Global Partnership for PLANT CONSERVATION 2018

28–30 August 2018

CONFERENCE PROGRAMME WITH ABSTRACTS






VENUE: Old Mutual Conference Centre, Kirstenbosch National Botanical Garden,
South African National Biodiversity Institute (SANBI), Cape Town, South Africa

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environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

SANBI
Biodiversity for Life
South African National Biodiversity Institute

25 YEARS Convention on Biological Diversity
SAFEGUARDING LIFE ON EARTH

The Global Partnership for Plant Conservation

BOTANIC GARDENS CONSERVATION INTERNATIONAL

MISSOURI BOTANICAL GARDEN

BOTANICAL SOCIETY OF SOUTH AFRICA Est. 1913

2030 NDP

PROGRAMME

VENUE: OLD MUTUAL CONFERENCE CENTRE, KIRSTENBOSCH NATIONAL BOTANICAL GARDEN, SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE (SANBI), CAPE TOWN, SOUTH AFRICA

Tuesday, 28 August 2018

09:00 CONFERENCE OPENING

Including:

- Welcome from the South African National Biodiversity Institute (SANBI).
- Welcome from Secretary General of Botanic Gardens Conservation International (BGCI).
- Welcome and introduction from the Chair of the Global Partnership for Plant Conservation (GPPC).
- Statement and welcome from a representative of the Secretariat of the Convention on Biological Diversity (SCBD):
  - Robert Höft (SCBD): Perspectives on the post-2020 global biodiversity framework.
- Statement and official opening by the Director General: Department of Environmental Affairs (DEA), South Africa.

10:00 PRESENTATIONS ON GSPC PROGRAMMES, PROGRESS AND IMPLEMENTATION AT THE NATIONAL LEVEL

- **Domitilla C. Raimondo**, Z. Rabaney & L. von Staden (South Africa):
  Progress towards implementing South Africa's Strategy for Plant Conservation.
- **Cristina López-Gallego, Carolina Castellanos & Hernando García** (Colombia):
  The main achievements of the National Plant Conservation Strategy in Colombia.
- **Hesiquio Benitez Dias** (Mexico):
  Implementation of the Mexican Strategy for Plant Conservation (EMCV).
- **Ethan Freid** (Bahamas):
  Implementation of the Global Strategy for Plant Conservation in the Bahamian Archipelago.

11:00 COFFEE BREAK

11:30 PRESENTATIONS ON GSPC PROGRAMMES, PROGRESS AND IMPLEMENTATION AT THE NATIONAL LEVEL (CONT.)

- **David A. Galbraith** (Canada):
  Biodiversity, conservation, the GSPC and the 2020 Biodiversity Goals & Targets for Canada.
- **Hai Ren** (China):
  Progress of implementation on the Global Strategy for Plant Conservation (2011–2020) in China.
- **Haining Qin** (China):
  The role of expert volunteers in the implementation of GSPC: a case study of the China Plant Specialist Group of the IUCN Species Survival Commission.

- **Sahoby Ivy Randriamahaleo** (Madagascar):
  Madagascar's progress in achieving the Global Strategy for Plant Conservation: the need for a successor to the GSPC to pursue national priorities.
- Philippe Bardin, **Maïté Delmas** & Serge Muller (France):
  Progress by France in the implementation of the GSPC targets.
- **Gustavo Martinelli** & Rafaela Forzza (Brazil):
  GSPC advances in Brazil: updates and perspectives for 2020.

13:00 GROUP PHOTOGRAPH

13:15 LUNCH

14:00 PARALLEL WORKSHOPS

1. **Achieving Target 8 of the GSPC**
   Coordinators: Paul Smith (BGCI) and John Donaldson (SANBI)
   - **Catherine A. Offord** & Karen D. Sommerville (Australia):
     Challenges in ex situ conservation in the South Pacific.
   - **Damian Wrigley** (Australia):
     Seed Banking throughout Australia in support of Target 8 and 9 of the GSPC.
   - **John R. Clark**, Joyce Maschinski & Peter Raven (U.S.A.):
     Achieving measurable success towards the Global Strategy for Plant Conservation, Objective II – the Center for Plant Conservation model to urgently and effectively conserve plants.
   - Jordan Wood, Jeremie B. Fant, Andrea T. Kramer, Kayri Havens & **Gregory M. Mueller** (U.S.A.):
     What to do when we can't bank on seeds: Applying zoo population management protocols to rare plants in living collections.

2. **Raising awareness of the GSPC and engagement with stakeholders (at all levels, including amongst governments, CBD stakeholders, conservation and genetic resource practitioners and other groups and sectors) – a Target 14 workshop.**
   Coordinators: Tim Entwisle (Melbourne) and Colin Clubbe (Kew)

3. **Plant conservation and crop plants – a Target 9 workshop.**
   Coordinators: Ehsan Dulloo (Bioversity International, Mauritius) and Luigi Guarino (Crop Trust, Germany).
   - **Nigel Maxted**, Shelagh Kell, Joana Magos Brehm & Ehsan Dulloo (U.K.):
     Addressing GSPC Target 9: Toward the systematic conservation of global plant agrobiodiversity to 2020 and beyond.
   - **M. Ehsan Dulloo**, N. Maxted, Joana Magos Brehm, Shelagh Kell, E. Allen, I. Thormann, H. Gaisberger, Y. Jaufeerally-Fakim, D. Ng'uni & T.T. Tjikana (Mauritius):
     Showcasing crop wild relative conservation planning in the SADC region.
   - **Wolke Tobón**, A. Mastretta-Yanes, B. Goettsch, T. Urquiza-Haas, A. Cuervo-Robayo, M.A. Orjuela, E. Urquiza, E.P. Gómez Ruíz, O. Oliveros, J. Alarcón, F. Acevedo1 & P. Koleff (Mexico):
     Mesoamerican crop wild relatives: Planning to safeguard genetic diversity.
   - Danny Hunter, Teresa Borelli and **M. Ehsan Dulloo** (Mauritius):
     'Plants of the past, or crops for the future': Biodiversity for food and nutrition is central to the 2030 agenda on sustainable development.

