small maple which occurs at low altitudes in Guangdong, China and Hong Kong. It has a limited, and fragmented, distribution. It is threatened with habitat loss, particularly due to urbanization. It is assessed as Endangered.

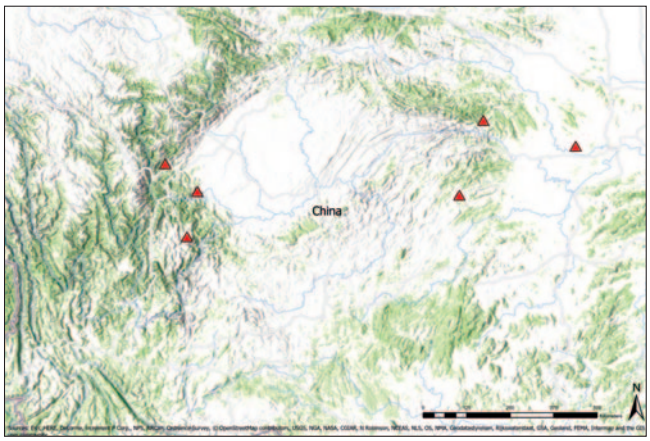


Acer skutchii Rehder
CR B2ab(iii,v)
Guatemala; Mexico
Acer skutchii is a deciduous tree species, 20–30 m tall. Only five subpopulations of the species exist, two of which are in Mexico and the remaining three are found in Guatemala. The distribution is considered disjunct. The estimated area of occupancy (AOO) for this species is between 0.0345 km^2 and 20 km^2. The species has a small, fragmented population which is genetically isolated as there is evidence that gene flow existed between this populations only until the last glaciation event. The species is threatened by conversion of habitat to agriculture such as coffee and corn farms and within Guatemala the species is also at risk from mining. The species is further threatened by the increased occurrence of fire and climate change. *Acer skutchii* is globally assessed as Critically Endangered. It is essential that the species habitat is effectively protected and that *ex situ* collections from Guatemalan populations are produced and propagated. It is also recommended that the forest sites be regenerated.



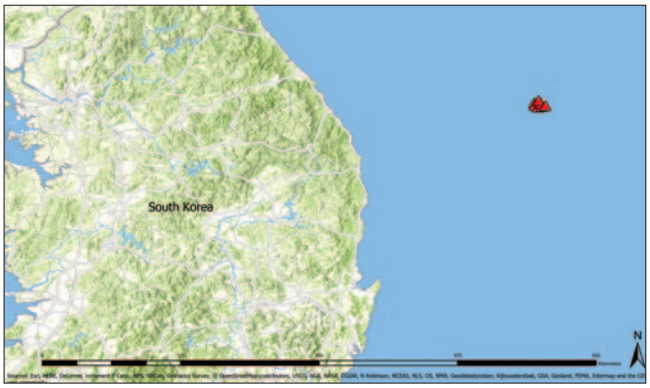
Acer skutchii *(Yalma Luisa Vargas Rodríguez)*

Acer sutchuenense Franch.
EN B2ab(i,ii)
China
Acer sutchuenense is a rare maple which grows in small subpopulations in central China, some of which occur in protected areas. It has an extent of occurrence (EOO) of 184,007 km^2 and an estimated area of occupancy (AOO) of 24 km^2. It is assessed as Endangered based on its AOO.

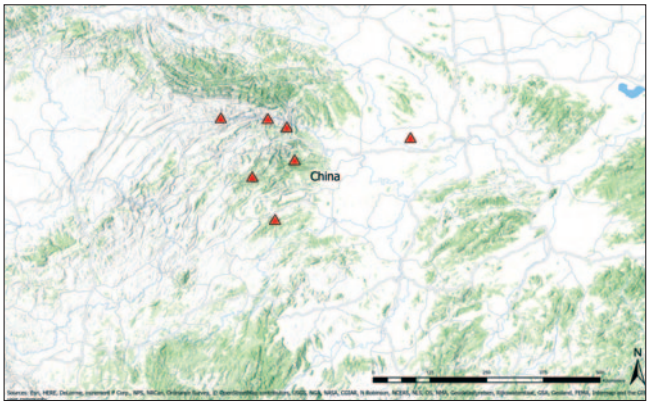


Acer sutchuenense *(©Arboretum Wespelaar – Koen Camelbeke)*

Acer takesimense Nakai
VU D2
Republic of Korea
This species is endemic to Ullong-do, an island east of mainland South Korea. The extent of occurrence is 26 km^2 and the area of occupancy 24 km^2. The population is widespread across the island but considered scarce. The main threats to the species are logging and forest conversion (past threats) and increasing tourism and associated increases in infrastructure (future threats). Stochastic events such as typhoons and other extreme weather are a real risk that may drive this species to become Critically Endangered in the near future, due to its restricted range and population size. The species therefore qualifies for Vulnerable D2.



Acer tenellum Pax
EN A2c
China
This species is endemic to China. It is only known from two provinces; Sichuan and Hubei. The species is threatened by anthropogenic pressures on the landscape such as the loss of habitat to the construction of the Three Gorges Dam on the Yangtze River. The varieties of the species are assessed to be experiencing severe population decline. Here it is inferred that the population of the species will decline by 50 to 80% over three generations. The species is assessed as Endangered.



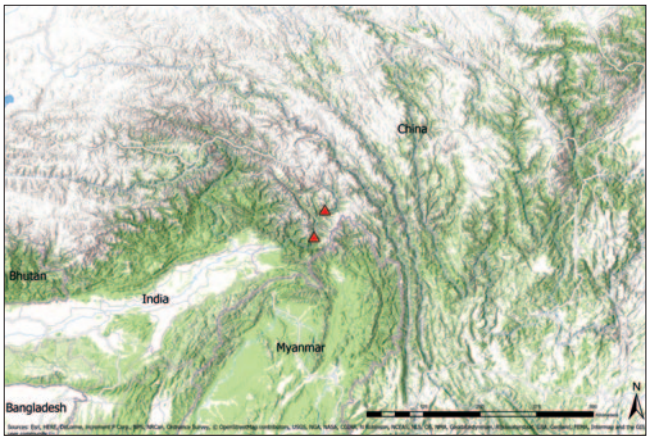
Acer tenellum *(Hugh Angus)*

Acer tibetense W.P.Fang

VU B1ab(iii)

China; India

This species is native to north east India and Xizang, China. The species has a narrow geographic range, with an extent of occurrence expected to be less than 10,000 km^2 based on reports of the species in the literature and the current herbarium record. The species is threatened by habitat loss and conversion. It is considered to be found in fewer than 10 locations. More information on localities and the scale of threats to the species would be valuable. It is assessed as Vulnerable.



