Journal of Botanic Gardens Conservation International

BGjournal

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PlantNetwork response to Target 8 of the GSPC

South Africa's National Botanical Gardens

The Global Trees Campaign

BGCI
Plants for the Planet

Forthcoming Meetings

July 18 - 23, 2005
VIENNA, AUSTRIA

XVII International Botanical Congress (IBC 2005)

The International Botanical Congress is held every six years and provides a forum for the presentation and discussion of the latest advances in plant sciences worldwide. It follows the IBCXVI which was held in St Louis, Missouri, USA. in August, 1999, which passed a resolution on the need for the *Global Strategy for Plant Conservation* (GSPC).

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E-mail: Marianne.Popp@univie.ac.at or botanik@univie.ac.at, Internet: http://www.ibc2005.ac.at/

August 12 – 14, 2005
CHRISTCHURCH, NEW ZEALAND

New Zealand Plant Conservation Network (NZPCN) Conference 2005
Restoring our threatened plant life – empowering our community

The NZPCN Conference will include a series of plant conservation workshops on subjects such as: threatened plant propagation, cultural use of native plants and fungi, how to implement the Global Strategy for Plant Conservation by 2010, enhancing plant diversity in the urban environment, developing a national ex situ strategy for threatened plants and introduction to threatened and common fungi.
For information visit the website at http://www.nzpcn.org.nz/news_events/conference.asp.

August 22 – 26, 2005
PETROZAVODSK, RUSSIA

Botanic Gardens in Life of the people

This meeting is being organised by the Karelian Government in the the Petrozavodsk Botanic Garden in cooperation with BGCI and the Council of Botanic Gardens of Russia. For further information contact Alexei Prokorov, Director, Botanic Garden of Petrozavodsk University, Lenina Av., 33 Petrozavodsk, 185910 Karelia, Russia.
Tel: +7 8 142 784948, Fax: +7 8142 711000,
E-mail: a;pro@onego.ru. hortus@psu.karelia.ru,
Internet: http://hortus.karelia.ru/

September 26 - October 1, 2005
ADELAIDE, AUSTRALIA

National Conference of the Australian Network for Plant Conservation (ANPC)
Plant Conservation; the Challenges of Change

The ANPC and the South Australian Department of Environment and Heritage are organising this conference for discussions on the challenges that currently face everyone in plant conservation, such as the challenges of changing climates, changing environmental conditions, changes in government and policy focus, or confronting scientific information. The Conference will be held at the National Wine Centre, in the environs of the Adelaide Botanic Gardens. For further information visit http://www.plevin.com.au/anpc2005/index.htm

October 23 - 25, 2005
GLASNEVIN, IRELAND

A Global Partnership for Plant Conservation – supporting national implementation of the GSPC

The Global Partnership for Plant Conservation is organising an international conference to promote and support national implementation of the CBD Global Strategy for Plant Conservation. The meeting will be hosted by the National Botanic Gardens of Ireland, Glasnevin, Dublin and further details can be found on www.plants2010.org

October 29 – November 1, 2005
HOBART, AUSTRALIA

BGANZ Congress 2005

The 2005 BGANZ (Botanic Gardens of Australia and New Zealand) Congress is being hosted by the Royal Tasmanian Botanical Gardens. Hobart. The Congress will explore the following theme: impacts and influence - the environmental potency of botanic gardens and will include four streams: environmental sustainability for botanic gardens, weeds and urban ecology, collections into the future and environmental education. Visit http://www.anbg.gov.au/chabg/ to read the online Newsletter for the Botanic Gardens of Australia and New Zealand prepared by the Council of Heads of Australian Botanic Gardens (CHABG).

To register online or for more information please visit: Internet: www.cdesign.com.au/bganz2005,
Tel: +61 (03) 6224 3773,
Fax: +61 (03) 6224 3774,
E-mail: mail@cdesign.com.au.

October 30 - November, 5, 2005
SAN IGNACIO, BELIZE

2nd Conference of Caribbean Botanic Gardens for Conservation
Caribbean Botanic Gardens: serving a diversity of global, national and local communities

This conference is being organised by the Caribbean Botanic Gardens for Conservation (CBGC) Network & Belize Botanic Gardens in collaboration with the Association of Latin American and Caribbean Botanic Gardens (ALCJB) and Botanic Gardens Conservation International (BGCI). Further information can be obtained from the website: http://www.bgci.org/caribbean.

November 9 – 12, 2005
OAXACA, MEXICO

First DIVERSITAS Open Science Conference (OSC) on Biodiversity
Integrating biodiversity science for human well-being

This conference, DIVERSITAS: OSC1 offers an opportunity to explore recent advances and probe pressing issues across the breadth of biodiversity science. For general enquiries about DIVERSITAS: OSC1, please contact the DIVERSITAS Secretariat, DIVERSITAS, 51, bd Montmorency, 75016 Paris, France. Tel: +33 1 45 25 95 25,
Fax: +33 1 42 88 94 31,
E-mail: info@diversitas-osc1.org,
Internet: http://www.diversitas-osc1.org/

November 12 - 14, 2005
CIENFUEGOS, CUBA

The Botanical Gardens in the conservation of the vegetable biological diversity

This scientific event is being held at the Cienfuegos Botanical Garden, Cuba. It will include sessions on plant conservation in botanical gardens, herbaria development, floristic taxonomy, phytogeography, the history of botany in Cuba, ecosystem and protected areas management, environmental education and community work in botanical gardens, the development of horticulture in botanical gardens, sustainable forest management, public ornament and landscape and tourism and nature.

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Tel: +53 (43) 45334, 45326,
E-mail: lazaro@jbc.perla.inf.cu,
E-mail: felix@jbc.perla.inf.cu.

November 28 – 2, December 2, 2005
LIMBE, CAMEROON

Plants and People for Sustainable Development in Africa

Following on from the successful 1st African Botanic Gardens Congress in Durban 2002, which saw the launch of the African Botanic Gardens Network, the 2nd African Botanic Gardens Congress will be held in Limbe Botanic Garden, Cameroon. The Congress will look at the role of botanic gardens in linking people and plants with sustainable development in Africa. For further details of the Congress, please visit www.bgci.org/africa or contact Limbe Botanic Garden, P.O. Box 437, Limbe, Cameroon.
Tel: +237 333 2620, Fax: +237 333 2834,
E-mail: lbzg@bifunde.com.

June 19 - 25, 2006
SANTO DOMINGO, DOMINICAN REPUBLIC

IX Congress of the Latin American Botanical Society (IX Congreso Latinoamericano de Botánica)
Contribuyendo al conocimiento global de la flora nativa latinoamericana (Contributing to the global knowledge of the native flora of Latin America)

The objectives of this Congress are to spread information about the flora of Latin America and bring together the botanical community to develop plans for the conservation and sustainable use of its flora.

For further information, please contact Sonia Lagos-Witte, President Asociación Latinoamericano de Botánica - ALB and Coordinator, IX Congreso Latinoamericano de Botánica, Jardín Botánico Nacional, Apartado Postal 21-9, Santo Domingo, Dominican Republic. Tel: +1 809 385 2611/2612,
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Cover Photo: Flowering tree in Parque Internacional La Amistad, Costa Rica (Photo: Juan Pablo Moreiras/FFI) (see article on the Global Trees Campaign)

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Submissions for the next issue should reach the editor before 20th October, 2005. We would be very grateful for text on diskette or via e-mail, as well as a hard copy. Please send photographs as original slides or prints unless scanned to a very high resolution (300 pixels/inch and 100mm in width); digital images need to be of a high resolution for printing. If you would like further information, please request *Notes for authors*.

BGjournal is published by **Botanic Gardens Conservation International (BGCI)**. It is published twice a year and is sent to all BGCI members. Membership is open to all interested individuals, institutions and organisations that support the aims of BGCI (see page 32 for Membership application form)

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BGCI is a worldwide membership organization established in 1987. Its mission is to build a global network for plant conservation. BGCI is an independent organization registered in the United Kingdom as a charity (Charity Reg No 1098834) and a company limited by guarantee, No 4673175. BGCI is a tax-exempt (501(c)(3) non-profit organization in the USA and in Russia.

BGjournal replaces *BGCNews* and is published twice a year. *BGjournal* has been given a new name as the news section of *BGCNews* and *Roots* (Botanic Gardens Conservation International Education Review) is now contained in *Cuttings* which is published quarterly. There are 31 issues of *BGCNews* published twice yearly from 1987-2003.

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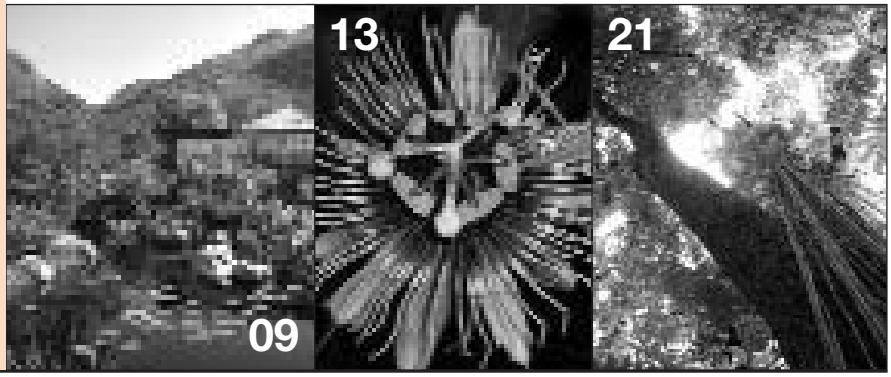

Editorial

The CBD Global Strategy for Plant Conservation (GSPC) provides a unique opportunity to address the huge problems of plant extinction around the world. With its broad political acceptance, clear and ambitious targets, strong support from key organisations and opportunities for involvement at all levels, the Strategy is well-placed for success. BGCI and its Botanic Garden members are playing a crucial role in promoting, supporting and implementing the Strategy and this is one of the reasons I am delighted to join BGCI as Secretary General.

The GSPC complements and reinforces the *International Agenda for Botanic Gardens in Conservation*. This issue of *BGjournal* focuses on the ways that BGCI and its members are taking action to implement the *International Agenda* and support the targets of the GSPC. We can only highlight a selection of the many examples of innovative and imaginative conservation approaches currently underway but hope that these will interest and inspire you! I am deeply impressed by the level of commitment to plant conservation shown by the botanic gardens and arboreta that I have visited and worked with over the years – as a network we will continue to share and expand our successful conservation experiences.

In situ and ex situ plant conservation, promoting the cultural values of plants, networking, training, education and capacity building are some of the topics covered by the articles in this issue. The major importance of botanic gardens in conserving plants in areas of high biodiversity and threat is highlighted in the articles on South Africa and Spain. The National Botanic Gardens of South Africa, for example, already hold 17 per cent of the country's threatened plant species. Their target, in line with Target 8 of the GSPC, is to ensure that 90 percent of Critically Endangered species are included in collections within the next five years. The National Botanic Gardens are working with the Millennium Seed Bank at the Royal Botanic Gardens, Kew, UK to reach this target. The Gardens are also directly contributing to in situ plant conservation within natural areas of their grounds and are working closely with the Botanical Society of South Africa to support plant conservation in the wild.

Through networking and partnerships at all levels, Botanic Gardens are in a strong position to ensure the long-term conservation of plant species and to contribute to sustainable development. The article on the Global Trees Campaign highlights some of the ways that Botanic Gardens and Arboreta are working with Fauna & Flora International (FFI) to secure the conservation of trees around the world. When I joined FFI in 1998 one of my main tasks was to develop and direct the Global Trees Campaign. This was established in response to the publication of the results of a three year survey that I led at UNEP World Conservation Monitoring Centre on the global conservation status of trees. Undertaken in partnership with the IUCN Species Survival Commission and based on information from over 300 botanists and foresters, for the first time the survey revealed that at least 10 percent of the world's tree species were threatened with extinction.

I hope that the successful collaboration between Botanic Gardens and Arboreta and the Global Trees Campaign will continue to grow and that similar conservation alliances will be formed for other groups of plants. The value of the Global Partnership for Plant Conservation, supported by BGCI, will be to encourage and foster such conservation partnerships.

The challenge set by the GSPC remains huge but everyone can be involved in making the Strategy a success. Every conservation action large or small is a worthwhile contribution. I greatly look forward to working with all members of BGCI to facilitate, promote, and implement the Strategy and our Agenda for conserving *Plants for the Planet*.

Sara Oldfield
18th May, 2005

Authors: Etelka Leadlay,
Suzanne Sharrock, Stella Simiyu

The BGCI contribution to the implementation of the Global Strategy for Plant Conservation

The Global Strategy for Plant Conservation (GSPC) was adopted at the sixth Conference of the Parties (COP6) to the Convention on Biological Diversity (CBD) held at The Hague, The Netherlands in April, 2002 in Decision VI/9 (CBD, 2003).

The history of Botanic Garden Conservation International's (BGCI) contribution to the development of the GSPC until its adoption by COP6 has been reviewed by Peter Wyse Jackson (2002). This paper describes BGCI's continued contribution to developing, promoting and implementing the Strategy at global and national levels and its support for such work in botanic gardens and related institutions.

Global

In February 2003, a Memorandum of Understanding (MOU) was signed between the Secretariat to the Convention on Biological Diversity (SCBD) and BGCI, thus formalising BGCI's contribution to the implementation of the Strategy. The aim of the MOU is to promote the further development, implementation and monitoring of the GSPC.

In the spirit of the MOU, BGCI seconded a member of staff, Ms Stella Simiyu, based in Nairobi, to the CBD Secretariat to act as GSPC Programme Officer with effect from 1st August, 2003. Financial support for this position and BGCI's involvement in the implementation of the GSPC has been generously provided by HSBC, through the *Investing in Nature* partnership. *Investing in Nature* is a US$50 million, five year environmental partnership funded by HSBC, working with BGCI, Earthwatch and WWF. For more information, visit www.hsbc.com/investinginnature.

Similarly, BGCI collaborated with the CBD Secretariat to convene two Expert Group meetings. The first (Liaison group meeting) was held at the Jardín Botánico "Guillermo Pineres", Cartagena, Colombia, in October 2002 and the second meeting (Expert meeting) was held in Co. Kerry, Ireland in October 2003. The meetings were held to review the development of sub-targets, milestones and indicators for each of the 16 targets included in the GSPC, and elaborate baseline data available and necessary for monitoring.

One of the key recommendations from these meetings was the establishment of the Global Partnership for Plant Conservation (GPPC), open to all organisations which would contribute to the implementation of the Strategy.