17:30 POSTER SESSION

Venue: Kirstenbosch Conservatory

- **Sefra Alexandra Levin**:
  The seed huntress: 'On the hunt to save the genetic biodiversity of our Earth'
- **Diana Milena Arango Uribe** (Colombia):
  Introducing trees to increase biodiversity and decrease pollution in the metropolitan area and the Andean region.
- Tamaz Darchidze, Tinatin Barblishvili, Tsira Mikatadze-Pantsulaia (Georgia):
  Plant conservation in Georgia – strategic targets of the National Botanical Garden of Georgia for 2030.
- **Peta Hardy** (South Africa):
  Prioritising areas for conservation management: putting theory into practice.
- Sean Hoban, Emma Spence, Bethany Zumwalde, Nicole Cavender, M. Patrick Griffith, Michael Bruford, Gernot Segelbacher & **Gerard Donnelly** (U.S.A.):
  Achieving two GSPC targets by documenting existing genetic diversity and developing best practices for preserving it.
- **Peter M. Hollingsworth** (U.K.):
  Using DNA for plant identification to support conservation and sustainable use.
- **Lerato N. Hoveka**, Michelle van der Bank, Bezeng S. Bezeng & Jonathan Davies (South Africa):
  Barriers to conserving South Africa's endemic flora: a gap analysis.
- **M.M. le Roux**, Ronell R. Klopper, Janine E. Victor (South Africa):
  The e-Flora of South Africa – achievements and progress of the past four years.
- Lee, Cheul Ho; Shin, Hyun Tak & Kim, Dong-Kap (South Korea):
  A review of progress in implementation of the Korea Strategy for Plant Conservation (KSPC) 2020 by the Korea National Arboretum.
- Eva Martens & **Colin Clubbe** (U.K.):
  The Millennium Seed Bank Partnership: its role in global plant conservation.
- Kim Norton Taylor, Barney L. Lipscomb & Edward Schneider (U.S.A.):
  Assessing progress towards Targets 1 and 2 of the GSPC 2020 objectives in Texas, U.S.A.
- **J.C. Onyango**, Seline Omondi & Mary O.A. Onyango (Kenya):
  Plant conservation strategies using botanic garden model checklist and photochemistry analysis for classification and herbal medicine usage.
- **Anjum Perveen**, Shazia Mansuri & Saifullah Khan (Pakistan):
  Assessment of *Pulicaria boisseri* Hook.f. (A rare and endemic plant of Sindh, Pakistan).
- **Ing. Tomáš Peš** (Czech Republic): Czech Native Flora Project in the Zoological and Botanical Garden of Plzen.
- S. Rivière, J.V. Müller, E. Breman, A. Carta, M. Kiehn & M. Miranto (France):
  Progress report towards meeting 2020 GSPC Targets 8 & 9 in Europe – implementation and subsequent recommendations.
- Emiliano Sánchez Martínez, Beatriz Maruri Aguilar & María Magdalena Hernández Martínez (Mexico):
  The botanical gardens of Mexico and their commitment to plant conservation plans and strategies.
- **Raviraja Shetty G.**:
  Efforts to conserve endangered and economically useful medicinal plants of the Western Ghats of India.

- Ulyana Spirina & Yuri Naumtsev (Russian Federation):
  Bryophyte horticulture as ex situ conservation method: Case study of the Botanical Garden of Tver State University.
- **F. Tarquini**, M. Pepe, A. Spoletini, G. Fabrini, L. Varone, L. & Gratani (Italy):
  Plant conservation strategy of the Botanical Garden of Rome.
- **Gene-Sheng, Tung**, Chih-Liang, Chao & Tsung-Yu, Hung (Taiwan):
  To enhance the flora conservation of botanical gardens based on participatory citizen science approach in Taiwan.
- Murphy Westwood, Nicole Cavender & **Gerard Donnelly** (U.S.A.):
  Towards achieving the GSPC targets for trees through global collaboration.

Poster presenters will be invited to speak for 2–3 minutes about their poster presentations during the session.

18:30 CLOSE FOR THE DAY

Wednesday, 29 August 2018

09:00 PRESENTATIONS ON GSPC PROGRAMMES, PROGRESS AND IMPLEMENTATION AT THE NATIONAL LEVEL (CONT.)

- **Pierre-André Loizeau** and Anouchka Maeder (Switzerland):
  The impact of the GSPC on the biodiversity legislation and awareness in Switzerland.
- **Libor Ulrych** (Slovakia):
  Global Strategy for Plant Conservation 2011–2020; implementation in Slovakia.
- **Didik Widyatmoko, R.A.**, Risna, D.W. Purnomo, D.O. Pribadi & S.R. Ariati (Indonesia):
  Implementation of the Global Strategy for Plant Conservation in Indonesia.
- **Lillian Swee-Lian Chua** (Malaysia):
  Progress on the implementation of the Global Strategy for Plant Conservation in Malaysia.
- **Joni Jackson** (Jamaica):
  Implementation of the Global Strategy on Plant Conservation in Jamaica.
- **Biljana Panjkovic** & Jelena Dučić (Serbia):
  A review of progress in implementing the Global Strategy of Plant Conservation in the Republic of Serbia.
- **James Mougal** (Seychelles):
  Implementation of the Global Strategy on Plant Conservation in the Seychelles.
- **Camila de Sousa** (Mozambique):
  The challenges and role of IIAM to contribute to achieving GSPC targets.

