GSPC

GLOBAL STRATEGY FOR PLANT CONSERVATION

A GUIDE TO THE GSPC

ALL THE TARGETS, OBJECTIVES AND FACTS







Global Strategy for Plant Conservation

GSPC

CBD

BGCI

Plants for the Planet

GSPC

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ALL THE TARGETS, OBJECTIVES AND FACTS

Compiled by Suzanne Sharrock

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United Nations Decade on Biodiversity 2011-2020

Global Strategy for Plant Conservation GSPC

CBD

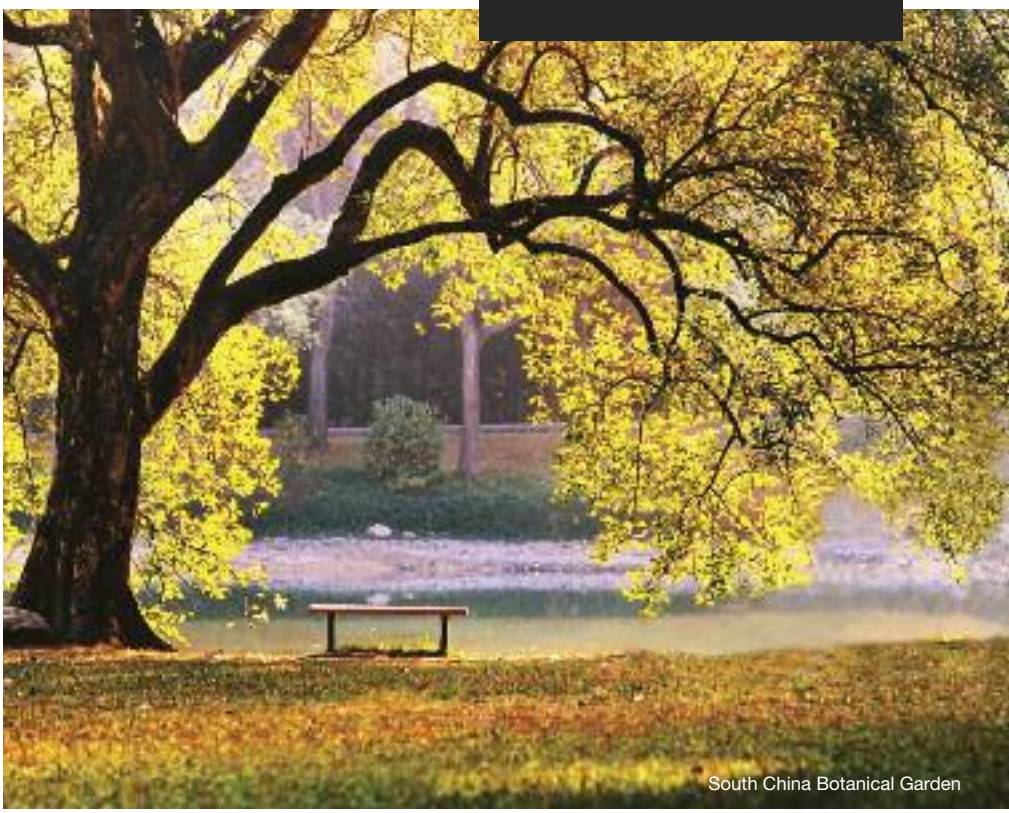
BGCI Plants for the Planet

"People from a planet without flowers would think we must be mad for joy the whole time to have such things around us" Iris Murdoch

Introduction | A guide to the GSPC

THE GSPC MISSION:

The Global Strategy for Plant Conservation is a catalyst for working together at all levels - local, national, regional and global - to understand, conserve and use sustainably the world's immense wealth of plant diversity whilst promoting awareness and building the necessary capacities for its implementation.



South China Botanical Garden

An international initiative for plant conservation was first proposed at the International Botanical Congress in 1999. A concerned group of botanists (the Gran Canaria Group) took the idea forward and developed the Global Strategy for Plant Conservation (GSPC) which, in 2002 was adopted by the world's governments as a programme under the Convention on Biological Diversity (CBD).

As the GSPC states: *"Without plants, there is no life. The functioning of the planet, and our survival, depends on plants. The Strategy seeks to halt the continuing loss of plant diversity."*

The GSPC includes **five objectives** and **16 targets** for plant conservation to be achieved by 2020. The aim of this Guide is to introduce the objectives and targets, providing background information explaining the need for and purpose of each target. The Guide also indicates the current status of implementation and gives links to further sources of information relevant to each target.

This Guide is closely linked to the GSPC Toolkit, which is available on-line at www.plants2020.net and which provides practical advice and tools for implementing the targets.

The targets of the GSPC relate to flowering plants, and other well-described groups such as bryophytes (mosses and liverworts) and pteridophytes (ferns) that occur on land, as well as in inland water and marine environments. While the targets have been set at the global level, plant conservation activities are generally carried out at the national level. The global targets therefore provide a flexible framework for the development of national targets, which can be set according to the country's own priorities and capacities. Implementation of the GSPC targets is also carried out within the context of National Biodiversity Strategies and Action Plans. Many organisations and individuals around the world are helping to implement the GSPC – everyone can play a part in saving plant species from extinction!

Further background information about the GSPC and its linkages with the CBD's Strategic Plan for Biodiversity 2011-2020 can be found on the GSPC toolkit website (www.plants2020.net).

Acknowledgements

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Particular thanks are due to Andrew Wood who carried out background research, identified images and quotes and drafted original text for the Guide.

Cartoon images included in the Guide were drawn by high school students participating in the Fairchild Challenge/BGCI Global Option Competitions 2010/11. More details of this are provided on page 36.

Thanks are also due to BGCI staff for comments and suggestions on the text, Elizabeth Radford and Sarah Simons for help with images and to Jan Chamier for editing the text.

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Target 1: An online Flora of all known plants

"If you take a flower in your hand and really look at it, it's your world for the moment."

Artist Georgia O'Keeffe

Curitiba Botanic Garden

SANBI

An important first step in plant conservation is to make a list of the world's known plant species: we can't know a plant species is becoming extinct unless we know that it exists.

It may be surprising to know that until very recently, there was no complete checklist of the world's plants.

The first definitive list (The Plant List) was published In December 2010 and it provides the scientific (Latin) names for 300,000 species of plants. At the end of 2010, the Plant List was thought to be about 85% complete. Work is now continuing to complete the list.

At the same time as completing the list, this target focuses on developing the list into a "Flora". The word "Flora" with a capital 'F' refers to the publication of scientific descriptions of plants occurring within a given region. A Flora is more than just a list of plant names. It also typically includes common names, literature references, descriptions, habitats, geographical distribution, illustrations, flowering times and notes.

The importance of a name

Creating a definitive list of plants may seem a simple task. However, the same plant species may be given a different name by people in different places and at different times (or simultaneously). Each accepted name is based on a dried specimen of that plant, known as a herbarium specimen. The Plant List includes 300,000 species yet there are at least a further 480,000 names by which these plants are also known (synonyms). There are often many plant names for one plant species. For example, the tree which is commonly known as the Doum Palm or Gingerbread Tree, and who's scientific name (in Latin) is *Hyphaene thebaica*, is also known by 16 other scientific names.

A little history....

Botanists have been writing Floras since the early 1600s. Physicians used Floras for information on medicinal plants while horticulturists used Floras to identify plants that might be brought into cultivation. Floras have documented plants collected in exotic places as well as plants growing in a botanist's own area. The form of Floras--lists of plants with associated information about them--has changed very little over the centuries, but in the last two decades the use of computers to store and organize such information has increased dramatically.

James Aldred

RBG Kew

Where are we now?

The Plant List, published in December 2010, is a working list of all known plant species. Version 1 aims to be comprehensive for species of Vascular plant (flowering plants, conifers, ferns and their allies) and of Bryophytes (mosses and liverworts). Collaboration between the Royal Botanic Gardens, Kew and Missouri Botanical Garden enabled the creation of The Plant List by combining multiple data sets held by these institutions and other collaborators.