Acer tibetense *(©Jan De Langhe – Arboretum Wespelaar/Ghent UBG)*

Acer tibetense *(Hugh Angus)*

Acer undulatum Pojark.

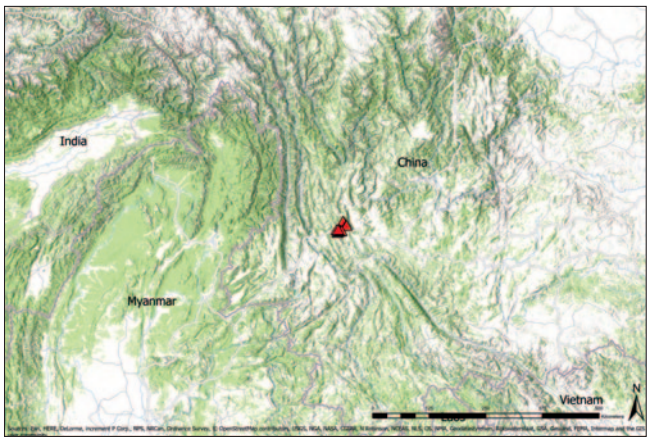
CR B1ab(iii)+2ab(iii)

Turkey

This small tree species is only known from a single location, the top of Babadag Mountain near Fethiye in the province of Mugla, Turkey. With Fethiye being one of the top tourist destinations in Turkey and Babadag Mountain also being popular, it is threatened by the high number of visitors to the area resulting in damage to its habitat. It is also impacted by the Shothole borer. This species has a small area of occupancy and extent of occurrence both of which are declining in area. The species is of serious conservation concern and listed as Critically Endangered.

Acer yangbiense Y.S.Chen & Q.E.Yang
EN B1ab(iii,v)+2ab(iii,v); C2a(i,ii)
China

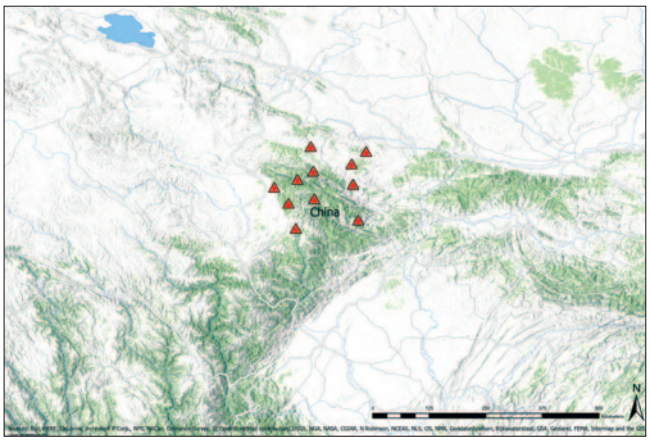
Acer yangbiense is a very rare species of maple. It is endemic to Yunnan Province, China. In 2003 surveys only identified 5 trees of the species, however a wider survey in 2016 identified 577 trees. The species has a narrow range, with an area of occupancy of only 64 km^2 and an extent of occurrence of 218 km^2. It is distributed across two mountains. Sixty-two trees are found across three localities in the Cangshan National Nature Reserve while the remaining 515 individuals are found outside protected areas on the Laoseshang Mountains where they are threatened by anthropogenic activities. This includes the development of roads, agriculture and cutting of the trees. The population has an inverse J structure, with most trees below 30 cm dbh; however only 4 seedlings were identified in 2016, so regeneration of the species may be poor. The overall number of mature individuals is expected to be below 500, with most of these being found in just the Laoseshang mountain subpopulation. The species is globally assessed as Endangered.



Acer yangbiense *(Weibang Sun)*

Acer yui W.P.Fang
EN B2ab(iii)
China

Acer yui is a small, deciduous maple from Gansu and Sichuan provinces, China. It is reported to have a fragmented distribution and is threatened by habitat degradation and loss. Based on these factors and the small area of occupancy (AOO) of the species it is evaluated as Endangered.



Acer yui *(Anthony S. Aiello)*

B. *Acer* SPECIES EVALUATED AS NEAR THREATENED

Acer erythranthum Gagnep.
Viet Nam

Acer miaotaiense P.C.Tsoong
China

Acer pauciflorum W.P.Fang
China

Acer tonkinense Lecomte
China; Lao People's Democratic Republic (?); Myanmar; Thailand (?); Viet Nam

Acer wangchii W.P.Fang
China

Acer tonkinense *(Dan Crowley)*

Acer miaotaiense *(Dan Crowley)*

C. *Acer* SPECIES EVALUATED AS DATA DEFICIENT

Acer anhweiense W.P.Fang & M.Y.Fang
China

Acer hookeri Miq.
Bhutan; India; Nepal

Acer lungshengense W.P.Fang & L.C.Hu
China

Acer miaoshanicum W.P.Fang
China

Acer pilosum Maxim.
China

Acer pinnatinervium Merr.
China; India; Lao People's Democratic Republic (?); Myanmar; Thailand; Viet Nam

Acer sosnowskyi Doluch.
Georgia

Acer turkestanicum Pax
Afghanistan; Islamic Republic of Iran (?); Kyrgyzstan; Pakistan; Tajikistan; Turkmenistan; Uzbekistan

Acer yinkunii W.P.Fang
China; Viet Nam (?)

