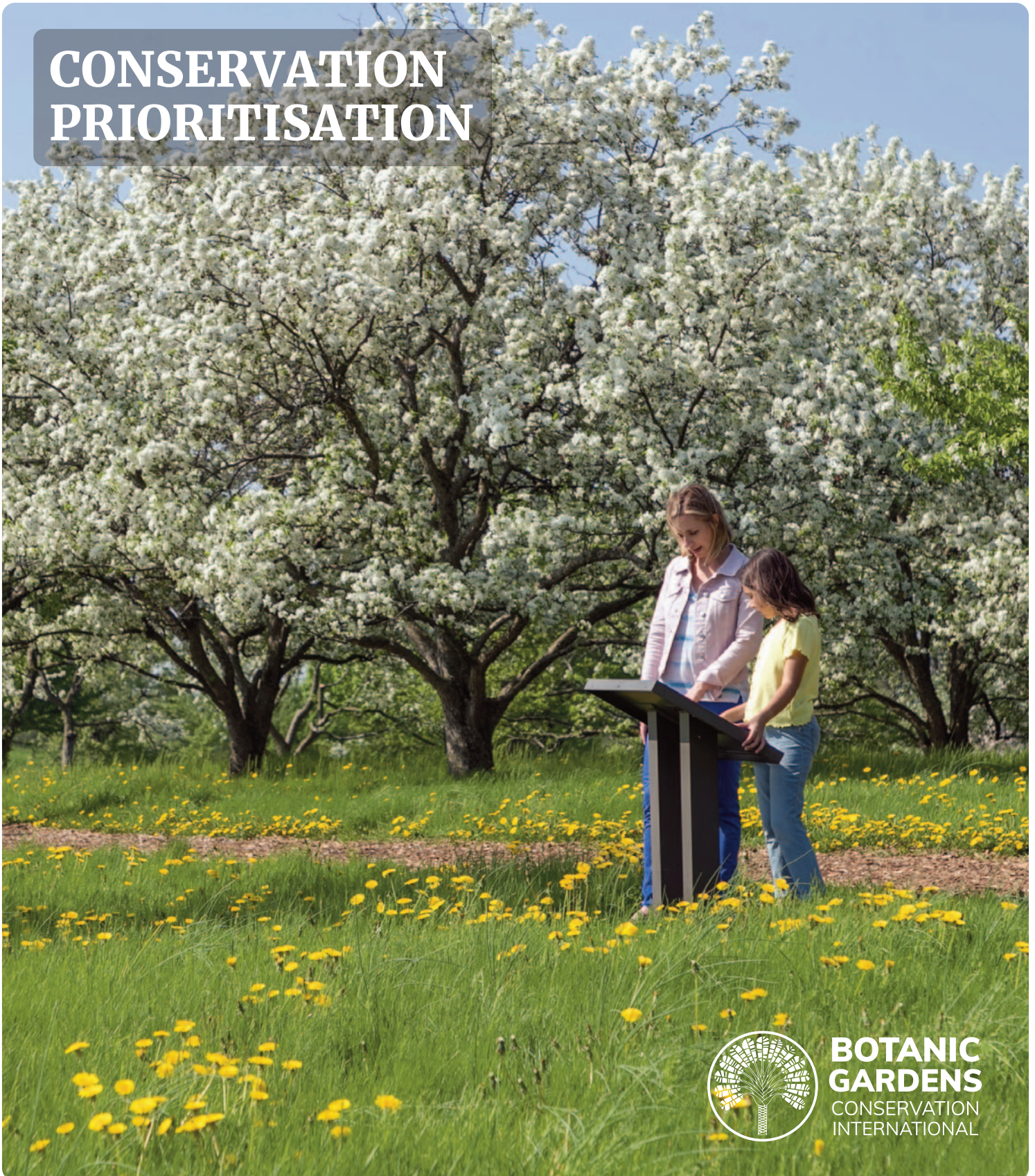


# ROOTS

BOTANIC GARDENS  
CONSERVATION  
INTERNATIONAL  
EDUCATIONAL REVIEW

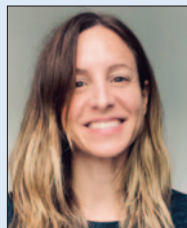
VOLUME 21, NUMBER 1  
MAY 2024

## CONSERVATION PRIORITISATION



**BOTANIC  
GARDENS**  
CONSERVATION  
INTERNATIONAL

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## FIRST WORD

# CONSERVATION PRIORITISATION



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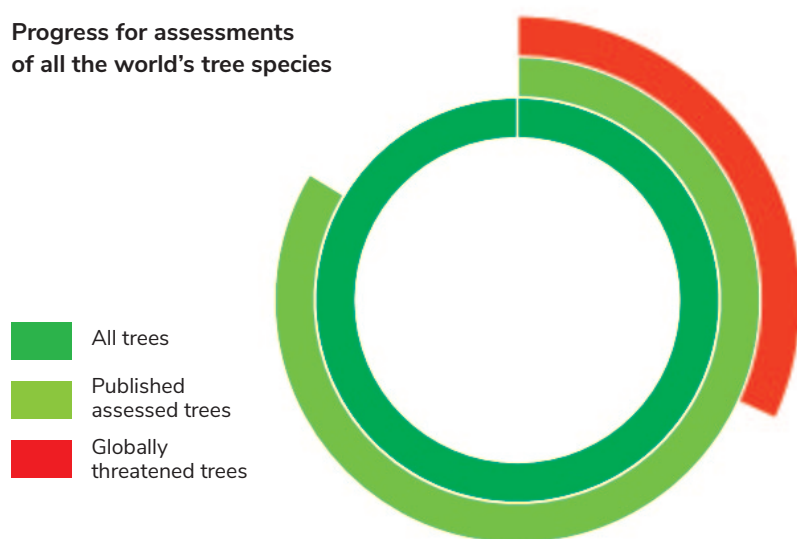


**GTA**  
Global Tree  
Assessment

This issue of Roots is about the Global Tree Assessment, a flagship project of Botanic Gardens Conservation International (BGCI) for the last seven years. It explores how this initiative can inspire and help botanic gardens and arboreta to both prioritise their conservation work and to communicate the importance of conservation prioritisation to their visitors and audiences. Malin Rivers, Head of Conservation Prioritisation explains that at BGCI, we work on conservation prioritisation by measuring the extinction risk of plants in the wild through [Red List](#) assessments. The findings from the Global Tree Assessment underscore a pressing reality: one third of the tree species (over 17,500 species) are threatened with extinction. In addition, the assessment underscores the value of leveraging data on conservation actions, both in the wild and from the collections of plants conserved in botanic gardens, arboreta and seed banks, to monitor their status over time. Conservation prioritisation is complex, and needs to balance a range of factors, including extinction risk, current conservation action, but also cost, chance of success, and many other variables. Access to comprehensive information and specialized tools for prioritizing conservation actions enables stakeholders to make more informed decisions, thereby strengthening conservation efforts worldwide.



Progress for assessments  
of all the world's tree species



[www.bgci.org/our-work/saving-plants/conservation-prioritisation/red-lists/](http://www.bgci.org/our-work/saving-plants/conservation-prioritisation/red-lists/)

Botanic gardens and arboreta can play a very important role in conservation prioritisation. They are actively involved in conserving threatened trees in both their natural habitat (*in situ*) and within their collections (*ex situ*). Additionally, these institutions offer a very unique opportunity to engage visitors and to bridge the gap between the ongoing conservation assessment work aimed at understanding the status of the world's plant species, and the stories that we tell our visitors.

This issue starts with a detailed explanation of what conservation prioritisation is, written by our BGCI Communications Officer (page 5). Each botanic garden has its own ways to communicate conservation prioritisation to their visitors. Cadereyta Regional Botanical Garden from Mexico has been highly creative and developed an exhibition with haiku about threatened plant species. A haiku is a Japanese short poem that does not rhyme and uses three lines and 17 syllables. The haiku have been translated into English but will be especially appreciated by our Spanish readers (page 7). Westonbirt Arboretum in the UK developed the “Little Book of Disappearing Trees” to communicate the conservation stories of 50 threatened trees that can be found in the arboretum. This has been so successful that a second edition has been published in 2022 on page 11.

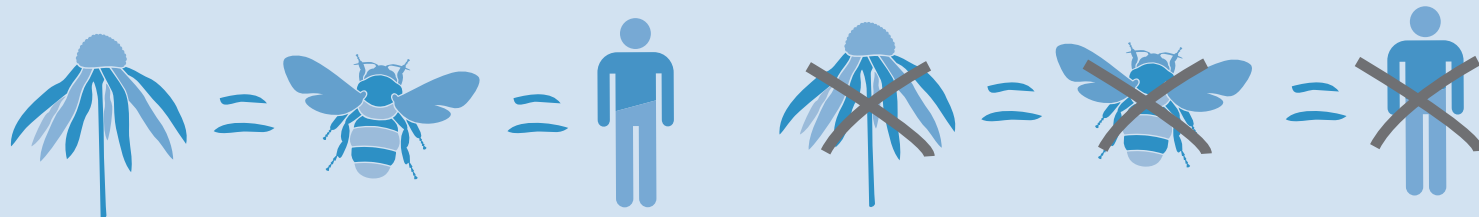
Other botanic gardens have highlighted endangered tree species in their garden as part of their everyday public awareness activities and incorporate them into their educational trails and visitor engagement activities. OSA Arboretum in Costa Rica (page 14) and Villa Clara Botanical Garden in Cuba on page 18 both show innovative examples of how to engage the public and inspire the next generations. In Cartagena Botanical Garden, page 21, it is all about Caribbean mangroves with the keystone species *Pelliciera benthamii* functioning as a bridge between science and the public.

The Philippines and China are home to an incredible richness of endemic tree species. They are both megadiverse tree countries, home to thousands of tree species that are found nowhere else. Authors from both countries describe a Critically Endangered species of which only handfuls of individual trees are left. A few *Vatica elliptica* trees have been rediscovered in Zamboanga in the Philippines by EDC (Energy Development Corporation) and the BINHI arboretum with the help of the local community (page 25). In the Nankin mountains in China, 11 individuals of *Magnolia longipedunculata* have been located by South China Botanic Garden and the Chinese Academy of Sciences, p. 28. In both projects, the local community is actively involved and activities for students have been developed to make them aware of these highly unusual discoveries.

