Plant extinction – threats and solutions

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The need to conserve biodiversity is increasingly recognised by society and a variety of mechanisms are in place at local to global levels. In reviewing the overall progress in biodiversity conservation to which botanic gardens contribute it is apparent that we lack basic information at a species level but nevertheless we see the devastation of ecosystems around the world and instinctively realise that species are under threat. The botanic garden community has a particular responsibility to take care of rare and threatened plants that are often surprisingly overlooked in the biodiversity debate. The main aim of this Congress is to review the contributions that botanic gardens are making to biodiversity conservation around the world, particularly within the framework of the *Global Strategy for Plant Conservation* (GSPC) of the Convention on Biological Diversity (CBD) (CBD Secretariat, 2003).

Measuring biodiversity

Biodiversity is considered by the CBD to include diversity at the genetic, species and ecosystem level. Of course we need to conserve biodiversity at all these levels as well as the linkages between them but conservation at the species level is a particular focus for botanic gardens.

In general species are the units of biodiversity that are easiest to characterise, monitor and measure. There are relatively few data for the measurement of genetic variation; for ecosystems there is no single agreed classification and they can exist at any scale. Species are irreplaceable, unique units of biodiversity with a combination of traits that are products of long, independent evolution (Mace *et al.,* 2003). There is relatively good data for measuring and monitoring species diversity looking at richness, diversity, endemism and of course threats to individual species.

In measuring biodiversity, we do not know with certainty how many flowering plant species there are in the world but reliable estimates suggest around 300,000. The total number of globally threatened plant species is equally uncertain. The 1997 IUCN Plant Red List documented 34,000 globally threatened plant taxa (Walter & Gillett, 1998). Currently the *2006 IUCN Red List of Threatened Species* (IUCN, 2006) lists 12,906 plant taxa consisting of:

- Bryophytes: 93 spp
- Ferns and fern allies: 211 spp
- Gymnosperms: 1016 taxa
- Angiosperms: 11,586 taxa

Of the 12,906 plants on the current IUCN Red List, 8,563 are listed under the 1994 version of the IUCN Red List Categories and Criteria (version 2.3) whereas only 4,343 are listed using the latest IUCN Red List Categories and Criteria (version 3.1). Hence, apart from increasing the number of plants assessed, there is a considerable amount of work required to update the current listings. There is however a lot of information on the status of plants available and botanic gardens around the world are actively involved in plant conservation assessments. We need to speed up and consolidate these efforts – botanic gardens have a major role to play.

The Millennium Ecosystem Assessment

As a consequence of the slow process with red listing, plants are generally under-represented in regional and international biodiversity assessments and policy setting, for example in the Millennium Ecosystem Assessment (MA) (MA, 2007). This was the largest assessment ever undertaken of the health of ecosystems, involving 1360 experts from 95 countries. It was called for by the UN Secretary General in 2000 and reports were presented in 2005.

The Assessment represents a consensus of the world's scientists on the state of biodiversity; where there is broad consensus within the scientific community this is noted as are instances where controversies or uncertainties remain. The process of undertaking the Assessment was guided by a multi-stakeholder board including representatives from governments, business, NGOs, and indigenous peoples groups. Key findings of the MA therefore help to reinforce the general information that environmentalists are so familiar with in a broadly credible way. Furthermore although not intended to be policy prescriptive the findings help shape environmental policy, particularly relating to the CBD, at an international level.

The *Ecosystems and human well-being: Biodiversity synthesis* report of the MA (Millennium Ecosystem Assessment, 2005) has six key findings including those highlighted below.

Finding 1: *Human actions are fundamentally, and to a significant extent irreversibly, changing the diversity of life on earth, and most of these changes represent a loss of biodiversity. Changes in important components of biological diversity were more rapid in the past 50 years than at any time in human history.* . . .

Virtually all of earth's ecosystems have now been dramatically transformed. Over half the 14 biomes assessed by the MA have experienced a 20-50% conversion to human use. The rate of loss of many biomes and their associated species is continuing with recovery limited to a few taxa and habitats that have been the focus of intensive management. Projected future changes are concentrated in the tropics, while limited recovery is expected in the temperate forests and woodlands.