11:00 COFFEE BREAK

11:30 PRESENTATIONS ON CROSS-CUTTING ISSUES IN THE GLOBAL STRATEGY FOR PLANT CONSERVATION

- Paul Smith & **Kirsty Shaw** (BGCI):
  The Global Trees Campaign: an integrated approach to delivering the Global Strategy for Plant Conservation.
- **Chipper Wichman** (Hawaii, U.S.A.):
  The Hawaii Strategy for Plant Conservation – implementing the GSPC in one of the most unique floristic regions of the world.
- **Malin Rivers**, Steven Bachman, Emily Beech, Abby Meyer, Suzanne Sharrock and Paul Smith (U.K.):
  Targets 2 and 8 – measuring progress towards conservation assessments for all plants and ex situ conservation of threatened species.
- **Stuart Hall**, Alexander Lansdowne, P.M. Holmes, M. Gaertner & K.J. Esler (South Africa):
  Understanding restoration needs at the ecosystem level: Case studies from threatened vegetation types in South Africa's Fynbos Biome.
- **Colin Clubbe** (U.K.):
  Implementing GSPC Targets 2 and 5: Kew's Tropical Important Plant Areas Programme.
- **Porter P. Lowry II** (U.S./France):
  Contributions to GSPC Targets: examples of integrated conservation approaches from Africa and Madagascar.

13:00 LUNCH

14:00 PARALLEL WORKSHOPS (3)

1. **Mainstreaming the GSPC into national biodiversity strategies and action plans (NBSAPs) and reporting (including aligning GSPC targets with the Aichi Targets, the Sustainable Development Goals and contributions to the Global Biodiversity Outlook – GBO-5)**
   Coordinators: Domitilla Raimondo (SANBI), Hesiquio Benitez Dias (Mexico) and Robert Höft (SCBD).

2. **Capacity building and support measures for plant conservation / GSPC implementation.**
   Coordinators: Sebsebe Demissew (Ethiopia), Suzanne Sharrock (BGCI) and Christopher Willis (SANBI).

   - **Suzanne Sharrock** & Helen Miller (U.K.):
     Capacity building for plant conservation.
   - **Suvarna Parbhoo-Mohan**, Zaitoon Rabaney, I. Ebrahim & V. Zikishe (South Africa):
     Developing capacity to implement South Africa's Plant Conservation Strategy.
   - **Vanessa Handley** & Holly Forbes (U.S.A.):
     Progress through partnership: How small organizations can make meaningful GSPC contributions.
   - **Kimberlie McCue** & Bárbara Goettsch (U.S.A.):
     IUCN SSC Specialist Group–Host Institute Collaborations Advance GSPC Target 2: A case study.

3. **Evaluation of the current global status of GSPC implementation and priorities for 2018–2020.**
   Coordinators: Stephen Blackmore (BGCI), Maïté Delmas (France) and Peter Wyse Jackson (GPPC).

16:30 GUIDED TOURS OF THE KIRSTENBOSCH NATIONAL BOTANICAL GARDEN, FOLLOWED BY CLOSE FOR THE DAY

Thursday, 30 August 2018

09:00 PRESENTATIONS ON ACHIEVING INDIVIDUAL TARGETS OF THE GLOBAL STRATEGY FOR PLANT CONSERVATION

- **Target 1**: **M. Marianne le Roux**, Peter Wyse Jackson & Pierre-André Loizeau (South Africa): Building a World Flora Online.
- **Target 2:** **Steven Bachman** & Malin Rivers (U.K.): A machine learning approach to assess the conservation status of all plants.
- **Target 7**: **Lize von Staden**, Rupert Koopman & Ismail Ebrahim (South Africa): Achieving GSPC Target 7 in a megadiverse country.
- **Target 9**: **Luigi Guarino** (Germany): Measuring progress in the conservation of crop diversity.
- **Target 13:** **Christopher Dunn** & Peter Wyse Jackson (U.S.A.): Traditional knowledge conservation and the GSPC: progress and perspectives.
- **Target 13:** Tom Suchanandan & **Carol van Wyk** (South Africa): The National Recordal System – An initiative of the Department of Science and Technology towards the protection, promotion, development and management of indigenous knowledge.

11:00 COFFEE BREAK

12:00 REPORTS FROM WORKSHOPS OF THE PREVIOUS DAYS AND DISCUSSION

followed by:

PLENARY WORKSHOP – A FUTURE GSPC FOR 2020 TO 2030

The workshop will address questions such as:

- What will be the suggested structure of a post-2020 GSPC – formulation, objectives, targets (revised, updated and new), stakeholders
- How will it address emergent issues such as cities and urban biodiversity, the SDGs, climate change and action, ecological restoration?
- Aligning the post-2020 GSPC with the Strategic Plan for Biodiversity, Aichi Targets and the SDGs
- How will relevant stakeholders be engaged fully?

13:00 LUNCH

14:00 WORKSHOP CONTINUES…

16:00 WRAP UP AND GPPC BUSINESS MEETING

17:00 CONFERENCE CLOSE

ABSTRACTS

Compiled and edited by Peter Wyse Jackson, Kathy Farris and Suzanne Sharrock, July 2018.

Tuesday, 28 August 2018

PRESENTATIONS ON GSPC PROGRAMMES, PROGRESS AND IMPLEMENTATION AT THE NATIONAL LEVEL

Domitilla C. Raimondo, Z. Rabaney and L. von Staden:

Progress towards implementing South Africa's Strategy for Plant Conservation.

***Domitilla C. Raimondo**, South African National Biodiversity Institute, National Botanical Gardens, Private Bag X101 Pretoria, South Africa.*
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L. von Staden, South African National Biodiversity Institute.
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South Africa is signatory to the Convention on Biological Diversity (CBD) and is committed to the implementation of a national strategy to conserve plants that aligns with the Global Strategy for Plant Conservation (GSPC). With 6% of the world's plant diversity and strong botanical and conservation capacity, South Africa is well placed to make a significant contribution to plant conservation globally. South Africa's Strategy for Plant Conservation is nationally relevant, aligns with, and is incorporated into, South Africa's updated National Biodiversity Strategy and Action Plan (NBSAP).