We end this issue with a strong example of networking between botanic gardens. Three large US botanic gardens were motivated to work together and build a network, Coordinating Consortia to Conserve Living Plant Collections to protect the biodiversity of three big families. Morton Arboretum, Atlanta Botanical Garden and Montgomery Botanical Center set up the conservation consortia of oak, magnolia and cycad species on page 31.

We hope you will enjoy reading this issue and it will inspire you to enhance conservation prioritisation in your garden.





## DIFFICULT DECISIONS: COMMUNICATING CONSERVATION PRIORITISATION

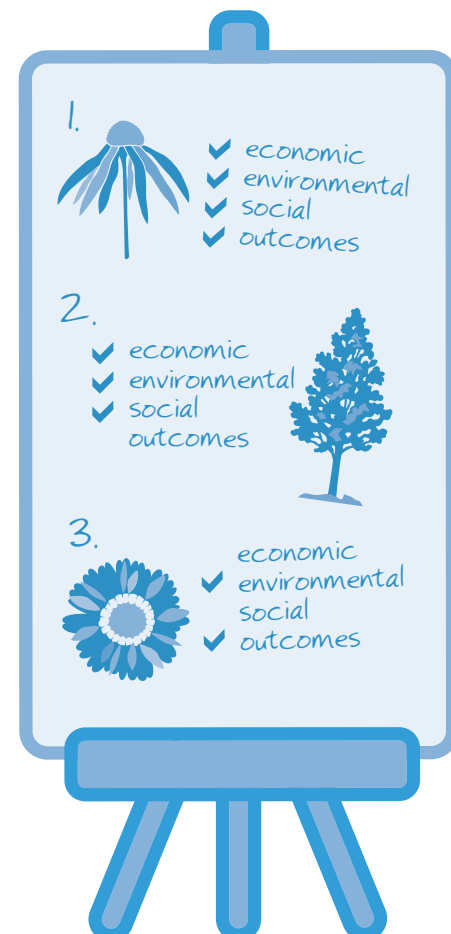
Multifaceted topics, such as conservation prioritisation, can be challenging to communicate to the audiences of botanic gardens and arboreta. However, it is vital that we offer reliable insights into the global environmental issues that we face in modern times. Whether that is through fully fledged campaigns or bite-sized chunks of information – we can help improve the overall understanding of conservation throughout our audiences and their networks, and perhaps help to meet the ever-growing needs of global conservation projects.

Let's start at the beginning. There are so many different terms and environmental jargon that are used in the conservation sector, which, although useful, can mystify those who aren't 'in-the-know'. Conservation prioritisation is one such term. So, let's demystify it.

Conservation Prioritisation is the process of identifying species which require conservation action and ranking them in order of priority. This is a vital process in modern times, due to the sheer number of species that need protection. It all comes down to the age-old question of how can we decide the best way to use the limited resources available for conservation, in a way that will do the most amount of good? (BGCI, 2024). To do this effectively, we need to collate numerous tools, expert opinions, and information sources to evaluate and prioritise which species should be the focus of conservation action.

In 2024, BGCI will complete their ambitious project to assess the extinction risk of all tree species. This project, known as the Global Tree Assessment, has been years of work, from hundreds of partners and individuals, assessing 57,000 tree species for the IUCN Red List. Collating this information on extinction risk is a vital first step in conservation action and it is this type of project that should be utilised by botanic gardens when communicating about prioritisation.

However, to undertake these projects, funding is an ongoing challenge across conservation, with many organisations acknowledging that more investment is needed to halt the current environmental and biodiversity issues that the world is facing (Solberg, 2021). Therefore, there are numerous decisions to be made surrounding which species, which habitats, and which locations to invest the limited time and money in. Consideration into several factors is pivotal, including economic, environmental, and social objectives, alongside various potential outcomes, to ensure that informed decisions are made. This then needs to be evaluated to ensure it is appropriate for all stakeholders and mitigates a variety of the ever-evolving threats facing the natural world (The CPG, 2017).



To effectively communicate the complexities surrounding conservation prioritisation to botanic garden audiences, we need to address the natural world as a whole - with humans included within it. Everything is interconnected, and although the full complexity of this can be difficult to grasp, as communicators, we can pull specific examples that help to better highlight the need of plants. We need to take them from the background into the spotlight, by showcasing them as a vital part of the natural world and as the building blocks of habitats. This will help the public to view them as part of the solution of how to protect the “poster-species” that are often more popular to conserve due to their charisma or importance within popular culture.

Communicating the importance of conservation prioritisation within botanic gardens and arboreta, may include speaking about non-plant species to help put facts into a context that visitors and audiences can better understand. For example, explaining that biodiversity loss isn't just an issue for the 'natural world' but for the 'human world' too. If we lose pollinators, then this will seriously impact global food security (Solberg, 2021), or if deforestation continues, not only will we lose the iconic species that call forests home, but we risk another global pandemic from increased exposure to zoonotic diseases (Tollefson, 2020). This is a far more tangible outcome for most people than the loss of an already rare plant species that they may not have come across previously and have no context for within their daily lives.

Effective communications can help to reduce misunderstandings surrounding conservation prioritisation amongst the non-scientific community. As scientific organisations which are accessible to the public, botanic gardens and arboreta are ideally placed to communicate complex ideas, such as conservation prioritisation, even if only at a basic, ground-floor level. We are lucky enough to have several communication tools available, which should be utilised fully for important work such as this. They include in-person communication, online platforms, storytelling, lectures, workshops, lessons, events, marketing materials, citizen science projects, interpretation, awareness campaigns, and advocacy initiatives within gardens. The audiences that we already have are primed to learn more about the issues that are facing our planet, so it is up to all of us to offer reliable information about these complex ideas.

It is important to note that communications don't have to “big budget” to be effective. To be honest, the only ‘make-or-break’ criteria which make science communications a success or not is whether we have been able to make the big, scientific topics easy for non-scientists to understand in a meaningful way (Bijl, 2022). This could be in a full campaign with printed materials and accompanying web-series, or a short video that is posted on Instagram – the important thing is to know what we want the takeaway to be, and then connect with our audiences.

Like most environmental issues, there is no single answer for how best to communicate the complex nature of conservation prioritisation. There is a lot of uncertainty that can be equally difficult to understand and to explain, even by those actively involved in the sector. However, one thing that can be easily understood and explained is the need for us to all work together towards a common goal, and if conservation prioritisation can help us to refine that goal and protect the greatest amount with the limited resources available, then that must be a positive thing.

So, I guess that's always a good place to start when it comes to communicating big ideas. At the end of the day, the one thing that we surely all have in common, both within the conservation sector and across our engaged audiences, is a wish to make the world a better place for all who call it home.

*“Like most environmental issues, there is no one answer for how best to communicate the complex nature of conservation prioritisation.”*

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## “EX-TINCIONES... HAIKU”, AN INSTANT OF COMMUNION WITH A THREATENED SPECIES

Many reasons exist for the popularity of the Cactaceae. At our botanic garden, we witness how visitors get fascinated by their robust and harmonious beauty, bright-colored flowers, and remarkable adaptations to rough environments. We have used poetry to raise awareness of the threatened Cactaceae species, with a temporary exhibition of Haikus. They are written, naturally, in Spanish.

**T**he Cadereyta Regional Botanic Garden lies close to one of the Chihuahuan Desert hotspots of richness and diversity for the Cactaceae: The Semiarid Zone of Querétaro and Hidalgo (Hernández Oria et al., 2007). Nevertheless, in this hotspot, Cacti experience diverse threats. The predominant processes include land conversion to agriculture and hydraulic infrastructure, unscrupulous collection of living plants and seeds for the horticultural trade, and private ornamental collections (Goettsch et al., 2015). Consequently, several Cactaceae species of this region face the risk of extinction.

Above: Haiku for *Kroenleinia grusonii* (Hildm.) Lodé (syn. *Echinocactus grusonii* Hildm.) “Golden barrel”. Behind the column is a planter with individuals of the species rescued from a transformed environment (Beatriz Maruri Aguilar)

Aiming to promote education and awareness about plant diversity, the teaching practices at the garden permanently share knowledge to achieve different goals in visitors: recognition of plant biodiversity, connection with ideas regarding the importance of its conservation, understanding of the relationships between biodiversity and the environment, and learning ways in which average citizens can be involved to change the current critical panorama. Resources have been devoted to developing workshops, talks, teaching materials, and artistic resources for these purposes. The most recent innovation is a graphical installation that groups science and art, called “Ex-tinciones... Haiku” (Ex-tinciones... Haiku). Target audiences include not only students but also the public in general.

### Extinciones... Haiku

The exhibition pieces are fixed on a recent addition of infrastructure in the botanic garden: a series of stone columns spread throughout the planters and known as “The Pillars of Botany.” The poems are printed on transparent acrylic plates.

The Haiku series was signed by Sánchez (2000) and included eighteen short Japanese-style poems. The poet Miguel Aguilar Carrillo prefaced the original edition with a text called “Respect for the Minimum,” claiming respect for these small, apparently useless plants: “(the Cactaceae) are so small, so pointless, so unproductive, that we have taken them away from our sight; putting them apart from the respect that they deserve and forgetting that every living being is relevant just with its existence (...)”.

Twelve Haiku were picked to create the current exhibition. As a rule, every species appears in the Mexican List of Threatened Species and the Red List. The display was settled in January 2023. Since then, the gardens' guides have introduced visitors to the exhibition and invited them to read and reflect on the species portrayed in the poems.