With regard to species, humans have increased the species extinction rate by as much as 1,000 times over background rates typical over the planet's history. Future projections, noted with a low degree of certainty by MA scientists, suggest that species extinction rates could increase to 10 to 100 times higher than in the recent past.

Finding 2: *Biodiversity contributes directly (through provisioning, regulating, and cultural ecosystem services) and indirectly (through supporting ecosystem services) to many constituents of human well-being, including security, basic material for a good life, good social relations, and freedom of choice and action.* . . .

This finding provides societal relevance to biodiversity.

Finding 4: *The drivers of loss of biodiversity and the drivers of change in ecosystem services are either steady, show no sign of declining over time, or are increasing in intensity.*

The main direct drivers of biodiversity loss are recorded by the MA as:

- Habitat transformation – particularly for agriculture
- Climate change
- Invasive alien species
- Overexploitation of species
- Pollution

Finding 5: *Many of the actions that have been taken to conserve biodiversity and promote its sustainable use have been successful in limiting biodiversity loss . . . However, further significant progress will require a portfolio of actions that build on current initiatives . . ..*

General conclusions of the MA are that the ability of the world's ecosystems to sustain future generations can no longer be taken for granted. The degradation of ecosystem services could grow significantly worse during the first half of this century and would be a barrier to achieving the Millennium Development Goals. The degradation of many ecosystem services can, however, be reversed over the next 50 years, but the changes in policy and practice required are substantial and not currently underway.

The Global Strategy for Plant Conservation

The Millennium Ecosystem Assessment provides a general backdrop on the status of the world's biodiversity against which the specific actions being taken for plant conservation can be considered. The *Global Strategy for Plant Conservation* (GSPC) which was adopted unanimously by the 187 Governments at the Conference of the Parties of the CBD in April 2002 is a specific strategy relating to plant diversity. The long-term objective of the GSPC is to halt the current and continuing loss of plant diversity.

The scope of the GSPC covers five main areas:

- Understanding and documenting plant diversity
- Conserving plant diversity
- Using plant diversity sustainably
- Promoting education & awareness about plant diversity
- Capacity building for plant diversity

These themes are mirrored in our discussions at the Third Global Botanic Gardens Congress which adopts the same broad themes.

An innovative feature of the GSPC was the inclusion of 16 outcome-oriented targets to be achieved by 2010. These represent the first ever internationally agreed targets in biodiversity conservation. The Strategy was considered as a pilot approach for the use of outcome-oriented targets under the CBD as a whole and was used as a template for developing sub targets for the goals of the overall biodiversity 2010 target, *a significant reduction in the current rate of loss of biological diversity.* Using the framework of the Strategy as a guideline, in decision VII/30 regarding the Strategic Plan of the Convention, the following focal areas were selected for the target setting exercise across the Convention:

> (a) reducing the rate of loss of the components of biodiversity, including (i) biomes, habitats and ecosystems; (ii) species and populations; and (iii) genetic diversity;
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> (b) promoting sustainable use of biodiversity;
>
> (c) addressing the major threats to biodiversity, including those arising from invasive alien species, climate change, pollution, and habitat change;
>
> (d) maintaining ecosystem integrity, and the provision of goods and services provided by biodiversity in ecosystems, in support of human well-being;
>
> (e) Protecting traditional knowledge, innovations and practices;
>
> (f) ensuring the fair and equitable sharing of benefits arising out of the use of genetic resources; and,

> (g) mobilizing financial and technical resources, especially for developing countries, in particular least developed countries and small island developing States among them, and countries with economies in transition, for implementing the Convention and the Strategic Plan.

Discussions within the CBD recognise the need to link action to implement the GSPC at national, regional and global level, with findings of the MA given that progress made in achieving the various targets of the GSPC will potentially assist in securing the plant resources and thus ecosystem provisioning services. This is especially with regard to GSPC Targets 1 and 2 (baseline studies); Targets 4-7 (*in situ* conservation) and Targets 8-9 (*ex situ* conservation). A focus on Targets 10-13 will allow communities to continue to derive benefits from plant diversity especially for food, medicines, fuel, fibre, wood and other uses.