The Plant List includes 620 plant families, 16,167 plant genera and 298,900 accepted species names. It also contains 477,601 synonyms (alternatives for the accepted names) and 263,925 names that are yet to be determined as accepted names or synonyms.

Find out more:

www.theplantlist.org
www.catalogueoflife.org
www.tropicos.org
www.efloras.org

Extinction Risk

Target 2: An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action


Andrea Mondoni

Wild plant species around the world are under increasing threat of extinction. The primary causes of loss of plant species are:

- **Habitat destruction** Urban development, intensive agriculture and tree logging all destroy and degrade the natural habitats of plants. It is estimated that habitat destruction from human activity is the primary cause of risk for 83 per cent of endangered plant species;
- **Invasive alien species** Aliens are not science fiction, but a nature conservation fact. An 'alien' is any species that is moved by humans, animals or other natural forces to an area outside its native range. 'Invasive' species are those that spread quickly to become very common and dominant in the new habitat, posing a great threat to native species;
- **Pollution** Pollution is a big problem for plants, particularly the misuse of herbicides and pesticides, which can directly kill wild plants and their pollinators;
- **Climate change** This is likely to result in changes in the distribution of species, flowering times etc. The impacts will be most pronounced in mountainous and island ecosystems, where plants have 'nowhere to go' as environmental conditions change.

Once a plant species is named and recorded, we need to assess its conservation status, that is, its abundance or scarcity. To do this, we need to know the species location, distribution and the number of plants or populations of the plant. Assessments may be desk based, using computer records from previous surveys or may involve additional data collection by


Theo Moya (apexnewspix.com)

fieldwork. This process of assessing rarity is known as 'Red Listing': species which are rare appear on Red Lists. A global Red List is maintained by the International Union for the Conservation of Nature (IUCN). Species in the Red Lists are categorized as: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Data Deficient and Least Concern.


Bill Silvermintz

I

Case study: *Malus niedzwetzkyana*


Chris Loades/FFI

Malus niedzwetzkyana is a wild species of apple which is found in Central Asia and is believed to be the primary ancestor of the domesticated apple.

This species potentially possesses characteristics that might be useful in future apple improvement programmes and is therefore considered to be a globally important genetic resource. Although it is distributed over a wide area, (Afghanistan, Kazakhstan, Kyrgyzstan and Uzbekistan as well as parts of China) the wild populations of this species are declining at a rapid rate.

A staggering 90% of its forest habitat has been lost in the last 50 years and the species is classified as Endangered. Current threats include over-harvesting of fruits and loss and degradation of habitat due to agricultural expansion. The Global Trees Campaign is working to conserve the Niedzwetsky apple. A nursery has been established and field surveys have taken place to map its distribution in Kyrgyzstan.

Find out more:
www.globaltrees.org

Red List categorization of Malus niedzwetzkyana

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

Where are we now?

So far, less than 4 per cent of the known plant species (around 13,000 species) have been fully assessed for their conservation status for the IUCN global Red List, although many more have been assessed nationally or regionally. Indeed, an analysis carried out in 2010 revealed that 96 countries have national plant red lists. Threat assessments have also been carried out for particular groups of species. In the case of trees, BGCI, in association with the Global Trees Campaign is supporting the Red Listing of tree species, with all species of magnolias, oaks, maples and rhododendrons having been recently assessed.

BGCI

A global analysis of a representative sample of the world's plants, conducted in 2010 by the Royal Botanic Gardens, Kew, together with the Natural History Museum, London and IUCN, has revealed that one in five of the world's plant species are threatened with extinction. The study, ' Sampled Red List Index for Plants', is an important baseline for plant conservation and gives an indication of the true extent of the threat to the world's estimated 380,000 plant species.

Find out more:

www.iucnredlist.org
www.globaltrees.org
www.kew.org
www.arkive.org


Theo Moya (apexnewspix.com)

"The preservation of biodiversity is not just a job for governments... every individual has a role to play." **Kofi Annan, former UN Secretary General**

Sharing (or Not Reinventing the Wheel)

Target 3: Information, research and associated outputs, and methods necessary to implement the Strategy developed and shared

Plant conservation research, methodologies and practical techniques are fundamental to the conservation of plant diversity. Relevant techniques are being developed and used by many individuals and institutions around the world and methodologies developed in one place may well have useful applications elsewhere. However these are not necessarily known about or accessible. The aim of this target is to ensure that useful information and technologies are shared amongst the global community and that information gaps are identified, so that they can be filled with newly generated knowledge.

BGCI

Chicago Botanic Garden

As plant conservation needs and available resources vary from country to country, it is important to provide information in as many languages as possible and provide case studies covering a range of circumstances. Each target of the GSPC will have its own set of information and research needs, hence this target is considered 'cross-cutting' and applicable to all other targets. As progress is made towards each target it is important to ensure that the relevant lessons learned are shared and practical guidance on how to implement the target is made available to others. This is the purpose of the GSPC toolkit.

Key areas where the development of methodologies and techniques are required include:

- How to integrate *in situ* and *ex situ* conservation. How the information that has been developed on how to grow threatened plants in 'protected' environments (*ex situ*) can be used to help conserve them in their native habitats;
- How to reduce threats and ensure that threatened plants are maintained within ecosystems, especially in the face of changing climates;

A toolkit for plant conservation

BGCI has developed an internet-based 'toolkit' that provides information on how to implement the 16 targets of the GSPC. The toolkit website: www.plants2020.net provides technical details and links to manuals, guidelines and case studies relevant to each of the targets.

Chicago Botanic Garden

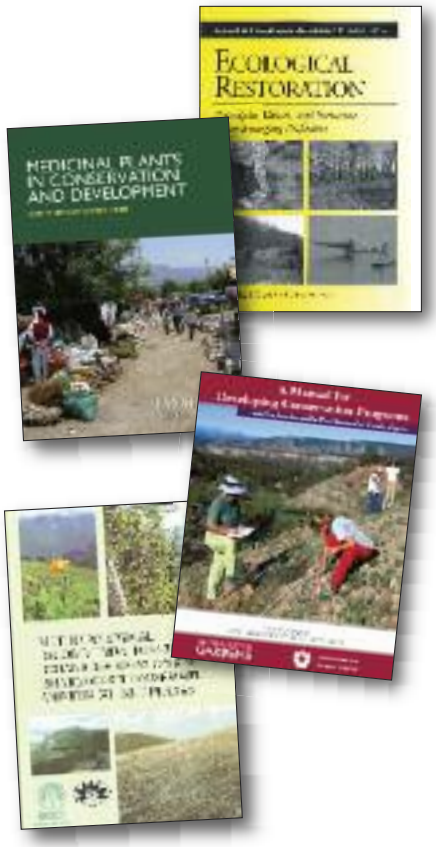
- How to balance increasing demands for plant-based products harvested from the wild with conservation of the species that provide them.

Where are we now?

Methodologies for different aspects of plant conservation and sustainable use have been developed by both professionals and amateurs in countries around the world over the past few decades. Much of this information has, however, not been coordinated and often lies in unpublished reports and manuscripts, not easily accessible to plant conservation practitioners. So efforts should be focused on retrieving this information and making it widely available in a range of languages.

PlantzAfrica.com

This is a website providing information about plants native to southern Africa and related conservation topics. There are more than 22,000 different species of plants indigenous to southern Africa. Many of the more popular plants are described in detail, including how to use them in gardening and in herbal medicine. The website also provides information about the different vegetation types in southern Africa and the plant species found in them.
Visit: www.plantzafrica.com



"Individually, we are one drop. Together, we are an ocean."