D. *Acer* species evaluated as least concern

Acer acuminatum Wall. ex D.Don
China; India; Nepal; Pakistan

Acer acutum W.P.Fang
China

Acer albopurpurascens Hayata
Province of China, Taiwan

Acer amoenum Carrière
Japan

Acer amplum Rehder
China; Viet Nam

Acer argutum Maxim. ex Miq.
Japan

Acer barbinerve Maxim. ex Miq.
China; Democratic People's Republic of Korea; Russian Federation

Acer buergerianum Miq.
China; Japan; Province of China, Taiwan

Acer caesium Wall. ex Brandis
China; India; Nepal; Pakistan

Acer caesium *(Christophe Crock)*

Acer campbellii Hook.f. & Thomson ex Hiern
Bhutan; China; India; Myanmar; Nepal; Viet Nam

Acer campbellii *(Douglas Justice)*

Acer campestre L.
Albania; Algeria; Andorra; Armenia; Austria; Azerbaijan; Belarus; Belgium; Bosnia and Herzegovina; Bulgaria; Croatia; Czech Republic; Denmark France; Georgia; Germany; Greece; Hungary; Islamic Republic of Iran; Italy; Liechtenstein; Luxembourg; Moldova; Monaco; Montenegro; Netherlands; North Macedonia; Poland; Portugal; Romania; Russian Federation; San Marino; Serbia; Slovakia; Slovenia; Spain; Sweden; Switzerland; Tunisia; Turkey; United Kingdom

Acer capillipes Maxim. ex Miq.
Japan

Acer cappadocicum Gled.
Armenia; Azerbaijan; Bhutan; China; Georgia; India; Islamic Republic of Iran; Nepal; Pakistan; Turkey

Acer cappadocicum *(Hugh Angus)*

Acer carpinifolium Siebold & Zucc.
Japan

Acer caudatum Wall.
Bhutan; China; India; Myanmar; Nepal

Acer chienii Hu & W.C.Cheng
China; India; Myanmar

Acer chienii
(©Jan De Langhe – Arboretum Wespelaar/Ghent UBG)

Acer chingii Hu
China

Acer circinatum Pursh
Canada; United States

Acer cissifolium (Siebold & Zucc.) K.Koch
Japan

Acer cordatum Pax
China

Acer coriaceifolium H.Lév.
China; Province of China, Taiwan

Acer crataegifolium Siebold & Zucc.
Japan

Acer crataegifolium *(Hugh Angus)*

Acer davidii Franch.
China; Myanmar; Viet Nam

Acer davidii *(©Arboretum Wespelaar – Koen Camelbeke)*

Acer diabolicum Blume ex K.Koch
Japan

Acer distylum Siebold & Zucc.
Japan

Acer distylum *(Dan Hinkley)*

Acer duplicatoserratum Hayata
China; Province of China, Taiwan

Acer elegantulum W.P.Fang & P.L.Chiu
China

Acer erianthum Schwer.
China

Acer erianthum *(Hugh Angus)*

Acer fabri Hance
China; Viet Nam

Acer flabellatum Rehder
China; Myanmar (?); Viet Nam

Acer floridanum Pax
United States

Acer forrestii Diels
China

Acer forrestii *(Dan Crowley)*

Acer glabrum Torr.
Canada; Mexico; United States

Acer granatense Boiss.
Morocco; Spain

Acer granatense *(Dan Crowley)*

Acer grandidentatum Nutt.
Mexico; United States

Acer heldreichii Orph. ex Boiss.
Albania; Armenia; Azerbaijan; Bosnia and Herzegovina; Bulgaria; Greece; Georgia; Iran; Montenegro; North Macedonia; Serbia; Turkey

Acer henryi Pax
China

Acer heptaphlebium Gagnep.
Lao People's Democratic Republic; Viet Nam

Acer hyrcanum Fisch. & C.A.Mey.
Albania; Armenia; Azerbaijan; Bosnia and Herzegovina; Bulgaria; Georgia; Greece; Islamic Republic of Iran; Lebanon; Montenegro; Serbia; Syrian Arab Republic; Turkey; Ukraine

Acer insulare Makino
Japan

Acer japonicum Thunb.
Japan

Acer kawakamii Koidz.
Taiwan, Province of China

Acer komarovii Pojark.
China; Democratic People's Republic of Korea; Russian Federation

Acer kuomeii W.P.Fang & M.Y.Fang
China; Viet Nam (?)

Acer kweilinense W.P.Fang & M.Y.Fang
China

Acer laevigatum Wall.
Bhutan; China; India; Myanmar; Nepal; Viet Nam

Acer laevigatum *(Dan Hinkley)*

Acer laurinum Hassk.
Cambodia; China; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Philippines; Thailand; Timor-Leste; Viet Nam

Acer laxiflorum Pax
China

Acer leucoderme Small
United States

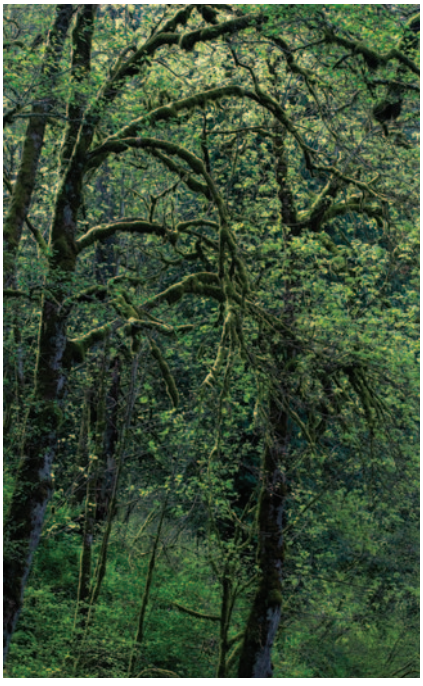
Acer lobelii Ten.
Italy

Acer longipes Franch. ex Rehder
China

Acer longipes
(©Jan De Langhe – Arboretum Wespelaar/Ghent UBG)

Acer lucidum Metcalf
China

Acer macrophyllum Pursh
Canada; United States



Acer macrophyllum *(Daniel Mosquin)*

Acer macrophyllum *(Douglas Justice)*

Acer mandshuricum Maxim.
China; Democratic People's Republic of Korea; Republic of Korea; Russian Federation

Acer mandshuricum
(©Arboretum Wespelaar – Koen Camelbeke)

Acer maximowiczianum Miq.
China; Japan

Acer maximowiczii Pax
China

Acer metcalfii Rehder
China; Viet Nam (?)