The Global Partnership for Plant Conservation

The 7th meeting of the Conference of the Parties (COP7) to the CBD welcomed the establishment of the Global Partnership for Plant Conservation (GPPC) and encouraged the participating organisations to continue to contribute to the implementation of the Strategy. The meeting also invited other organisations to join the Partnership, and encouraged BGCI to continue its support for the partnership.

The GPPC was launched at a side event organised by BGCI on 13th February, 2004 at the COP7. The aim of the Partnership, as elaborated in a statement released at the launch is: '*To provide a framework to facilitate harmony between existing initiatives aimed at plant conservation, identify gaps where new initiatives are required, and promote mobilization of the necessary resources*'.

In response to CBD Decision VII/10, BGCI agreed to continue to support the Partnership over the coming period, by providing the Secretariat and its Interim Chairman (Peter Wyse Jackson, former Secretary General, BGCI) in close cooperation with the GSPC Programme Officer.

An initial ad hoc meeting of representatives of Partnership member organisations was convened by BGCI in May, 2004, at the Royal Botanic Gardens, Kew, UK. The purpose was to review the ways and means of supporting the national implementation of the GSPC by the Partnership, and review existing and suggesting new global level enabling activities. Recommendations were made for potential initiatives. A follow up meeting, again convened by the

Partnership Secretariat, BGCI, was recently hosted by FAO (Food and Agriculture Organization of the United Nations) in Rome. The meeting discussed among other matters, the organisation of an international conference on the GSPC due to be held in October, 2005 in Dublin, Ireland under the auspices of the Partnership.

Plans for the Partnership are being developed and will be available on the Global Partnership for Plant Conservation website (www.plants2010.org) which is maintained by BGCI.

Ex situ conservation Target 8

Target 8 of the GSPC is: 60 per cent of threatened plant species in accessible ex situ collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes.

BGCI, together with the International Plant Genetic Resources Institute (IPGRI) were requested by the CBD Secretariat to facilitate stakeholder consultations to review the scope, terminology, base-line information, technical and scientific rationale of Target 8 (Anon, 2003). Further, BGCI and IPGRI organised a stakeholder consultation meeting on Target 8 in July, 2003 at the National Botanic Garden, Brussels, Belgium (Wyse Jackson et al., 2003).

Plant Search Database
To monitor the achievement of Target 8, BGCI has developed a Plant Search Database to provide a record of taxa in living collections. This database was launched on BGCI's website (www.bgci.org) in 2003. By March 2005, the database held 125,961 taxa, of which 8,816 are known to be rare and threatened. The plant records are linked to three databases – the 1997 and 2004 IUCN Red Lists of threatened plant species, the International Plant Names Index (IPNI) and Google's image service which finds pictures on the web. The ability to cross reference the species with current red list data shows which threatened species are in cultivation and which need to be conserved. A user is able to identify a taxon in cultivation but not where it is being held; the user can send a 'blind' e-mail to the gardens concerned and the gardens receiving the message can decide whether or not to respond. This means that gardens can add their plant collection details to the database in the knowledge that they will not be putting confidential information about the location of rare plants in the public domain.

BGCI is adapting their 1992 BGCI Propagation database for PlantNetwork (The Plant Collections Network of Britain and Ireland) for endangered British and Irish plants (Jebb, 2004). The Cultivation and Propagation Database Project being developed by PlantNetwork will be linked to the Plant Search Database; this database will help to promote the link to in situ conservation and monitor the achievement of the second part of Target 8: *10 per cent of them [threatened plant species] included in recovery and restoration programmes*. There is also a reintroduction database module under development.

Ex situ conservation
BGCI is supporting many in country ex situ projects which contribute to the achievement of Target 8 in Africa, Argentina, Brazil, Indonesia, India, China, Mexico and Russia through the HSBC *Investing in Nature* Programme (see examples in the box: BGCI supporting local initiatives to implement the GSPC).

Education and public awareness Target 14

Target 14: *The importance of plant diversity and the need for its conservation incorporated into communication, educational and public-awareness programmes*.

Initially, the CBD Secretariat did not invite institutions to facilitate stakeholder consultations on this target as it was considered a cross cutting target together with Targets 3, 15 and 16; these targets were expected to be considered by the consultations on each of the other targets. However the Expert meeting held in Ireland on reviewing the progress in stakeholder consultations recognised that this was an important target and was not likely to be adequately considered as a cross cutting target.

The meeting recommended a separate consultation and BGCI volunteered to carry out this process as this target was closely linked to its own mission at a global level. BGCI was invited to help facilitate a stakeholder consultation, involving expertise in communication, education and public awareness in relation to plant conservation.

A consultation document on Target 14 of the GSPC was produced and distributed in January, 2004 to a wide number of organisations including BGCI members, the American Association of Botanical Gardens and Arboreta (AABGA), Plantlife International, IUCN Commission on Education and Communication, United Nations Environment Programme (UNEP), WWF, Earthwatch, CBD Secretariat and the U.K Department for Environment, Food and Rural Affairs (Defra).

In March, 2004, BGCI staff participated in a meeting organised by the Botanic Gardens Education Network (BGEN) in London, UK to respond to the consultation paper. In April, 2004, BGCI held a workshop on Target 14 at the 2nd World Botanic Gardens Congress in Barcelona, Spain. Comments from the workshop have been useful in developing the next stages of the consultation process.

BGCI education staff have held workshops and given many presentations on the GSPC and the importance of Target 14 over the last year to botanic garden and zoo educators in UK, Germany, Hong Kong, Russia and Canada.

BGCI, botanic gardens and other botanical organisations have contributed to an important reference book, Plant, the international version of which was published this year (Marinelli, 2005). This valuable reference book will contribute to the public understanding of the relationship between plants and the environment from a horticultural perspective.

The Education Department of BGCI has developed a series of informative and thought-provoking pages on the BGCI website within the education

section to look at how education feeds into and contributes to the GSPC (http://www.bgci.org/education/index.html).

Promotion: communication and raising awareness

In May, 2003, a colour brochure of the GSPC in English was produced and published by the Secretariat of the Convention in association with BGCI and supported by HSBC through the *Investing in Nature* partnership (CBD, 2003). A large print-run of 40,000 copies of the brochure[1] was made to enable a wide distribution. BGCI has sent copies to over 2,200 botanic gardens worldwide. By the end December, 2004, 15,730 brochures had been distributed. Several language versions of the GSPC brochure have been prepared (Chinese, Russian and Spanish and a pdf version in French); the Chinese and Russian versions through the *Investing in Nature* Partnership. BGCI produced a CD-Rom, *Plants for the Planet* (BGCI, 2004) which included the text of the GSPC in four languages (English, French, Russian and Chinese).

In addition to the website for the Global Partnership for Plant Conservation at http://www.plants2010.org, BGCI has developed a variety of web-based resources related to various targets of the Strategy (www.bgci.org). BGCI also publicises the progress of the GSPC in its serial publications, BGjournal, Roots and Cuttings and on its website at www.bgci.org.

BGCI staff have made presentations on the GSPC at national and international meetings and facilitated workshops for the development of strategies to implement the GSPC at national level and through botanic gardens.

BGCI and national responses to the GSPC

BGCI staff have given presentations and contributed to workshops on developing national responses to the GSPC. For instance, BGCI staff were involved with the development of *The Plant Diversity Challenge*, the UK's response to the GSPC which was published in February, 2004 (Cheffings *et al*.). BGCI collaborated with the Ministry of Environment and Natural Resources of The Seychelles and a local NGO, the Plant Conservation Action Group (PCA) to plan a response by The Seychelles to the GSPC at a two-day workshop in March, 2004 (Beaver *et al*., 2005).

The GSPC and botanic gardens

BGCI is developing, promoting and supporting the implementation of the GSPC through the botanic garden community. This also supports the cross-cutting Targets 15 *(The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this Strategy)* and Target 16 *(Networks for plant conservation activities established or strengthened at national, regional and international levels)*. Examples of BGCI supporting local initiatives to implement the Targets of the GSPC through the botanic garden community can be seen in the Box: BGCI supporting local initiatives to implement the GSPC

An important outcome of the 2nd World Botanic Gardens Congress was the development of the 2010 Targets for Botanic Gardens; these are a series of 20 targets for botanic gardens to be achieved by 2010, to help measure the achievement of the objectives of the International Agenda for Botanic Gardens in Conservation (Wyse Jackson & Sutherland, 2000) and as a contribution towards the GSPC (Wyse Jackson, 2004).

The GSPC Targets and the 2010 Targets for Botanic Gardens have provided a framework for the development of botanic garden targets and strategies at national levels. For example BGCI staff contributed to the development of the draft Strategic Framework and Action Plan for the African Botanic Gardens Network (ABGN) which were aligned with the GSPC which was an outcome of the African Botanic Garden Congress – Partnerships and linkages in Durban, South Africa (November, 2002) (Willis *et al*., 2002).

BGCI (U.S.) has taken the lead in facilitating the development of a *North American Botanic Garden Strategy for Plant Conservation* through a committee made up of four partner organisations: BGCI (U.S.), CBCN (Canadian Botanical Conservation Network), CPC (Center for Plant Conservation) and the AABGA. BGCI staff from the UK contributed to the first meeting in Atlanta, Georgia (January, 2004). Subsequently, a work plan was devised and discussed at the 2nd World Botanic Gardens Congress by representatives from US gardens. HSBC's *Investing in Nature* Programme sponsored a round table meeting (October, 2004) to review a document which had been revised at the annual AABGA meeting in Dallas (June, 2004) and another meeting of the partners was held in March, 2005 to review the final draft which consists of 19 clear outcome-orientated targets. The review process included the circulation of the document to hundreds of members of the botanic garden community.

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[1] Copies are available from the Secretariat of the Convention on Biological Diversity, World Trade Centre, 393 St. Jacques, Suite 300, Montreal, Quebec, Canada H2Y 1N9. Tel: +1 (514) 288-2220; Fax: +1 (514) 288 6588; E-mail: secretariat@biodiv.org; website: http://www.biodiv.org, or from BGCI.

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BGCI supporting local initiatives to implement the GSPC

Through the *Investing in Nature* Programme 42 small grants have been awarded for plant conservation in botanic gardens in Africa (5), Argentina (4), Brazil (9), India (21) and Russia (3). All these projects support several GSPC Targets. Examples from completed projects are given below from India and Brazil.

India

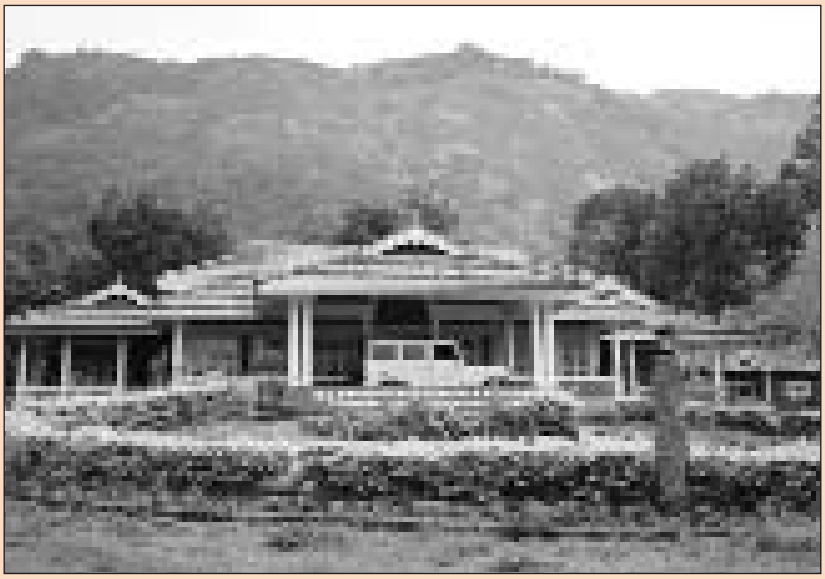
Auroville Botanical Gardens, Tamil Nadu has upgraded the infrastructure at the garden's nursery to increase capacity for seedling production of Tropical Dry Evergreen Forest (TDEF) plant species of South India. The Botanic Garden has propagated and multiplied a total of 3,607 accessions of the 17 TDEF species at Auroville nursery.

Right: Orchid House at the Auroville Botanical Gardens, Tamil Nadu

Right: Planting in the arboretum of the Coimbatore Zoological Park and Conservation Centre, Tamil Nadu

The Coimbatore Zoological Park and Conservation Centre (CZPCC), Tamil Nadu is establishing an arboretum of 100 endemic and endangered plants of the Nilgiri Biospere Reserve (NBR). CZPCC has undertaken extensive field trips in several localities of the NBR and have introduced six endemic species to the arboretum (*Arenga wightii, Diospyros bourdilloni, Vepris bilocularis, Entada rheedii, Decalepis hamiltonii, Elaeocarpus tuberculatus*). About 30 living plants were raised from these collections and maintained at the arboretum site. CZPCC, in association with the Centre for Environment, Tiripur also organised an awareness workshop on biodiversity conservation for school students, teachers and parents in April 2004.

The Community Agrobiodiversity Centre (CABC) MS Swaminathan Research Foundation at Wayanad, Kerala has made significant initiatives in the collection, propagation and management of seven rare, endangered and threatened and important species identified for the project. A total of 62 living collections of seven species (*Aristolochia tagala*, *Dioscorea*



Far left: MS Swaminathan Research Foundation at Wayanad, Kerala

Left: *Pilosocereus pachycladus* (Photo: F.M.Fernandes)

hamiltoni, Dendrobium aqueum, Embelia ribes, Ipsea malabarica, Ochlandra travancorica, Sarcostigma kleinii) were collected. Propagation and multiplication through vegetative methods and seed germination were carried out for *Aristolochia tagala, Dioscorea hamiltoni* and *Ochlandra travancorica*. CABC is planning for mass multiplication of *Ipsea malabarica* and *Dendrobium aqueum* in collaboration with the Kerala Forest Research Institute (KFRI) for reintroduction into local habitats. CABC has also established a partnership with the Gram Panchayats in Wayanad through the State Planning Board for preparation of a Plant Biodiversity Register which includes the ten target species identified for the IiN-India small grants project. CABC has also formed a Biodiversity Conservation Group in Wayanad District for linking their project programme with the people, elected bodies and government organisations.