South Africa's targets from the GSPC have been modified to ensure that they are achievable in the megadiverse flora context in which plant conservation work takes place. Much of South Africa's conservation work is done in an integrated fashion with plant and animal conservation combined with the conservation of ecosystems and habitats. Plant conservation is not done in isolation of other work to conserve biodiversity. South Africa's biodiversity sector bases its work on priorities identified through systematic biodiversity plans that identify Critical Biodiversity Areas (CBAs), which represent ecological viable networks of ecosystems and species for conservation. The targets to conserve plant diversity in production lands (Target 6), and the conservation of ecosystems (Target 4) in particular, have been guided by systematic biodiversity planning work.

This strategy was developed under the leadership of SANBI, the focal point for the implementation of the GSPC nationally with support from the Botanical Society of South Africa (BotSoc). Through the development of this strategy a network of botanists has been developed that includes conservation agencies, non-governmental organisations (NGOs) and academic institutions. This presentation will report on South Africa's progress towards achieving the GSPC targets nationally.

Cristina López-Gallego, Carolina Castellanos and **Hernando García**:

The main achievements of the National Plant Conservation Strategy in Colombia.

Cristina López-Gallego[1], Carolina Castellanos[2] & Hernando García[2]
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Colombia first formulated a National Strategy for Plant Conservation in 2001, which was reviewed in 2010 and now has a concrete Action Plan within the framework of the National Biodiversity Strategy and the international Strategic Plan for Biodiversity 2011–2020. Since the implementation of our National Strategy for Plant Conservation, major achievements have been accomplished – especially for Targets 1, 2, 3, 7, 8 and 11 – related to generating knowledge for decision making and to implementing conservation actions for species, but also for other targets related to increasing awareness and education, capacity building and institutional strengthening for conservation in the country.

In 2015, the first version of a Catalogue of Plants of Colombia was published, reporting more than 26 000 species for the country. In the last decade, important efforts have been carried out to advance the Red List of Colombian Plants, with close to 2 000 species

assessed to date, included in an official governmental resolution with implications for management of threatened species in the country (for example, within the framework of environmental impact assessments and off-sets programs). In the last five years, collaboration with SANBI of South Africa and CNC Flora of Brazil has resulted in a strong programme to advance and complete this Red List in the following years. In addition, strategic groups of plants have been chosen to implement Conservation Action Plans (CAPs) for, including palms, orchids, magnolias, cycads and some timber trees, and there are several new plans in development. These CAPs include strategies for in situ protection, restoration and sustainable use of species; and they use target species as charismatic umbrella taxa to promote the conservation of other plants, their habitats and all components of biodiversity. Finally, the country has made advances in identifying and formulating management plans for invasive species and for economically important plants (medicinal, crop-relatives). In the near future, information on species diversity and conservation status (from the Red List), in addition to lessons learned from the implementation of conservation plans, will be used to properly identify Important Plant Areas (IPAs) and IUCN Key Biodiversity Areas (KBAs), and to better use plant information for conservation planning at the regional and national level.

Hesiquio Benitez Dias:

Implementation of the Mexican Strategy for Plant Conservation. (EMCV)

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After GSPC adoption by the CBD, Mexico established a participatory process involving representatives from government, academia and relevant associations on flora, to develop the Mexican Strategy for Plant Conservation 2012–2030 (EMCV). With six strategic objectives, 33 goals and 34 actions indicating key actors for its implementation, it is in alignment to the Strategic Plan for Biodiversity (2011–2020).

Since 2013, a Coordination Committee has been established to promote its implementation on a voluntary basis. Among main areas of progress, highlights are the following: active participation at e-FloraMex online project in collaboration with World Flora On Line (WFO); publication of the contribution of Mexican Botanical Gardens to conservation of plants; workshops and publication of case studies on ecosystem restoration; a pilot project on production systems and sustainable use of plant species; a project on information of maize and its wild relatives in Mexico to determine centres of genetic diversity; the insertion of mainstreaming biodiversity in productive sectors; amendment proposals to include Mexican plant species into CITES Appendixes; and a voluntary guideline for sustainable use of mahogany.

Regarding overall GSPC targets implementation in Mexico, Targets 1,5,10 and 14 show the best progress; targets 8,9,12 and 13 shows the least progress; while the rest of the targets show progress at a slow pace.

Ethan Freid:

Implementation of the Global Strategy for Plant Conservation in the Bahamian Archipelago

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The Leon Levy Native Plant Preserve (LLNPP) is a 30-acre site on Eleuthera in the central Bahamas. It was developed through a partnership between the Levy Foundation and the Bahamas National Trust (BNT). Since ground breaking in January 2009, the LLNPP developed a Welcome Centre, Education Pavilion, Lath House, Medicinal Plant display beds, an Edible History section, a 2 km hiking trail system, a Weather Station, and a Tower Overlook, in addition to numerous display beds showcasing endemics and other native plant species. Eighty per cent (80%) of the site is intact Caribbean Dry Forest with footpaths for access, and includes three 20 × 20 m. permanent forest plots. After opening to the public in 2011, the LLNPP and the BNT have been working toward fulfilling 11 of the targets in the Global Strategy for Plant Conservation for the Bahamian Archipelago (Targets 1–5, 7–8 and 13–16) as part of its Science and Conservation Programme. The LLNPP has naturally occurring populations of five endemic species and has added 41 species through its living collections programme (52 % of the 89 vascular plants are endemic to the Bahamian Archipelago). The LLNPP developed a conservation horticulture programme to produce stocks of endemic and native species for landscaping and conservation purposes. To increase in-country capacity, the LLNPP created an intensive eight-week terrestrial natural history internship aimed at university age Bahamians that focuses on Plant Taxonomy and general Field Biology. One of the missions of the LLNPP is to increase awareness of plants, their conservation importance, and training the next generation of Bahamian field botanists.