BGCI has been very much involved in the GSPC from its original conception in 2000, through its development and subsequent adoption by the CBD in 2002 and it continues to support its implementation in a wide variety of ways. As well as seconding a member of staff to the CBD Secretariat to act as GSPC Programme Officer, BGCI also provides the Secretariat to the Global Partnership for Plant Conservation and has mobilised some considerable level of funding to support GSPC-related activities worldwide. The GSPC has been completely mainstreamed within our programmes and activities and provides the basic framework for the new BGCI Five Year Plan 2007-2012.

The botanic garden community as a whole has also widely embraced the GSPC and around the world, botanic gardens are implementing a very wide range of activities that support the GSPC targets. The extent to which these activities are reported to the CBD through the national reporting framework is however variable, and we believe that a gap exists between the extent of activity actually taking place, and the amount that is being reported. The Congress this week provides an opportunity to review the progress the botanic garden community is making towards the GSPC targets, for gaps to be identified and for plans for the future to be developed.

The GSPC is currently subject to an in-depth review that will be discussed at the CBD SBSTTA meeting in July this year and at the Ninth Conference of the Parties in 2008. The review of the progress in implementation of the Strategy will also contribute useful baseline information and experiences for the overall review of the 2010 biodiversity target.

Looking at the GSPC targets which specifically address the challenge of plant extinctions:

Conserving plant diversity

Target 5: *50% of the most important areas for plant diversity protected*

Sixty-seven countries around the world have participated in Important Plant Area (IPA) initiatives focusing on Target 5 since the endorsement of the *Global Strategy* in 2002. More than 50% of these countries have taken steps to identify IPAs and 24% (16 countries) have ongoing programmes that are addressing conservation issues as well as documenting sites. Many of these national projects have been initiated as a result of regional workshops; in Central and East Europe, the Mediterranean, the Himalayas, the Caribbean, Arabia, South East Asia and southern Africa.

Plantlife and IUCN are lead facilitating agencies for this Target. BGCI is currently working with IUCN to implement a project focussing on the identification and conservation of important areas for plant diversity in six countries: Cameroon, Costa Rica, Madagascar, Morocco, Philippines and Sri Lanka. This project, financed by the Global Environment Facility, represents the only GSPC-specific project to have received funding from the GEF to date.

Target 7: *60% of the world's threatened species conserved* in situ

This is clearly a challenging target and one that is of fundamental importance for plant conservation. The lead facilitating agency for this Target is the UNEP World Conservation Monitoring Centre.

Although botanic gardens are generally regarded as being of importance for *ex situ* conservation, *in situ* conservation of wild plants is also often part of their remit. It is interesting to note that more than 400 botanic gardens around the world manage natural areas for *in situ* conservation within their boundaries. For example the Sao Paulo Botanic Garden manages one of the few remaining areas of the Atlantic Forest – one of the most threatened ecosystems on the planet. Similarly, the New York botanic garden maintains the largest remaining expanse of the native woodland that once covered New York City and the Balkan Botanic Garden maintains a native oak forest.

Target 8: *60% of threatened plant species in accessible ex situ collections, preferably in the country of origin, and 10% of them included in recovery and restoration programmes*

BGCI, together with Bioversity International are lead facilitating agencies for this Target. The following proposed milestones for measuring progress towards Target 8 are taken from the Stakeholder Consultation document developed in 2003 (Plants2010, 2007).