Brazil

The Belo Horizonte Zoo-Botanic Foundation, Minas Gerais has carried out surveys of six Caatinga habitats. The Caatinga is a unique habitat which covers 10% of Brazil and is characterised by its semi-arid climate and thorn forest. Unfortunately it is becoming increasingly degraded and threatened due to extensive cattle rearing and charcoal production. Many of the endemic species of this region are now considered endangered.

As a result of the project, 187 specimens of Caatinga flora are now cultivated in the glasshouses and thematic gardens of the botanic garden. Of these 24 are species of cacti considered of particular importance for conservation. Herbarium samples were prepared of 339 species, and fruits and seeds of 86 species have been added to the carpological collection. These samples have already proved of great educational value and have been used in the production of seeds and fruit kits for use by local schools.

The team also established excellent relationships with local organisations and collected data on the socio-cultural and environmental aspects of the region. A number of schools and community groups were involved and education materials on the project were developed for the local population.

As part of the project the greenhouse at the botanic garden has been redeveloped and is now home to an outstanding educational exhibit aimed at raising awareness of the social and cultural importance of the unique Caatinga plants, the people they support and the threats they face. Around 100,000 visitors per year are expected to visit the new glasshouse.

Left: Barriguda (*Ceiba ventricosa)*, a species of the Caatinga in the dry season (left) and in flower (bottom left) (Photo: F.M.Fernandes)

Mid left: Seeds of *Amburana cearensis* (Photo: Inês Ribeiro)

Far left: Inauguration of the Caatinga Greenhouse at the Belo Horizonte Zoo-Botanic Foundation (Photo: F.M.Fernandes)

Developing a PlantNetwork response to Target 8 of the Global Strategy for Plant Conservation

Target 8 of the Global Strategy for Plant Conservation aims to secure *60 per cent of threatened plant species in accessible ex situ collections, preferably in the country of origin, and 10% of them included in recovery and restoration programmes*.

At a meeting of PlantNetwork: the Plant Collections Network of Britain & Ireland, on 6–7th April 2005 at the National Botanic Gardens, Glasnevin, Ireland, eight targets were elaborated for botanical collections in Ireland and Britain to develop a co-ordinated response to support efforts to meet the 2010 target.

In particular the role of ex situ collections in serving the broader remit of plant conservation through public awareness, building and sharing cultivation expertise, collaborating with in situ conservation programmes, and in lobbying at governmental level were all seen as vital elements that plant collections and their staff can bring to conservation work in these islands. The meeting included representatives of 53 institutions in Britain and Ireland.

Targets

The following eight targets were adopted to be achieved by 2010:

PlantNetwork Target 1: 100% of critically endangered vascular plant species in managed *ex situ* collections

Sub-targets

1a: PlantNetwork Gardens involved in every appropriate national, regional or local Biodiversity Action Plan (BAP) or Irish Priority Species conservation programme.

1b: Species in the Extinct in the Wild (EW) category secured in no fewer than two living collections.

1c: Species in the Endangered (E) category, with high rates of decline, secured in no fewer than two living collections.

PlantNetwork Target 2: Genetically representative conservation collections established for all vascular plant species with small, limited or rapidly declining extant populations

PlantNetwork Target 3: Cultivation and propagation protocols available for all threatened plant species

Sub-targets

3a: On-line database of cultivation and propagation protocols launched by end of 2006.

3b: Duplication of effort minimised through the collation and dissemination of available datasets.

PlantNetwork Target 4: Participate in species recovery or management programmes with partners

Sub-target

4a: 100% of UKBAP & Irish Priority Species included in recovery programmes.

PlantNetwork Target 5: Develop complementary collections of threatened bryophytes in cultivation

Sub-target

5a: A PlantNetwork Conference organised with the British Bryological Society (BBS) on how horticulture and botanical collections can contribute to bryophyte conservation.

PlantNetwork Target 6: Public and political awareness raised of native flora and the need for its conservation

Sub-targets

6a: 25% of PlantNetwork gardens working with appropriate partners or community groups to develop public-awareness programmes for plant conservation.

6b: Positive stories on plant conservation promoted in the media, with articles in all major horticultural-news journals by 2007.

6c: A 20% increase in public understanding of need for conservation of native plants needs achieved.

6d: Coherent shared themes for plant conservation developed and implemented throughout PlantNetwork gardens, including the production of framework documents to assist with individual education projects.

6e: 50% of PlantNetwork member institutions participating in International Biodiversity Day (22 May) every year.

PlantNetwork Target 7: Build the capacity required in PlantNetwork member institutions to achieve the PlantNetwork targets for Target 8 of the Global Strategy for Plant Conservation

Sub-targets

7a: Side-by-side living collections of critical native species developed in PlantNetwork member institutions, with at least one such collection in each region (England, Scotland, Wales, Ireland).

7b: Expertise in native plant taxonomy available and accessible in 50% of PlantNetwork member institutions.

PlantNetwork Target 8: Best practice achieved in the implementation of actions needed to meet the targets of the Global Strategy for Plant Conservation

Sub-targets

8a: Website established to disseminate protocols and best-practice information, and to highlight gaps, as a clearing-house mechanism.

8b: Available guidelines for the collection, acquisition and maintenance of genetic diversity of ex situ material applied and, where necessary, developed, for the management of collections.

8c: PlantNetwork member institutions to have accessible, effective and comprehensive documentation systems for their native plant collections.

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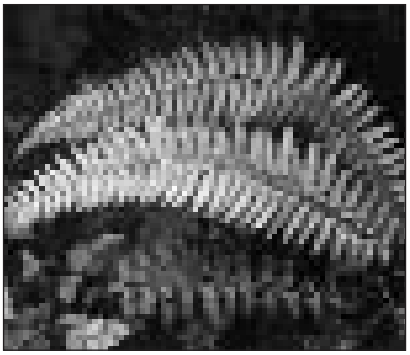

Right: *Polystichum lonchitis* - Holly Fern
This species is Vulnerable. Small populations exist in Wales and the Lake District; it is more frequent in the Scottish uplands and western Scotland

Author: Christopher K. Willis

National Botanical Gardens: embassies of South Africa's biodiversity and culture

Above: Map showing the location of South Africa's eight national botanical gardens (drawn by Linette Ferreira)

Left: Tranquil scenes in the Harold Porter NBG (Photo: Hans Heilgendorff)

Introduction

South Africa has a network of eight National Botanical Gardens (NBGs) managed by the South African National Biodiversity Institute (SANBI). This was previously the National Botanical Institute or NBI which from 1 September 2004, with the promulgation of South Africa's new National Environmental Management: Biodiversity Act 2004, the NBI became SANBI, a parastatal organisation under the national Department of Environmental Affairs and Tourism. The focus of the NBGs is growing and conserving South Africa's indigenous plants and together conserve over 1,350 ha of natural vegetation and associated biodiversity within their boundaries and promoting and raising environmental awareness at home and abroad. The botanical gardens are centres of excellence for plants; they provide information, professional skills in horticulture and tourism and support national, regional and international networks for the conservation, sustainable use and appreciation of the flora of South Africa.

Living Collections

The eight NBGs–Free State, Harold Porter, Karoo Desert, Kirstenbosch, Lowveld, KwaZulu-Natal, Pretoria and Walter Sisulu NBGs–are located in five of South Africa's nine provinces (see map). The NBGs are situated in different parts of the country, ranging from predominantly winter-rainfall mediterranean climates (Kirstenbosch and Harold Porter NBG) to semi-arid climates (the Karoo Desert NBG) and from summer rainfall subtropical and tropical climates (Lowveld and KwaZulu-Natal NBG) to South Africa's interior plateau areas that can receive frost during the dry, cold winter months (Free State, Pretoria and Walter Sisulu NBGs). This range of climatic conditions means that different gardens are able to grow plants that might not be grown so successfully in other gardens without artificial structures having to be built.

The NBGs include natural vegetation representative of six of southern Africa's seven biome units, namely forest, fynbos (characterized by the presence of ericas, restios and proteas), grassland, savanna, Nama Karoo, and Succulent Karoo. The only biome not represented is the Desert Biome, represented in Namibia almost exclusively by the Namib Desert. Further, Kirstenbosch NBG was entrusted in 1957 with the management of both the Edith Stephens Wetland Park (3,42 ha) on the Cape Flats and the Tienie Versfeld Reserve (20,72 ha) near Darling in the western Cape. Both reserves are situated outside Kirstenbosch.

Each NBG has a dedicated collecting policy, with an overall Living Collections Policy covering all of the gardens. As there is some overlap between gardens' collecting areas, many collaborative field trips are undertaken between gardens. Wherever possible the gardens try to grow plants that have been collected from the wild, after the necessary

Right: The Walter Sisulu NBG's succulent rockery (*Aloe* in foreground) serves an important role in its garden-based education programmes (Photo: Hans Heilgendorff).

permits and permission have been obtained from the provincial conservation agencies/authorities and landowners.

Horticulture

In recent years maintenance or continuance plans have been developed by horticulturists for plant collections requiring special cultivation attention and techniques, such as some of the succulent plant groups (e.g. *Haworthia* spp.). Special collections that are currently held across the various NBGs include cycads, pelargoniums, haworthias, *Lithops*, *Plectranthus*, and various bulb species.

Above: Botanical Society volunteer looking after the proteas at the Kirstenbosch Garden Fair (Photo: Dave McDonald)

Descriptive notes and cultivation/propagation techniques for South Africa's indigenous plants are currently made available electronically to the general public through a SANBI-managed web site, www.plantzafrica.com. SANBI staff have, in addition, over the past few years also contributed towards a series of guides to the cultivation and propagation of various indigenous South African plants, known as the Kirstenbosch Gardening Series. Titles in this series, amongst others, have included *Grow South African Plants, Grow Bulbs*, and *Grow Clivias*.

Conservation collections

A survey completed in 2002 of living collections across the eight NBGs provided some interesting results (Golding & Heilgendorff, 2002). Based on a preliminary data set of living collections in South Africa's NBGs, the eight gardens together house some 8,500 indigenous plant species, 36 per cent of South Africa's indigenous flora (estimated at 23,420). The number of indigenous plant taxa per garden ranged from 347 taxa in the Free State NBG to 5,538 in the Kirstenbosch NBG (24% of South Africa's flora), SANBI's flagship garden. A total of 813 Red List plant species are represented throughout the NBGs, 384 being regarded as threatened (see Golding, 2002). The NBGs collectively hold 17 per cent of South Africa's estimated 2,301 (9.8% of South Africa's flora) threatened plants. Low priority taxa (*Rare and Lower Risk*) accounted for about 50 per cent of all the Red List species in the NBGs.

Threatened species from the families Proteaceae, Amaryllidaceae, Aloaceae and Iridaceae are the most well-represented in the NBGs. They are mainly showy, well-known and highly attractive species that appeal to garden visitors. Of concern is that the majority (65%) of Red List species in South Africa's NBGs occur in only a single collection. Horticultural protocols for individual threatened plant taxa need to be developed so that conservation collections can be held in several botanical gardens. Surveys set meaningful targets, particularly those linked to Target 8 of the Global Strategy for Plant Conservation (GSPC).

Based on this preliminary review (Golding & Heilgendorff, 2002), South Africa's NBGs are currently working on developing a plant conservation strategy, linked to the targets of the GSPC, together with other sections and programmes of SANBI, to serve as a framework for the various gardens' conservation programmes.

Plant records

An IT Review is currently being conducted for the new SANBI, with the garden records database a priority area for development. Attempts have been made in the past to develop a plant records database compatible with SANBI's in-house PRECIS (National Herbarium, Pretoria (PRE) Computerised Information System) database. The ideal situation will be where each NBG, despite being in eight different centres, has direct access to a centralized, regularly updated, database system.

With each garden having relatively large areas of natural vegetation within their boundaries, they should, through appropriate partnerships with both amateur and professional biologists, continue to develop and refine existing checklists of biodiversity recorded in each NBG.

Training

The NBG provide training for staff and other conservation workers in horticulture, tourism and service skills, which builds competence for conservation and making gardens environments for learning.

In line with national health and safety regulations, staff in all eight gardens have received training in various aspects of the national Health and Safety Act, chemical safety, fire fighting and first aid. In addition, horticultural skills training programmes (facilitated in mother tongue) for ground staff have now been implemented at all eight NBGs. In line with legislation regulating training in South Africa, these courses are nationally registered and offered by

an accredited training provider. Training courses and workshops have also been presented to various staff on topics such as supervisory and personal skills improvement and financial life skills training. Service standards in the NBGs have also been improved through a nationally recognised South Africa Host Programme. Selected staff in the NBGs have also been assessed and registered with their provincial registrars as tourist guides, both on a site and regional level.

For several years now, SANBI has contributed towards the academic and in-service training of the next generation of professional horticulturists. Practical training (six months) in indigenous flora is offered to second and third year students who study horticulture through the South African education system.

At Kirstenbosch NBG, newly qualified horticulturists also receive training in the practical application of theoretical principles in horticulture, with specific reference to botanical gardens. The duration of the internship is two years. Since 2000, SANBI has accommodated 12 students, four of whom have been appointed as horticulturists in the various NBGs of South Africa.

A Kirstenbosch Scholarship is also provided every year to one qualified horticulturist with a special aptitude for botany and research work connected with indigenous flora. The duration of the scholarship is one year.

Networks

The NBGs work very closely with organisations and institutions in South Africa for the conservation and sustainable use of plants in the region.

For instance, the NBGs are very closely involved with, and supported by, the Botanical Society of South Africa, a non-governmental organisation. The Botanical Society of South Africa was established in 1913 to support the development of Kirstenbosch NBG and now works with the other seven NBGs. The members act as the 'friends' of the gardens and support both garden-based and in situ conservation efforts. The Botanical Society has also contributed significantly to the infrastructural development of South Africa's NBGs, particularly in Kirstenbosch, where the largest branch of the society and it's Head Office is based.

South Africa's NBGs have also made a significant contribution towards supporting other gardens in southern Africa through the successful GEF/UNDP and USAID/IUCN ROSA-supported Southern African Botanical Diversity Network (SABONET) Programme. The project was aimed at upgrading facilities and strengthening the level of botanical diversity expertise throughout the subcontinent. The participating countries are Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

Key partnerships have also been developed within the past five years with the Millennium Seed Bank (Royal Botanic Gardens, Kew, U.K.) and a strategic partnership with the Ball Horticultural Co. based in Chicago, USA.

Environmental Education

Education is defined as one of the key functions of a botanical garden. South Africa's NBGs have been serving an education role for learners, teachers and the general public for many decades.