Acer metcalfii *(Dan Crowley)*

Acer micranthum Siebold & Zucc.
Japan

Acer micranthum *(Hugh Angus)*

Acer monspessulanum L.
Albania; Andorra; Armenia; Azerbaijan; Bosnia and Herzegovina; Bulgaria; Croatia; France; Georgia; Germany; Greece; Islamic Republic of Iran; Iraq; Israel; Italy; Lebanon; Montenegro; Morocco; North Macedonia; State of Palestine; Portugal; Romania; Serbia; Slovenia; Spain; Switzerland; Tunisia Turkey; Ukraine

Acer monspessulanum *(Dan Crowley)*

Acer morifolium *(Dan Crowley)*

Acer morifolium Koidz.
Japan

Acer negundo L.
Canada; Guatemala; Honduras; Mexico; United States

Acer nigrum F. Michx.
Canada; United States

Acer nipponicum H.Hara
Japan

Acer oblongum Wall. ex DC.
Bhutan; China; India; Japan; Lao People's Democratic Republic; Myanmar; Nepal; Pakistan; Thailand; Viet Nam

Acer obtusifolium Sm.
Cyprus; Israel; Lebanon; Syrian Arab Republic

Acer oliverianum Pax
China; Viet Nam

Acer opalus Mill.
Albania; Algeria; Croatia; France; Germany; Greece; Hungary; Italy; Montenegro; Morocco; Serbia; Slovenia; Spain; Switzerland

Acer opalus *(Dan Crowley)*

Acer palmatum Thunb.
China; Japan; Republic of Korea; Taiwan, Province of China

Acer paxii Franch.
China

Acer paxii *(Hugh Angus)*

Acer pectinatum Wall. ex G.Nicholson
Bhutan; China; India; Myanmar; Nepal

Acer pectinatum *(Christophe Crock)*

Acer pensylvanicum L.
Canada; United States

Acer pensylvanicum *(Hugh Angus)*

Acer pentapomicum Stewart ex Brandis
Afghanistan; India; Pakistan; Tajikistan

Acer pictum Thunb.
China; Japan; Democratic People's Republic of Korea; Republic of Korea; Mongolia; Russian Federation; Viet Nam

Acer platanoides L.
Albania; Andorra; Armenia; Austria; Azerbaijan; Belarus; Bosnia and Herzegovina; Bulgaria; Croatia; Czech Republic; Estonia; Finland; France; Georgia; Germany; Greece; Hungary; Islamic Republic of Iran; Italy; Latvia; Lithuania; Moldova; Monaco; Montenegro; North Macedonia; Norway; Poland; Romania; Russian Federation; San Marino; Slovakia; Slovenia; Spain; Sweden; Switzerland; Turkey; Ukraine

Acer pseudoplatanus L.
Albania; Andorra; Austria; Azerbaijan; Belgium; Bosnia and Herzegovina; Bulgaria; Croatia; Czech Republic; France; Georgia; Germany; Greece; Hungary; Italy; Liechtenstein; Luxembourg; Moldova; Montenegro; Netherlands; North Macedonia; Poland; Portugal; Romania; Russian Federation; Serbia; Slovakia; Slovenia; Spain; Switzerland; Turkey; Ukraine

Acer pseudosieboldianum (Pax) Kom.
China; Democratic People's Republic of Korea; Republic of Korea; Russian Federation

Acer pseudosieboldianum
(©Arboretum Wespelaar – Koen Camelbeke)

Acer pubinerve Rehder
China

Acer pubipetiolatum Hu & W.C.Cheng
China

Acer rubescens Hayata
Taiwan, Province of China

Acer rubrum L.
Canada; United States

Acer rubrum *(Philippe de Spoelberch)*

Acer rufinerve Siebold & Zucc.
Japan

Acer saccharinum L.
Canada; United States

Acer saccharum Marshall
Canada; United States

Acer saccharum
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Acer sempervirens L.
Greece; Turkey

Acer serrulatum Hayata
Taiwan, Province of China

Acer serrulatum *(Dan Hinkley)*

Acer shenkanense W.P.Fang ex C.C.Fu
China

Acer shirasawanum Koidz.
Japan

Acer sieboldianum Miq.
Japan

Acer sieboldianum *(Philippe de Spoelberch)*

Acer sikkimense Miq.
Bhutan; China; India; Myanmar; Nepal; Viet Nam

Acer sinense Pax
China

Acer sinopurpurascens W.C.Cheng
China

Acer spicatum Lam.
Canada; United States

Acer stachyophyllum Hiern
Bhutan; China; India; Myanmar; Nepal

Acer stachyophyllum *(Douglas Justice)*

Acer sterculiaceum Wall.
Bhutan; China; India; Viet Nam

Acer sterculiaceum *(Douglas Justice)*

Acer sycopseoides Chun
China

Acer tataricum L.
Afghanistan; Albania; Austria; Bosnia and Herzegovina; Bulgaria; China; Croatia; Czech Republic; Georgia; Greece; Hungary; Islamic Republic of Iran, Iraq; Japan; Republic of Korea; Kyrgyzstan; Mongolia; Montenegro; North Macedonia; Romania; Russian Federation; Serbia; Slovakia; Slovenia; Tajikistan; Turkey; Turkmenistan; Ukraine; Uzbekistan

Acer tegmentosum Maxim.
China; Democratic People's Republic of Korea; Republic of Korea; Russian Federation

Acer tenuifolium Koidz.
Japan

Acer thomsonii Miq.
Bhutan; China; India; Myanmar; Nepal; Thailand

Acer triflorum Kom.
China; Democratic People's Republic of Korea; Republic of Korea

Acer truncatum Bunge
China; Democratic People's Republic of Korea; Republic of Korea

Acer tschonoskii Maxim.
Japan

Acer tschonoskii *(Hugh Angus)*

Acer tsinglingense W.P.Fang & C.C.Hsieh
China

Acer tutcheri Duthie
China; Hong Kong; Province of China, Taiwan

Acer ukurunduense Trautv. & C.A.Mey.
China; Japan; Democratic People's Republic of; Korea, Republic of Korea; Russian Federation

Acer ukurunduense
(© Arboretum Wespelaar – Koen Camelbeke)