Ryunosuke Satoro

Find out more:

www.plants2020.net

Preserving Natural Complexity

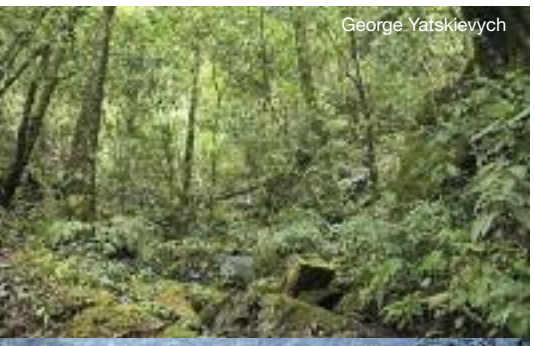
Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration

Protection of the world's terrestrial ecoregions in 2009, UNEP-WCMC

This target focuses on the conservation of plant species through the conservation of the landscapes, or ecological regions (eco-regions) in which they exist. Types of landscape might be forests, wetlands, grasslands or deserts. Each contains a different assemblage of plant species.

Conserving a percentage of each of the different types of eco-regions that can be found on earth will ensure the conservation of the different species found in those landscapes. Conservation at the eco-region level is usually carried out through 'protected areas'. Protected areas are the cornerstone of biodiversity conservation; they maintain key habitats, allow for species migration and movement, and ensure the maintenance of natural processes, including species evolution, across the landscape.

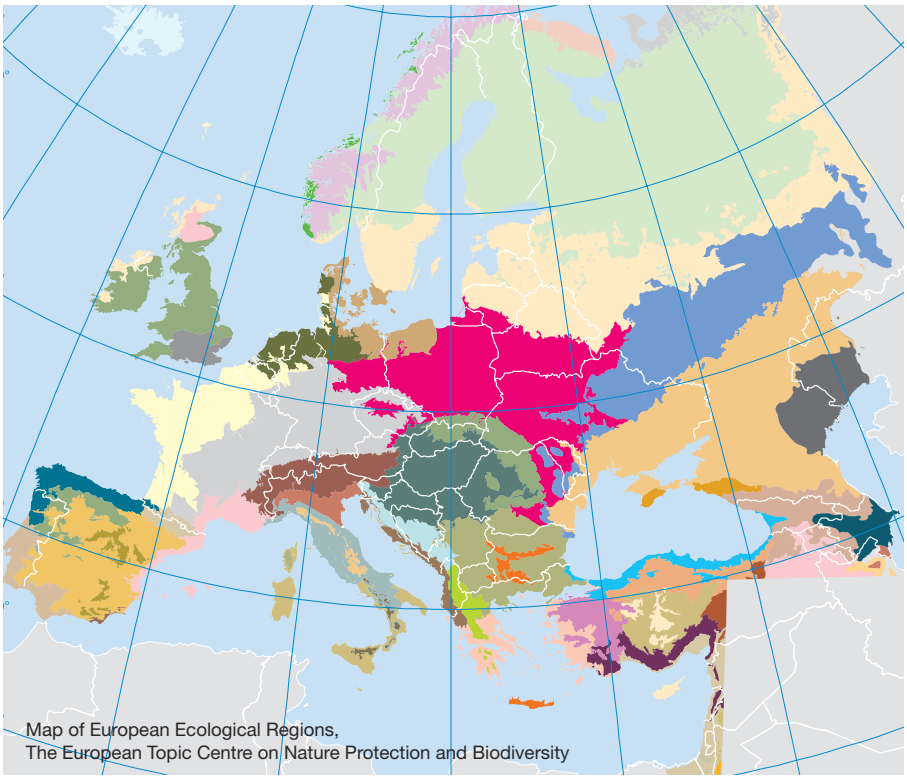

BGCI


George Yatskievych


Amazon Conservation Team

"The wilderness holds answers to more questions than we have yet learned to ask."

Nancy Newhall


Map of European Ecological Regions, The European Topic Centre on Nature Protection and Biodiversity

II

Suzanne Sharrock

Find out more:

www.cbd.int/protected
www.protectedplanet.net
www.ser.org/

Where are we now?

In total about 13 per cent of the world's land surface is covered by protected areas. However, not all ecological regions are equally well protected. The conservation organization WWF has identified 14 different ecological regions and in a report published in 2009, it was noted that 'only 54 per cent of the WWF terrestrial ecoregions reach 10 per cent protection.'
In general, forests and mountain areas are well represented in protected areas, while natural grasslands (such as prairies) and coastal and estuarine ecosystems, including mangroves, are poorly represented.

Laurel McIvor

'A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values.'
IUCN

RBG Kew

Ecosystem services

Protected areas perform many functions. As well as being essential for conserving biodiversity, they also deliver vital ecosystem services. The term 'ecosystem service' was popularized in 2005 by the United Nations Millennium Ecosystem Assessment, a four-year study involving more than 1,300 scientists worldwide. This study recognized that the health and well-being of humankind depends upon the services provided by ecosystems and their components: water, soil, nutrients and organisms.

Ecosystem services can be grouped into four broad categories:

- **Provisioning**, such as the production of food and water;
- **Regulating**, such as the control of climate and disease;
- **Supporting**, such as nutrient cycles and crop pollination;
- **Cultural**, such as spiritual and recreational benefits.

A sense of Place

Target 5: At least 75 per cent of the most important areas for plant diversity of each ecological region protected, with effective management in place for conserving plants and their genetic diversity

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."

Aldo Leopold, A Sand County Almanac

Elizabeth Radford

This target has two components: identifying the areas important for plant diversity (also known as Important Plant Areas), and then assuring effective protection of at least 75 per cent of these areas.

An Important Plant Area (IPA) can be defined as a site exhibiting exceptional botanical richness and/or supporting an outstanding assemblage of rare, threatened and/or endemic plant species and/or vegetation of high botanic value.

Important areas for plant diversity may occur both inside and outside designated protected areas. In either case, the key challenge will be to ensure that appropriate management measures are taken to maintain and enhance plant diversity in these areas.

What is an endemic species?

An endemic species is one that is unique to a defined geographic location, such as an island or a country. Species that are indigenous to a place are not endemic to it if they are also found elsewhere. Endemic species are especially likely to develop on biologically isolated areas such as islands and on mountain tops because of their unique eco-geography.

James Hitchmough

II

Christopher K. Willis

Where are we now?

To date, more than 66 countries have taken steps to identify important areas for plant diversity and many have ongoing programmes to address conservation issues as well as documenting the sites. The organizations carrying out the assessment of IPAs vary from country to country but they include wildlife and conservation organizations, universities, government departments, botanic gardens, and other groups.

The number of identified IPAs varies widely. For example, by 2010, Mozambique had a preliminary list of 28, the Seychelles had 29 and the UK had identified more than 150 sites important for plant diversity.

Find out more:

www.plantlife.org.uk

Annie Lane

Plant micro-reserves

Plant micro-reserves are small areas in which there is a significant presence of rare, threatened or endemic plant species. While all areas are smaller than 20 hectares, most of them are no larger than 1 or 2 hectares. These small areas can be highly efficient in protecting endemic plant species.

The protection of species important for the surrounding community is also of importance to the micro-reserve concept. For example, the ancient town of Alcoi, in the Alicante province of Spain has been an important centre for textiles and dyeing since the Middle Ages. The plant micro-reserves near Alcoi aim to record and conserve ancient dye plants such as Madder (*Rubia tinctoria*), as well as the other 350 or so crops historically cultivated in Valencia, some 50 of which are still in cultivation today.

John Manning

Z. Ghrabi-Gammar

Conservation and Production

Target 6: At least 75 per cent of production lands in each sector managed sustainably, consistent with the conservation of plant diversity

Land in production (or 'production lands') covers a substantial portion – about a third – of the earth's surface. Agricultural landscapes can be found almost everywhere.

Sustainable management of production land can be defined as the use of the resources, such as soils, water and plants, for the production of goods (food, timber, fodder etc.) to meet human needs, while assuring the long-term productive potential of these resources.

Increasingly, production methods that address sustainability are being applied in agriculture. These include organic production, integrated pest management and conservation agriculture. Similarly, sustainable forest management practices are being more broadly applied. However, there are questions concerning the extent to which specific plant diversity conservation strategies are incorporated into such schemes.