	% of threatened plant species in accessible *ex situ* collections	% of critically endangered plant species in accessible *ex situ* collections, (estimated at 30% of the total)	% of threatened plant species in restoration and recovery measures
2003/4 (current estimated baseline)	10-20%	10%	2%
2007	40%	40%	5%
2010	60%	90%	10%

As part of BGCI's contribution to Target 8, BGCI has developed the PlantSearch Database as a means to identify plants in cultivation in botanic gardens. This database was launched on BGCI's website (www.bgci.org) in 2003. The database currently holds records for over 150,000 taxa, provided by nearly 700 botanic gardens. The plant records are presently linked to five databases – the 1997 and 2006 IUCN Red Lists of threatened plant species, the International Plant Names Index (IPNI), a list of Crop Wild Relatives and the Tree Conservation Database. We are currently adding an index of medicinal plant names. The database allows individual institutions to upload and manage their own data and provides a valuable means for in-country organizations to manage and review data on their own and on other national collections.

The ability to cross reference the species list with current Red List data shows which globally threatened species are in cultivation and thus require conservation action. At present, nearly 12,000 globally threatened species are recorded in the database. Given that the present number of globally threatened plants is around 34,000 (Gillett & Walters, 1997), the 2007 milestone of 40% of threatened plants in *ex situ* collections would translate to around 13,500 species. The PlantSearch database indicates that this milestone is close to being reached by botanic garden collections alone. However as we know very few plant species have been assessed for threat status at the global level.

The focus for BGCI now is to ensure that the major seed bank collections (such as the Millennium Seed Bank, ENSCONET seed banks and the crop genebanks) are also assessed with the PlantSearch database and that data is analysed with regard to the status of conservation in the country of origin. Further work is also required to identify and record species in recovery programmes. In this respect, BGCI has recently adapted the 1992 BGCI Propagation database (Wyse Jackson & Wyse Jackson, 1992) for endangered British and Irish plants and will link this to the PlantSearch 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% of threatened plant species included in recovery and restoration programmes*.

BGCI has also recently started work on the sub-target that 90% of critically endangered plants should be included in *ex situ* collections by 2010. In this respect we are paying particular attention to selected groups of

plants. Earlier this year for example BGCI co-published *The Red List of Magnoliaceae*. The report indicates that over half of all *Magnolia* spp. are threatened in the wild according to the IUCN Red List Categories and Criteria (Cicuzza, Newton and Oldfield, 2007). Based on the Magnolia red list BGCI is now undertaking a global survey to establish where Critically Endangered and Endangered *Magnolia* spp. are in cultivation, where the gaps are in *ex situ* species conservation and the opportunities for restoration of populations in the wild. A similar report is now being prepared for oak species and again the publication will be followed by a survey of *ex situ* collections and plans for restoration.

Overall I believe that the GSPC has been a considerable success in stimulating and harmonising plant conservation efforts. It is particularly exciting for example to see that China, with 10 percent of the world's flora is developing a national response bringing together the work of botanic gardens with the State Forest Administration and State Environmental Protection Administration.

In general progress towards targets relating to sustainable management of production lands and products (GSPC Targets 6 and 12) has proved particularly challenging for all countries. This is no doubt to be expected but is of concern given that habitat transformation – particularly for agriculture - is one of the main drivers in biodiversity loss as noted in the Millennium Ecosystem Assessment. Overall constraints noted by the in-depth review process from experiences in national GSPC implementation are:

- limited institutional integration,
- lack of mainstreaming – particularly in relation to agricultural policy,
- lack of supporting policies and legal framework
- lack of data, tools and technologies
- resource (financial and human) challenges

On the question of finance it is interesting to note that new resources generated in response to the GSPC include an $11 million grant from HSBC to BGCI through the *Investing in Nature* Programme and $50 million mobilised by Bioversity International. These amounts are certainly very significant but in comparison Balmford & Whitten (2003) noted that developed countries spend $17 billion annually on petfood and $24 billion annually on slimming products. Plant conservation clearly does not yet receive the funding it deserves.

Despite these constraints, it is very clear that botanists must make sure that the GSPC is a resounding success. As part of this botanic gardens must continue to give clear messages on the need for plant conservation, demonstrate our effectiveness and publicise our results. The threats to wild plants are increasing at a time of rapid global change. Beyond 2010, the innovative target-setting approach for plant conservation under the auspices of the CBD will need to be adapted to reflect the reality of climate change but in the meantime we need to demonstrate that the existing targets can substantially be met.

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