There has been major investment in Kirstenbosch, over the last 15 years, in upgrading visitor amenities with new garden management facilities, a conservatory, restaurant, nursery, herbarium, library and research facilities and since 2000, significant investment has also been made in upgrading facilities in the other seven NBGs. This has included new restaurants, visitors' centres, new and upgraded parking areas, environmental education centres, function facilities and pathways. Combined, South Africa's NBGs receive over one million visitors per annum, with Kirstenbosch receiving over 685,000 visitors.

Below: South Africa's Millennium Seed Bank team collecting *Pavonia senegalensis* in the Kalahari (Photo: Erich van Wyk)

New environmental education centres have been built in the Walter Sisulu, Pretoria, Free State and Lowveld NBGs, allowing dedicated education staff to be housed and garden-based programmes to be hosted in the various NBGs. This has allowed the expansion of the formal education programmes to gardens beyond Kirstenbosch.

Left: New Kirstenbosch Tea Room set against the dramatic backdrop of Table Mountain, Cape Town (Photo: Hans Heilgendorff)

Above: A picture of Pretoria NBG's Environmental Education Centre, using materials from the natural grassland in the garden (Photo: Eugenie Novellie)

During the past ten years, outreach greening programmes have been developed and expanded to extend beyond the boundaries of the botanical gardens. Much of this focus has been on working together with local communities, using indigenous plants, to 'green' disadvantaged schools in township areas around the gardens in Cape Town, Pretoria and Johannesburg.

In recent years, since its first democratic elections took place in 1994, South Africa has become known as the 'rainbow nation', due to it's many diverse cultures, languages (South Africa has 11 official languages) and peoples. In order to promote and share this cultural diversity with visitors, South Africa's NBGs have been developing demonstration gardens with associated buildings in many of the gardens to promote the association of various cultures with South Africa's indigenous plants. These range from water wise gardens, useful plants and medicinal gardens to traditional huts and a traditional cooking shelter (used in the arid Richtersveld area in the north western corner of South Africa) in the Karoo Desert NBG.

Interpretation

Interpretation has received increased support in South Africa's NBGs in the past five years, and several gardens currently have dedicated Interpretation Officers. Each of the gardens has dedicated interpretation themes and plans that assist in guiding their interpretive work. The overall slogan for interpretation in South Africa's NBGs is 'indigenous plants enrich our lives–let's care for them'. Each of the gardens' natural areas includes an interpreted self-guided hiking/walking trail.

Although the gardens do not have collections of animals maintained in enclosures or cages, the interpretive signage certainly does promote the links and dependence between animals, people and plants. Interpretive labels in the various gardens include a range of indigenous South African languages, particularly the languages spoken in those areas where the gardens are located. Languages generally used in interpretive signage are English, Afrikaans and the local African language spoken. These include Siswati, Zulu, Xhosa and Sotho.

Both standardised permanent and temporary interpretive signs are used in South Africa's NBGs. SANBI has also standardised the directional signage used in the various NBGs.

Since 1976, Kirstenbosch and other gardens in the national network have been participating in the world-renowned Royal Horticultural Society's Chelsea Flower Show held every year in London, UK. To date the Kirstenbosch/SANBI exhibition has won 26 gold medals at this annual show. Participation by SANBI in this event is currently made possible through a generous public-private sector sponsorship involving Old Mutual SA, the City of Cape Town and the Western Cape Provincial Government. This sponsorship has enabled young horticulturists from the NBGs to experience and participate in the show on an annual basis.

Corporate strategic plan and business plans

Each of the NBGs prepare, on an annual basis, business plans linked to the objectives of SANBI's Corporate Strategic Plan. These plans help the gardens define their programmes and activities for the forthcoming year. More recently, targets for South Africa's NBGs have been set within the latest SANBI Corporate Strategic Plan (2005–2009). These include the following:

- 45% of South Africa's plant taxa represented in NBGs.
- Maintenance or continuance programmes in place for all conservation collections within NBGs.
- Increased income (10% per annum) through new tourism related infrastructure and programmes in NBGs.
- Possible sites for new gardens in the Northern Cape and Eastern Cape provinces evaluated.
- 50% of South Africa's threatened plants in NBG collections and/or the Millennium Seed Bank (UK) (MSB).
- 90% of Critically Endangered South African plant taxa in NBG collections and/or the MSB.
- 100% of Extinct in the Wild South African plants held in NBGs and/or MSB.
- NBG plant collections computerized.
- Gap analysis of plants in cultivation in NBGs and South Africa's flora.
- Collecting areas for NBGs reviewed.
- Review the implementation of the International Agenda for Botanic Gardens in Conservation within NBGs.
- Back-up collections of threatened plants cultivated in NBGs stored in the MSB.
- Continued implementation of integrated threatened plant programmes in each NBG.

As part of a broader institutional review process, progress with the implementation of the International Agenda for Botanic Gardens in Conservation (IA) by South Africa's NBGs was reviewed for the first time in 2004. Results from the survey indicated that on average across the eight NBGs, 53% of the activities listed in the IA are being implemented.

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A global initiative to conserve crop wild relatives in situ

Above: Participants at the First Information Management Workshop of the project, held at IPGRI Headquarters, Rome (Diane Wyse Jackson, Head of computer systems and database development, BGCI – back row fourth from the left, Annie Laird, author of article - back row fifth from the left). (Photo: IPGRI)

'In situ conservation of crop wild relatives through enhanced information management and field application' is a UNEP/GEF supported project that addresses national and global needs to improve global food security through effective conservation and use of crop wild relatives. This large, multi-faceted, five year project was launched in 2004 and brings together five countries and six international organizations to manage and make use of the wild relatives of vitally important crops.

The natural populations of many crop wild relatives are increasingly at risk and they are at present poorly conserved, for a range of reasons. There are technical problems involved in developing conservation plans for such a diverse range of species with different biological characteristics, ecological requirements, conservation status and uses. There are also political, administrative and infrastructural problems that limit effective in situ conservation actions. In many cases, collaboration between different ministries, agencies or institutions is required where there is no tradition of collaboration and in fact may even be a history of competition. While many countries already have conservation initiatives in place (e.g. gene banks and protected areas) few of these target crop wild relatives (Meilleur & Hodgkin, 2004). An assessment of in situ conservation of *Lupinus* spp. in Spain, for example, showed that protected areas do not consider crop wild relative populations unless they are an endangered species (Parra-Quijano, *et al*., 2003). Undoubtedly, however, a major limitation is in the capacity to bring together and use information that does exist. A number of studies have shown that substantial amounts of information often exists (e.g. Thormann *et al*., 1999) but that it is dispersed among different institutions and agencies in different countries and international organizations.

The project was developed to address national and global needs to improve conservation of crop wild relatives, focusing on improved management and use of information on these species. It brings together five countries - Armenia, Bolivia, Madagascar, Sri Lanka and Uzbekistan, with IPGRI (International Plant Genetic Resources Institute) as the project manager, and five other international conservation agencies - the Food and Agriculture Organization of the United Nations (FAO), Botanic Gardens Conservation International (BGCI), the United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC), the World Conservation Union (IUCN) and the German Centre for Documentation and Information in Agriculture (ZADI) - to enhance the conservation status of selected crop wild relatives in each country. All partners are contributing experience, expertise and information to the project. Each country has significant numbers of important and threatened taxa of crop wild relatives and all but Uzbekistan are among the world's biodiversity hotspots—places that have the highest concentrations of unique biodiversity on the planet. They are also the places at greatest risk of loss of diversity.

Project development and implementation

The preceding two year design and development phase of the project analyzed the conservation situation for crop wild relatives in the five countries. It was found that relatively little is known of the conservation status of these species, no management plans have been developed for reserves with such species in mind, where modern information management systems existed they were extremely limited in their scope and application, and no in situ conservation projects or monitoring activities targeted to crop wild relatives

Right: Wild pepper (*Piper* sp.) in the limestone grottoes of Walvulpana, SE of Colombo, Sri Lanka

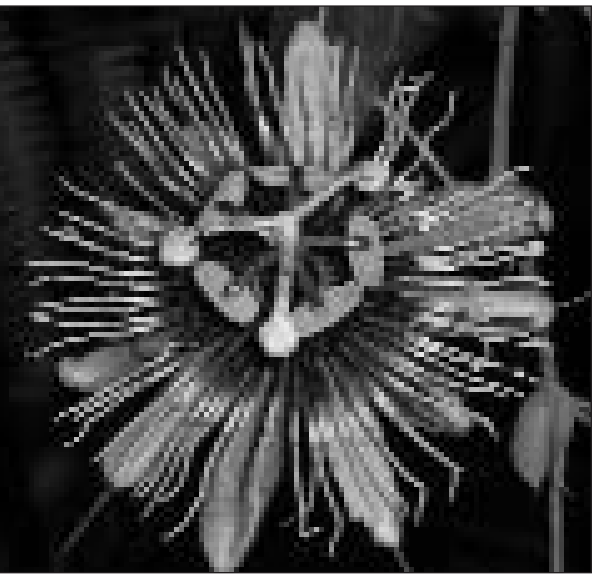
were currently in place. All of the partner countries expressed their desire to improve the conservation and wise use of these important resources in a sustainable and cost-effective way. To achieve this, they decided to use approaches that maximize the use of existing information and conservation resources in ways that are widely applicable to the different taxa that occur within their borders.

Key elements

The project has four major components, the first two of which focus on the systematic compilation, access and use of information related to crop wild relatives. Application of this information will significantly enhance the development of effective in situ conservation and monitoring strategies for crop wild relatives, which is the major focus of the third component, and in raising awareness, the fourth component.

Component 1. International Information System. An information portal dedicated to crop wild relatives will be developed to serve as a gateway for access allowing users to search for information through a single web address. The system will bring together information from available national and international sources on the identity, status, distribution and potential use of crop wild relatives. National partners will test the effectiveness of access and use of the international systems to support country conservation decisions. The development of the International Information System is co-funded by GTZ, an international cooperation enterprise for sustainable development.

Below: Passionfruit (*Passiflora* sp.) in the Cochabamba region of Bolivia



The major activities under this component are:

(a) Design of the system will involve all international partners and national information experts and will be achieved using Unified Modeling Language. The design process will also address issues of ownership, custodianship, access, use, exploitation and intellectual property.

(b) Joint terminology which will involve the development of an appropriate ontology that will provide definition of terms, their specification and the relationship between them. The main entry point for accessing information is likely to be species name. Sixty four crop genera comprising about 12,000 species have at this stage been identified as the focus of the project. Eighteen of these are crops listed in Annex 1 of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), which came into force on June 29, 2004, for which multilateral exchange agreements are envisaged. The terminology development work will directly support national information management in the five partner countries.

(c) Development of infrastructure that will provide a cost-effective internet based system that can host information gathered and compiled by partners. Analytical tools suitable for spatial information and geographic analysis will allow the distribution of crop wild relatives to be visualized and related to variables such as climate, edaphic factors and land use and social-economic factors such as human population and poverty.

(d) Content development will ensure that information maintained by relevant international and national organizations is made available to users.

At the first International Management Committee (IMC) meeting it was agreed that the system design would be based on the model used by Global Biodiversity Information Facility (GBIF). Information categories were agreed and work was initiated on the development of descriptors. This work has now been finalized and countries and international organizations are beginning to enter data and modify information categories and their descriptors.

Component 2. National Information Systems. In all five partner countries information exists in herbaria and ex situ gene banks that can be used to determine the likely location of populations of species of crop wild relatives. Information on the extent and distribution of protected areas is also available from natural resource management agencies, and information on the use of crop wild relatives can be found in institutions attached to the Ministry of Agriculture, universities and colleges.

The national partners will analyse existing information holdings, establish necessary infrastructure, develop appropriate hardware and software systems and national data exchange protocols and ensure that the information is available to the information system. Their systems will include aspects of species biology, ecology, conservation status, distribution, crop production potential, local community uses and existing conservation actions and information sources on crop wild relatives.

Component 3. Enhanced capacity and in situ conservation actions. Lack of capacity, including the absence of an effective operational framework and national plans to deal specifically with conservation of crop wild relatives, has been identified as a significant obstacle to the conservation and use

of crop wild relatives. This component contains a range of activities to improve country capacity to effectively conserve and use crop wild relatives. A solid legal structure is needed and decision-making procedures for identification of priority conservation actions need to provide for the participation of all stakeholders. The legal framework as it relates to in situ conservation of these species will be reviewed in each country. Recommendations will be made where new or modified legislation is required. Similarly, benefit-sharing practices are to be framed into legal rules that set out entitlements. Supporting the development of an operational framework will be a series of training activities and these will include information management, Red Listing procedures, and participatory approaches and benefit sharing issues.

The partners in each country will implement and monitor conservation strategies that are needed to conserve priority crop wild relatives in situ. Countries will undertake ecogeographic surveys and analysis on three to five selected taxa and use this information to refine procedures for using spatial information as a tool in conservation management and monitoring. Specific conservation actions will be identified by integrating information on the species themselves, information on the existing conservation actions and the use of these species at local level. A selected set of actions that are identified as high priority will be implemented and tested for operational effectiveness and sustainability. An action plan will be developed for at least one protected area per country that contains crop wild relatives, and at least two significant in situ crop wild relative conservation demonstration projects will be implemented and assessed with a view to their application as national (and potentially international) models for sustainable conservation. Priority will be given to working with wild relatives of crops of importance to the partner countries. However, wild relatives important for crop improvement in one country may only occur in other countries. This international dimension will be reflected by working on wild relatives of a common agreed list of crops. In this way, the outcomes will provide globally relevant solutions to improving conservation of crop wild relatives.

Output 4. Public awareness. Awareness concerning the need for conservation of plant genetic resources (PGR) and especially crop wild relatives is relatively recent. Awareness of PGR has increased since the approval of the ITPGRFA but knowledge of the value of crop wild relatives to plant diversity and sustainable livelihoods is low. The output will raise awareness within the countries and internationally of the importance of considering crop wild relatives and their value for improving agricultural production. Country and international partners will work together to develop international public awareness activities that ensure that project outputs are made available to conservation workers in non-target countries. These activities will be targeted at various sectors involved in PGR such as policy makers, conservation managers, plant breeder and local users.

The outcomes of the project will be widely disseminated nationally and globally, and successful strategies (best practices) will be readily transferable to other countries with significant populations of crop wild relatives. In this way, global efforts to conserve biological diversity in general, and crop wild relatives in particular, will be accelerated and optimized for the benefit of both the global community and local users.