Eva Schuster

What qualifies as production lands

For the purposes of this target, production lands are areas where the primary purpose is agriculture, horticulture, grazing or forestry.

Some definitions

Organic production
Organic farming excludes or strictly limits the use of manufactured fertilizers, pesticides (which include herbicides, insecticides and fungicides), and plant growth regulators such as hormones.

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM takes advantage of all appropriate pest management options including, but not limited to, the judicious use of pesticides.

Conservation agriculture aims to achieve sustainable and profitable agriculture through the application of the three principles: minimal soil disturbance, permanent soil cover, and crop rotations.


Rita Juliana

"There is a sufficiency in the world for man's need but not for man's greed."

Mohandas K. Gandhi

II

Figure 1: Distribution of organic agricultural land by region 2009

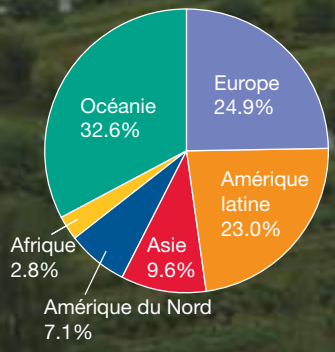
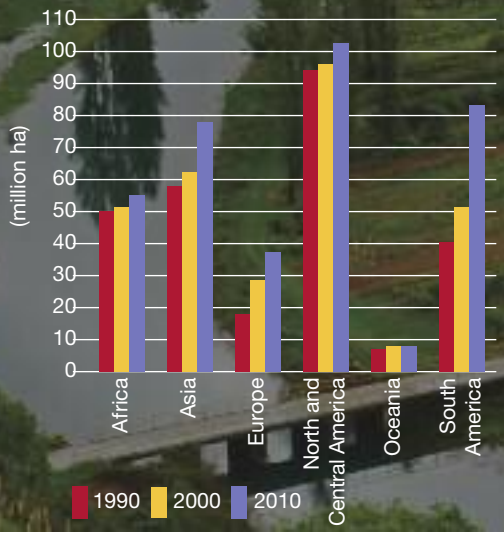


Figure 2: Trends in area of forest designated for conservation of biodiversity by region, 1990-2010



Find out more:

www.fsc.org
www.globalgap.org
www.ifoam.org
www.fao.org

Lena Pourzenic

South Africa's Biodiversity and Wine Initiative

Nearly 95 per cent of South Africa's wine-growing takes place in the Cape Floral Kingdom (CFK), the richest and also the smallest plant kingdom on the planet. Recognized both as a global biodiversity hotspot and a World Heritage site, it has nevertheless come under increasing threat from agriculture, urban development and invasive alien species. A pioneering partnership between the country's wine industry and conservation sector, the Biodiversity and Wine Initiative is not confined to protecting natural habitat, but also encourages wine producers to farm sustainably and express the advantages of the Cape's abundant diversity in their wines.

National Tropical Botanic Garden

Land sharing or land sparing?

This target is central to the question of how we feed a global population of some 7 billion (set to reach 9 billion by 2050) without losing biodiversity. Do we squeeze ever more production from our existing arable land, or do we need to find a way of increasing agricultural land area while protecting the wildlife on that land?

Some studies have shown that to produce a given amount of food, it is better for biodiversity to farm existing arable land as intensively as possible, and allow more natural habitat to be protected or restored. However, others argue that the 'land sharing' approach, where a greater amount of land is farmed, but in a wildlife-friendly way, is the better option.

Where are we now?

A 2010 survey by IFAOM (International Federation of Organic Agriculture Movements) identified 0.9 per cent of the world's agricultural land as organic), while according to the UN's Food and Agriculture Organization (FAO), 12 per cent of the world's forests are managed sustainably. Figure 1 above, taken from *The World of Organic Agriculture* (FiBL & IFAOM) provides a breakdown of organic land by region, while Figure 2 from FAO's Global Forest Resources Assessment 2010 shows the regional situation for sustainable forests.

Every Species Is Important

Target 7: At least 75 per cent of known threatened plant species conserved *in situ*

In situ conservation, or the conservation of species in their natural environments, is generally considered to be the primary approach for conservation as it allows evolutionary processes to continue. Moreover, for some species, which are dependent on complex relationships with other species for their survival (specialized pollinators, soil bacteria etc.), it may be the only feasible conservation method.


Chicago Botanic Garden

In addition to designating protected areas, some countries have put in place laws specifically designed to conserve threatened species. Such species need to be conserved where they grow, and this can include urban landscapes and production areas, as well as natural and semi-natural habitats.


Nikos Krigas

Where are we now?

A major constraint to the achievement of this target at the global level is the lack of information on which plant species are globally threatened. However, better information is available at national and regional levels.

In Europe, for example, half of the region's 4,700 vascular plant endemics are in danger of extinction and 64 have already become extinct. The disappearance and declining populations of many endangered plant species present the European Union with one of its greatest conservation challenges. Since its beginning in 1992, LIFE, the financial instrument for the environment, has been a cornerstone of plant conservation efforts in Europe. A number of LIFE projects have focused specifically on conserving rare species *in situ*. Such projects often differ considerably according to the individual plant species targeted by the project. However, they typically include:

- combining local conservation measures (*in situ*) and off-site actions (*ex situ*) such as plant nurseries;


Suzanne Sharrock

II

"I perhaps owe having become a painter to flowers"

Claude Monet

Mecit Vural

The case of the Brazil nut

The Brazil nut tree has yellow flowers which, following pollination, give rise to the fruit and then the nuts. A particular insect, the orchid bee, is the only one able to enter the heavy flower and, using its long tongue, reach the nectar inside and pollinate the flower. The orchid bee is attracted by the scent produced by a particular orchid, which though it does not grow on the Brazil nut tree itself must be present nearby for pollination to occur. Furthermore, a second animal plays a unique part in the reproductive success of the Brazil nut tree. The outer casing of the fruit is so hard that only one known creature – the agouti, a large rodent with sharp, chisel-like teeth – can crack it open. The agoutis eat the nuts and bury others for later use; some of these are able to germinate and become new trees.

Sara Oldfield

- increasing plant species knowledge by gathering scientific information (population sizes and locations, genetic studies, etc.) to be used in the development and implementation of protection, management or recovery plans;
- increasing public awareness and knowledge of the plant species (which is often very low), together with the establishment of partnerships with relevant stakeholders at the local level.

Find out more:

http://ec.europa.eu/environment/life/

Banking on Nature

Target 8: At least 75 per cent of threatened plant species in *ex situ* collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes

Ex situ plant conservation is defined as the conservation of plant diversity outside its natural habitat. *Ex situ* conservation plays a complementary role to *in situ* conservation, providing a safety 'back-up' and an insurance policy against extinction in the wild. Given the fact that ecosystems are already changing as individual species react differently to climate change, *ex situ* conservation is assuming a new and important role in conservation strategies.

Antonina Shmaraeva


RBG Edinburgh

There are various forms of *ex situ* conservation:

Seed conservation: This is useful for plants with 'normal' seeds that can be dried and stored at low temperatures for long periods. It is the most cost efficient and common form of *ex situ* conservation.

***In vitro* conservation**: This includes plant tissue culture and cryopreservation. In these types of conservation, small parts of the plant (typically growing points) are removed and conserved in sterile conditions at low temperatures (very low in the case of cryopreservation). These techniques are useful for plants whose seeds are 'recalcitrant', or cannot be dried and stored at low temperatures.

Field genebanks: These are more commonly used for maintaining the genetic diversity of agricultural crops that cannot be stored as seeds (see Target 9). They are less common for the conservation of wild plant species.


RBG Kew

Kew's Millennium Seed Bank (MSB) partnership is the largest *ex situ* plant conservation project in the world. Working with a network of partners across 50 countries, the MSB has successfully banked 10 per cent of the world's wild plant species. Their aim is to save 25 per cent by 2020, with a focus on plants and regions most at risk from climate change and the ever-increasing impact of human activities.