David A. Galbraith:

Biodiversity, conservation, the GSPC and the 2020 Biodiversity Goals & Targets for Canada.

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Covering nearly 10 million km², Canada's immense geography includes fifteen terrestrial ecozones as diverse as the Arctic Cordillera in the high north and the temperate rainforests of the Pacific Maritime. Many of these are larger than some individual countries. Plant conservation in Canada has been addressed largely at the level of individual species at risk and actions for their recovery, and the conservation of protected areas. Although there are 5 211 known vascular plant species occurring spontaneously in Canada (including 1 315 exotics), only 42 are considered endemic. Given this expanse, much attention has been paid to the conservation of genetic diversity and adaptation to local habitats. Of the native taxa, 138 are considered of high conservation priority, with 102 listed nationally as Endangered, 49 as Threatened and 47 of Special Concern. Most threatened species in Canada are in the south, in areas of high human disturbance.

Plant biodiversity and biomass are of immense importance to Canada, especially as approximately 42% of the country is covered by forest. Canada's timber and non-timber forest products alone are valued at over $34 billion per year. Plant diversity is also of immense importance to indigenous peoples, scientists and everyone concerned with conservation and ecology. In response to the Aichi Biodiversity Targets, Canada has developed its own national targets, the 2020 Biodiversity Goals & Targets for Canada. These 19 national targets were adopted in 2015. There is good agreement in subject coverage between the Global Strategy for Plant Conservation and the Canadian biodiversity targets. Eleven of the sixteen GSPC targets (about 66%) are covered in part or in whole by the 2020 Canadian targets. There are also some gaps. GSPC Targets 1 (global flora on-line), 8 (threatened plant species in ex situ collections), 9 (conservation of genetic diversity of crops), 15 (capacity-building), or 16 (networking) do not find close matches in the 2020 targets for Canada. Similarly, six of the Canadian targets focus on areas not covered expressly in the GSPC: 3 (wetlands), 4 (urban areas), 5 (climate change), 8 (aquaculture), 9 (pollution) and 17 (natural capital). Particular attention is being given to Canada's Target 1, the protection of 17% of Canada's terrestrial area by 2020 (related to GSPC Target 4).

At present, approximately 10.5% of Canada's terrestrial area is protected in national or provincial parks. Protection of additional area by the federal and provincial governments, and other effective area-based conservation measures, are being considered. Five habitats in particular are drawing attention because of the high number of listed species at risk: the Garry Oak meadows (British Columbia), tallgrass prairies and Aspen parkland (Manitoba), the Thames River watershed (Carolinian forest; Ontario), St Lawrence lowlands (Quebec), and coastal limestone barrens (Newfoundland and Labrador). Conservation in agricultural, urban and near-urban areas is particularly important in Canada, as there is a strong correlation between these land uses, habitat loss, and endangered species.

Hai Ren:

Progress of implementation on the Global Strategy for Plant Conservation (2011–2020) in China.

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Plant diversity is an essential resource for the earth, which supports human survival. Many plant species are threatened by human disturbance and are now in danger of extinction. The Global Strategy for Plant Conservation (GSPC) seeks to save the world's plant species and slow the pace of plant extinction around the world. China adopted the GSPC in 2008 with the preparation of its national plant conservation strategy. This presentation will assess the progress of GSPC implementation in China.

The results showed that China has made varying degrees of progress towards all targets. Target 1, 2, 4, 5 and 7 have been implemented before 2018 and substantial progress have been made. China now is on track toward meeting Targets 3, 8, 9, 11, 12, 14, 15 and 16 by 2020. Limited progress has been made so far in reaching Targets 6, 10 and 13. While GSPC implementation has promoted the conservation and restoration of plant diversity, it is certain that China need to develop more effective strategies to take practical measures toward reaching all targets by 2020.

Haining Qin:

The role of expert volunteers in the implementation of GSPC: a case study of the China Plant Specialist Group of the IUCN Species Survival Commission

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In the past decade, the China Plant Specialist Group (CPSG)/SSC/IUCN has played an import role in the implementation of the Global Strategy for Plant

Conservation (GSPC) targets in China. It can be said that the achievement of Targets 1 and 2 are mainly the result of the works of the CPSG. The group members also make contributions to Targets 7, 8 and 14. The CPSG was established in the early 1990s. Currently its members total 85, including academic researchers, university teachers and conservation agency officials; and they mainly come from professional backgrounds. They are all passionate about the environment and have a particular interest in plant conservation.

GSPC Target 1 proposes going from creating a working list of the world's flora in the first GSPC phase to an online flora of known plant species by 2020. China has been progressing very well and is close to achieving this target by setting up an updated national plant list (http://www.sp2000.org.cn/; http://www.chinaplantspecies.org/) and an online flora of China (http://www.onlineflora.cn/). Both the database and website are being developed mainly by CPSG members. Target 2 aims at an assessment of the conservation status of all known plant species, to guide conservation action. China recently finished the assessment of the threatened status of all native plant species and produced the Red List of China plants (RLoC). Since the RLoC was officially released in September 2013 (http://www.mee.gov.cn/gkml/hbb/bgg/201309/t20130912_260061.htm), it has been used more and more as the baseline list for in situ and ex situ conservation in China. The RLoC project is led by the Chair of the CPSG, and many members are invited to contribute species survival data and/or to review the assessment results.

CPSG members' work also strengthens the implementation of in situ and ex situ conservation of threatened species (Targets 7 & 8). They also promote education and awareness about plant diversity (Target 14) through their daily work.