Acer velutinum Boiss.
Azerbaijan; Georgia; Islamic Republic of Iran

Acer wardii W.W.Sm.
China; India; Myanmar

Acer wardii *(Hugh Angus)*

Acer wilsonii Rehder
China; Viet Nam

APPENDIX 1

Full list of evaluated *Acer* species and the number of *ex situ* collections

Species	Author(s)	Red List Category	Red List Criteria	*Ex situ* Collections
Acer acuminatum	Wall. ex D.Don	LC		19
Acer acutum	W.P.Fang	LC		2
Acer albopurpurascens	Hayata	LC		11
Acer amamiense	T.Yamaz.	CR	D	4
Acer amoenum	Carrière	LC		6
Acer amplum	Rehder	LC		23
Acer anhweiense	W.P.Fang & M.Y.Fang	DD		12
Acer argutum	Maxim. ex Miq.	LC		38
Acer barbinerve	Maxim. ex Miq.	LC		54
Acer binzayedii	Vargas-Rodriguez	CR	B1ab(i,ii,iii,v)+2ab(i,ii,iii,v)	0
Acer buergerianum	Miq.	LC		180
Acer caesium	Wall. ex Brandis	LC		47
Acer calcaratum	Gagnep.	VU	A2c	7
Acer campbellii	Hook.f. & Thomson ex Hiern	LC		57
Acer campestre	L.	LC		251
Acer capillipes	Maxim. ex Miq.	LC		109
Acer cappadocicum	Gled.	LC		183
Acer carpinifolium	Siebold & Zucc.	LC		108
Acer caudatum	Wall.	LC		58
Acer chiangdaoense	Santisuk	EN	B1ab(iii)	2
Acer chienii	Hu & W.C.Cheng	LC		3
Acer chingii	Hu	LC		0
Acer chunii	W.P.Fang	VU	B2ab(iii)	0
Acer circinatum	Pursh	LC		117
Acer cissifolium	(Siebold & Zucc.) K.Koch	LC		114
Acer confertifolium	Merr. & F.P.Metcalf	VU	A2c	0
Acer cordatum	Pax	LC		9
Acer coriaceifolium	H.Lév.	LC		20
Acer crassum	Hu & W.C.Cheng	VU	B1ab(iii)	0
Acer crataegifolium	Siebold & Zucc.	LC		55
Acer davidii	Franch.	LC		233
Acer diabolicum	Blume ex K.Koch	LC		35
Acer distylum	Siebold & Zucc.	LC		19
Acer divergens	K.Koch ex Paxton	VU	B1ab(iii)	15
Acer duplicatoserratum	Hayata	LC		13
Acer elegantulum	W.P.Fang & P.L.Chiu	LC		31
Acer erianthum	Schwer.	LC		22
Acer erythranthum	Gagnep.	NT		6
Acer fabri	Hance	LC		29
Acer fenzelianum	Hand.-Mazz.	VU	B1ab(iii)	1
Acer flabellatum	Rehder	LC		12
Acer floridanum	(Chapm.) Pax	LC		4
Acer forrestii	Diels	LC		16
Acer fulvescens	Rehder	VU	B2ab(iii)	5

Species	Author(s)	Red List Category	Red List Criteria	*Ex situ* Collections
Acer glabrum	Torr.	LC		102
Acer gracilifolium	W.P.Fang. & C.C.Fu	EN	B1ab(i,iii)+2ab(i,iii)	0
Acer granatense	Boiss.	LC		11
Acer grandidentatum	Nutt.	LC		30
Acer griseum	(Franch.) Pax	EN	B2ab(iv,v); C2a(i); D	217
Acer heldreichii	Orph. ex Boiss.	LC		109
Acer henryi	Pax	LC		81
Acer heptaphlebium	Gagnep.	LC		3
Acer hilaense	Hu & W.C.Cheng	CR	B1ab(iii)+2ab(iii)	0
Acer hookeri	Miq.	DD		2
Acer hyrcanum	Fisch. & C.A.Mey.	LC		53
Acer insulare	Makino	LC		3
Acer japonicum	Thunb.	LC		93
Acer kawakamii	Koidz.	LC		56
Acer komarovii	Pojark.	LC		11
Acer kungshanense	W.P.Fang & C.Y.Chang	VU	B2ab(iii)	1
Acer kuomeii	W.P.Fang & M.Y.Fang	LC		1
Acer kwangnanense	Hu & W.C.Cheng	EN	B2ab(iii)	1
Acer kweilinense	W. P. Fang & M. Y. Fang	LC		1
Acer laevigatum	Wall.	LC		20
Acer laurinum	Hassk.	LC		7
Acer laxiflorum	Pax	LC		23
Acer leipoense	W.P.Fang & Soong	EN	A2c; B2ab(iii)	0
Acer leucoderme	Small	LC		25
Acer lobelii	Ten.	LC		14
Acer longipes	Franch. ex Rehder	LC		39
Acer lucidum	F.P.Metcalf	LC		5
Acer lungshengense	W.P.Fang & L.C.Hu	DD		0
Acer macrophyllum	Pursh	LC		99
Acer mandshuricum	Maxim.	LC		82
Acer maximowiczianum	Miq.	LC		96
Acer maximowiczii	Pax	LC		14
Acer mazandaranicum	Amini, H.Zare & Assadi	EN	B1ab(iii)+2ab(iii)	0
Acer metcalfii	Rehder	LC		6
Acer miaoshanicum	W.P.Fang	DD		0
Acer miaotaiense	P.C.Tsoong	NT		6
Acer micranthum	Siebold & Zucc.	LC		54
Acer miyabei	Maxim.	VU	C1+2a(i)	91
Acer monspessulanum	L.	LC		165
Acer morifolium	Koidz.	LC		11
Acer negundo	L.	LC		325
Acer nigrum	F.Michx.	LC		36
Acer nipponicum	H.Hara	LC		29
Acer oblongum	Wall. ex DC.	LC		49