In Taiwan, the **Dr. Cecilia Koo Botanic Conservation Center** has become an important *ex situ* sanctuary for tropical plants. The aim over the next 20 years is to preserve at least 25,000 species of living tropical plants. Currently the centre has over 12,000 species, almost half of which are tropical orchids.

II


Robert Benson


BGCI

"In the face of an uncertain future, an urgent priority now must be conservation through seed-banking and living collections for as many plant species as possible, by way of an insurance policy."

BGCI report on Plants and Climate Change: Which Future?

Living collections of botanic gardens: The plant collections of botanic gardens include a large number of threatened wild plant species. Well-documented, genetically representative plant collections are valuable for *ex situ* conservation as well as having additional value, in that they provide material for:

- Horticulture and research
- Propagation of plants to remove or reduce pressure from wild harvesting
- Display, education and community engagement activities
- Species reintroduction and habitat restoration programmes

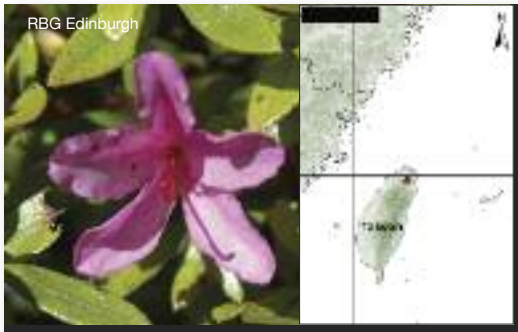
Where are we now?

Botanic gardens are the main institutions involved in the *ex situ* conservation of wild plant diversity. The number of botanic gardens in existence around the world has more than doubled in recent years and their combined plant collections consist of more than 100,000 species, nearly one third of all known plants, including many threatened species. These are documented in BGCI's PlantSearch database. In a number of countries, national botanic garden networks have adopted this target as a particular focus for their activities.

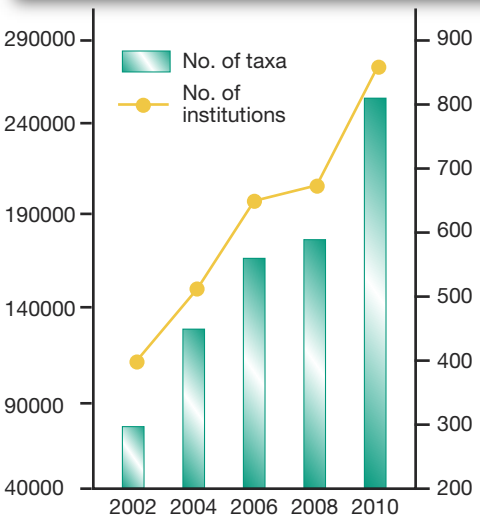

Bian Tan

Find out more:

www.bgci.org
www.kew.org
www.centerforplantconservation.org
www.nativeplantnetwork.org


RBG Edinburgh

Rhododendron kanehirae is considered to be extinct in the wild, following flooding of the river banks around its only known natural locality in Northern Taiwan. However, an ex situ conservation project is being run by the Taiwan Endangered Species Research Institute. As a result, plants have now been distributed to botanic gardens in Taiwan, and elsewhere to ensure the future for this unique species.



No. of taxa and no. of institutions providing data to BGCI PlantSearch database since 2002

The Wealth of Nations

GLOBAL CROP DIVERSITY TRUST

Target 9: 70 per cent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved, while respecting, preserving and maintaining associated indigenous and local knowledge


Jeff Haskins


IRRI


Hanspeter Klasser

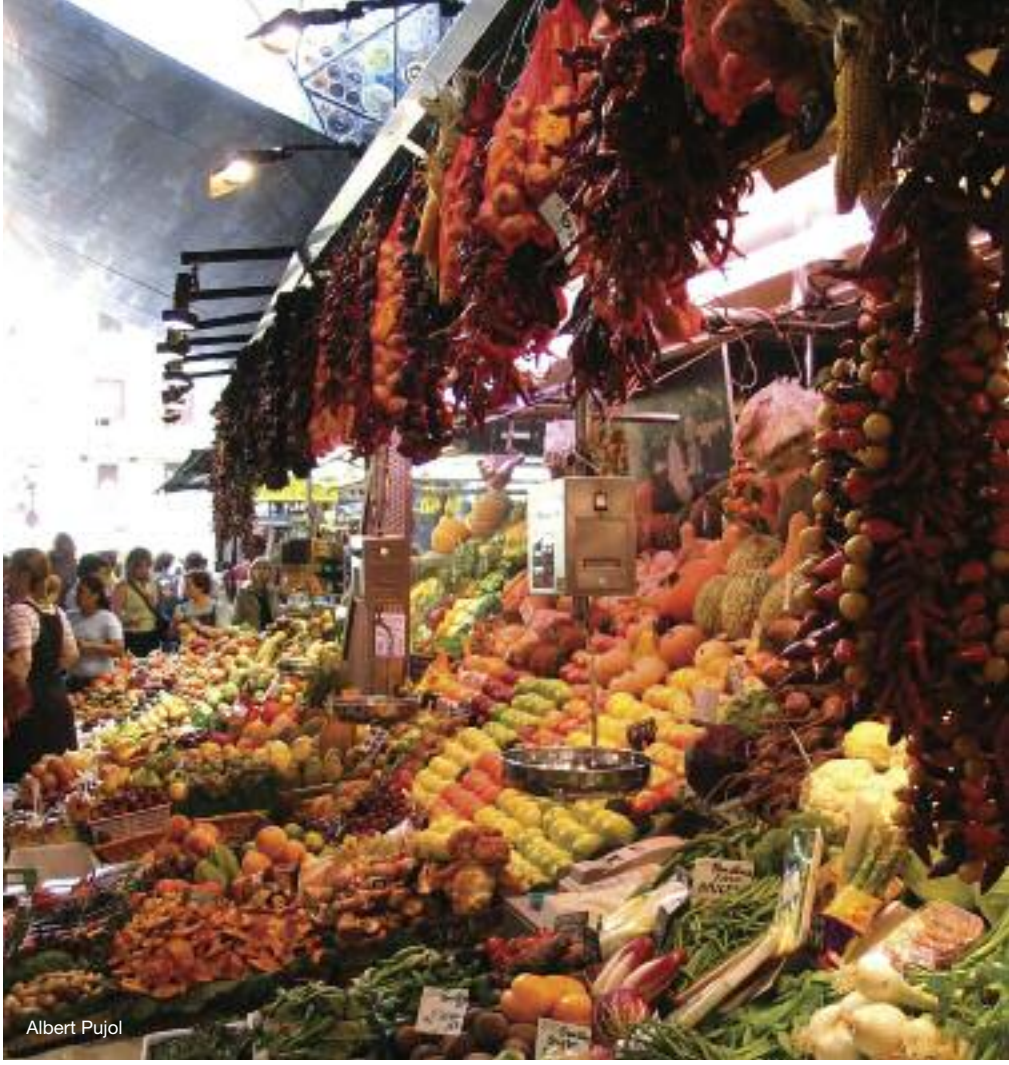
It is often stated that only 30 crops feed the world, and wheat, rice and maize alone provide more than half the world's plant-derived energy intake. However, about 7,000 species of plants have been cultivated or collected by humans for food at one time or another, over 50,000 medicinal and aromatic plants (MAP) species are used globally and a wide range of other species are important as ornamental, fodder, and fibre crops. There are, therefore, a very large number of socio-economically important plant species, and each country has to identify its own set of species to conserve under this target.
The genetic diversity of a crop includes the species that are closely related to it (wild relatives) that can potentially donate genes in breeding and improvement programmes, as well as the traditional varieties (or landraces) that constitute the 'within-species' diversity. It is these genetic resources that provide the biological basis for food security, and directly or indirectly support the livelihoods of every person on earth.