The experience learned from the CPSG on GSPC targets is being effectively combined with research project work with the specialist group. For this aspect, the group has made a work strategy, then focused on the communication among the group members and they try to play a big role in the individual and group function.

Sahoby Ivy Randriamahaleo:

Madagascar's progress in achieving the Global Strategy for Plant Conservation: the need for a successor to the GSPC to pursue national priorities

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Madagascar is one of the 17 megadiverse countries, largely because of its exceptional flora, which is both highly endemic and threatened, qualifying it as a biodiversity hotspot. Ratification of the CBD required the development of a National Strategy for Plant Conservation, but to date this has not yet been accomplished. However, national reports to the CBD (except for the most recent one) have included an annex on this subject, for which the botanical community, structured as the IUCN-mandated Madagascar Plant Specialist Group (MSPG), provided input.

The MSPG is an effective, federative entity of experts working on Malagasy plants that has been particularly active in the implementation of Target 2 of the GSPC, having conducted more than 3 000 conservation assessments to date. Very significant progress has been made in Madagascar toward achieving this and several other targets. Currently 1 450 assessments have officially been published on the IUCN Red List, which represents more than 10% of Madagascar's very rich and highly endemic flora. Substantial progress can also be reported on some of the other targets. For the delivery of Target 1, in 2017, Madagascar participated in the WFO Consortium through the MPSG. This reflects the will of the country to contribute to this global effort with information on its exceptional flora, via the Catalogue of the Plants of Madagascar (MadCat) developed by the Missouri Botanical Garden with several partners, offering an authoritative input for WFO. Significant achievement has been made on Target 5 as more than 60% of the 80 currently recognised IPAs have Protected Areas status, with management delegated to local communities and their collaborators. Madagascar has made significant progress in implementing Target 8: over the last decade, the establishment of gene banks maintained locally and abroad has experienced remarkable growth, geographically (covering almost all of the island's ecosystems), in number (more than 3 500 species of the ± 13 000–14 000 species known), and in terms of the types of actors (governmental and non-governmental institutions, the private sector, and local populations). The field gene bank concept has evolved with the establishment of new protected areas, which provide opportunities for ex situ conservation.

The level of implementation of the GSPC's 16 targets in Madagascar is not uniform; considerable effort must still be made to take into account current realities and circumstances in the country. This is the case for Target 11, which must respond to the continued increase in wildlife crime, one of the principle threats to the flora. Extensive scientific research and drastic, informed policy measures are required to reverse current trends. Also, while for Target 5 forests have been prioritised, the protection of aquatic (fresh water) ecosystems has become a priority because more than ten key areas for biodiversity, including AZEs for plants, have recently been identified. Another challenge is the implementation of the 'recovery and restoration' aspect of Target 8.

Progress toward GSPC implementation has benefited from various policy frameworks developed as part of

Madagascar's CBD commitment, but there remains a need for capacity building and on-the-job training at all levels (from implementing stakeholders to the general public). Three interdependent levels need to be addressed: a) strengthening the institutional framework for implementing actions, b) improving the quality and availability of the human resources required to carry out priority actions, and c) raising awareness among the general public, especially those who, in their professions or daily lives, are users of biodiversity. Therefore, objectives III and IV of the GSPC require more actions in the future. Much work related to the GSPC will remain to be done beyond 2020, which Madagascar regards as an ongoing priority. Consequently, there is a strong need for a clearly articulated strategy for the next decade to follow on the current GSPC and to build on its successes. Madagascar considers it a priority to establish a successor to the current GSPC that will provide a framework for pursuing national priorities linked to its international obligations under the CBD.

Philippe Bardin, **Maïté Delmas** and Serge Muller:

Progress by France in the implementation of the GSPC targets

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Mainland France is the most biodiverse country in Europe and home to 40% of the plant species found in Europe and over 50% of the natural habitat types of community interest is held in four out of the nine European biogeographical regions: Alpine, Continental, Atlantic and Mediterranean.

With its overseas departments, territories and collectivities, France is present in many latitudes, representing a wide range of biogeographic regions: Mascarene Islands, Comoros, Mozambique Channel, Guiana Shield, Caribbean, Southern Pacific, Southern and Antarctic Islands to the North American boreal zone. Eighty per cent (80%) of the French biodiversity is held overseas and out of the world's 34 designated biodiversity hotspots, five land hotspots are in France, including four overseas: Mediterranean basin, Antilles, Polynesia, New Caledonia and Indian Ocean. This gives France a great responsibility.

France adopted its revised National Biodiversity Strategy in 2011 to mainstream biodiversity in all public policies and to produce a deeper commitment by all players at all levels in mainland France and overseas, to achieve the adopted targets. It sets a common ambition to conserve, restore, strengthen and develop biodiversity and to ensure its fair and sustainable use.

France has made strong commitments, notably through its law for the restoration of biodiversity, nature and landscapes (August 2016). Many actions have already been taken nationally to tackle biodiversity loss: designation of new protected areas; mapping of green and blue infrastructure; cartography of the natural and semi-natural vegetation; definition of action plans for endangered species; strategies to control invasive species; spread of biodiversity practices; information and knowledge-building campaigns; and regional and international cooperation actions.

The National Natural History Museum and an array of institutions are engaged in the realisation of the Global Strategy for Plant Conservation targets and are contributing to national and regional action plans for the implementation of the Aichi Biodiversity Targets 12 and 15 and the Sustainable Development Goals. This presentation will showcase some of the major progress made in the last few years and a specific response on the GSPC targets will be presented in the French 6th National Report to the Convention on Biological Diversity.