A cluster of *Lophophora diffusa* (Croizat) Bravo in habitat (2017) (Red List: VU. Mexican List: P) (Beatriz Maruri Aguilar)

*A Haiku is not just a short poem; it communicates something happening at a particular time and place. Vicente Haya, 2012*

At the exposition's opening, the author explains his work to visitors and members of the botanic garden staff (January 2023) (Yazmin Hailen Ugalde de la Cruz)



(Meise Botanic Garden)



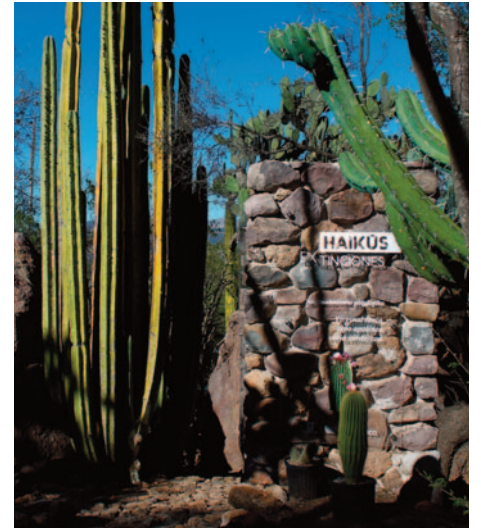
## Science and art in poetry

The combination of literature and science fits well in the setting of the living plants' collection of a botanic garden, whose beauty and stillness encourage self-awareness and introspection. Science and art merge in a single expression: a plant species under threat, according to a scientific evaluation, has a remarkable aesthetic value. Enjoying nature contemplation leads to recognizing its beauty (Tafalla, 2005) and raises awareness of its fragility.

Poetry is born from the wonder and emotion that the world provokes. It is written by making a profound effort to express the unfathomable interiority through the poem, to objectify a fragment of the mystery the poet carries within (Castro, 2020). Haiku poetry is nature-related and emerges from a moment of deep awareness. When an aesthetic contemplation is completed, the artist fully realizes the plant and perceives it as a totality in an aesthetic, timeless moment of man and nature in harmony (Yasuda, 1957). Far from being an esoteric, purely Japanese form, incomprehensible to the West, this poetry meaningfully and significantly shares common ground with all art (Yasuda, 1957).

Artistic knowledge contrasts with scientific knowledge. However, there is an exercise in acquiring knowledge with poetry, and it is valid as a paradigm of the adventure of creation (poiesis). Without creation, there is no knowledge; without knowledge, there is no science (Moure Rojas, 2012). One of the greatest writers of the twentieth century, the Argentinian Jorge Luis Borges, said, "There is no essential difference between a metaphor and the so-called scientific explanation of a certain phenomenon. Both are a plotted linkage of two different things" (Moure Rojas, 2012).

Left: *Ariocarpus kotschoubeyanus* (Lem.) K.Schum. in habitat (2017). (Red List: N. Mexican List: Pr). (Beatriz Maruri Aguilar)



Potted individuals are often displayed close to their Haiku, like this young *Cephalocereus polylophus* (DC.) Britton & Rose [syn. *Neobuxbaumia polylopha* (DC.) Backeb.] at the foot of its poem. (Beatriz Maruri Aguilar)

*Poetry might not offer specific ways to solve a problem. However, it does open a gate to thought and deep reflection*  
*Elba Castro, 2020*



*Mammillaria herrerae* Werderm. in habitat (2010) (Red List: CR. Mexican List: P). (Beatriz Maruri Aguilar)

Sharing “aware” moments

Poetry is not restricted to representing a single concept, content, or previously known idea. Through different images, poetry multiplies and diversifies contents and concepts (Moure-Rojas, 2012). The readers combine the meanings with their experiences, like the contemplation of nature at the botanic garden. They might unleash their own “aware” moment and experience a glimpse of communion with a threatened species. According to Haya (2012), “aware” [Mono no aware (物の哀れ) in Japanese] is a sudden moment of revelation, with a sadness that emanates from the ephemeral nature of the beauty of the world. An “aware” moment is the only necessary condition to write a Haiku (Haya, 2012).

To be the witness of beauty brings a great responsibility. The one who experiences it has no right to block the flow of astonishment to his/her/their fellows (Haya, 2012). One of the precepts of Haiku is to be shared. Our botanic garden shares the exhibition “Ex-tinciones... Haiku”, hoping those who read it and contemplate the plants will experience awareness and respect the species that triggered it.

<p><b>Ariocarpus kotschoubeyanus</b> (Lem.) K.Schum. [N] (Pr) Solevantado, verde aceitunado, solferino sol. (Restless, olive green, purple-red Sun).</p>	<p><b>Astrophytum ornatum</b> (DC.) Britton &amp; Rose Vorágine de espinas, arrecife de efélides. (Vortex of bristles Reef of freckles).</p>	<p><b>Mammillaria herrerae</b> Werderm. [CR] (P) Bola de hilo frente al precipicio, tú puedes, vuela. (Threadball Facing the precipice, You can, fly).</p>
<p><b>Echinocereus schmollii</b> (Weing.) N.P.Taylor [EN] (P) Voz cinérea, sibarítica sierpe, casta flor rosa. (Ashy voice Sybarite snake, Modest pink flower).</p>	<p><b>Kroenleinia grusonii</b> (Hildm.) Lodé (syn. <i>Echinocactus grusonii</i> Hildm.) [EN] (P) Rútila ruta reflejo de un sueño, abismo, cielo. (Blonde path, Reflection of a dream, Abyss, heaven).</p>	<p><b>Lophophora diffusa</b> (Croizat) Bravo [VU] (P) Gris rehilete, molino que al centro una flor mece. (Gray spinner, A mill, moving a flower back and forth).</p>

A sample of Haikus of endangered Cactaceae species of the Semiarid Zone of Querétaro and Hidalgo. An interpretation in English is included. Brackets show the Red List categories [N-near threatened; VU-vulnerable; EN-endangered; CR-critically endangered]; parenthesis show the Mexican Endangered Species List categories (Pr-under special protection; A-threatened; P-danger of extinction).

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# WESTONBIRT'S LITTLE BOOK OF DISAPPEARING TREES



Using data and information generated by the Global Tree Assessment (GTA), Westonbirt have produced *The Little Book of Disappearing Trees*, which highlights the plight of threatened trees that grow at the arboretum. Two editions have been published as more information has become available over time, and the book has been well received by both visitors and botanic garden colleagues alike.

First and second editions of *The Little Book of Disappearing Trees* (Forestry England)

Westonbirt, The National Arboretum, attracts more than 500,000 visitors a year. Staff at the arboretum are always looking for new and innovative ways to engage visitors with all aspects of trees. Prior to the Global Tree Assessment, there was little information available on the threats to trees worldwide, including many that grow in collections such as Westonbirt. However, the results of the Global Tree Assessment told us that more than 100 tree species that grow in the collection are threatened with extinction in the wild. As well as increasing the arboretum's focus on practical conservation of threatened trees, the increased availability of information on threatened trees has provided an opportunity to engage visitors in this issue to a greater extent than ever before.

To engage visitors with the plight of trees, Westonbirt has produced two editions of *The Little Book of Disappearing Trees*, designed to specifically highlight threatened tree species which grow at the arboretum. Through these books, we have not only been able to inform visitors of the threats that trees face, but also of Westonbirt's role in conservation and our work with other botanic gardens both in the UK and internationally. The books are aimed at visitors who already have some interest in trees but are not specialists.

*'Hard to believe so many trees I know are now endangered – ones I thought were common'*  
Visitor to arboretum



An example label for a threatened tree featured in the book (Forestry England)



Prepared using information published in IUCN Red List assessments, produced as part of the Global Tree Assessment, our specific objectives in producing *The Little Book* were to:

- highlight the importance of botanic collections as a resource for conservation and research
- highlight Westonbirt's international role as a botanic collection
- highlight specific tree species which are threatened and why

We were also able to use the book as a tool to help differentiate Westonbirt as not just a 'wood' or a 'garden' – to counter visitor's comments that we are "just a walk in the woods".

Detailing 40 threatened species, the first edition of *The Little Book* was produced in 2017 as part of a broader project funded by the UK National Lottery Heritage Fund (then the Heritage Lottery Fund), and as such, was able to be made available to arboretum visitors free of charge. Featured trees in the collection were given additional labels providing a snapshot of the information included in the book, and a corresponding map showing highlighting the trees was included within the book.

As stipulated by the funders, visitors were also surveyed on how they thought about the book. Feedback received was overwhelmingly positive, with visitors clearly more aware about the threats to trees and the role of botanic gardens in relation to plant conservation after using the book. Several offered comments describing how the information included changed their perception of threatened trees. For example, when asked 'What fact, if any, struck you the most and why?' many of the comments relate to how the visitor didn't realise and were surprised by how many trees were threatened, and how some of the trees they see so regularly (e.g. horse chestnut, *Aesculus hippocastanum*) are facing threats. Copies of the book were also shared with botanic garden colleagues across the world, which have also been enthusiastically received.

Anecdotally, we have had a huge number of visitors, staff and volunteers praising the book and saying how informative it is. Volunteer guides also use it to help plan walks and/or get information out of it to relay to visitors. On occasion, arboretum staff would encounter individuals in the collection looking to 'complete' the book by finding each of the trees featured.

#### Interpretation panel of *Cedrus atlantica*

*This is really special that I'm here touching this bark or looking at this tree that nobody else in the world might be able to do. That's brilliant; I really like that little book.'*  
**Visitor to arboretum**



*Acer pycnanthum* (Dan Crowley)



Autumn in Westonbirt (Johnny Hathaway)

Owing to the positive feedback, and the huge advances made on the Global Tree Assessment since 2017, a second edition of *The Little Book* was produced in 2022. Funded by the Friends of Westonbirt Arboretum, this edition included 50 species, with a modified selection, with new and updated information on each of the trees included. Additional information was included on the Global Tree Assessment, Global Trees Campaign and BGCI's Global Conservation Consortia (GCC), to which Westonbirt contribute. The conservation needs of several of the species highlighted in both editions of the Little Book are addressed via the GCC. This edition is sold at the Westonbirt Shop, with proceeds going towards supporting arboretum activities via the Friends of Westonbirt Arboretum.

To accompany the second edition of *The Little Book*, new labels were produced, and a seasonal trail with interpretation panels was dedicated to several of the threatened trees featured in the book. Free after entry, the trail was used over two consecutive autumns, with a complementary leaflet also produced. Volunteer guides feature several of the trees included within guided walks, and arboretum staff even conducted field queries from members of the public about how they best care for threatened trees that grow in their home garden (e.g. *Acer griseum*).