The diversity within some of the major crop species is immense. Estimates for the number of distinct varieties of the rice species *Oryza sativa* range from tens of thousands to more than 100,000. At least seven different vegetables derive from the single wild cabbage species *Brassica oleracea* (kale, cabbage, Brussels sprouts, kohl rabi, broccoli, calabrese, savoy cabbage). Genetic variation also exists within these vegetables and numerous different varieties of each can be found.

Where are we now?

The Doomsday vault
The Svalbard Global Seed Vault serves as the ultimate safety net for the world's crop diversity. It is a failsafe, state-of-the-art seed storage facility, built to stand the test of time – and of disasters, natural or manmade. The purpose of the vault is to store duplicates (back-ups) of all seed samples from the world's crop collections.


Mari Tefre/Global Crop Diversity Trust



Permafrost and thick rock ensure that even in the case of a loss of power the seed samples will remain frozen. The vault can therefore be considered the ultimate insurance policy for humanity's food supply. It will secure, for centuries or longer, millions of seeds representing every important crop variety on earth, and today holds over 500,000 samples originating from almost every country in the world. Ranging from unique varieties of primary African and Asian food staples, such as maize, rice, wheat, cowpea and sorghum, to European and South American varieties of eggplant, lettuce, barley and potato, the Doomsday vault already holds the most diverse collection of food crop seeds anywhere on earth.

The Potato Park

One example of preserving and maintaining plant diversity as well as the indigenous knowledge related to it, is found in Peru at the Andean Potato Park. Estimates suggest that there are approximately 6,500 potato varieties in existence worldwide, but it is only in the Andes region, its place of origin, that a wide diversity of potato species and varieties are still cultivated and used. Even here, many of these local varieties were disappearing. To address this situation, six Quechua communities in Peru came together to create the Parque de la Papa, the Potato Park. This 'Indigenous Biocultural Heritage Area' Park covers more than 12,000 ha and aims to preserve the landscape and the traditional way of life of its inhabitants. Around 1,200 different potato varieties are identified by name and used in the region, and a typical family farm will grow between 20 and 80 potato varieties. In addition to preserving this rich biodiversity, the Park is also being used to re-introduce varieties that have already disappeared from farmers' fields.

"A seed hidden in the heart of an apple is an orchard invisible."

Welsh proverb

Find out more:

www.croptrust.org
www.bioversityinternational.org
www.fao.org

Uninvited Company

Target 10: Effective management plans in place to prevent new biological invasions and to manage important areas for plant diversity that are invaded

Invasive Alien Species (IAS) are plants, animals or microorganisms not native to an ecosystem, whose introduction threatens biodiversity, food security, health or economic development. While only a small percentage of organisms transported to new environments become invasive, the negative impacts can be extensive. Globally, the cost of damage caused by invasive species has been estimated to be US$1.5 trillion per year – close to 5 per cent of global GDP. Estimates of costs within Europe alone are €12 billion.

Many ecosystems are affected by invasive species and they pose one of the biggest threats to biodiversity worldwide. Globalization through increased trade, transport, travel and tourism will inevitably increase the intentional or accidental introduction of organisms to new environments. Current predictions are that climate change will enhance the spread and impact of many existing invasive species, as well as potentially creating suitable conditions for presently non-invasive species to become so.

Emerald Ash Borer in the USA

In 2002, the beetle Emerald Ash Borer (native to Asia) was discovered in Michigan, USA. The infestation was not discovered in time to eradicate it and prevent its spread. In only five years, over 53 million native ash trees (*Fraxinus* spp.) were killed by the beetle, and over the following ten years the infestation is predicted to cost an estimated $10.7 billion to treat, remove and replace the more than 17 million trees likely to be killed in urban areas alone.

Andrew Gapinski

Prevention, through thwarting the international movement of IAS and rapid detection at borders, offers less costly measures than control and eradication. Deterring entry of IAS is carried out through inspections of international shipments, customs checks and proper quarantine regulations. Prevention requires collaboration among governments, economic sectors and non-governmental and international organizations.

Suzanne Sharrock


Joachim Gratzfeld

One successful example of countering a biological invasion is in Mauritius in the Western Indian Ocean. After ten years of weeding at sites infested with *Psidium cattleianum*, juveniles of rare native plant species (two presumed extinct, three critically endangered, and four endangered) were recorded, and vigorous regeneration of many other native species was noted. Interestingly, the same positive trend was also found for butterfly species at the sites.

Expat plants

The New Zealand Expat Plant project aims to identify New Zealand plants growing in collections overseas that could be used as international sentinels of emerging pests that might threaten New Zealand flora, should they be introduced into the country. Working together, botanic gardens could develop an international sentinel plant network, using the predictive power of their collections as an early warning system.

"A weed is a plant that has mastered every survival skill except for learning how to grow in rows."

Doug Larson

Find out more:

www.cbd.int/invasive
www.issg.org
www.cabi.org/isc

Infamous examples of IAS

Water hyacinth
is a water weed that has clogged African lakes, is now widespread in Southeast Asia and has reached southern Europe. Its removal from 75 km of the Guadiana river in Spain has cost nearly 15 million euros.

Japanese knotweed,
an ornamental plant introduced to Europe in the mid-nineteenth century, is one of the few terrestrial plants to be the subject of legislation – it is designated 'controlled waste' under UK law.

Crossing Continents

Target 11: No species of wild flora endangered by international trade


RBG Kew


BGCI

The collection of certain rare or commercially desirable plant species for trade poses a major threat to their survival in the wild. Examples include trees which produce high quality timber, herbs for medicinal use, and unusual, exotic ornamental species, such as some orchids, cacti and cycads.

The implementation, monitoring and review of this target is through links with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) under its Plants Committee. CITES allows trade in plant species that can withstand current rates of harvest from the wild, but prevents trade in those that face extinction. CITES has been in force for over 30 years and has been ratified by over 170 countries – the provisions of the Convention are translated into law in the countries which sign up to it.

"When one tugs at a single thing in nature, he finds it attached to the rest of the world."

John Muir

The Convention operates through the issue and control of export and import permits for a number of clearly defined species listed in three Appendices.

- Appendix I is for the most threatened species: trade in specimens of these species is permitted only in exceptional circumstances;
- Appendix II is for species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival;
- Appendix III is slightly different to the others. It contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling trade.


Bian Tan

Find out more:

www.cites.org

Moray McLeish / The Nature Conservancy

Where are we now?

- Approximately 300 plant species are included in CITES Appendix 1.
- Over 28,000 species are included in CITES Appendix 2, including the entire orchid and cactus families.
- Only a handful of plants are listed on Appendix 3, but over the past 15 years, some countries have used this Appendix to help control international trade in certain tree species.

CITES recognizes the need to promote sustainable trade in a wide range of timber and medicinal plant species and is broadening links with other organizations, such as the International Tropical Timber Organization (ITTO).

Case study: Brazilian Rosewood (*Dalbergia nigra*)

The threatened tree species *Dalbergia nigra* produces one of the most highly prized woods in Brazil. Its attractive red/brown timber is very heavy and strong, highly resistant to insect attack and decay. Of more importance, however, is its high resonance – ideal for the production of musical instruments. The tree has long been harvested for the construction of high quality furniture as well as instruments, and also for its oils and resins. Brazilian Rosewood was listed on CITES in 1992, making trade in its timber illegal. Nevertheless, deforestation in its native habitat and illegal logging have continued and trees with thick trunks are now very rare.

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Wild Harvests

Target 12: All wild-harvested plant-based products sourced sustainably

"Pluck not the wayside flower; it is the traveler's dower."

William Allingham


BGCI

Plants harvested directly from the wild are probably of greatest importance in rural areas of the developing world, where they provide food, fuel, timber and medicines. However, there is also a large and growing demand for wild plants and products derived from them in the global food, cosmetics and medicinal market sectors. As a result of this increasing trade, many plant species are at risk from over-harvesting. The decline in wild plant populations has serious consequences for the livelihoods of the people these plants support.