Expected benefits

The UNEP-GEF Crop Wild Relatives Project will provide a sustainable and cost-effective information and decision-making framework for current and subsequent work on the conservation of crop wild relatives and in doing so make a significant global contribution to their conservation and use. Whilst wild relatives have already contributed many useful genes to crop plants, there is great potential to significantly improve our knowledge, information dissemination systems and ultimately effective use of these species. This will lead to further improvements in crop production and, critically for subsistence farmers, reduced risk of crop failure and improved food security.

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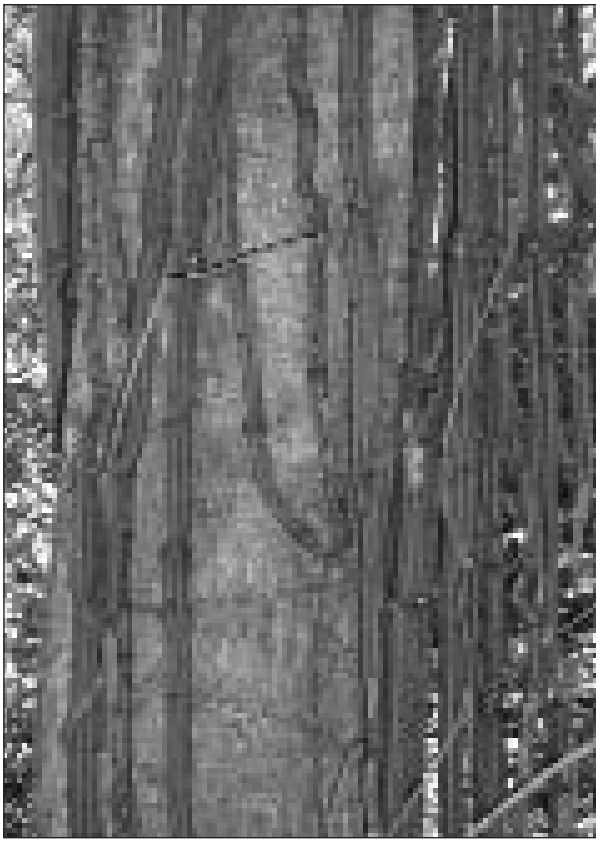

Left: Wild vanilla (*Vanilla* sp.) Ankarafantsika National Park, Madagascar; an important spice common in markets and on the street

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Conservation collections at Meadowlark Botanical Gardens, USA: supporting the *International Agenda* through education and conservation

Meadowlark Botanical Gardens in Vienna, Virginia, USA. has created three distinct native plant collections in support of the *International Agenda for Botanic Gardens in Conservation*. The largest of these is the Potomac Valley Collection (PVC). The PVC development is based on biogeography and floristic composition within the Potomac River basin (see *BGCNews* 3(7), June, 2001). Whereas, the Virginia Native Tree Collection (VNT) and the Virginia Native Wetland collection (VNW) include species that occur within the state as a political unit.

Virginia is topographically and floristically diverse. The Appalachian Mountains in the southwest region of the state reach elevations of 1,600 m. Many other peaks in the west are more than 1,200 m high. West to east the state traverses six distinct geographic regions. These include the Appalachian Highlands, Valley and Ridge, Shenandoah Valley, Blue Ridge, Piedmont and Coastal Plain. The Coastal Plain area is represented by most of the Chesapeake Bay and reaches the Atlantic Ocean further east. The entire state is located between 36-40° N and 74-83° W. In Takhtajan's *Floristic Regions of the World*, Virginia occupies the Appalachian Province and the northern tip of the Atlantic and Gulf Coast Plain Province. Virginia is a state where bromeliads reach their most northerly distribution, cacti adorn beach dunes, endemic birches are found and northern spruce forests dominate the highest mountains. It is also a state in need of both in situ and ex situ conservation. A principal goal of these collections is to educate the public about the connection between garden conservation collections and saving plants in the wild.

The Virginia Native Wetland (VNW)

This collection is located in and around a small wetland called Lake Lena at the lowest elevation in the Gardens. The native biota of Lake Lena is an ideal classroom for educational programmes focused on Virginia's native wetlands and the need for conservation. No horticultural selections are used in this collection. Conservation work began in 1999. Several native trees were already established on the site when the boardwalk was installed adjacent to the lake over ten years ago. Among these are numerous bald cypress trees (*Taxodium distichum*). These trees have grown well and developed their trademark "knees" on the water's edge. Sycamore (*Platanus occidentalis*), black gum (*Nyssa sylvatica*), river birch (*Betula nigra*), black willow (*Salix nigra*) and sweet gum (*Liquidambar styraciflua*) also grow in the area. Many of Virginia's most southerly wetland shrubs and wildflowers are on exhibit here.

Lake Lena is a place of solitude in the garden – a place where native plant horticulture and habitat conservation blend to create a naturalized wetland. Aquatic native plants such as pickerelweed (*Pontideria cordata*), native fragrant water lilies (*Nymphaea odorata*), arrowhead (*Sagittaria latifolia*) and sweet flag (*Acorus calamus*) flourish in summer's humidity. On the lake shore, carnivorous pitcher plants (*Sarracenia purpurea*), red and blue cardinal flower (*Lobelia cardinalis, L. siphilitica*) and blue flag iris (*Iris versicolor*), souring rush (*Equisetum hyemale*) mingle with aromatic bayberries (*Myrica pensylvanica*). Many widespread wetland species are naturalizing around the lake, including cattails (*Typha latifolia*) and numerous native sedges (*Cyperus* spp. and *Carex* spp.).

Lake Lena also provides a habitat for aquatic animals and birds. Several species of turtles, northern water snakes and native frogs inhabit the area. Many native fish and aquatic insects coexist with the plants. Wading birds frequent the lake. Great blue herons, green herons and black crowned night herons enjoy secretive hunting on the water's edge. A full assortment of perching birds frequent the lake too.

The Virginia Native Tree Collection (VNT)

The Virginia Native Tree collection resides in a far corner of the gardens. Here visitors can see some of the State's best native trees for use in the home setting. Several smaller native trees make up a good part of this collection. The fringe trees

Left: View of Lake Lena

(*Chionanthus virginicus*), native members of the olive family, routinely amaze visitors with their fragrant, strap-like white flowers. In the fall, these trees display a dark blue ovoid drupe. This is an ideal tree for the discerning gardener with a small yard.

Growing close by are several paw paws (*Asimina triloba*). These handsome little trees are familiar to people who spend time along local rivers where it grows in abundance. The long, broad leaf tapers neatly to a "drip tip," a feature that illustrates its tropical origin as a member of the Annonaceae. When crushed, the leaves have a distinctive odor reminiscent of diesel fuel. The fruit is a large oblong berry with a slightly coriacious green or brown rind. The mesocarp is white and creamy, often described as a mix between apple and banana with large black seeds. Paw paw is widely regarded as Virginia's finest indigenous fruit.

Other trees in this collection include the hop hornbeam (*Ostrya virginiana*), a hazelnut relative with soft shaggy bark. Also from the Corylaceae is the hornbeam or muscle wood (*Carpinus carolinana*). This tree is notable for its extremely hard wood and fine twigs with delicate imbricate buds. Muscle wood is slow growing and, with age, provides a beautiful fluted trunk. Further along the trail, is overcup oak (*Quercus lyrata*), so named as the imbricate involucre on the acorn covers nearly the entire nut. A tree with highly variable cruciform leaves, it is a good candidate for low, wet sites.

The sweet-bay magnolia (*Magnolia virginiana*) grows nearby. Found from Massachusetts to Florida, sweet-bay magnolia varies in size, attaining much larger stature in the south. In time, sweet-bay becomes a handsome yard tree. The early summer flowers are creamy white and very fragrant. Several other native trees are in this collection, which is located below the Hillside gazebo, about a ten-minute walk from the Visitors Center. The VNT is one of the featured collections in our Specimen Tree programme.

Collection Based Education for Conservation

In the United States, amateur gardeners are constantly encouraged to use horticulture selections by the popular literature and many public gardens. In the collections at Meadowlark, horticultural selections are used only in the VNT. This is an intentional departure from the relatively strict dictum of using regional genotypes in the PVC and VNW. This specific strategy is designed to interest ornamental gardeners in native species through the initial use of horticultural selections. The vast majority of native plants in the American nursery trade are selections. Thus, most amateur gardeners are using these horticultural creations without realizing the wild ancestor may be in need of conservation.

Ultimately, we hope to encourage use of native plants in the landscape and educate the public about the often-subtle differences between native species that represent wild populations and horticultural selections. Furthermore, we educate the visiting public and avocation gardeners alike about the ecological and conservation value of native plants in public garden collections and in the landscape at large. Through this decidedly didactic approach, we have created a forum based on living collections that promotes the *International Agenda* and fosters an appreciation for conserving plant diversity to a wider audience.

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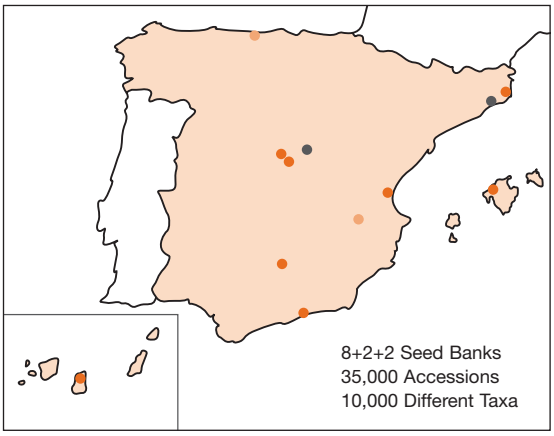
REDBAG: the Spanish Network of genebanks for wild plants



Right: Map of distribution of consolidated partners

Introduction

Spain is a privileged country with respect to the wealth of its biological diversity compared to the rest of the European Union (EU) and the taxonomic knowledge of this diversity is still limited in many cases. There are at least 8,000 vascular plant species in Spain of which 1,500 are endemic. However, Spain also has the largest number of threatened plants in the EU with approximately 12 per cent with IUCN threatened categories (IUCN, 2001).

The objectives of the Convention on Biological Diversity (CBD) and the CBD programme, the *Global Strategy for Plant Conservation* (GSPC) recognises the importance of ex situ conservation (CBD Article 9. Ex situ Conservation, GSPC Target 8: *60 per cent of threatened plant species in accessible ex situ collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes* and the importance of networks for conservation (CBD Article 18. Technical and Scientific Cooperation, GSPC Target 16: *Networks for plant conservation activities established or strengthened at national, regional and international levels* (CBD, 2003; CBD, 2005).

As in many other countries of the world, seed banks in Spain were created and developed in response to the necessity of conserving plant genetic resources such as crops, local varieties and wild relatives. At present, there are more than 25 seed banks mainly located in the provinces of Asturias, Badajoz, Córdoba, La Coruña, Madrid, Málaga, Murcia, Pontevedra, Valencia and Zaragoza. These seed banks hold more than 65,000 accessions of the main crops and families of economic interest for Spanish agriculture such as cereals, legumes, vines, potatoes, tomatoes, citrus, berries or fleshy fruits.

Simultaneously and especially during the last twenty-five years, seed banks for the Spanish flora have been developed in line with the improvement, restoration or creation of botanic gardens and measures for in situ conservation such as reserves, national parks or the implementation of recovery plans for endangered species.

The first wild-flora seed bank initiative was undoubtedly that of the Department of Vegetal Biology of the Polytechnic University of Madrid (PUM). Under the direction of Professor Gómez Campo, it was started in 1966 for the conservation of the Brassicaceae in the Mediterranean. Then, in 1971 the seed bank extended its scope to the Iberian endemic flora, at the time when two people joined its team, who later developed the Botanic Garden of Córdoba and its seed bank (the first author and Margarita Clemente). The seed bank of the PUM holds the highest number of accessions of the Spanish flora (9,900). At the beginning of the 80s, the seed banks of the Botanic Garden Viera y Clavijo in Gran Canaria and the above-mentioned Botanic Garden of Córdoba were also started. The first one now has 2,200 accessions almost exclusively of the Canarian flora, and the second has 5,200 accessions of plants of ethnobotanical interest, Andalusian endemic species and species of the family Cardueae. For the first twenty years of existence until 2002, the Córdoba Seed Bank was managed through several agreements with the Department of Environment of the Regional Government, and it has recently become the Andalusian Seed bank (BGVA).

The seed bank in the Botanic Garden of Valencia University was created in 1991. It now contains more than 1,500 accessions mainly from the Mediterranean flora of eastern Spain (Autonomous Community of Valencia).

The seed bank in the Botanic Garden of Sóller is the same age and also specialises in the local and regional flora. It conserves most of the

endemic species of the Balearic Islands with an emphasis on the conservation of critically endangered species. It plays an essential role in the protection of the Balearic flora.

The Botanic Garden of Marimurtra in Blanes has a small seed bank specialising in Mediterranean bulbous species and a germplasm collection of the genus *Androcymbium* at a world level.

Other seed banks involved with the conservation of Spanish wild flora are those of the Royal Botanic Garden Juan Carlos I, Madrid and the Botanic Garden La Concepción in Málaga.

Finally, there are plans for new seed banks at the Botanic Garden of Barcelona, as well as botanic gardens being built in Gijón, Asturias (Atlantic Botanic Garden) and the University of Albacete (Botanic Garden of Castilla-La Mancha).

The founding of REDBAG

In November 2002, the AIMJB (Asociación Ibero-Macaronesian de Jardines Botánicos) with the collaboration of the Department of Vegetal Biology of the PUM called for a meeting of all the members of the Association that manage germplasm banks and conservation programmes. The result of this meeting was the founding of REDBAG (Red Española de Bancos de Germoplasma de Plantas Silvestres - Spanish Network of genebanks for wild plants).

Membership categories

REDBAG is open to all those institutions which actively manage seed banks of wild species and other phytogenetic resources; they can be AIMJB members with seed banks or other institutions. There are three different member categories:

1) **Consolidated partners** are those non-profit making institutions whose seed bank conserves and manages the plant germplasm of wild populations of the Spanish flora or the autochthonous phyto-resources, with short and medium-term aims, appropriate facilities and methods (See Boxes 1 and 2).
2) **Consolidating partners** are those institutions whose seed bank is in a development stage with a view to becoming a consolidated partner.
3) **Potential partners** are those institutions which are developing a seed bank or have a clear plan. Those institutions that have a seed bank but do not belong to AIMJB are considered **invited partners**.