Species	Author(s)	Red List Category	Red List Criteria	*Ex situ* Collections
Acer obtusifolium	Sm.	LC		24
Acer okamotoanum	Nakai	VU	D1+2	8
Acer oliverianum	Pax	LC		80
Acer opalus	Mill.	LC		140
Acer osmastonii	Gamble	VU	B2ab(iii)	0
Acer oligocarpum	W.P.Fang & L.C.Hu	EN	B2ab(iii)	0
Acer paihengii	W.P.Fang	EN	B2ab(iii)	0
Acer palmatum	Thunb.	LC		373
Acer pauciflorum	W.P.Fang	NT		29
Acer paxii	Franch.	LC		16
Acer pectinatum	Wall. ex G.Nicholson	LC		101
Acer pensylvanicum	L.	LC		152
Acer pentaphyllum	Diels	CR	A4c	46
Acer pentapomicum	J.L.Stewart	LC		11
Acer pictum	Thunb.	LC		200
Acer pilosum	Maxim.	DD		15
Acer pinnatinervium	Merr.	DD		1
Acer platanoides	L.	LC		219
Acer poliophyllum	W.P.Fang & Y.T.Wu	VU	B2ab(i,ii,iii)	0
Acer pseudoplatanus	L.	LC		202
Acer pseudosieboldianum	(Pax) Kom.	LC		129
Acer pseudowilsonii	Y.S.Chen	EN	B1ab(iii)+2ab(iii)	1
Acer pubinerve	Rehder	LC		18
Acer pubipetiolatum	Hu & W.C.Cheng	LC		0
Acer pycnanthum	K.Koch	VU	C2a(i)	34
Acer rubescens	Hayata	LC		19
Acer rubrum	L.	LC		269
Acer rufinerve	Siebold & Zucc.	LC		111
Acer saccharinum	L.	LC		190
Acer saccharum	Marshall	LC		424
Acer sempervirens	L.	LC		49
Acer serrulatum	Hayata	LC		12
Acer shenkanense	W.P.Fang ex C.C.Fu	LC		8
Acer shihweii	F.Chun & W.P.Fang	CR	B1ab(iii)+2ab(iii)	0
Acer shirasawanum	Koidz.	LC		68
Acer sieboldianum	Miq.	LC		72
Acer sikkimense	Miq.	LC		25
Acer sinense	Pax	LC		16
Acer sino-oblongum	F.P.Metcalf	EN	B2ab(ii,iii)	2
Acer sinopurpurascens	W.C.Cheng	LC		7
Acer skutchii	Rehder	CR	B2ab(iii,v)	12
Acer sosnowskyi	Doluch.	DD		0
Acer spicatum	Lam.	LC		88
Acer stachyophyllum	Hiern	LC		113
Acer sterculiaceum	Wall.	LC		64
Acer sutchuenense	Franch.	EN	B2ab(i,ii)	1
Acer sycopseoides	Chun	LC		0
Acer takesimense	Nakai	VU	D2	9
Acer tataricum	L.	LC		398
Acer tegmentosum	Maxim.	LC		87
Acer tenellum	Pax	EN	A2c	7
Acer tenuifolium	Koidz.	LC		3
Acer thomsonii	Miq.	LC		2
Acer tibetense	W.P.Fang	VU	B1ab(iii)	1
Acer tonkinense	Lecomte	NT		3
Acer triflorum	Kom.	LC		131
Acer truncatum	Bunge	LC		105
Acer tschonoskii	Maxim.	LC		76
Acer tsinglingense	W.P.Fang & C.C.Hsieh	LC		11
Acer turkestanicum	Pax	DD		20
Acer tutcheri	Duthie	LC		3
Acer ukurunduense	Trautv. & C.A.Mey.	LC		29
Acer undulatum	Pojark.	CR	B1ab(iii)+2ab(iii)	0
Acer velutinum	Boiss.	LC		59
Acer wangchii	W.P.Fang	NT		1
Acer wardii	W.W.Sm.	LC		1
Acer wilsonii	Rehder	LC		16
Acer yangbiense	Y.S.Chen & Q.E.Yang	EN	B1ab(iii,v)+2ab(iii,v); C2a(i,ii)	2
Acer yinkunii	W.P.Fang	DD		0
Acer yui	W.P.Fang	EN	B2ab(iii)	4

Acer macrophyllum (Christophe Crock)

Appendix 2
Participating institutions

Key West Tropical Forest & Botanical Garden; Kings Park and Botanic Garden; Korea Botanic Garden; Kunming Botanical Garden; Kurpark Bad Bellingen; Lady Bird Johnson Wildflower Center; Lakes Park Botanic Garden; Landis Arboretum; Lauritzen Gardens; Les Jardins Suspendus; Leuven Botanic Garden; Lewis Ginter Botanical Garden; Lincoln Park Zoo; Logan Botanic Garden; Longwood Gardens; Los Angeles County Arboretum and Botanic Garden; Lushan Botanical Garden, Jiangxi Province and Chinese Academy of Sciences; Luthy Botanical Garden; Main Botanical Garden, Russian Academy of Sciences; Malva Permaculture Farm; Maribor University Botanic Garden; Marie Selby Botanical Gardens; Mary M.B. Wakefield Estate & Arboretum; Matthaei Botanical Gardens & Nichols Arboretum; Maymont Foundation; Mead Botanical Garden; Meadowlark Botanical Gardens; Meise Botanic Garden; Memorial University Botanical Garden; Mercer Botanic Gardens; Millennium Seed Bank; Milner Gardens and Woodland; Minnesota Landscape Arboretum; Missouri Botanical Garden; Missouri State Arboretum; Mly any Arboretum SAS; Montgomery Botanical Center; Montreal Botanical Garden / Jardin botanique de Montréal; Moore Farms Botanical Garden; Morden Arboretum Research Station; Moscow State University Botanical Garden; Mount Auburn Cemetery; Mountain Botanical Garden of the Dagestan Scientific Centre; Mountain Top Arboretum; Mt. Airy Arboretum; Mt. Cuba Center; Museo Orto Botanico di Roma; Nanjing Botanical Garden Mem. Sun Yat-sen; Naples Botanical Garden; National Arboretum Canberra; National Botanic Garden of Latvia; National Botanic Garden of Wales; National Botanical Garden of Georgia; National Garden (Seed Bank); National Museum de História Natural e da Ciência (Seed Bank); National Museum d'Histoire Naturelle (Seed Bank); National Plant Germplasm System - USDA-ARS-NGRL; National Rhododendron Garden; National Tree Seed Centre; Native Plant Trust - Garden in the Woods; Nebraska Statewide Arboretum; Neuer Botanischer Garten der Universität Göttingen; New Brunswick Botanical Garden; Noosa Botanic Gardens; North Carolina Botanical Garden; Northwest Trek Wildlife Park; Northwestern University Ecological Park and Botanic Gardens; Novosibirsk Dendropark; Oekologisch-Botanischer Garten Universitaet Bayreuth; Oklahoma City Zoo and Botanical Garden; Orquidario de Morelia; Orto Botanico - Università degli Studi di Catania; Orto Botanico "Carmela Cortini" - Università di Camerino; Orto Botanico "Giardino dei Semplici"; Orto Botanico dell'Università degli Studi di Padova; Orto Botanico dell'Università degli studi di Siena; Orto Botanico dell'Universita della Calabria; Orto Botanico di Bergamo "Lorenzo Rota"; Orto Botanico di Perugia; Orto Botanico di Torino; Oxford University Botanic Garden & Arboretum; Paignton Zoo Environmental Park;