Overall, the Westonbirt's *Little Book of Disappearing Trees* has shown us that, among the arboretum's visitors, there is clearly an appetite for understanding more about threatened tree species. It has been exciting to be able to share important information of trees at risk of extinction, which would not have been possible without the work of the Global Tree Assessment.

*"The little book of disappearing trees is a brilliant guide communicating the conservation value of Westonbirt's collections and what we can all do to help prevent tree extinctions. It is exactly the sort of resource that should be available in all botanic gardens!"*

**Sara Oldfield, Former Chair  
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Kids at the Osa Arboretum gazing at the top of an Ajo tree (*Caryocar costaricense*) (Osa Conservation)

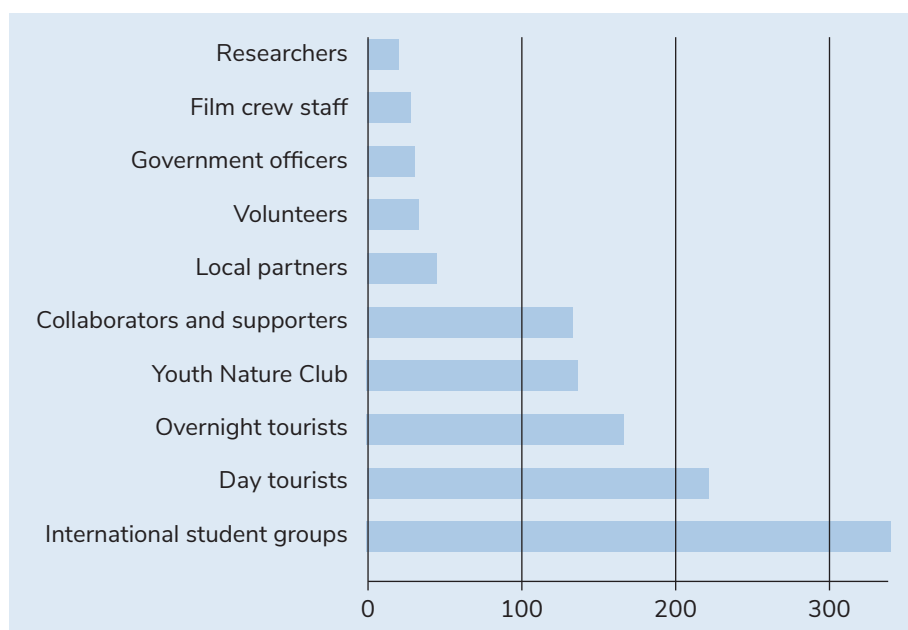
## RAISING AWARENESS OF COSTA RICA'S THREATENED TREES AT THE OSA ARBORETUM

The Osa Arboretum aims to provide immersive opportunities to experience the region's vast botanical diversity and to serve as a capacity building centre. During educational experiences, talks and tours, we have drawn on our team's experience working with threatened trees to raise awareness about the conservation status of trees. The Global Tree Assessment initiative and results have been a tool in getting our audiences engaged with the region's tree diversity and the conservation work. Moving forward these experiences will guide the on-going education efforts in our mission of getting people closer to trees.

**T**he intensively biodiverse Osa Peninsula is home to more than 813 species of trees, from which 14% are endemic to the Peninsula (Cornejo et al., 2012) and 103 are threatened with extinction (BGCI, 2024). Every year tree species new to science are being described (e.g. Santamaría-Aguilar et al., 2021, Santamaría-Aguilar et al., 2023), and many trees are so rare that they are only known in the location in which they were described. Despite the increasing tourism in the region and growing leadership in tree conservation worldwide, the trees in Costa Rica continue to face human-induced threats such as illegal logging and land use change (Brumberg et al., 2024).

*Costa Rica has over 2,500 native tree species and more than 400 of them are at threatened.*

<https://www.bgci.org/resources/bgci-databases/globaltree-portal/country-search/?c=CR>



Left: Different audiences visiting the Osa Conservation Campus and the Osa Arboretum during 2023 (Osa Conservation)

*Osa Conservation is a nonprofit organization dedicated to protecting the globally significant terrestrial and marine biodiversity of the Osa Peninsula, Costa Rica, by implementing ecosystem stewardship, enhancing scientific understanding, providing education and training, and creating sustainable economic opportunities.*

Bridging the gap between biodiversity, conservation and the general public is one of Osa Conservation's goals in its mission to save threatened tree species from extinction through science-based conservation action in southern Costa Rica. This project is a fundamental piece of the working model of conservation action we are building to enhance plant conservation and restoration for climate resilient landscapes throughout Central America.

The Osa Arboretum is a living collection of trees that brings together a diverse set of visitors through a network of over 40 km of trails, spanning mangrove forests, secondary, and old growth forests, in the largest remaining patch of tropical lowland rainforest in the Pacific of Central America. In the last year, the Osa Arboretum hosted over 1,000 people who were exposed to tree conservation and restoration experiential learning lessons, talks, tours, or hiked the trails and interacted with the interpretative signs.

An abundance of diverse visitors interacting directly with breathtaking trees provides the opportunity to bring awareness of the growing extinction risk, which will lead to a greater buy-in for conservation action. We have selected three of our target audiences to kickstart an immersive tree conservation experience that socialises key information about tree diversity and conservation status and that inspires action through a hands-on approach to tropical forest conservation.

### Fostering tree conservation through digital interactive learning

The Ridge to Reef Youth Nature Club was created in 2021 and since then welcomes school-age children from communities of the Osa Peninsula, who during our outdoor lessons discover the value of conserving their natural environment. Here, year after year, nature-based learning processes are developed, through deep understanding about coral reefs, intertidal zones, mangroves, rainforests and the connection between all of these is built.

The arboretum has played a key role in learning about the giant and vulnerable beings of the rainforest; children have interacted with relevant and accessible information about rare and threatened trees. In 2023 more than 100 children from the club participated in tree conservation, restoration, and agroecology activities at the Osa Arboretum and our regenerative farm led by our Tree Conservation and Education teams.



Ridge to Reef Youth Nature Club member during tree climbing practice at the Osa Arboretum (Osa Conservation)

*The Osa Arboretum –and other living collections throughout the world– showcase the opportunity to give shape, colour, and texture to the impactful work carried out by the GTA and its collaborators.*



Diversity patterns are presented as questions and games, and extinction risk is told in the form of anecdotes. We always emphasise the trees around us and the interesting facts or striking animals that are observed as we skip along the trails.

### Inspiring the next generation for conservation

In collaboration with the National Ministry of Education in 2023 we taught for the first time the “Exploratory Workshop: Naturalist Guide”, an official course for the 9th grade in the Colegio Técnico Profesional Puerto Jiménez. Our aim was to consolidate the knowledge and strengthen the skills of the students, related to the conservation of the biological diversity of the Osa Peninsula and its link with sustainable tourism.

During this course we presented the biological diversity of the terrestrial and aquatic ecosystems of the Osa Peninsula. It then described the link between tourism and biodiversity conservation, with special emphasis on nature-based tourism as a booming activity in the region. The course culminated by encouraging reflective practices on the social and environmental implications of tourism on social welfare and the local economy, in order to promote a tourism praxis in line with the social demands and environmental concerns of the communities of the peninsula.

During the botanical module, we had an introduction to plant taxonomy by going out and collecting plants of all shapes and sizes, classifying them and creating their own botanical voucher to take home. After getting familiar with tree diversity, we hiked a trail in the arboretum and visited some of the threatened trees in the collection. Sitting between the buttresses of an ancient Ajo tree (*Caryocar costaricense*), we discussed the threats and the conservation opportunities in the region.

### Leveraging local knowledge for conservation action

During October 2023, 23 of the top tourism guides in the Osa Peninsula joined the Osa Conservation Campus for a 4-day natural history and conservation course. The course had a participative approach and was organised as a knowledge exchange, because this audience were local experts on the species and habitats of the region, and directly represent the Osa Peninsula as a conservation jewel to international tourists.

One of the educational modules offered during the course was a day-long dive into restoration ecology and tree conservation. Trying to fill the gap between regional expertise on biodiversity and information about global conservation initiatives, the participants were introduced to patterns of tree diversity and to the conservation status of trees, using the State of World’s Trees report as a tool to discuss the patterns and threats. After the talk, the participants visited the tree nursery where we discussed species specific natural history, threats and opportunities for conservation action.

Part of Osa Conservation’s restoration, tree conservation, and education teams, together with 9th grade students and teachers from the Colegio Técnico Profesional de Puerto Jiménez, the local highschool, during a tree conservation module in the Osa Conservation Campus and the Osa Arboretum (Osa Conservation)

*Trying to fill the gap between regional expertise on biodiversity and information about global conservation initiatives, the participants were introduced to patterns of tree diversity and to the conservation status of trees, using the State of World’s Trees as a tool to discuss the patterns and threats.*



Tree Conservation and Research Coordinator, María José Mata Quirós, shared key concepts about conservation assessments and the Global Tree Assessment initiative to local tourism guides in the Osa Conservation Campus.



Tourism guide during Natural History and Conservation course at the Osa Arboretum (Osa Conservation)

### Scaling our on-the-ground impact

During the above-mentioned events and many other divulgation activities carried out, we always start by asking participants, either children or adults, to name five living organisms that are in danger of extinction. Without an exception all participants name more than five animals - mostly mammals. This makes it clear that despite people born and raised in the Osa Peninsula having knowledge of the diversity that surrounds them, there is a missing link towards the tree conservation initiatives.

Even though our environmental education activities have not been formally evaluated yet, our experiences from 2023 have inspired more robust planning and evaluation of outcomes. In an anonymous survey to the high school participants, 7 out of 10 individuals said they are now familiar with trees being in risk of extinction and were able to mention one or two threatened species, such as the endangered Ajo Negro (*Anthodiscus chocoensis*), the vulnerable Cedro Amargo (*Cedrela odorata*), and the endangered and emblematic Ajo (*Caryocar costaricense*).

The Osa Arboretum - and other living collections throughout the world - showcase the opportunity to give shape, colour, and texture to the impactful work carried out by the Global Tree Assessment and its collaborators.