Gustavo Martinelli and Rafaela Forzza:

GSPC advances in Brazil: updates and perspectives for 2020

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Brazil does not have a National Strategy for Plant Conservation. However, it has been working on a set of targets based on the GSPC global objectives and other strategies, goals and programmes contained in the framework of the Convention on Biological Diversity, which contribute to achieving biodiversity goals and targets by 2020.

Despite the absence of a National Strategy adapted to the reality of its mega-diversity and territorial extension, a network of professionals and institutions committed to plant conservation have been contributing to the advancement of GSPC goals in Brazil and significant advances have been achieved.

A symposium on the GSPC goals in Brazil was held during the 67th National Congress of Botany (2017), in which the importance of the GSPC and the advances

and perspectives for plant conservation in Brazil were discussed. The results of this symposium will be published in a special issue of *Rodriguesia* journal available at https://rodriguesia.jbrj.gov.br/ from September 2018.

A summary of the results covering 14 GSPC Targets so far and the strategies for 2020 and perspectives post-2020 framework are presented. A network with more than 1 100 professionals and 435 institutions was involved in these actions.

The results from Brazil show that it is possible to advance in plant conservation, despite the lack of integration mechanisms and low budgets to implement the GSPC goals. We conclude that the GSPC framework is crucial for consistent progress on conserving plants in megadiverse countries like Brazil.

PARALLEL WORKSHOPS

1. Achieving Target 8 of the GSPC

Catherine A. Offord & Karen D. Sommerville:

Challenges in ex situ conservation in the South Pacific

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Rainforests in the South Pacific hold a considerable amount of plant diversity, with rates of species endemism >80% in some countries. This diversity is rapidly disappearing under pressure from logging, clearing for agriculture or mining, introduced pests and diseases, and other anthropogenic sources. Ex situ conservation techniques offer a means to limit the loss of plant diversity. Seed banking is considered the most efficient and cost effective of these techniques, but is only applicable to seed capable of tolerating desiccation and cold storage. Data on the degree of tolerance of these conditions were lacking for more than half of the 1 503 South Pacific rainforest genera examined in our recent review. Of the 710 genera for which data were available, the storage behaviour of 324 was based on an assessment of only one or two species, although 76% of those genera contained at least ten species. Many of the unstudied or poorly studied genera are shared across several South Pacific nations, providing an excellent opportunity for collaboration on future ex situ research and conservation. Of the 386 genera for which three or more species have been studied, 343 have a very high proportion of species (>95% of those tested) that are suitable for seed banking. Seed banking could therefore provide an excellent means for preserving a large proportion of the rainforest flora before it becomes extinct in the wild. Alternatives for preserving species that are not suitable for seed banking will also be discussed. The ex situ conservation options currently employed to meet current Targets 8 and 9 of the Global Strategy for Plant Conservation include seed banking (the storage of dry seeds at sub-zero temperatures), the maintenance of whole plants in orchards and botanic gardens, the establishment of tissue cultures in vitro, and cryopreservation of tissue cultured material or seed embryos. The most appropriate option for conserving individual rainforest species will be dependent on the biology of the species itself and the resources available to conserve it.

Damian Wrigley:

Seed banking throughout Australia in support of Targets 8 and 9 of the GSPC

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The Australian Seed Bank Partnership was established in 2011 to strategically collect and store seed, undertake research, develop standards and support restoration activities throughout Australia. Over the past seven years the Australian Seed Bank Partnership has grown to include government, non-government and not-for-profit organisations represented through nine conservation seed banks and two flora focussed organisations. This collaborative approach to seed banking underpins the Australian Seed Bank Partnership's ability to achieve its vision of conserving Australia's native plants for future generations, as well as contributing meaningfully to the Global Strategy for Plant Conservation.

Since 2011, the Australian Seed Bank Partnership has delivered projects on behalf of government, philanthropy and the non-government sector to collect seed, undertake research and support the restoration of Australia's unique ecosystems. The Global Strategy for Plant Conservation, particularly Targets 8 and 9, continue to provide global relevance for the national and regional activities of the Australian Seed Bank Partnership. Funding delivered through the Australian Seed Bank Partnership has secured viable seed from

over 1 300 Australian taxa, including collections from over 300 nationally listed threatened species. These collections have been duplicated at the Millennium Seed Bank, Kew, UK with many duplicated in other seed banks throughout Australia.

The Australian Seed Bank Partnership also undertakes critical research on recalcitrant species. These efforts improve the shared knowledge of longer-term storage options for recalcitrant species at risk of climate change, land clearing and biosecurity threats such as *Austropuccinia psidii* (myrtle rust). Additional research seeks to improve the restoration of grassland species in highly populated urban fringes of eastern Australia as well as mine site rehabilitation in Western Australia. The Australian Seed Bank Partnership strives to share the knowledge generated through seed banking and research both nationally and internationally with the academic and plant conservation communities.

In 2016 the Australian Seed Bank Partnership hosted the National Seed Science Forum, culminating in international research collaborations that have further advanced our understanding in the fields of seed ecology for restoration, prioritising crop wild relative conservation and breaking seed dormancy in grassland species. Partner institutions have also been recognised for their contributions to conservation at the national and international levels, including Botanic Gardens Conservation International's 2017 Global Seed Conservation Challenge.

This talk will detail the work of the Australian Seed Bank Partnership, highlighting specific projects and research as well as exploring the collaborations that support conservation outcomes for Australia's native plants and the realisation of Targets 8 and 9 of the Global Strategy for Plant Conservation.