The REDBAG Objectives are to:

1) establish an efficient system of collaboration with the Central and Regional Governments to fulfil the objectives of the Global Strategy for Plant Conservation (GSPC), especially those included in the Targets 8 and 16;
2) coordinate the development of priorities for REDBAG seed banks to avoid biogeographical and phytogenetic gaps, and share the responsibility for each objective;
3) develop and apply protocols for the management of Spanish plant germplasm, especially those related to its distribution, donation and transfer, according to the current international framework of cooperation and the national and regional legal development as regards Access and Benefit Sharing (ABS) i.e. the access systems and methods of sharing the benefits derived from the commercial and other utilisation of germplasm;
4) establish methods to provide information on biological characters related to reproduction and dispersal, germination tests, cultural techniques, distribution and demography, extinction risks, conservation methods, restoration programmes and the legal framework for the conservation of Spanish plant germplasm;
5) cooperate in the training of technicians for management and research in relation to seed banks;
6) provide coordination for international projects and seed bank networks or any other forum or supra-national framework that relates to the activity of REDBAG members;
7) foster network development by adding new seed banks to complete the biogeographical and phytogenetic map of plant diversity conservation in Spain;
8) promote joint initiatives among network members such as seed collecting expeditions, duplicate distribution, licence management, and in short, any activity that eases the work of the Network member.

The first actions of REDBAG were to:
1) elect a Board made up of four partners from the seed banks of the UPM, Gran Canaria, Valencia and Córdoba. Córdoba will act as the Secretariat;
2) promote a declaration of the Spanish Parliament fostering the creation of a Seed Bank Network committed to the conservation of the wild flora.
3) promote the signing of an agreement with the Department of Conservation (Ministry of Environment), to recognise the existence of REDBAG and to promotes its coordinated activities and ensure the national implementation of the GSPC by the Spanish Government (see Box 2).

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Box 1 Consoldidated partners of REDBAG

Germplasm bank (Consolidated partners)	Place	Foundation year	Main collections	Nº accessions	Conservation techniques	Other relevant facilities
UPM Plant Biology Department	Madrid	1966	Iberian endemic flora	9900	Cool-room Cryopreservation In vitro culture	Seed technology facilities Molecular biology
BGVA Andalusian Govrt. & Córdoba Botanic Garden	Córdoba, Andalusia	1982	Andalusian endemic flora, ethnobotanical collection, Cardueae	5200	Underground cool-roomWith 20 cool chambers (-20 & -5ºC)	Seed technology facilities Cryopreservation In vitro culture Molecular biology
Valencia University Botanic Garden	Valencia	1991	Valencia endemic flora	1500	Cool-room	Seed technology facilities
Royal Botanic Garden of Madrid	Madrid	1986	Spanish flora	4211	Cool-room	Molecular biology
Viera y Clavijo Botanic Garden	Canary Islands	1983	Canarian flora	2200	Cool-room In vitro culture	Seed technology facilities Molecular biology
Royal Botanic Garde Juan Carlos I	Alcalá de Henares, Madrid	1997	Spanish flora	2556	Cool-room In vitro culture	Cryopreservation
La Concepción Botanic Garden	Málaga, Andalusia	1994	Exotic and autochthonous plants	6242	Cool chambers	Molecular biology
Marimurtra Botanic Garden	Blanes, Catalonia	1990	Androcymbium Medicinal plants	210	Cool chambers	Molecular biology
Sóller Botanic Garden	Sóller, Mallorca, Balearic Islands	1991	Balearic flora and endemic flora	460	Cool rooms	Seed technology facilities

Box 2 The activities of REDBAG for agreement with the Department of Conservation (Ministry of Environment)

- A preliminary inventory of the germplasm collections currently conserved in the seed banks of REDBAG
- The development of a co-ordinated database leading to a complete inventory of the collections conserved in the seed banks of REDBAG
- The design and creation of a website
- An inventory of those species with recovery plans in the Spanish Autonomous Regions
- The development of a proposal of priorities and plans for implementing the work of seed banks in the coming years
- The design of a protocol related to the distribution, donation and transference of plant germplasm, within the framework of the CBD regarding ABS
- The design of a method of seed exchange through the Index Seminum for members of REDBAG, including using the Network website
- The development and publication of a manual of good practice for wild germplasm collection
- The official approval of a system of data registration common and accessible for all members of the Network and the corresponding national and regional authorities
- The establishment of a method of cooperation among the members of the Network that allows official approval for security measures and promotion of a duplicate system which ensures the ex situ conservation of the Spanish flora
- The support and implementation of collecting programmes for those regions and taxa which require urgent measures for ex situ conservation
- The organization of meetings to implement the above mentioned aims
- The provision of information and awareness on the activities of REDBAG
- The attendance of meetings of international networks and conventions related to the Network aims
- The support for the Department of Conservation in meetings and commitments related to the conservation of plant diversity within the framework of the CBD and other international agreements
- The facilitation of access and use of the phytogenetic material conserved in the seed banks of REDBAG for conservation or restoration activities by the Department of Conservation
- The support of the conservation and restoration activities implemented by the Department of Conservation

Author: Sara Oldfield

Saving trees around the world: the Global Trees Campaign

The immense ecological, cultural and economic importance of trees around the world should provide strong incentives for their conservation. That is the rationale behind the Global Trees Campaign developed by Fauna & Flora International (FFI) in partnership with the UNEP World Conservation Monitoring Centre. The Campaign aims to save the world's most threatened trees and their habitats by the provision of good information, taking conservation action and promoting sustainable use. The Campaign supports key targets of the CBD Global Strategy for Plant Conservation (GSPC) and is a practical mechanism contributing to the implementation of the Strategy.

The Global Trees Campaign was launched in 1998 in response to the publication of *The World List of Threatened Trees*. This report, resulting from a three year survey, documented the conservation status of around 8,000 tree species globally, information which has subsequently been incorporated into the IUCN Red List. The survey indicated that less than 12 per cent of the globally threatened trees were protected within national parks or other sites set aside for conservation and only eight per cent were in cultivation. FFI decided to take action to promote the value of trees and implement conservation action.

Now the Global Trees Campaign is working on priority projects in over 20 countries. Projects are carefully selected in consultation with local people and with advice from members of the IUCN/SSC Global Tree Specialist Group which is closely associated with the Campaign. Some of these projects are carried out by FFI through the work of its Regional Programmes and others are supported financially by FFI through small grants. A significant source of funding has been the Flagship Species Fund managed by FFI on behalf of the UK Government's Department for Environment, Food and Rural Affairs (Defra).

In parallel to the conservation action, gaps in the information on the conservation status of tree species, building on the 1998 data, are being filled by field research and networking with experts worldwide. The updating of this important conservation information is coordinated by the IUCN/SSC Global Tree Specialist Group, for which FFI provides the Secretariat at its Cambridge, UK headquarters.

The Global Trees Campaign functions effectively by working through partnerships. These may be for example with local community groups, NGOs, forestry departments or other government agencies. Botanic Gardens and Arboreta are important partners in the Global Trees Campaign working in various different ways. The botanical knowledge, horticultural skills and expertise in public awareness and education provided by botanic gardens have been very valuable to the success of the Campaign.

Above: Cultivated Magnolias in China (Photo: Paul Mathew/FFI)

Projects around the world

One of the current projects of the Global Trees Campaign is undertaken by the Havana Botanic Garden in Cuba, working with the IUCN/SSC Cuba Plant Specialist Group. The Cuban Palm Project, is assessing the conservation status and threats to some of Cuba's rarest palms, and is developing strategies to save them from extinction. Recent field work has confirmed that one of the species being studied, *Coccothrinax crinita*, is

Right: Large-leaved Mahogany (*Swietenia macrophylla*) threatened because of exploitation of its valuable hard wood. (Photo: Juan Pablo Moreiras/FFI)

Below: Pau Brazil (*Caesalpinia echinata*). This is one of the species included in the SoundWood programme. (Photo: Paul Mathew/FFI)

Critically Endangered. Only 130 individuals remain in the wild at two localities in Pinar del Río Province. *Coccothrinax crinita* has many uses for local people. The leaves and fibres are used to make brushes, hats and stuffing for pillows and mattresses. The trunks are used in house construction and the fruits are used as animal feed. Over exploitation is one of the threats faced by this palm together with habitat degradation through cattle grazing, burning and the impact of invasive species.

Conservation action for *Coccothrinax crinita* and other threatened palms of Pinar del Río was discussed at a project workshop held in November 2004. In situ conservation, propagation studies, reintroduction and public education form important components of the conservation strategy for this species. To promote public awareness individuals are being planted in prominent places such as in the grounds of health centres and in the recreational park in the Bahía Honda municipality. A very significant success of the Project has been the declaration earlier this year of a Flora Reserve to protect *Coccothrinax crinita* in its natural habitat. The Reserve will also protect other threatened trees including species of box, *Buxus* spp which grow at the same forest site.

Caribbean tree conservation activities have been developed in close association with Fairchild Tropical Botanic Garden Miami, USA with which FFI has signed a Memorandum of Understanding. Fairchild is also supporting another important Global Trees Campaign in Madagascar. This focuses on four highly endangered tree species found in the Vohibola forest, one of the two remaining littoral forests in the eastern part of the country. The project, undertaken by local partners will help people who live in the area and depend on forest resources to improve forest burning controls and policing against illegal timber cutting. Recovery of the tree species will be further assisted by translocating saplings produced in an on-site nursery back into their forest habitat.

In China a new Global Trees Campaign project to conserve threatened species of Magnoliaceae was designed at a workshop held in Kunming Botanic Garden in May 2004. At this workshop, species conservation priorities were agreed on the basis of status, threat, reliability of taxonomy and use. A project proposal was subsequently prepared and funding has been provided through the Flagship Species Fund to support the conservation of five priority species: *Manglietia sinica, Manglietia grandis, Magnolia sargentiana, Magnolia phanerophlebia* and *Michelia coriacea*.

In association with FFI's China Programme the project will:

- Conduct a thorough literature survey of the five priority species, followed by field survey work to fill information gaps and to ground-truth the distribution data. The survey results will be used to prepare practical conservation strategies for protecting key species or areas of concern.
- Hold a workshop involving Chinese and Vietnamese scientists and officials to develop proposals for cross-border survey and conservation work in south-east Yunnan province, China and Vietnam. The intention is to build partnerships between scientists in the two countries and develop the basis for joint conservation work once further funding becomes available.
- Review the impact of wild collection of Magnoliaceae in China for the horticultural trade, the impact of the international (particularly UK) trade in wild and propagated Chinese Magnoliaceae, and the ex situ conservation of Magnoliaceae in the UK. The project will assess the ways propagation is benefiting Magnoliaceae and will promote links between UK and Chinese institutions involved in ex situ conservation activities.

In Brazil, the Global Trees Campaign is working with the Rio Botanic Gardens and the Margaret Mee Foundation to carry out detailed studies of remaining populations of the endangered tree Pau Brasil, *Caesalpinia echinata*. Regeneration of the species is being studied, planting schemes carried out and local community education projects undertaken

Pau Brasil is the national tree of Brazil, and gave the country its name. This Endangered species acts as a Flagship species for the threatened Atlantic Coastal Forest - a global biodiversity hotspot. Pau Brasil was initially exploited by European settlers as a source of valuable purple dye. Felling the trees led to the clearance of vast amounts of the Atlantic Forest from the 16th to mid-19th centuries and populations of the species continued to decline until the 1920s when synthetic dyes were made widely available. The timber is still highly sought after for the manufacture of bows for stringed musical instruments, although government legislation now prevents export of the timber.

SoundWood

Pau Brasil is one of the species included in the SoundWood Programme of the Global Trees Campaign. This aims to conserve threatened tree species that are used in musical instrument manufacture. SoundWood works with industry to support sustainable production and procurement of the required timbers, supports international policy initiatives on sustainable trade in timber and has a strong educational component. Projects to conserve and restore species such as Pau Brasil, Mahogany *Swietenia macrophylla* and African Blackwood *Dalbergia melanoxylon* in their natural habitats are also undertaken. These in turn feed into the educational activities bringing alive the ecological and livelihood issues associated with the tree species.

SoundWood education programmes have been running for schoolchildren in the UK, US and Brazil. In the UK, projects have been undertaken in collaboration with the University Botanic Garden, Cambridge and the Eden Project, Cornwall. Education resources have been developed for wider use and can be accessed from the Global Trees Campaign website.

Looking ahead

The Global Trees Campaign continues to grow and to develop new partnerships. Over the coming months BGCI will be exploring ways to work with FFI to help further the aims of the Campaign. Linking in situ and ex situ activities will be crucial, for example, to save the 900 Critically Endangered tree species that are currently recorded by IUCN. BGCI's Plant Search facility, will be an important tool to facilitate prioritisation of tree species for further action.

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Below: Impressive flowering tree inside the rainforest, Parque Internacional La Amistad, Costa Rica. (Photo: Juan Pablo Moreiras/FFI)

Authors: Guo Cheng-ze, Guo Da-zhu, Ma Pei-shen

The ex situ conservation of *Tsoongiodendron odorum* Chun (Magnoliaceae) in Nanyue Arboretum, Hunan Province, China

Right: *Tsoongiodendron odorum* growing in the Arboretum Endangered Plants Plot

The tree *Tsoongiodendron odorum* Chun is rare and nationally protected in China (Fu, 1992). *T. odorum* occurs from a latitude of 26°N southward throughout the mountain areas of subtropical China, where it grows naturally in the provinces of Fujian, Jiangxi, Hunan, Guangdong, Hainan, Guangxi, Guizhon and Yunnan. Its altitude range is from 200–1,200 m. It is scattered in mountain evergreen broadleaved forests or in villages, but does not form continuous tracts (see map).

Mature trees are isolated and natural regeneration is weak. Seedlings or young trees are not seen near the parent trees. There are few fruiting trees and mature seeds are frequently eaten by birds and mice. The trees grow fast, but because the tree's trunk is straight and large; and the timber is very good and easily worked, young trees are always cut down and the roots are dug out by local residents. Thus the number or trees is decreasing. It is estimated that there only 80 individual trees remaining in Hunan Province and if it is not saved in time it will become extinct.

The Nanyue Arboretum has been studying this species over the last 24 years. Areas of research have included its botanic and ecological characteristics, distribution, causes of threat and the development of techniques for propagation and cultivation through seeds and cuttings. The long life of the tree makes it suitable for planting as a street tree, as an ornamental or as a lumber tree.