### Acknowledgments

Osa Conservation is a team of driven conservationists, where every team member has an important role in the protection and restoration of southern Costa Rica's biodiversity; we are thankful to the staff, interns, volunteers and community members that work in, visit, and enrich the Osa Arboretum. We are both thankful and proud to have the support of Franklinia Foundation, International Conservation Fund of Canada and Schuy Family, critical to the establishment of the Osa Arboretum and the protection of southern Costa Rica's rare and threatened trees.

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# PLEASURE AND CONSERVATION AT THE VILLA CLARA BOTANICAL GARDEN, CUBA



To conserve biodiversity, the Botanical Garden of Villa Clara (VCBG) promotes meaningful experiences and pleasure across an interpretative trail that culminates in an endemic area which represents the xeromorphic scrubland on serpentines, an important Cuban ecosystem. Moreover, endangered specimens of native and endemic species are planted inside and outside the VCBG by members of different communities and target groups combining participatory techniques with ex situ conservation procedures. Thus enjoyment, pride, science and social responsibility allows them to have endangered plants, and even some fauna, in their daily lives. For us, educators, that's the key element to preserve our biodiversity.

**H**ow to attract visitors to our botanical gardens in times of climate change, mass extinctions, global crises and online distractions? How to turn them into leaders of local biodiversity conservation? The educators of the Villa Clara Botanical Garden (VCBG) take on these challenges by combining the socialisation of knowledge and ex situ conservation actions, generating meaningful experiences among those who visit us. The core of this approach is based on sharing pleasurable experiences in order to internalise ecological knowledge and try to transform, with dedication and respect, peoples' environmental behaviour and attitudes.

Above: Children arriving into the gallery forest to plant *Terminalia buxeras* next to the Ochoa river (Arnaldo Toledo-Sotolongo)

We aim to influence both the thematic and dynamic content of individual and group interactions experienced by visitors with our ecosystem collections. Thematic content being the ecological information to be communicated, while dynamic content being the socio-environmental behavioural models that visitors are encouraged to adopt.

With regard to the thematic component, the content units are linked to the stops on our interpretive trail that crosses the living collection areas of the VCBG with some 700 plant species, mainly from the neotropics. These stops, lagoon vegetation, bambusetum, gallery forest, arboretum and endemics, allow us to share content not only of the flora and ecosystems represented in them, but also of the biological diversity present at each stop, especially soils, rocks, fungi, insects, birds, reptiles and mammals.

The visit concludes with the most important stop: the area of endemic plants. Before entering, an explanation of the selection of the plants that form part of the collection is constructed collectively. Visitors are invited to consider the importance of ecosystems and the role of plants as shelter and food providers. Using comparison from their previous experiences, they begin to visualize that there are plants that are overly abundant and others that are very scarce or that they no longer see. In this way the visitors can understand the various categories of threats. This gradation is represented in the collection because it has been formed following the criterion that the best way to conserve plants species is to conserve the plant formation to which it belongs.

Based on this premise, the visitor interacts with non-threatened plants, but encounters others that are threatened, vulnerable, endangered and critically endangered. Although these categories have validation in the Red List of the Flora of Cuba, as a result of scientific field and laboratory work, visitors compare what they see with their previous experiences. Comparing and investigating while touring the area, each visitor or group of visitors establishes the route through one of the most important Cuban plant formations, due to its number of endemism and threats: the spiny xeromorphic scrubland on serpentines.

In this area, visitors' attention and participation is maximised because the city of Santa Clara was built on serpentines, so its development still has a negative impact on numerous species with high biogeographical value. The adaptations of the plants to xerophytism are shown in this plant formation, as low bushes, spiniscence, small leaves (microphilia), small flowers (micrantia) and small fruits (microcarpia). Plant-animal interactions are also discussed, especially with regard to pollinators and dispersers. The information is exemplified with specimens of local endemics, some of them Critically Endangered, such as *Rhodogeron coronopifolius* and *Harpalyce macrocarpa*. It also focuses on other species with other threat statuses or relevant for their endemism. Some of them are of curiosity, such as species whose scientific name has a specific epithet inspired by the city, such as *Guettarda clarensis*, or which honour those who have studied our flora, such as *Xylosma acunae* and *Daphnopsis bissei*.

In addition, this area possesses specimens of the flora adapted to limestone substrates. Here the emphasis is on charismatic local endemics, some Critically Endangered such as *Hemithrinax ekmaniana*, others with varying degrees of threat such as *Gaussia princeps* (Sierra palm, Low Concern). The visitors are also stopped at the specimens of *Behaimia cubensis*, *Agave ofoyana*, *Coccothrinax crinita*, among others.

As the VCBG is located in the central region of Cuba, the plants represented in the collection of endemics, whether they belong to xerophytic substrate on serpentine or limestone, are generally local endemics or of scarce distribution in the country. By prioritizing these species, our Botanical Garden contributes to their ex situ conservation, both by preserving the genotype of each species and by raising awareness among visitors about the importance of conserving them inside of the VCBG or in their natural areas.



Sociology students planting *Tespesia cubense* at the university campus (Roberto Fernández-Blanco)

*The Red List of the Flora of Cuba evaluates the conservation status of 4627 species, 66.57% of the flora of the archipelago. 2417 of these species are endemic, and of these 1386, 30% of the total number of species assessed, possess some degree of threat. González-Torres et al., (2016)*



University students riding a rustic togoban made from the petiole of the Cuban national tree *Roystonea regia*. (Arnaldo Toledo-Sotolongo)



Left: Twisted and enjoying the part of the plants (Arnaldo Toledo-Sotolongo)

This awareness is formed not only through informative actions. The real goal in acquiring these experiences is to participate in direct ex situ conservation actions. These consist of planting specimens of endemic and native species, generally endangered, both in this area of the VCBG and in sectors of the university campus dedicated to gardening and landscaping. When planting, members of various target groups, especially children and university students, combine the knowledge about each species with the personal bond that comes from planting one or more specimens in sites close to their daily activities.

Each conservation action is carried out using group work procedures that allow for pleasant interactions between participants before, during and after the tasks are completed. In this way, information and conservation actions are combined with techniques and group dynamics aimed at transforming the environmental behaviour and attitudes of each individual. As part of this work, specimens of *Ravenia spectabilis* ssp. *leonis*, *Thespesia cubense*, *Terminalia buseras*, *Leptocereus filiforme*, *Trichilia hirta*, *Cordia gerascantus*, among others, have been planted in the VCBG endemic area and also in gardening places of our university campus. As part of the conservation protocol, each planted specimen is registered for monitoring, with the intention of involving the same people who participated in the establishment of every specimen for watering, fertilizing and caring for the plants in case of drought or disease.

All conservation action includes a mix of scientific data and local knowledge about endangered species. For example, *Hemithrinax ekmaniana* is said to be the most endangered palm in the world due to its small population and very reduced extension. Years of environmental education have made this charismatic plant well known to the local population who name it *The Little Palm of Jumagua* because of the mogotes mountain system on which it grows. Another example is *Harpalyce macrocarpa* which is hardly known by the local community. In some places it is called cypress even though it has no relation to that family. Another species used in ex situ conservation actions is *Thespesia cubense*. Known as Black majagua negra, Coastal majagua, Hair majagua or Cuban majagua, this tree is subjected to heavy pressure because the wood is used in charcoal making and to build furniture and rustic houses.

By combining an informative and transformative approach, the VCBG's environmental education actions broaden their scope, as the planting and monitoring activities generate affective ties with the specimens and among those involved. These bonds can potentially transform the environmental attitudes of our visitors, especially children and young people. Those of us who have made the VCBG our home and our faith believe that fostering this transformation is our main contribution to the sustainable conservation of biodiversity on a local scale.

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# BRIDGING CONSERVATION EFFORTS TO VISITOR ENGAGEMENT: A HOLISTIC APPROACH

A conservation-focused initiative at the Cartagena Botanical Garden builds upon the critical role of the threatened mangrove tree species *Pelliciera bentharii*, within the Caribbean's mangrove ecosystems. We enhanced conservation efforts for this neotropical mangrove species. To bridge the gap between horticultural and scientific conservation actions and engage the garden's visitors, we established a new living collection of mangrove species aimed at enlightening visitors about the significance of this vital ecosystem and important conservation assessments. Ground-truthing activities provided a solid baseline for conservation efforts, raising awareness among local communities and governmental institutions, and contributing to decision-making processes aimed at its protection.

## Prioritizing Conservation for Mangroves and *Pelliciera bentharii*

When it comes to biodiversity conservation, keystone species are often the best suited for the restoration of entire ecosystems. Among such species, mangroves are vital for their respective coastal ecosystems, while also contributing significantly to global biodiversity, carbon sequestration, and shoreline strengthening. Among mangroves, one species might be overlooked in the Caribbean but is nevertheless key for the region – *Pelliciera bentharii* (Planch. & Triana) Cornejo.

Above: School children visiting the new living collection

*Acknowledging the significance of community engagement, we proactively involve nearby schools and universities in our initiatives.*



*Pelliciera bentharii*, a mangrove species characterized by its striking bract colors and leaf dentition, takes the spotlight in an arduous conservation project within the Cartagena Botanical Garden with the aid of Franklinia Foundation and Naples Botanical Garden. As a keystone species, the well-being of *P. bentharii*, better known locally as “piñuelo”, is connected to the health of the broader mangrove forests it inhabits and the species which depend on said forests. The assessment and preservation of *P. bentharii* thus becomes a focal point for conservation prioritization.

Botanical gardens play a decisive role in this endeavor, serving as platforms beyond scientific studies for raising awareness and fostering engagement. From school children to graduate students, botanical gardens provide a space for individuals to connect with nature while also understanding and recognizing the urgency of conservation efforts conducted by the garden.

This article explores one of these conservation initiatives undertaken by the Botanical Garden of Cartagena with mangroves in the Caribbean. From the assessment of the endangered piñuelo to the construction of a new living collection, the garden bridges the gap between scientific endeavors and public understanding; a story where the preservation of *Pelliciera bentharii* becomes an example of how botanical gardens, visitors, and students can work together towards a sustainable and biodiverse future.

### IUCN Conservation Assessment for *Pelliciera bentharii*

In our commitment to safeguard mangrove species, the Botanical Garden of Cartagena undertook a comprehensive IUCN Red List assessment. This assessment aimed to unveil the current status of *Pelliciera* spp., with a special focus on *P. bentharii*. It employed an integrative approach that combined historical records, ground-truthing activities, and herbarium records.