The case of medicinal plants

Medicinal plants have been used by humankind for millennia. The range of species used and their scope for healing is vast. It is estimated that more than 50,000 plant species are used worldwide for medicinal purposes.

The World Health Organization estimates that 80 per cent of people in developing countries rely on traditional medicine for their primary healthcare. Demand for traditional remedies and a desire for healing through natural products is also increasing in so-called developed countries. Collecting medicinal plants for sale is an important income source for poor rural communities around the world. Unfortunately, commercial demand now exceeds supply in many cases, and the unregulated collection of these plants has the potential to endanger plant species' survival in the wild.

Cultivation versus wild harvest

Cultivation has long been suggested as a possible mitigation to the unsustainable wild harvest of plants, simultaneously taking the pressure off wild stock, whilst boosting commerce.


Sara Oldfield


Joachim Gratzfeld


Nautilus Film / TRAFFIC / WWF

However, cultivation often requires major inputs for a far-off return and there is little incentive to bring into cultivation species that are required in relatively small volumes, are slow growing, are believed to be more potent in their wild form, or do not command sufficiently high prices. Moreover, there are social, economic and ecological benefits to wild harvesting. Since much of it is carried out in low-wage countries, by low income, underprivileged groups, it often provides a chance for the poorest people to earn some income, despite having no land. Wild harvest also gives an economic value to ecosystems and habitats, therefore providing an incentive for the protection of something larger than just the plant itself.

Where are we now?

In response to the decline in wild plant resources, the FairWild Foundation was established in 2008. It promotes the sustainable use of wild-collected ingredients, with a fair deal for all those involved


Fernando M. Fernandez


Peter Wyse Jackson

Case study: *Prunus africana*

Prunus africana (Pygeum, African cherry) is found in mountainous tropical forests in central and southern Africa and Madagascar. It has been harvested for centuries for its hard and durable timber as well as for the medicinal properties of its bark, which is used to treat malaria, fevers, kidney disease, urinary tract infections and more recently prostate enlargement (benign prostatic hyperplasia). As long as the tree is not completely girdled it can bear repeated harvests and has been used sustainably for hundreds of years. Indigenous knowledge maintained that, post-harvest, bark grows back more quickly on the side of the tree that faces the sunrise and it was also believed that medicine made from this east-facing bark will heal a patient faster. Thus, traditionally, only one side of the tree was stripped, yielding about 55kg of bark. But when completely stripped, a large tree may yield up to a metric ton of bark – worth considerably more to the collector. Harvest limits and protective folklore have therefore given way to market demand and wild *Prunus africana* populations now appear to be in steep decline. This species is included in CITES Appendix II (see Target 11).

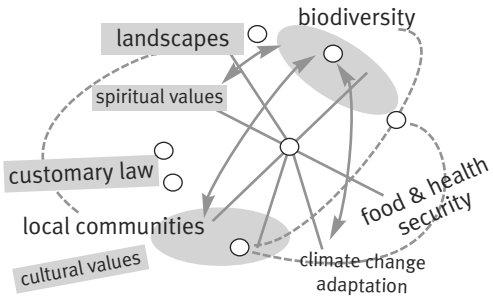
Find out more:

www.fairwild.org
www.imo.ch
www.fsc.org
www.traffic.org

Target 13: Indigenous and local knowledge, innovations and practices associated with plant resources, maintained or increased, as appropriate, to support customary use, sustainable livelihoods, local food security and health care

"Knowledge matters - understanding how people and societies acquire and use knowledge is essential to improving people's lives, especially the lives of the poorest."

World Development Report 1998



Indigenous knowledge, innovations and practices are often collectively referred to as 'traditional knowledge'. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is generally transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, and forestry.

There is today a growing appreciation of the value of this kind of knowledge and many widely used products, such as plant-based medicines and cosmetics, are the products of it.

Traditional knowledge can make a significant contribution to sustainable development. Most indigenous and local communities are situated in areas where the vast majority of the world's plant genetic resources are found. Many of them have cultivated and used biological diversity in a sustainable way for thousands of years and continue to do so today. An example is sub-Saharan Africa, where over 90 per cent of food is produced using traditional farming practices.


Alan Hamilton


Fernando M. Fernandez


Bian Tan


Archana Godbole

Indigenous knowledge in Belize

From 1988 to the present, a group of traditional healers and conservationists in Belize has worked with The New York Botanical Garden on a project to inventory and catalogue the flora and ethnobotanical knowledge of that country. The most significant printed results of the project to date have been a primary health care manual, a checklist of the flora of Belize, and a forthcoming encyclopedic treatment of the useful plants. From the standpoint of traditional knowledge, one of the most important outcomes has been the establishment of an association of traditional healers, aiding the development of a community of individuals dedicated to this practice.

A cultural diversity crisis

While we are all well aware of the extinction crisis facing biodiversity, it less well known that this is being accompanied by a cultural diversity crisis, which could lead to the disappearance of up to 90 per cent of the world´s languages, and of the traditional knowledge and cultures expressed by them, over the next 100 years. Concern for the loss of traditional knowledge is the driving force behind many of the ethnobotanical and culture-related projects now underway throughout the world.

Where are we now?

A Traditional Knowledge Information Portal has been developed by the Secretariat of the Convention on Biological Diversity, which will promote awareness and enhance access by indigenous and local communities and other interested parties to information on traditional knowledge, innovations and practices relevant for the conservation and sustainable use of biological diversity. A wide range of initiatives to conserve traditional knowledge have been developed at national and local levels, and increasingly these are being documented using video.


Joachim Gratzfeld

Find out more:

www.bdln.net/
http://biocultural.iied.org/

Education and Awareness

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

Plant blindness is the inability to see or notice the plants in one's own environment, leading to: (a) the inability to recognize the importance of plants in the biosphere, and in human affairs; (b) the inability to appreciate the aesthetic and unique biological features of the life forms belonging to the Plant Kingdom; and (c) the misguided, anthropocentric ranking of plants as inferior to animals, leading to the erroneous conclusion that they are unworthy of human consideration.
(Wandersee & Schussler, 1998)

Surveys have shown that there is a low level of recognition amongst the general public of the term 'biodiversity' and more specifically, a lack of understanding of the important role that plants play in supporting human well-being.

Plants are often under-represented in the conservation debate and neglected in efforts to engage the public in environmental action. Furthermore, increasing urbanization is resulting in a growing disconnect between people and nature, especially noticeable among young people.

Plant conservation targets, such as those of the GSPC, will only be achieved if changes are made at all levels of society, from policy makers to the general public. For this reason, communication, education and public awareness programmes are essential in underpinning the Strategy.

A consultation on how well plants are included in education programmes has been carried out by BGCI in six countries (Brazil, China, Indonesia, Russia, UK and USA). Similar issues were identified across the countries, in particular:

- over-emphasis on animals and neglect of plants in environmental education programmes
- the need for increased teacher-training relative to plant diversity
- a lack of opportunity for children to experience nature first-hand

Bian Tan

- plant conservation messages being lost under an overwhelming level of advertising in all media.

Citizen science

Engaging the public in new and innovative ways is key to raising awareness of plant conservation issues. One example is the increasing popularity of citizen-science projects focused around plant monitoring in changing climates (see Box: Project BudBurst).


Timothy Walker

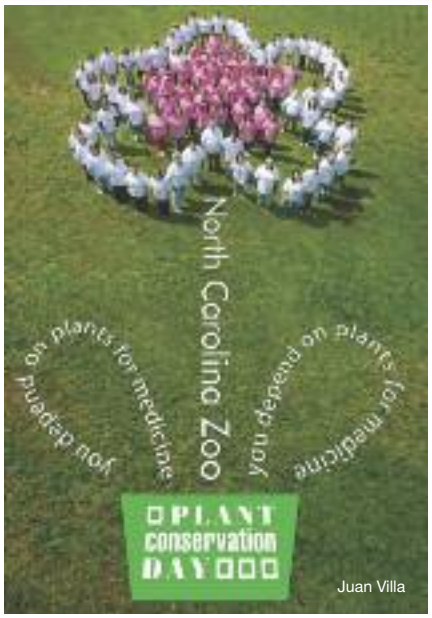
"Look deep into nature, and then you will understand everything better."