Seeds were collected between 1980 and 1983. These were germinated and two thousand seedlings of the species have developed into saplings. They have been planted in a plot of about 3 ha in the Arboretum that is reserved for rare and endangered species. The saplings (2003) have a mean height of 23 m with a trunk diameter of 19.6 cm (at chest height); the tallest is 24 m with a trunk diameter of 22 cm. All the trees have flowered and fruited; and each tree can produce up to 15 kg of seed each year. The seeds are used for propagation.

The seed was collected from the forest region of Gao Ze Yuan (Jiangyong county) in southern Hunan Province where it grows at elevations of 200–300 m. This region is at a latitude of 25 °N. The soil of the site is derived from weathered sandy shale or granite. The tree grows on fertile, deep, moist, loose soils that have a pH of 5–6.5; the surface soil layer is rich in humus. The annual mean temperature is between 18–20 °C with a minimum temperature of -3 °C and a maximum temperature of 43 °C. There is a frost-free period of 300–310 days; the annual rainfall is around 1,500–2,000 mm and the relative humidity is 65–85 per cent. *T. odorum* grows with companion trees such as *Exbucklandia populnea* (R.Br. ex Griff) R.W. Brown, *Altingia chinesis* Oliver, *Daphniphyllum macropodium* Miq., *Elaeocarpus decipiens* Hemsle., *Liquidambar formosana* Hance and *Choerospondias axillaris* (Roxb.) Burtt. & Hill. To sum up, this species likes warm, moist, mountain habitats in a monsoon climate and fertile or very fertile soils.

However, even though the Rare and Endangered Plant Plot in the Garden has different conditions from the provenance area in Gao Ze Yuan and is 300 km apart, this species has been successfully cultivated in the Arboretum. It is 2.5 degrees of latitude further north and has a higher altitude of 300–450 m. The soil derived from weathered granite turns into mountain red earth and mountain yellow loam with a lower pH of 4.5–5.5. The annual mean temperature is lower at 16 °C, with a lower minimum and maximum temperature of -8 °C and 40 °C. It has

Propagation procedure

The mature fruits (conocarpium) are picked and put in the sun for several days (see illustration). When the walls of the fruits have broken down, the seeds are soaked in water for 3–4 days; the water must be changed every day. The pulp seed stalks become soft and are lightly rubbed with the hands; the seeds are extracted and dredged in moist sand (one part seed and three parts sand) and stored in wooden, bamboo or ceramic containers over the winter in a ventilated, shaded room. The seeds must be kept moist, and checked frequently to prevent drying out, as well as for damage by fungi or mice.

A kilo of fruit contains about 2,200–2,500 seeds, and about 70 per cent of these will germinate. Seedlings were grown in experimental nurseries at altitudes of 100 m, 200 m and 400 m. Seeds were sown in lines, 20–25 cm apart, 2–3 cm deep, in groups of 40–50. They are covered by one centimetre of soil and two layers of rice straw, so the soil can only just be seen. After about two months the seeds germinate and the rice straw can be removed on a cloudy day or at dusk on a fine day. Seedling diseases and pests need to be controlled by weeding, loosening soil and good drainage to prevent water logging.

In their first year, the seedling's mean height is 60–70 cm with a ground diameter of 0.4–0.7 cm. and they develop a good root system. Over 85 per cent of seedlings may be planted in the following spring; smaller seedlings can be kept in the seed bed for a further year.

Successful vegetative propagation has been undertaken by using cut or cleft-grafting and layering half woody cuttings in spring. The stock used was *Magnolia maudiae* (Dunn) Figlar. The scions taken were one year old from the canopy of the seed tree. In total about 200 plants have been grafted and 95 per cent survived.

Above: Distribution of *Tsoongiodendron odorum* in China

a shorter frost-free period of 280–300 days; lower annual mean rainfall around 1,200–1,700 mm, but similar relative humidity of 60–85 per cent; and there is an annual snowfall of not more than 7 days. The plant cover of the provenance site includes *Pinus massoniana* Lamb., *Loropetalum chinense* Oliver, and *Rhododendron simsii* Planch.

Reference

➡ Fu, Li Kuo (ed) 1992. *China plant red data book: rare and endangered plants*. Beijing: Science Press.

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Left: Fruit of *Tsoongiodendron odorum* in the Arboretum

Author: Jacob Thomas

The Arboretum at The Barnes Foundation USA: an exquisite piece of nature and a professional training center for horticulturists

Above: A view of the greenhouse

The eastern coast of United States, particularly Philadelphia and the Delaware Valley area, often described as the 'gateway to America's gardens,' possesses the largest concentration of botanical gardens and arboreta in the country. Among them, the Arboretum at The Barnes Foundation in Merion, Pennsylvania, presents a unique assemblage of mature specimens of rare and unusual trees and other woody plants of aesthetic interest that is visited by about 40,000 people annually. The plants are cultivated in a fine landscape and garden setting that reflects concepts from the unique arrangement of art works in the *Gallery** rooms. The Arboretum and the attached School have served as a training ground for the horticultural movement among eastern Pennsylvania communities for more than sixty years.

Below: A very old *Wisteria sinensis* on the terrace garden

* Albert Coombs Barnes (1872-1951), a medical doctor, established The Barnes Foundation in 1922 as a school to promote the advancement of education and the appreciation of fine arts and horticulture. The Foundation carries out its mission through teaching, research, and other programs related to its Art and Arboretum Departments, as well as through public access to the Arboretum and the Gallery which houses its main collection of paintings, sculpture, and other works of art. The Foundation owns one of the finest collections of French Impressionist, Post-Impressionist, and Early Modern paintings in the world. An extraordinary number of masterpieces by Renoir (181), Cézanne (69), and Matisse (60) and many exemplary works by American artists give visitors a depth of experience unavailable anywhere in the world. Fine examples of African, Native American, Asian, and Classical art, as well as hand-wrought iron, early American furniture, ceramics, textiles and glass, together make it the nation's first purposely-multicultural collection of approximately 9,000 objects.

The Arboretum was established on a 13-acre plot of land previously owned by Captain Joseph Lapsley Wilson, a Philadelphia attorney, who planted a number of different trees as early as the 1880s. When Dr Albert Barnes purchased the property in 1922, he agreed to preserve Wilson's trees, which became the nucleus of the Arboretum of The Barnes Foundation. Dr Barnes made Wilson the first director of the Arboretum and later entrusted its development to his wife, Laura Leggett Barnes. Several of Wilson's original trees still stand around the Gallery, including an unusual fern-leaf beech (*Fagus sylvatica* 'Laciniata'), a Japanese raisin tree (*Hovenia dulcis*), and a very large honey locust (*Gleditsia triacanthos*).

With the support of E.H. Wilson from the Arnold Arboretum and Dr. John Fogg Jr. from the University of Pennsylvania, Laura Barnes enhanced the living collections. Mr. Frank A. Schrepfer, a landscape architect, also from the University of Pennsylvania, prepared the plan for the grounds including a series of formal terraces crowned with a rose garden. Special emphases were given to broad-leaved evergreens for this area and for groups like lilacs and peonies. Representative species in each genus of the conifers were introduced including the monkey-puzzle tree (*Araucaria araucana)*, Californian redwood (*Sequoia sempervirens*) and Dawn redwood (*Metasequoia glyptostroboides*).

Here, most cultivated plants serve a dual purpose: to exist as a part of the general display/teaching collection and of the aesthetic scheme developed by experiment and careful observation. In 1933, Laura Barnes testified her purpose in developing an area behind the gallery building as, "…to obtain a compositional effect that would be beautiful in it and also a unit that would harmonize with other units and form a composition of all parts of the Arboretum. In doing this, I followed the same instinct as the painter does in organizing his canvas … It takes time to find rare trees and to find out by experiment the particular arrangement of masses, colors, graceful lines and spatial intervals that gives the most beautiful effect." She experimented boldly and successfully with plants usually grown south of Washington, DC, and in other countries that were not supposed to be hardy in the frigid Pennsylvania winter, including southern

magnolias, camellias and mimosas and most continue to survive and flourish today. Specimens of different teaching collections, like Japanese maples, Hollies, Stewartias, Magnolias, Phellodendrons, Crabapples etc., are placed in close proximity for the convenience of comparison. Plant names like *Ilex aquifolium* cv.'***Laura L. Barnes***,' *Syringa vulgaris* cv. '***Laura L. Barnes***,' *S. vulgaris* cv. '***The Barnes Foundation***,' *Picea orientalis* cv.'***Barnes***.' reflects her in-depth involvement in breeding and naming new cultivars/varieties of decorative plants.

French architect Paul Cret, who designed the gallery building, also created a stone teahouse in a small remnant of indigenous woodland covered by an enchanting forest of trees, native plants and water. This woodland serves as the setting for the collections of wild flowers and many species and varieties of hardy native ornamental ferns including a number of English varieties, arranged in masses and drifts. As early as the 1930s this collection was described by fern authorities as unmatched in range and in display value in the United States. Over the years, Mrs. Barnes continued to demonstrate a concern for the environment and extended her hospitality to everyone with an interest in gardening, opening the gates of the Arboretum to the community.

No account of this Arboretum would be complete without reference to the Arboretum School that Laura Barnes organized in 1940. It was the first of its kind in the region, conceived to address the lack of opportunity in this part of the country for serious students to study horticulture under professional guidance. Her mission to guide students to better appreciate the aesthetic appeal of plants and gardens, while providing a sound scientific and practical base in botany, horticulture and landscape design, was soon realized. She developed an interesting program for training a well-informed horticultural practitioner, which is unique even today in this region. Students gain required practical knowledge and experience by working in the Arboretum and greenhouse. Started with a faculty of three and five courses, this program now in its seventh decade, has a college-level faculty of thirteen or more and offers 17 courses over a three-year period. Recently, the American Council on Education recommended the courses for college credit transfer. This school has changed many lives during its existence; many have gone on to careers/businesses in horticulture or became volunteer gardeners in their communities; many of the area public gardens have Barnes graduates as volunteers, as board members or as paid staff.

Dr. John M. Fogg Jr., director of the Arboretum after Laura Barnes, created and developed a herbarium of about 10,000 specimens. It houses voucher specimens of almost every species, variety, form and cultivar, growing in the Arboretum as well as specimens from Dr. Fogg's exploration trips to different parts of the world. The herbarium serves as an important teaching aid and a resource for the study of critical groups of woody plants. A checklist of the woody collections was periodically published and disseminated among other gardens and students. Laura Barnes documented relevant information about each specimen on index cards as they were procured, which is still regarded as the authentic accession record. Detailed location maps were also prepared for the woody collections, and separate maps for the lilacs and peonies. This information and the voucher specimens in the herbarium serve as the reference resource for curatorial and research projects.

Recently, several creative steps were initiated including hiring professional staff and development of a collections policy, to renovate and upgrade the Arboretum and its features. The old greenhouse was rebuilt during 2000-02 with climate controls and is being used for classes, and for propagation and display of plants, including tropicals. Individual plant tags, descriptive labels and directional signs were installed. Replanting of lost or dead plants has been initiated along with selected new introductions. The fern collection is being renovated for its historic and conservation values.

A Children's Garden is being developed with vegetables, annuals and a butterfly garden. School students who visit The Foundation under the K-12 curriculum and learning program are making use of the Arboretum and related facilities for their exercises. Special horticultural programs are being developed with selected schools and introduced to the students in the community. A small but active group of volunteers, mostly graduates from the Arboretum School, render many hours of service to maintain and develop the gardens, for plant sales and as tour guides.

Above:
A view of the woodland garden with tea house and pond

In the coming years, we intend to present the Arboretum as a good public garden with better amenities and access to various collections, especially for the disabled. Living collections of germplasm value, like lilacs and peonies constituting hundreds of predominant varieties and cultivars of those periods, are being evaluated for research and conservation. Also under consideration is a plan to participate in the conservation of native and local flora using the 'Ker-Feal' grounds, 137 acres of natural woodlands in Chester County, Pennsylvania. The greenhouse will also be used for continuing experiments with unusual plants, a practice initiated by Laura Barnes. Plant records, presently on index cards and registers, need to be updated and computerized. Fifty year's comprehensive data on the flowering records of the plants of the Arboretum- an invaluable reference document- is awaiting publication. It is hoped that the Arboretum at The Barnes Foundation will continue to serve its aesthetic and educational mission as envisaged by its founders.

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Short Communications

Re-introduction of Native Orchids in Singapore

During the last two years, two native orchids, *Bulbophyllum vaginatum* and *B. membranaceum* have been successfully propagated and re-introduced by Singapore Botanic Garden.

Right: Using a crane to introduce orchids in Singapore

Seeds of these species were collected from plants growing in their natural habitats. The seeds were sown on aseptic media. Seedlings were grown on the media until 2-3 cm tall before being transferred to the nursery. Some seedlings were planted on fern bark measuring 7 by 5 cm. These were grown in the nursery for 6 months until new shoots began to develop, they were then reintroduced. Suitable trees were selected; fern bark with established seedlings was secured to the tree trunk by nails. So far, some 500 seedlings have been re-introduced in several locations in Singapore such as Pulau Ubin, Sembawang Park, Kent Ridge Park and Tiong Bahru Park. Over 90 per cent have settled down and are growing well in their new home, producing new shoots and growing onto the bark of the host tree. Several seedlings of *B. vaginatum* planted in Pulau Ubin have flowered.

Source: Yam Tim Wing, Aung Thame, 2004. Re-introduction of Native Orchids. *Gardenwise* 23: 8

Ex situ conservation of *Isonandra villosa* (Sapotaceae) at the National Botanical Research Institute, Lucknow, India

Isonandra villosa Wight is a rare Indian endemic reported, only from Andhra Pradesh, Kerala and Tamil Nadu States in India (Nayar & Satry, 1990). Wight described the species from voucher specimens at the Madras Herbarium that had been collected from the Quilon district of Kerala. The date of collection and original habitat of these specimens is not known. This species has not been collected again from the type locality or adjoining regions in the recent past. The last collections of this species were made from Nellore district of Andhra Pradesh and from the Kambakam Hills in the Chingalput district of Tamil Nadu State in 1923. A literature search and examination of specimens at the herbaria of the Botanical Survey of India at Kolkata (Calcutta) and Coimbatore (Tamil Nadu) revealed the extreme rarity of this species. Some recent exploration parties have reported that it is probably extinct in its natural habitat.