Gathering records dating back to 1982, we documented the presence of “piñuelo” within the departments of Bolívar and Sucre. We then conducted field trips to confirm the current distribution of *P. bentharii*, involving exploration of key areas such as Barú and Bocacerrada. Despite the considerable reduction of mangrove forests in some of the historical ranges for this species, we successfully identified thriving populations in Barú.

Left: New living collection, The Mangrove

*To foster a connection between horticultural and scientific conservation efforts, while also captivating the interest of garden visitors, we inaugurated an innovative living collection*



*Pelliciera bentharii* in fruit



Cartagena Botanical Garden team exploring the mangrove ecosystem in the Colombian Caribbean



Los Andes University students visiting the mangrove ecosystem

*At the Cartagena Botanical Garden, a conservation initiative is underway that underscores the vital importance of preserving threatened mangrove species*

Based on our findings, we have taken steps to protect *P. benthamii*. As part of the Global Tree Assessment, with the support of Fundación Franklinia, both this species and *Pelliciera rhizophorae* Triana & Planch. will have updated IUCN Red List assessment in the next update (2024.1). Recognizing the threats to mangrove ecosystems, including unplanned urban development, unsustainable practices in tourism, agriculture, aquaculture, and climate change, we developed mitigation strategies, such as propagation and restoring natural habitats. Local community engagement has been a cornerstone in this process. More specifically, our project aligns with community engagement levels proposed by Wilxco (1994), ensuring a holistic approach that includes information dissemination, collective decision-making, and collaborative actions whilst establishing partnerships with protected areas.

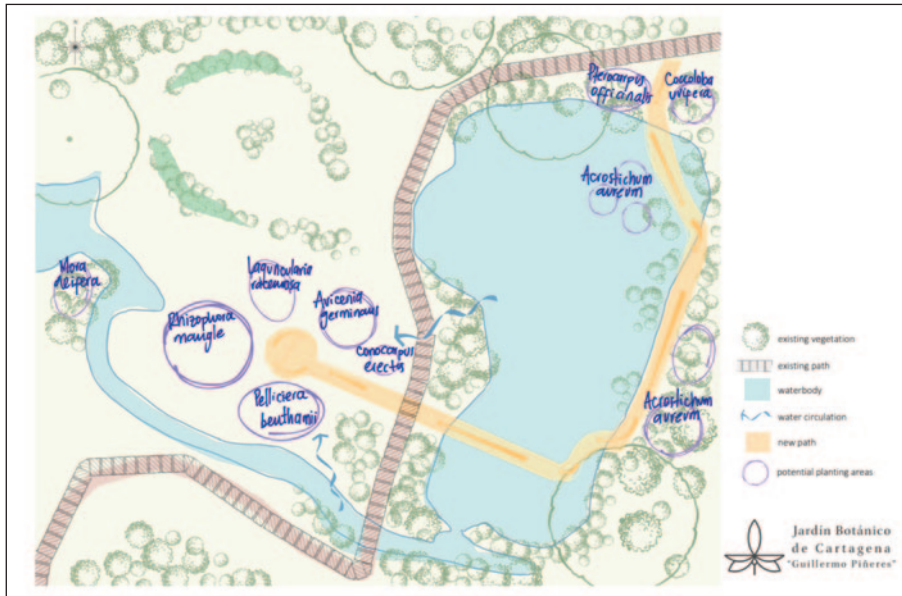
### Ex Situ Conservation at the Cartagena Botanical Garden

Once we recognized the threats faced by the species, we started to pursue its protection through ex situ conservation, serving as an essential complement to *in situ* efforts. At the Cartagena Botanical Garden, we built a new living collection with *P. benthamii* as its focal point to educate visitors on the significance of mangrove ecosystems. This living collection also educates visitors about other mangrove and mangrove-related species. Overall, this collection has proven invaluable as a source of data.

To build this living collection, we developed the first ex situ propagation protocols for “piñuelo”, ensuring its successful cultivation outside its natural habitat. For example, through germination trials conducted under different treatments, we revealed the ideal conditions for a successful establishment of this mangrove, such as waterlogged substrate consisting of sand; we also established guidelines for efficient seed collection based on pericarp colouring and beginning of carpel dehiscence. Furthermore, phenological monitoring of the living collection coupled with observations of wild populations has given us new insights into the adaptability of *P. benthamii* and its life history, filling previous gaps in our knowledge.



Propagules of *Pelliciera benthamii*



Left: Planting layout of the mangrove living collection

*Recognizing the importance of community involvement, we actively engage local schools and universities.*

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## The Living Collections in Our Garden and their Visitor Engagement

We recognize engagement as one of the metrics by which we measure the success of the garden. In this case, through the establishment of our new living collection, we aim not only to showcase the beauty of these plants but also communicate a narrative about conservation that connects with our visitors, a story in which we highlight the significance of mangrove ecosystems and the challenges we must overcome.

Within this collection, visitors are presented with the opportunity to learn about conservation through informative displays. These displays explain the importance of mangrove ecosystems, the threats they face, and the role everyone plays in preserving biodiversity. To complement this in the garden we also offer guided tours, well-informed booklets, and interactive learning stations with QR codes on labels and signage that lead to further online information.

Recognizing the importance of community involvement, we actively engage local schools and universities. Through organized visits and workshops, we extend our conservation messaging and hands-on educational experiences to these vital segments of the population. These initiatives amplify our reach and impact, cultivating a culture of environmental responsibility among the younger generation.

In quantifying our outreach and conservation efforts, our messages reach an estimated 1000 people per month through our social media presence. This digital outreach allows us to disseminate information and create a wide community of conscious individuals. Moreover, annual visitor statistics indicate an average visitation of 45,000 people per year. In short, the living collection at the Cartagena Botanical Garden transcends being a mere exhibition of plant diversity as it serves as a dynamic platform for engagement, educational outreach, and collaborative community involvement. Through this multifaceted approach, we aim to cultivate a shared commitment to the conservation of *Pelliciera benthamii* and the broader ecosystem it represents.



## RESCUING ONE OF PHILIPPINE'S RARE TREES – THE CRITICALLY ENDANGERED CALADES NARIG

In the lush landscapes of the Philippines, where biodiversity thrives but faces many threats of extinction, the EDC-BINHI Program stands as a beacon of hope. This ambitious private-led initiative, spearheaded by the Energy Development Corporation (EDC), is dedicated to the restoration of forest landscapes and the preservation of native tree species. At the heart of the program lies a profound commitment to the conservation of Philippine native trees, particularly those at the brink of extinction. The EDC-BINHI Program meticulously selects and prioritizes native trees based on their conservation status and economic value. Through a rigorous process, informed by the Global Tree Assessment, the BINHI Program has identified 96 priority and threatened native tree species, and is able to rescue and save the rarest among the rare Philippine native trees.

The EDC - BINHI Program, is dedicated to restoring and revitalizing degraded forest areas through the promotion of native tree species.

A notable success is the rediscovery of the Calades narig (*Vatica elliptica*). In 2015, two trees were rediscovered and it was assessed as Critically Endangered through the Global Tree Assessment. Swift action, protective measures and an intensive information campaign have led to its designation as a heritage tree in 2020. In 2022 the first fruiting of the species was documented, securing a sustainable source for future propagation. Local community participation in documentation and monitoring is pivotal, fostering ownership and stewardship.

Left: The first planting of Calades narig in Jerome Carlos BINHI arboretum in Ipil, Zamboanga Sibugay (Ronino Gibe)

*EDC-BINHI Program stands as an exemplary model for private-led conservation, combining science-based approaches, partnerships, and community-driven efforts to achieve positive outcomes in biodiversity restoration.*

The challenges faced by these threatened species are multifaceted, ranging from habitat loss, land use changes, deforestation, climate change and resource constraints for protection and conservation actions. In response, the EDC has devised a holistic value chain and a science-based approach, engaging various stakeholders in a collaborative effort to rescue and safeguard these precious vanishing trees.

The BINHI value chain encompasses several crucial steps:

**1. Species Inventory and Documentation:** Utilizing criteria such as the IUCN Red List of Threatened Species and the Philippine Local Red List through DENR Administrative Order (DAO) 2017-11, the BINHI program formulates its prioritization and selection criteria. These criteria are based on the conservation status of the species and other demand indicators such as economic value, which highlights why certain species are threatened. From the list, the team refers back to available references such as herbarium specimens and conducts rigorous surveys to rediscover the tree species.

**2. Propagation:** Employing various methods such as seed propagation and vegetative propagation, the program seeks to increase the population of rare tree species rescued after it has been documented. The program established a unique nursery across its project operations called “Vegetative Material Reproduction (VMR) Nursery” where nurseries are equipped to mimic natural forest habitat through innovation in irrigation systems to increase the survival rate of propagated rare and threatened species.

**3. Establishment of Future Mother Trees (Ex situ Conservation):** Establishing tree parks and arboreta serves as a vital initiative to preserve native tree species for future generations. These arboreta are designed to be accessible to the public, aiming to promote the utilization of native tree species. As these trees mature and produce fruits, seeds become available, enabling the possibility of reintroducing them to their natural habitats. This process involves implementing protection and conservation measures in collaboration with relevant stakeholders.

**4. Protection of Selected Habitat (In situ Conservation):** Protecting selected habitats to preserve species with limited planting materials, limited standing mother trees and narrow distribution records.

**5. Advocacy:** Disseminating information through various channels to raise awareness and garner support for native tree conservation efforts.

Despite these concerted efforts, one species remained elusive: *Calades narig* (*Vatica elliptica*), classified as Critically Endangered both on the IUCN Red list of Threatened Species and DENR Administrative Order 2017-11 (DAO 2017-11). This is an endemic tree that was last documented in 1915 in Zamboanga, Mindanao. However, through perseverance and meticulous research, the EDC-BINHI team achieved a remarkable feat in 2015, when they found an exact leaf sample that was similar to the herbarium specimen collected in 1915. After a century-long search, they rediscovered two individuals of *Calades narig* along the river of Barangay Calades, Municipality of Alicia in Zamboanga Sibugay. Both trees stand 15 meters tall and at about 30 centimeters in diameter at breast height.