Albert Einstein


Brent Stirton / Getty Images/ WWF-UK

Project BudBurst

Project BudBurst, initiated in 2007 by Chicago Botanic Garden, has grown into a network of people across the United States who monitor plants as the seasons change. The project has become a national field campaign designed to engage the public in the collection of important ecological data related to plants. Project BudBurst participants make careful observations of plant events, such as leafing, flowering, and fruiting. The data are collecting in a consistent manner across the country so that scientists can learn more about the responsiveness of individual plant species to changes in climate locally, regionally, and nationally. Thousands of people from 50 states across the US participate in the project.




BGCI

Find out more:

www.bgci.org/education/
http://www.cbd.int/cepa/

T15

Meeting Needs

Objective V: The capacities and public engagement necessary to implement the Strategy have been developed

V

Target 15: The number of trained people working with appropriate facilities sufficient according to national needs, to achieve the targets of this Strategy

Botanical capacity is necessary not only to achieve the targets of the GSPC, but is also essential for managing many of the major issues facing society today. Such grand challenges include climate change mitigation, land management and wildlife habitat restoration, understanding the provision of ecosystem services, management and control of invasive species, and the conservation and recovery of rare species.

Given the importance of plant science, the decline in the teaching of botany and plant sciences in schools and universities around the world is of particular concern. The fact that the plant sciences are often taught less in schools than other sciences contributes to a chain of events involving reduced research, reduced funding, fewer students studying botany at a higher level, and fewer universities offering courses in plant science.

Regional capacity building

Since 1988, the Red Latinoamericana de Botánica (RLB – Latin American Plant Sciences Network), has been engaged in capacity building, fostering the number of qualified Latin American botanists in order to adequately assess the regional vegetation, to understand ecosystem functioning and to provide the basis for the conservation and management of the important natural resources offered by the Latin American flora.

To achieve this goal young botanists from Latin American countries are being trained through the expertise and infrastructure available in qualified scientific institutions across the region. Over the past 20 years, RLB has trained over 200 graduate-level researchers from 18 Latin American countries, as well as offering many short-term specialized graduate courses, benefiting over 1,000 students. It also organizes and funds scientific events and provides small grants for botanical research.

In 2010, BGCI (US) and partners carried out a survey to assess the status of the capacity available in the US to conserve and manage native plant species and habitat. In 1988, 72 per cent of the nation's top 50 most

Bian Tan

Bian Tan


Bian Tan

funded universities offered advanced degree programmes in botany. Today, more than half these institutions have eliminated their botany programmes together with many, if not all, related courses. Similarly, the number of universities offering botany degrees in the UK decreased steadily over recent years until by 2011 botany degree programmes had been completely phased out.

However, despite the decline in university-level courses in botany and plant sciences, a number of national and international organizations do offer training or provide resources to support capacity building in plant conservation.

The taxonomic impediment

One particular area of concern is that of taxonomic capacity. There is a worldwide shortage of taxonomists who can be called upon to identify species, describe species that are new to science, determine their taxonomic relationships, and make predictions about their properties. The shortage is expected to worsen, because the expert workforce is ageing while the number of students being trained in taxonomy shrinks. Governments, through the Convention on Biological Diversity, have acknowledged the existence of a 'taxonomic impediment' to the sound management of biodiversity, and have developed the Global Taxonomy Initiative to try to alleviate the situation.

"While education broadens the mind, training focuses the mind."

South African response to the GSPC


Chicago Botanic Garden

Where are we now?

While there is no global baseline from which progress can be measured, and despite relatively few countries having conducted needs assessments, several global and regional programmes have made progress in increasing the number of trained people in plant conservation. However, given the importance of plant science, the decline in the teaching of botany and plant sciences in schools and universities around the world remains a worrying issue.


BGCI

Find out more:

www.plants2020.net


Bian Tan

T16

Working Together

Objective V: The capacities and public engagement necessary to implement the Strategy have been developed

V

Target 16: Institutions, networks and partnerships for plant conservation established or strengthened at national, regional and international levels to achieve the targets of this Strategy

Networks supporting plant conservation activities provide the means to share experiences, exchange data, encourage professional development and build the capacity of the plant conservation community.

Many different models exist for such networks, ranging from informal, sometimes transient efforts to share information or cooperate on specific projects, to large national and international associations with paid staff and secretariats.

Global Island Plant Conservation Network

This was established in 2010 in recognition of the fact that islands with a small land area and isolated location face particular plant conservation challenges. Although these small islands only make up some 5 per cent of the earth's land surface, about one fifth of all known plants – some 70,000 species – are endemic to islands. However, they often have limited resources and fewer institutions than larger countries, so working together is essential. The Global Island Plant Conservation Network facilitates contact between botanical experts and the exchange of information, documents and experience. Electronic communication, especially email, is an important tool for a group whose members are located across great distances, and indeed in different oceans.

Christopher K. Willis

In some respects the GSPC itself could be called a grass-roots programme. Resulting from intensive networking between concerned individuals and organizations, it has also facilitated and strengthened networking as organizations respond to the Strategy. Most importantly, it has resulted in the establishment of the Global Partnership for Plant Conservation (GPPC), which brings together international, regional and national organizations united in a desire to implement the GSPC.

BGCI

In-country partnerships

Several countries that have developed national responses to the GSPC have started by holding national stakeholder workshops, to identify the relevant individuals and organizations involved in delivering plant conservation targets. Building strong national networks involving all these key players is often pivotal in successful implementation of the GSPC.

Where are we now

The establishment of the Global Partnership for Plant Conservation has successfully brought together the major international organizations working in plant conservation at the global level. However, some national and regional plant conservation networks have also been successfully developed:

- At the regional level, the Red Latinoamericana de Botánica has been very active in capacity building, education, conservation and sustainable use of plants throughout Central and South America.
- Similarly, good progress has been made in Australia and New Zealand through the New Zealand Plant Conservation Network and the Australian Network for Plant Conservation.

Find out more:

www.plants2020.net/gppc/
www.bgci.org
www.iucn.org

"You cannot produce results without effective partnerships."

Bruce Jenks, UNDP

BGCI

NBG Ireland

BGCI

Engaging young people


BGCI

The Fairchild Challenge/BGCI Global Competition 2010/11

Every year BGCI links up with The Fairchild Challenge to offer a Global Competition for students aged 14-19. In 2010-11, the Competition was to design a T-shirt that expressed what the students thought was important about plant conservation. In this publication we are featuring the top ten winning designs. These are:

More information about the Fairchild Challenge/BGCI Global Competition is available at: http://www.bgci.org/education/fair2/

Target 1
Jessy Herring,
Tavares High School, USA

Message:
Plants hold the world together

Target 3
Austin Cox, Courtney Prince and Casey Ierardi,
Avon Grove Charter School, USA

Message: Spread life

Target 4
Austin Cox,
Avon Grove Charter School, USA

Message: Conserve ecosystems

Target 5
Deanna Hobson,
Twin Valley High School, USA

Message: Living as one
(Winning entry)

Target 6
Whitney Nelson,
Homestead Senior High School, USA

Message: Life depends on diversity

Target 7
Cathy Li, North Allegheny Intermediate High School, USA

Message: Help protect the environment one plant at a time

Target 8
Emily Willow,
Twin Valley High School, USA

Message: The key to survival is conservation of biodiversity

Target 14
Karina Quintana,
Miami Springs Senior High School, USA
Message: Biodiversity matters to everyone

Target 15
Sarah Prescott,
Tavares High School, USA

Message: If we work together, we can make a ripple effect

Target 16
Sarah Weld,
Twin Valley High School, USA

Message: Plant, love, grow

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William Stadler