In the course of preparing inventories of the living plant collections at the Botanic Garden of the National Botanical Research Institute (NBRI), Lucknow, *Isonandra villosa* was found growing successfully, most probably from seed procured in 1972. Ex situ conservation and propagation studies on this taxon are being carried out in

Right: A branch of *Isonandra villosa* with flowers in leaf axils (right) and fruit in leaf axil (far right)

Far right: Twig of *Isonandra villosa* with successful air layering

the NBRI Botanic Garden to provide material for remedial measures for in situ populations. The results of these efforts are summarised below.

The plants flower profusely but very poor fruit formation and seed setting as well as maturation have been observed during the past ten years. A few seeds were collected in April 1996 and sown in the July, but none of them germinated.

Efforts were made to multiply this species vegetatively by taking stem cuttings, but these failed. Air-layering was attempted in July using rooting hormone. After a period of 30–40 days 50–60 per cent rooting was observed. The rooting response was better from branches more exposed to sunlight. Successfully rooted twigs (25–30 cm long) were treated with a 1 per cent solution of a mild fungicide and transplanted, at the end of August, into pots containing sterilised coarse sand and leaf-mould in a 3:1 ratio. The plantlets established within a period of 40–50 days. Transplantation of the plantlets into the ground was undertaken during the following year's rainy season (years 1999 and 2001 respectively). The plants are growing well and are under constant observation. Their germplasm has been provided on exchange to various institutions and organisations.

References

➡ Nayar, M.P. & Satry, A.R.K., 1990. *Red Data Book of Indian Plants: Vol 3*. Government of India, Calcutta.

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Seed germination of *Arbutus unedo* L. (Ericaceae)

Some ecological factors that could affect seed germination of *Arbutus unedo* have been studied. The following treatments were applied, 1) cold stratification (4°C), 2) thermal shock simulating fire effect, 3) sulphuric scarification simulating the pass through digestive tract of dispersers, and 4) effect of the fruit pulp. Sulphuric acid did not affect the germination capacity nor germination rate. The remaining treatments diminished germination capacity; no germination was observed in the seeds treated with fruit pulp. Results suggested that fruit pulp inhibits seed germination, and that seeds could be effectively dispersed by endozoochory and are damaged by fire.

Source: Eduardo Narbona, Montserrat Arista y Perdo L. Ortiz, 2003. Germinación de las semillas del madroño (*Arbutus unedo* L., Ericaceae). *Acta Botanica Malacitana* 28: 73- 78.

Chagual Botanic Garden - education and conservation of native Mediterranean plants from Chile

Santiago's new Botanic Garden is rapidly taking shape. It will be part of the Metropolitan Park of Santiago, probably the city's main historical and scenic milestone, with a magnificent view of the Andes Mountains. The Garden will be a centre for the conservation of the native plants of Chile and will help people recognise and value the flora as a part of the Chilean national identity, culture and landscape.

The Botanical Garden will extend over 40 ha (87 acres). It will be organized into three areas: plant collections of the ecosystems of Central Chile (30-38° S); thematic gardens highlighting taxonomy and plants of economic value with a "discovery garden" for young children and other special exhibits; and plants from other regions with Mediterranean climates such as South East and South West Australia, the South African Cape, California and the Mediterranean Basin. The Government has selected the Chagual Botanic Garden, out of a total of 800 initiatives, to receive a one of eight "Sello Bicentenario". This award will celebrate the bicentenary of Chile's independence in 2010 and has been awarded to initiatives which strengthen the country's identity as a nation. The Botanic Garden will make a significant contribution to the enhancement of the nation's natural heritage.

In the initial stages of this project, seed money was received from the United Nations Development Project (UNDP). Other contributions have been received from government as well as from private institutions. The Botanic Garden Master Plan was commissioned by the Catholic University in Santiago, Chile and will be completed by May 2005. An important fund raising campaign is now being launched, to secure the financing for future works.

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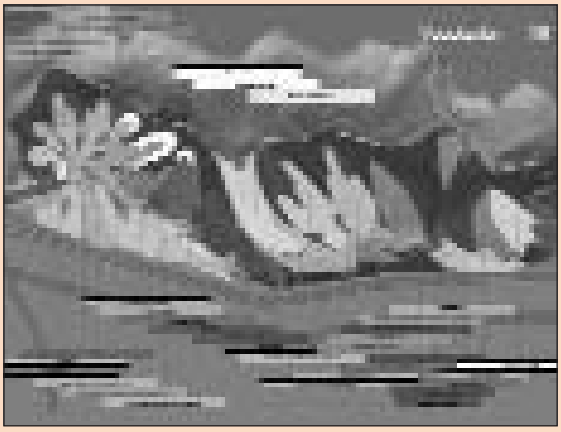
Below: Master plan of Chagual Botanic Garden which shows the proposed location of the plant groups



Left: Model of Chagual Botanic Garden

Book Notices

Janet Marinelli, 2005
Plant
DK Publishing, New York, USA.
512 pp. ISBN 075660589X
Price: US$50.00 excluding postage.
Contact: DK Publishing, 375 Hudson St., New York, NY 10014, USA.
Tel: +1 212 213 4800,
Fax: +1 212 689 4828, E-mail: ecommerce@us.penguingroup.com,
Internet: us.dk.com.

This beautiful encyclopedia is designed to provide environmental and horticultural information so that gardeners can make the right decisions about what to grow in their gardens. The book highlights the needs of each plant based on its natural habitat which shows why certain plants need watering and others need dry conditions. This information is then related to the conservation status in the wild (if it is threatened and why), which highlights the importance of managing habitats and cultivating plants for conservation. It also includes a section on invasive plants, plant information and global habitats.

The Editor-in-chief, Janet Marinelli is based at Brooklyn Botanic Garden in New York, USA. Ms Marinelli is a leading advocate of plant conservation and has pioneered the importance of ecological landscaping and sustainable horticulture. This book has been sponsored by BGCI and twenty botanic gardens worldwide and includes contributions from staff of many gardens. A royalty on sales of the international edition of this book will come to BGCI to support plant conservation worldwide.

This book provides a unique perspective which will help us develop horticultural skills so that we can manage our environment sustainably. It will be extremely useful for all botanic gardens as a reference work for scientists, horticulturists and environmental educators.

Ian Spellerberg and David Given (ed.), 2004
Going Native: Making use of New Zealand plants
Canterbury University Press, Christchurch, 256 pp.
ISBN 1-877257-13-3 Price: NZ$39.95
Order from Canterbury University Press, Private Bag 4800, Christchurch, New Zealand. Tel: +64 3 364 2914,
Fax: +64 3 364 2044,
E-mail: info@nationwidebooks.co.nz,
Internet: www.cup.canterbury.ac.nz

This book is a celebration of native New Zealand plants, their use and conservation. It is a collection of essays on topics from traditional plant use by Maori, native plants in art, plant chemicals, use of natives for horticulture (containers, amenity use, landscape design, shelter, restoration planting in schools), restoration of lowland and coastal habitats and horticulture (propagation, plant distribution and cultivation of natives and restoration). The final chapter provides a selection of New Zealand native plants with recommended propagation methods, environmental tolerance and garden and other uses. The book will lead to an increase in planting and revegetation of natives which is essential for their conservation and also a key to the future sustainability of most land uses.

It is a stimulating book for anyone working to conserve a native flora and for information on the propagation, cultivation and use of New Zealand plants.

J. Martínez, O. Fiz, V. Valcárcel and P. Vargas, 2004
Jardín Botánico de Madrid: Un Paseo guido (Botanic Garden of Madrid: a guided walk) Ibersaf, Madrid 304 pp.
ISBN: 84-95803-18-6 Price: €25
Orders from Safel Distribución, S.L.,
C/ San José, 2, Madrid 28014, Spain.
Tel: +44 91 429 95 34, +44 91 429 30 96l,
Fax: +44 91 420 39 48 l 28014,
E-mail: safel@ibersaf.es *In Spanish with notes in English*

This guide book to the Royal Botanic Garden Madrid is arranged in 41 stops with information panels in English, French and German. The stations describe the history, architecture and plants of the garden. For instance, there are stations describing the greenhouses, labels and fountains, the olive (Olea europaea) and the oak (*Quercus ilex*), statues in the garden, carnivorous and endemic plants and plant classification. The guide has information in Spanish with short notes in English and is clearly arranged with beautiful and relevant illustrations. This book would enhance a visit to the garden and shows how botanic gardens can provide a wealth of information to the public.

E. Weber, 2004
Invasive Plant Species of the World: A Reference Guide to Environmental Weeds
CABI Publishing, UK. 560 pp. ISBN 0 85199 695 7. Price £75/ US$140.00
Copies can be obtained form CABI Publishing, CAB International,
Wallingford, Oxon OX10 8DE, UK.
Tel: +44 (0) 1491 832111,
Fax: Tel: +44 (0) 1491 833508,
E-mail: cabi@cabi.org,
Internet: www.cabi-publishing.org

This book provides a reference guide to 450 major invasive plant species that are harmful to natural areas. Each species has an entry providing information covering lifeform, synonyms and commercial use, geographic distribution, habitats invaded, description of morphology and importantly, ecology and control with key references to each species. It has a useful introduction on invasive plant species with further references.

The book would be invaluable for a garden developing policies on invasive plants within the garden and providing advice to local and regional organisations on the control and management of invasive plants. The book, by providing baseline information, could also help

horticulturists in botanic gardens identify invasive traits; a role for botanic gardens, which are often accused of being a source of invasive plants. This book would be an important reference work for a any botanic garden library.

Tim Upson and Susyn Andrews, 2004
The Genus Lavandula
Royal Botanic Gardens, Kew 442pp.
ISBN 1842460102 Price: £37.50
Order from KewBooks.com, c/o Summerfield Books, Main Street, Brough, Cumbria CA17 4AX, UK.
Tel: +44 (0)17683 41577,
Fax: 44 (0)17683 41687,
E-mail: Information: info@kewbooks.com or Sales: sales@kewbooks.com
Internet: kewbooks.com

This book describes 39 species, numerous hybrids and almost 400 cultivars and brings together the taxonomy, distribution, history and cultivation of *Lavandula*. There are chapters on propagation, pests and diseases, and an overview of the commercial products, essential oils and plant chemistry. A new infrageneric classification is described which splits the genus into three subgenera which reflects the many different groups of species found in this genus. In recent years, five new species have been described, along with many infraspecific taxa, from the Arabian Peninsula, north and north-east Africa and the Canary Islands. It is in these regions where the genus is most diverse, rather than southern Europe where the most popular garden species originate. The work will be useful for perfumers, aromatherapists, growers and gardeners.

Dilys Roe, 2004
The Millennium Development Goals and Conservation - Managing Nature's Wealth for Society's Health
IIED http://www.meetingthemdgs.org/pubs.html

This is an e-book of essays on achieving the Millennium Development Goals free on the web. For instance there are useful and thought-provoking papers: Beyond Wildlife - Biodiversity and Human Health (Eric Chivian, Harvard Medical School), Climate Change - Biodiversity and Livelihood Impacts (Hannah Reid, IIED), How can Markets for Ecosystem Services Benefit the Poor? (Maryanne Grieg-Gran, IIED and Joshua Bishop, IUCN), Reconciling Global and Local Priorities for Conservation and Development (Sonja Vermeulen, IIED) Sustainable Landscapes - Linking Conservation and Production (Jeffrey A. McNeely, IUCN), Mainstreaming Biodiversity into Business (Annelisa Grigg, Fauna and Flora International) and Linking Biodiversity Conservation and Poverty Reduction to Achieve the Millennium Development Goals (Peter Hazlewood, Geeta Kulshrestha, and Charles McNeill, UNDP).

Graham Bennett, 2004
Integrating biodiversity conservation and sustainable use: Lessons learned from ecological networks
IUCN, Gland, Switzerland and Cambridge, UK. 55pp.
ISBN 2-8317-0765-X
Available from IUCN Publications Services Unit, 219c Huntingdon Road, Cambridge CB3 0DL, UK.
Tel: +44 1223 277894,
fax: +44 1233 277175,
E-mail: info@books.iucn.org,
Internet: www.iucn.org/bookstore

Habitat fragmentation is one of the greatest threats to biodiversity and ecosystem function. An ecological network is an inter-connected system of natural or semi natural landscapes that is managed with the objective of maintaining or restoring ecological services. This book describes systems throughout the world from industrialised and developing countries such as the Baltic Ecological Networks (Estonia, Latvia and Lithuania), the Green Wood in the Netherlands, the Tri-DOM in the Congo Basin, the Mesoamerican Biological Corridor, Y2Y (Yosemite to Yukon) in North America and the Terai Arc Landscap arc in Nepal. These systems conserve biodiversity and provide sustainable livelihoods for their people.

J.E.M. Baillie, C. Hilton-Taylor and S.N. Stuart, (eds) 2004
2004 IUCN Red List of Threatened Species. A Global Species Assessment
IUCN, Gland, Switzerland and Cambridge, UK 191 pp.
ISBN 2-8317-0826-5
Available from IUCN Publications Services Unit, 219c Huntingdon Road, Cambridge CB3 0DL, UK.
Tel: +44 1223 277894,
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This publication is an analysis of all the species (and their supporting documentation) listed in the *2004 IUCN Red List of Threatened Species*. The full list of species in the IUCN Red List is available as an on-line searchable database accessible via the internet at: http://www.iucnredlist.org. This analysis includes useful figures on topics such as extinction in recent times, trends in the status of threatened species, the social and economic context of the Red List and the many causes of threat. For instance, habitat loss appears to be the most pervasive threat, impacting 86 per cent threatened birds, 86 per cent threatened mammals and 88 per cent of threatened amphibians.

Romaric Pierrel and Jean-Pierre Reduron (eds) 2004
Les Herbiers: Un outil d'avenir. Tradition et modernité
AFCEV, Villers-lés-Nancy, France.
357 pp. ISBN 2-9514620-2-6
Price: €35.00 plus €3.48 postage.
To order contact AFCEV, 100 rue du jardin botanique, 54600 Villers-lés-Nancy, France. Tel: +33 (0) 3 83 91 84 93,
Fax: +33 (0)3 83 27 86 59,
AFCEV@jardin-bota.uhp-nancy.fr
In French

These are the proceedings of a meeting organised by AFCEV (L'Association Française pour la conservation des Espèces Végétales) in cooperation with the Botanical Society of France held in Lyon in November, 2002. This collections of papers illustrates the richness and scope of floristic research that has been undertaken in France over the last few centuries and that herbaria are the most important resource of botanical knowledge, representing an invaluable cultural heritage and an inexhaustible source of data for numerous disciplines as well as plant conservation.

The meeting included workshops which discussed the management of herbaria and herbarium data and policies for the use of material.

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