The rediscovery sparked a sense of urgency for conservation efforts, particularly following the illegal felling of one of the two remaining trees in 2016. As a response, comprehensive protective measures were implemented, such as designating *Calades narig* as a heritage tree in 2020. This declaration not only recognized the species' significance but also prohibited any cutting or illegal collection, prioritizing its protection and conservation throughout the province. Information boards about the species are distributed within the province and various webinars and information dissemination campaigns have been done by different stakeholders to inform the local community about the status of the threatened species.



The first planting of *Calades narig* in Jerome Carlos BINHI arboretum in Ipil, Zamboanga Sibugay (Ronino Gibe)



The *calades narig* tree in Brgy. Lambayugan, Alicia, Zamboanga Sibugay found during monitoring (Ronino Gibe)



*Calades narig* shoots (Ronino Gibe)



Above left: *Calades narig* first flowering documentation (Pastor L. Malabrigo Jr.)  
 Above right: *Calades narig* fruit (Cliff De Leon)

In collaboration with local stakeholders and the Department of Environment and Natural Resources (DENR), the BINHI team documented an additional ten mother trees in nearby barangays (neighbourhoods), ensuring the species' propagation and protection. Despite challenges posed by the COVID-19 pandemic, monitoring efforts persisted, culminating in a momentous event in 2022: the fruiting of one of the standing trees, heralding a new chapter in *Calades narig* conservation.

Buoyed by this success, efforts to protect and propagate *Calades narig* have intensified. The DENR, alongside local communities, is spearheading conservation initiatives, while the EDC-BINHI Program continues to mainstream the species through promotion and planting. EDC held various webinars and multisectoral workshops on how to conserve and protect the *Calades Narig* in Zamboanga Sibugay. The workshops produced various outputs including activities to conserve and protect the species. Information billboards are installed within the province and various barangays to intensify the protection of the species. The EDC also forged a MOA with DENR - Ecosystem Research and Development Bureau (ERDB) to develop propagation protocols through stem cuttings and closely monitors the phenology for seed propagation. ERDB is also exploring grafting technology to expand the species' population.

Information about the *Calades narig* has been posted on various platforms including the developed BINHI Website and BINHI social media channel. EDC receives several inquiries through these channels and meets with various concerned sectors to discuss how they can participate and support the conservation initiatives. With the success of its first fruiting in 2022, EDC's initial strategy is to plant the species in safe haven areas where it will be properly protected and maintained. This led to the establishment of arboretum the "Jerome Carlos BINHI Arboretum" named after the owner of the 2 hectares of land, which serves as a testament to the enduring legacy of *Calades narig* and its counterparts. Different sectors participated in the planting, including local government units from province to barangay level, DENR and other bureaus of the government and the local communities. As these remarkable trees take root in the arboretum, they symbolize not only the resilience of Philippine biodiversity but also the unwavering dedication of those committed to its preservation. The arboretum is open to the general public, students and environmental enthusiasts who learn not only about *Calades narig*, but also the many Philippine native tree species.

In the face of mounting environmental challenges, the rediscovery of *Calades narig* serves as a poignant reminder of the importance of collective action in safeguarding our natural heritage. Through collaborative efforts and sustained commitment, we can ensure a future where the forests of the Philippines continue to thrive, teeming with life and biodiversity for generations to come.

*In the face of mounting environmental challenges, the rediscovery of *Calades narig* serves as a poignant reminder of the importance of collective action in safeguarding our natural heritage.*

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*The Philippines has over 2,400 native tree species native of which nearly half are endemic.*  
**GlobalTreeSearch**

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# PROTECT THE PRECIOUS *Manglietia longipedunculata*



In 2003, *Magnolia (Manglietia) longipedunculata* was discovered in Nankunshan Nature Reserve by the scientific research team of the South China Botanical Garden, Chinese Academy of Sciences. This species is very difficult to regenerate, so its guardians have launched a long-term conservation program and a series of educational activities, such as science lectures, ecological investigations, nature painting, skill training, scientific planting and story creation, to get the public acquainted with the introduction and preservation story of *Magnolia longipedunculata*, and more involved in biodiversity conservation work.

**M**anglietia *longipedunculata*, better known as *Magnolia longipedunculata* belongs to the *Manglietia* genus of the *Magnolia* family. This species was discovered by a research team from the South China Botanical Garden of the Chinese Academy of Sciences during a field trip to the Nankun Mountains in Longmen County, Guangdong Province, China, in 2003 (Zeng and Law, 2004). The flower is white as jade when it blooms and looks like a dove landing on a tree branch with high ornamental and economic value. However, the species is threatened with extinction because of its small number of individuals and the impediments to its reproduction (a combination of protogyny, a short period of stigma receptivity, and a lack of efficient pollinators) (Ren, Liu, and Wang, 2015). *Magnolia longipedunculata* is a Critically Endangered species, assessed as part of the Global Tree Assessment, with only 11 wild plants found in the Nankun Mountain, and so far, no second wild population has been found in the world.

Above: *Manglietia longipedunculata*  
(Nankunshan Nature Reserve)

*The *Magnolia longipedunculata* is an amazing opportunity for the South China Botanical Garden of the Chinese Academy of Sciences to develop the value of endangered ex situ species and to popularize its scientific and technological resources*



Left: Science lesson at the campus  
(Nankunshan Nature Reserve)



Scientific planting activities  
(South China Botanical Garden, CAS)

Since 2008 the researchers of South China Botanical Garden of the Chinese Academy of Sciences and the Nankunshan Nature Reserve collected a total of two kilograms of seeds through technical management, such as artificial pollination and breaking through the barriers to reproduction. These seeds were sown in the Magnolia Garden of South China Botanical Garden, and approximately 2,200 seedlings were produced. Around 1,000 seedlings were replanted in the Nankun Mountain Nature Reserve (Xie, Fu and Zeng, 2009). The population of *Magnolia longipedunculata* continues to grow, and it has successfully returned to the wild and planted on a large scale.

Science education activities about the *M. longipedunculata* have been conducted continuously. Technical trainings for gardening students and forestry practitioners are held regularly in the South China Botanical Garden of the Chinese Academy of Sciences and the Nankun Mountain Nature Reserve. Engineers talk about the essentials of conserving endangered and rare plants and teach scientific knowledge such as plant ecology, taxonomy, the relationship between insects and plants, etc. Science programs such as Save the Magnolia and The Magical Transformation of the Magnolia are popular among the public because they combine science stories with nature education. The Expedition to the Native Land of *Manglietia longipedunculata* activities provides participants with an opportunity to learn more about *Magnolia longipedunculata*, *Tutcheria championii*, *Rhodoleia championii*, *Schefflera heptaphylla*, and other fine ornamental trees, in addition to planting seedlings of *Magnolia longipedunculata* together.

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In primary and secondary schools, unique science classes are being held. The science teachers bring the stories of *Magnolia longipedunculata*, *Magnolia pachyphylla*, *Magnolia crassipes*, and other special plants into the classroom. The children are guided to create plant collages to integrate plant knowledge into natural creations. The classes plant a "natural" seed in their hearts. The Crossing the Tropic of Cancer, Drawing the Beautiful Green Nankun Mountain theme painting contest has been successfully held for the second time. The outstanding works were exhibited in the South China National Botanical Garden in November 2023. The new popular science book "*Manglietia Longipedunculata: Flowering Without Fruiting*" has been officially published in December 2023. The patent application for the toolbox of the science popularization course (*Manglietia longipedunculata*) also has been accepted.

The presence of *Magnolia longipedunculata* presents a significant opportunity for the South China Botanical Garden of the Chinese Academy of Sciences to showcase the value of endangered ex situ species and leverage its scientific and technological resources. Additionally, it serves as a successful case of near-site conservation within the Nankun Mountain Nature Reserve. Efforts to popularize *M. longipedunculata* involve integrating it into scenic displays to ignite public interest in science and enhance scientific literacy, awareness, and innovation capabilities. By sharing the story of this Critically Endangered species, we aim to inspire more individuals to engage actively in biodiversity conservation.



*The Manglietia longipedunculata*  
publication (Nankunshan Nature Reserve)

*Manglietia longipedunculata* is a  
Critically Endangered species, with  
only 11 wild plants found in the  
Nankun Mountain

China has the highest number of  
magnolia species in the world with  
over 100 species

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Left: Parent-children activities in the field  
(South China Botanical Garden, CAS)

# BUILDING NETWORKS AND SHARING RESOURCES TO SAVE TREE SPECIES



The sobering results of the recently published Global Tree Assessment (GTA) represent a call for coordinated, cross-sector efforts to prevent extinction of the world's trees. The Global Conservation Consortia (GCCs) are networks of experts and stakeholders created to promote such work, with focus on specific taxonomic groups. Here, we describe a joint project among the cycad, magnolia, and oak consortia that focused on promoting coordinated ex situ conservation in botanic gardens around the world, and included the creation of outreach materials. These resources are expected to result in more informed visitors, as well as activated and engaged audiences.



One of the superpowers of botanic gardens is translating complex botanical concepts into tangible messages that engage audiences from diverse backgrounds and ages. Exhibits, programmes, and educational materials can be powerful tools to activate key audiences toward plant conservation. This was one of the project's goals, Coordinating Consortia to Conserve Living Plant Collections, funded by the Institute of Museum and Library Services (IMLS) of the United States between 2020-2023. It was co-led by The Morton Arboretum, Atlanta Botanical Garden and Montgomery Botanical Center. Motivated by the sobering results of the Global Tree Assessment (GTA; BGCI 2021) and in partnership with BGCI U.S., the gardens joined forces to promote conservation of three important groups of plants: oaks, magnolias and cycads.

*The Global Conservation Consortia (GCC) Program led by BGCI has been an instrumental avenue to translate results from the Global Tree Assessment into coordinated conservation of keystone taxa.*

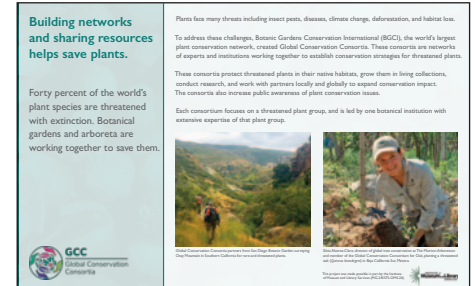
Above: Oak conservation and propagation workshop in Mexico (Silvia Alvarez-Clare)



These three plant groups are particularly reliant on cultivation for their conservation as they are exceptional, meaning seeds cannot be stored in traditional seed banks. The project, in collaboration with BGCI U.S., leveraged the Global Conservation Consortia model to network experts and partners for coordinated conservation efforts targeting priority threatened plant groups.