Acer macrophyllum *(Daniel Mosquin)*

Palacký University Botanic Garden; Parque Botânico da Tapada da Ajuda; Patterson Garden Arboretum; Peavy Arboretum; Peter the Great Botanical Garden of the V.L. Komarov Botanical Institute; Philodassiki Botanic Garden; Pine Lodge Pinetum; Plant Gene Resources of Canada; Planting Fields Arboretum State Historic Park; Pukeiti Garden; Pukekura Park; Pyunggang Botanical Garden; Quarryhill Botanical Garden; Queens Botanical Garden; Rancho Santa Ana Botanic Garden; Rancho Santa Ana Botanic Garden (Seed Bank); Real Jardín Botánico Juan Carlos I; Red Butte Garden and Arboretum; Regional Parks Botanic Garden; Reiman Gardens; Rhododendron Species Foundation and Botanical Garden; Rio Grande Botanic Garden; Rogów Arboretum of Warsaw University of Life Sciences; Rotterdam Zoological and Botanical Gardens; Royal Botanic Garden Edinburgh; Royal Botanic Gardens Kew (Wakehurst); Royal Botanic Gardens Sydney; Royal Botanic Gardens, Kew; Royal Botanic Gardens, Victoria - Melbourne Gardens; Royal Botanical Gardens, Ontario; Royal Horticultural Society's Garden, Harlow Carr; Royal Horticultural Society's Garden, Hyde Hall; Royal Horticultural Society's Garden, Rosemoor; Royal Horticultural Society's Garden, Wisley; Royal Roads University Botanical Gardens; Royal Tasmanian Botanical Gardens; Royal Veterinary and Agricultural University Arboretum; Sakhalin Botanical Garden; San Diego Botanic Garden; San Diego Zoo Safari Park; San Francisco Botanical Garden;

Acer griseum *(Anthony S. Aiello)*

San Luis Obispo Botanical Garden; Sanghyo Botanical Garden; Santa Barbara Botanic Garden; Sarah P. Duke Gardens; Scott Arboretum of Swarthmore College; Seeds of Success (SOS); Sentier de Decouverte; Shanghai Botanical Garden; Shanghai Chenshan Botanical Garden; Shaw Nature Reserve of the Missouri Botanical Garden; Sheffield Botanical Gardens; Sherwood Fox Arboretum; Siberian Botanical Garden of Tomsk State University; Singapore Botanic Gardens; Sister Mary Grace Burns Arboretum; Smith-Gilbert Gardens; Smithsonian Gardens - Tree Collection; Smithsonian National Zoological Park; South China Botanical Garden, CAS; South-Ural Botanical Garden-Institute – Subdivision of the Ufa Federal Research Centre of the Russia; Spring Grove Cemetery and Arboretum; St. Andrews Botanic Garden; State Arboretum of Virginia (Orland E. White Arboretum); State Botanical Garden of Kentucky; Station Alpine du Lautaret; Stavanger Botanic Garden; Stellenbosch University Botanical Garden; Stichting Botanische Tuin Kerkrade; Stoneleigh: A Natural Garden; Tasmanian Arboretum Inc; Tatton Garden Society/The Lovell Quinta Arboretum; The Ambler Arboretum of Temple University; The Arboretum at Columbus Academy; The Arboretum at Penn State; The Arboretum at Regis University; The Arnold Arboretum of Harvard University; The B.M. Kozo-Polyansky Botanical Garden of Voronezh State University; The Balkan Botanic Garden at Kroussia Mountains; The Barnes Arboretum at SJU; The Botanic Garden of Oklahoma State University; The Botanic Garden of Smith College; The Brenton Arboretum; The Crosby Arboretum; The Dawes Arboretum; The Dixon Gallery and Gardens; The Eden Project; The Garden of Morning Calm; The Gardens at SIUE; The Holden Arboretum; The Linnaean Gardens of Uppsala (Uppsala University); The Mediterranean Agronomic Institute of Chania (Seed Bank); The Morris Arboretum; The Morton Arboretum; The New York Botanical Garden; The Newport Arboretum; The Niagara Parks Botanical Gardens and School of Horticulture; The North Carolina Arboretum; The Polly Hill Arboretum; The Purdue Arboretum; The Reading Public Museum and Arboretum ; The Riverview Horticultural Centre Society; The Sir Harold Hillier Gardens; The State Botanical Garden of Georgia; The Tree Register of the British Isles; The University of Guelph Arboretum; Timaru Botanic Garden; Toledo Botanical Garden; Toronto Botanical Garden; Toronto Zoo; Treborth Botanic Garden; Trees Atlanta; Tyler Arboretum; UC Davis Arboretum; Ukrainian National Forestry University Botanic Garden; United States Botanic Garden; United States Capitol Grounds and Arboretum; United States National Arboretum; Universidad Politécnica de Madrid (Seed Bank); University Arboretum; University Botanic Gardens Ljubljana; University of Alabama Arboretum; University of Alberta Botanic Garden; University of British Columbia Botanical Garden; University of Dundee Botanic Garden; University of Idaho Arboretum & Botanical Garden; University of Oslo Botanical Garden; University of Tennessee Gardens; University of Washington Botanic Gardens; University of Wisconsin-Madison Arboretum; Utrecht University Botanic Gardens; V.N. Sukachev Institute of Forest SB RAS, Federal Research Center 'Krasnoyarsk Science Center' SB RA; Vanderbilt University Arboretum; VanDusen Botanical Garden; Von Gimborn Arboretum; W. J. Beal Botanical Garden; Warsaw University Botanic Garden; Wentworth Castle Gardens; Willowwood Arboretum; Wind River Canopy Crane Research Facility; Wuhan Botanic Garden; Xiamen Botanical Garden; Xi'an Botanical Garden; Xishuangbanna Tropical Botanical Garden, CAS; Yew Dell Botanical Gardens.