The Morton Arboretum, located in the state of Illinois, has a remarkable collection of *Quercus* (oaks), hosting more than 600 oak trees from across the globe. The Arboretum also supports oak research and conservation programs, making it a logical candidate to lead the oak consortium. Atlanta Botanical Garden is situated in the heart of the southern U.S., where magnolias (genus *Magnolia*) are an iconic group. The garden hosts an extensive *Magnolia* collection and is a regional leader in conservation networking. Finally, Montgomery Botanical Center has been leading cycad research since 1959 and is the host institution for the IUCN Species Survival Commission Cycad Specialist Group (CSG). The launch of the GCC-Cycads coincided with a CSG mandate to accelerate conservation action and the subsequent adoption of Cycads 2050, the CSG's global conservation strategy with which the GCC-Cycads is fully aligned. Thus, the three gardens were well poised to become champions for the world's oaks, magnolias, and cycads, engaging their audiences with thematic activities and programmes aligned with those taxa.

The project focused on establishing and managing living collections of these threatened exceptional tree species by coordinating efforts across gardens in the U.S. To address the challenge of limited space and resources, the idea was to create taxonomically-focused networks that could work together to support a collection of collections, or what is known as a metacollection for each plant group. The information from the Global Tree Assessment was crucial to decide which of the species were most threatened with extinction. Between 2020 and 2023, almost 400 plants were contributed to living collections and safe sites around the U.S. For *Magnolia ashei*, for example, the U.S. National Arboretum, a GCC-Magnolia Species Steward, led expeditions in Florida that resulted in collections from at least 31 mother trees to produce roughly 668 seedlings. The most exciting part was that these plants were collected from four new populations that were not previously represented in any botanic garden in the world. Genetic diversity allows a species to adapt under changing conditions, such as climate change, and thus it is crucial that enough genetic diversity is represented across the metacollections.



Interpretation panel

Left: Visitors engaging with interpretation signs at Morton Arboretum (The Morton Arboretum)

*One of the superpowers of botanic gardens is translating complex botanical concepts into tangible messages that engage audiences from diverse backgrounds and ages. Exhibits, programmes, and educational materials can be powerful tools to activate key audiences toward plant conservation*

*By building capacity for tree identification and conservation, we are opening an umbrella of opportunities for local stakeholders to engage in activities that promote conservation but also sustainable livelihoods”*

**Dr. Maricela Rodriguez,**  
GCCO coordinator for Mexico  
and Central America



*Magnolia ashei* collections at US National Arboretum (Jean Linsky)



To raise awareness on the importance of ex situ collections for species conservation, the Coordinating Consortia team designed interpretation panels to showcase what the GCC networks are, the concept of metacollections, as well as highlight species that are incorporated in metacollections and some interesting information about them. The goal is to increase people's understanding and support for living collections as a critical tool to conserving threatened taxa long-term. The panels were shared with botanic gardens that hold plants from the three target taxa to support the consortia members and expand the conservation impact. Currently, the team has started a new project to assess the effectiveness of the interpretation materials produced.

In the case of oaks, because many of the threatened species occur in Mexico and Central America, the GCC-Oak obtained additional funding to create identification and propagation manuals in Spanish (Rodríguez-Acosta et al. 2020). The information compiled in the red list assessments for oaks (Carrero et al. 2020) has been crucial to determine priority areas for conducting training, and the Species Steward Training Program has enabled the GCC-Oak to recruit more allies in biodiversity hotspots, where the majority of the species are being lost. "People love the workshops because they are hands-on and very practical. In the community of Zacapoaxtla, in Puebla state, Mexico, Stewards are using what they learned during the workshops to lead ecotourism initiatives focused on tree conservation in the cloud forest", said Dr. Maricela Rodríguez-Acosta, GCC-Oak coordinator for Mexico and Central America.

With more than 17,500 tree species under threat, we need cross-disciplinary and creative approaches to engage as many allies as possible to save tree species. The Global Conservation Consortia has been a powerful proof-of-concept program to engage scientists, botanic gardens, conservation practitioners and the general public to act on conserving trees around the world. We still have time to act - join a consortium as a steward or start your own! For more information visit <https://www.bgci.org/our-work/networks/global-conservation-consortia-gcc/>



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Left: *Magnolia asheii* (Jeff Talbert)

# RESOURCES

## BGCI – Global Tree Assessment

The GTA site shows the conservation assessments of the world's tree species. Currently, 84% of the tree species have an conservation assessment, but the number will continue to increase. If you click on the Resources button, you will see a lot of sources with internal and external links.

<https://www.bgci.org/our-work/networks/gta/>

## BGCI - GlobalTree Portal

This portal allows access to information on the world's nearly 60,000 tree species. On the species pages you can explore tree species distribution, conservation status (global and non-global) and conservation actions. On the country pages you can download a country checklist with associated information on endemism and conservation status. The Global overview allows you to see summary statistics for all trees.

<https://www.bgci.org/resources/bgci-databases/globaltreerearch/>

## BGCI – How to Red List a Tree

This is a training brief to give an introduction to tree red listing for anyone working in plant conservation who is interested in undertaking a red list conservation assessment of one or more tree species. Red list assessments help to determine which species are at greatest risk of extinction.

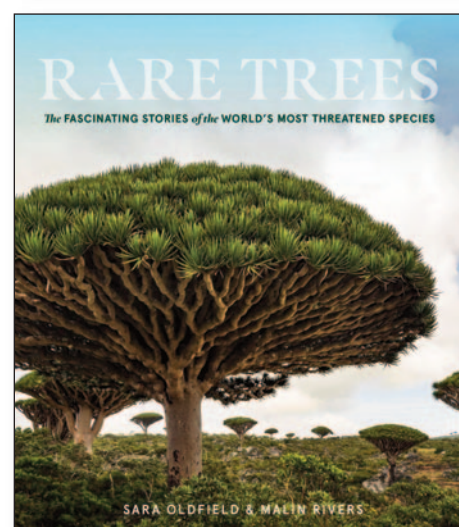
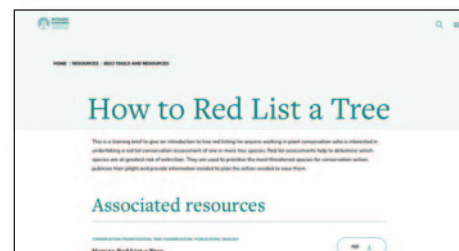
<https://www.bgci.org/resources/bgci-tools-and-resources/how-to-red-list-a-tree/>

## Sarah Oldfield and Malin Rivers -

### Rare trees: The fascinating stories of the world's most threatened species

The book Rare Trees was published March 2023. It is filled with facts and illustrated with beautiful colour photographs, and reveals the secrets, stories, and beauty of the world's rarest trees.

<https://www.bgci.org/news-events/rare-trees-the-fascinating-stories-of-the-worlds-most-threatened-species/#:~:text=In%20addition%2C%20Rare%20Trees%20covers,see%20the%20Global%20Conservation%20Consortia.>



## CONTRIBUTE TO THE NEXT ISSUE OF ROOTS

In the next issue of *Roots* we're celebrating the heroes of Botanic Gardens – the volunteers. We want to celebrate and spotlight their valuable contributions to botanic gardens and showcase their significance in botanical and environmental education. How important are volunteers in your Botanic Garden? What are the responsibilities of your volunteers? How are volunteers part of your education programmes? Share your success stories and help us highlight their integral and remarkable role in the heart of botanic gardens.

To contribute, please send a 100 word abstract to [annelies.andringa-davis@bgci.org](mailto:annelies.andringa-davis@bgci.org) by June 1.



## BGCI'S ONLINE TRAINING PLATFORM

BGCI's online training provides online training courses for BGCI members and other interested individuals. The platform allows the creation of a range of interactive content with resources designed to complement BGCI's existing face-to-face training courses, projects and publications. Current courses include an Introduction to Interpretation, an Introduction to Evaluation and an Introduction to Science Communication. Several modules are available in Spanish, including Defining a Botanic Garden.

Visit <https://training.bgci.org>



## 11TH INTERNATIONAL CONGRESS ON EDUCATION IN BOTANIC GARDENS



Korea National Arboretum

Korea National Arboretum will be the host of the 11th International Education Congress named Education for Change: Botanic Garden's Role in Addressing Global Challenges. The Congress will take place in South Korea from April 9-13, 2025.

BGCI's International Congresses on Education in Botanic Gardens bring together educators, practitioners, teachers, curators, researchers and academics to explore cutting-edge developments in botanic garden education. Held every 3-4 years, these congresses have served as global forums, bringing representatives together to exchange ideas, discuss future priorities, and foster collaborative efforts.

The 11th ICEBG promises to be an engaging experience. The congress will offer a unique opportunity to collaborate with international education experts, gain insights from diverse perspectives, and contribute to a collective effort in addressing environmental challenges. To ensure global accessibility, this Congress will be a hybrid event, allowing participation either in person or online.

We look forward welcoming as many of you as possible at the 11th ICEBG in South Korea! Stay tuned for more details!



**BOTANIC  
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Front cover image:  
Spring in the Morton Arboretum  
(The Morton Arboretum)

**ROOTS**

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## 8<sup>th</sup> Global Botanic Gardens Congress

Botanic Gardens – People and Plants for a Sustainable Future



Jointly organised by Singapore Botanic Garden & Botanic Gardens International.

The 8th Global Botanic Gardens Congress will feature engaging presentations by global thought leaders, technical presentations, panel discussion, poster sessions and thematic workshops.

We aim to explore innovative approaches for botanic gardens to fulfil their missions in research, conservation, education, and outreach.

- Abstract submission until May 2024.
- Early Bird registration closes April 30.



FOR MORE  
INFORMATION