APPENDIX 3
IUCN Red List Categories and Criteria

EXTINCT (EX)
A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time-frame appropriate to the taxon's life cycle and life form.

EXTINCT IN THE WILD (EW)
A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time-frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.

NEAR THREATENED (NT)
A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)
A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

NOT EVALUATED (NE)
A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

THE CRITERIA FOR CRITICALLY ENDANGERED, ENDANGERED AND VULNERABLE

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing an extremely high risk of extinction in the wild:

A. Reduction in population size based on any of the following:
   1. An observed, estimated, inferred or suspected population size reduction of ≥90% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
      (a) direct observation
      (b) an index of abundance appropriate to the taxon
      (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
      (d) actual or potential levels of exploitation
      (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

   2 An observed, estimated, inferred or suspected population size reduction of ≥80% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may

not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥80%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥80% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:
   1. Extent of occurrence estimated to be less than 100 km^2, and estimates indicating at least two of a-c:
      a. Severely fragmented or known to exist at only a single location.
      b. Continuing decline, observed, inferred or projected, in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) area, extent and/or quality of habitat
         (iv) number of locations or subpopulations
         (v) number of mature individuals.
      c. Extreme fluctuations in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) number of locations or subpopulations
         (iv) number of mature individuals.

   2. Area of occupancy estimated to be less than 10 km^2, and estimates indicating at least two of a-c:
      a. Severely fragmented or known to exist at only a single location.
      b. Continuing decline, observed, inferred or projected, in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) area, extent and/or quality of habitat
         (iv) number of locations or subpopulations
         (v) number of mature individuals.
      c. Extreme fluctuations in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) number of locations or subpopulations
         (iv) number of mature individuals.

C. Population size estimated to number fewer than 250 mature individuals and either:
   1. An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, (up to a maximum of 100 years in the future) OR

   2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
      (a) Population structure in the form of one of the following:
         (i) no subpopulation estimated to contain more than 50 mature individuals, OR
         (ii) at least 90% of mature individuals in one subpopulation.
      (b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a very high risk of extinction in the wild:

A. Reduction in population size based on any of the following:
   1. An observed, estimated, inferred or suspected population size reduction of ≥70% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
      (a) direct observation
      (b) an index of abundance appropriate to the taxon
      (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
      (d) actual or potential levels of exploitation
      (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥50% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, AND where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:
   1. Extent of occurrence estimated to be less than 5000 km^2, and estimates indicating at least two of a-c:
      a. Severely fragmented or known to exist at no more than five locations.
      b. Continuing decline, observed, inferred or projected, in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) area, extent and/or quality of habitat
         (iv) number of locations or subpopulations
         (v) number of mature individuals.
      c. Extreme fluctuations in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) number of locations or subpopulations
         (iv) number of mature individuals.

   2. Area of occupancy estimated to be less than 500 km^2, and estimates indicating at least two of a-c:

      a. Severely fragmented or known to exist at no more than five locations.
      b. Continuing decline, observed, inferred or projected, in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) area, extent and/or quality of habitat
         (iv) number of locations or subpopulations
         (v) number of mature individuals.
      c. Extreme fluctuations in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) number of locations or subpopulations
         (iv) number of mature individuals.

C. Population size estimated to number fewer than 2500 mature individuals and either:
   1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, (up to a maximum of 100 years in the future) OR

   2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
      (a) Population structure in the form of one of the following:
         (i) no subpopulation estimated to contain more than 250 mature individuals, OR
         (ii) at least 95% of mature individuals in one subpopulation.
      (b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild:

A. Reduction in population size based on any of the following:
   1. An observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are: clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
      (a) direct observation
      (b) an index of abundance appropriate to the taxon
      (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation
(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥30% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥30%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥30% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, AND where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:
   1. Extent of occurrence estimated to be less than 20,000 km^2, and estimates indicating at least two of a-c:
      a. Severely fragmented or known to exist at no more than 10 locations.
      b. Continuing decline, observed, inferred or projected, in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) area, extent and/or quality of habitat
         (iv) number of locations or subpopulations
         (v) number of mature individuals.
      c. Extreme fluctuations in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) number of locations or subpopulations
         (iv) number of mature individuals.

   2. Area of occupancy estimated to be less than 2000 km^2, and estimates indicating at least two of a-c:
      a. Severely fragmented or known to exist at no more than 10 locations.
      b. Continuing decline, observed, inferred or projected, in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) area, extent and/or quality of habitat
         (iv) number of locations or subpopulations
         (v) number of mature individuals.
      c. Extreme fluctuations in any of the following:
         (i) extent of occurrence
         (ii) area of occupancy
         (iii) number of locations or subpopulations
         (iv) number of mature individuals.

C. Population size estimated to number fewer than 10,000 mature individuals and either:
   1. An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, (up to a maximum of 100 years in the future) OR

   2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
      (a) Population structure in the form of one of the following:
         (i) no subpopulation estimated to contain more than 1000 mature individuals, OR
         (ii) all mature individuals are in one subpopulation.
      (b) Extreme fluctuations in number of mature individuals.

D. Population very small or restricted in the form of either of the following:
   1. Population size estimated to number fewer than 1000 mature individuals.

   2. Population with a very restricted area of occupancy (typically less than 20 km^2) or number of locations (typically five or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

Source: IUCN (2001)

The Red List of *Acer*

revised and extended

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