John R. Clark, Joyce Maschinski & Peter Raven:

Achieving measurable success towards the Global Strategy for Plant Conservation, Objective II – the Center for Plant Conservation (U.S.A.) model to urgently and effectively conserve plants

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Objective II of the Global Strategy for Plant Conservation (GSPC) is to ensure that plant diversity is urgently and effectively conserved. In 1984, long before this objective was set, the Center for Plant Conservation (CPC) was formed to coordinate conservation efforts among botanic gardens in the United States to help ensure the ultimate survival of all the vascular plants of the U.S. and Canada. This model has since been adopted variously around the world, forming the basis for many conservation partnerships, including foundations of the GSPC. Today, CPC serves a network of nearly 50 botanic gardens, arboreta and other similar organisations to ensure stewardship of imperiled native plants. Our model involves advancing the science of saving plants, applying that science to save plants through ex situ collections and in situ monitoring and management, and advocating for plants and their value to humankind. To date, CPC and its network of Participating Institutions have secured from extinction about a third of the estimated 4 400 kinds of imperiled plants (of a total native flora of about 15 500 species) in our region. Current efforts center on creating and sharing up-to-date guidelines on plant conservation science and on expanding dramatically our network of partners to affect greater conservation outcomes. Securing the future of all of our plants would address numerous targets of both the GSPC and the North American Botanic Garden Strategy for Plant Conservation. Details on current success will be shared as will updates on our evolving strategy for completing the various targets outlined in the two strategies. Opportunities to partner with CPC will also be shared and details on obtaining the newest CPC guidelines will be disseminated.

Jordan Wood, Jeremie B. Fant, Andrea T. Kramer, Kayri Havens & **Gregory M. Mueller**:

What to do when we can't bank on seeds: applying zoo population management protocols to rare plants in living collections.

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Living collections at botanic gardens are often used to conserve exceptional plant species (i.e. rare species that do not produce bankable seed). However, in many cases, protocols have not been implemented to minimize genetic decline and maintain demographic stability over multiple generations. The zoo community faced similar challenges in maintaining living collections of captive animals and has developed tools and practices to overcome them. A zoo-developed tool, PMx: Software for pedigree analysis and management was tested on a living collection of a critically endangered plant, *Brighamia insignis*. Using a combination of pedigree and molecular data, we found that the PMx software was able to provide valuable management recommendations for *B. insignis*, including identifying concern of elevated inbreeding in some collections and distinguishing genetically unique individuals. We found that PMx could dramatically improve the long-term retention of genetic diversity especially for collections that require managed breeding into the

future. While we were able to demonstrate the value of this software for managing collections of exceptional plant species in living collections, there are some caveats. First, PMx tracks individuals rather than accessions, and currently most botanic gardens do not follow individual plants in their plant records systems. Secondly, the software will need to be updated to fully accommodate the breadth of breeding systems found in plants. We are working with the software developers to help implement these changes.

2. Raising awareness of the GSPC and engagement with stakeholders (at all levels, including amongst governments, CBD stakeholders, conservation and genetic resource practitioners and other groups and sectors) – a Target 14 workshop.

3. Plant conservation and crop plants – a Target 9 workshop.

Nigel Maxted, Shelagh Kell, Joana Magos Brehm & Ehsan Dulloo:

Addressing GSPC Target 9: Toward the systematic conservation of global plant agrobiodiversity to 2020 and beyond

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Target 9 of the GSPC calls for: '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'. Such a target is necessitated by the dual challenges of unprecedented expanding human population and an unstable and changing cultivation environment. To increase food production sustainably in the face of these challenges requires significant additional plant genetic resources (PGR), beyond that currently held by ex situ collections. Such additional diversity is available in global plant agrobiodiversity, specifically landraces (LR) and crop wild relatives (CWR) populations held within more traditionally diverse farming systems and in nature. Historically the availability of such diversity has limited their use in crop improvement, but the use of the full breadth of plant agrobiodiversity will be required if we are to meet the challenge and feed the predicted 9.8 billion human population in 2050. The integration of global; regional and national CWR/LR conservation; of in situ and ex situ actions; of formal and informal sectors; and of conservation with use is critical to sustaining humankind. Specifically, we will need to build on existing regional and national PGR networks, where necessary establish novel networks of partners and sites that safeguard the wealth of PGR and promotes its utilisation as a means of underpinning future, climate smart agriculture, food and nutritional security. To achieve this aim, it will (1) establish PGR stakeholders, status and network best practice, (2) enhance PGR population management and best practice, (3) promote PGR in situ valuation and use, (4) establish durable PGR network partnerships linked to broader plant diversity conservation in Europe, and (5) promote PGR awareness and conservation product/tool dissemination.

Dulloo M.E., Maxted N., Magos Brehm J., Kell S., Allen E., Thormann I. Gaisberger H., Jaufeerally-Fakim Y., Ng'uni D. & Tjikana T.T.:

Showcasing crop wild relative conservation planning in the SADC region

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Target 9 of the Global Strategy for Plant Conservation (GSPC) puts emphasis on the conservation of genetic diversity of crop wild relatives (CWR) as an essential component of plant genetic resources for food and agriculture (PGRFA). CWR diversity is important for crop improvement – particularly to adapt crops to the more extreme and changeable environmental conditions brought about by climate change. In this paper we showcase the progress made in planning the conservation of CWR diversity in the South Africa Development Community (SADC) region, in the context of a three year EU/ACP funded project on in situ conservation and sustainable use of CWR in three countries of the SADC region (SADC Crop Wild Relatives) (http://www.cropwildrelatives.org/sadc-cwr-project/).

The project has shown that the region is important for CWR diversity with 1 900 CWR species related to 92 crops that are cultivated for food, beverage, ornamental, forage/fodder, forestry, medicinal, and other uses. Of these, 745 species related to 64 human food and beverage crops are of high socioeconomic importance and 100 species of these are of immediate priority for conservation action. These include wild relatives of crops of particularly high value for food and economic security such as cowpea, coffee, cottonseed oil, millet, oil palm, pigeon pea, rice, sorghum, sugarcane, sweet potato, watermelon and yam. The diversity of CWR in the SADC region was assessed and areas for CWR in situ conservation were identified in Madagascar, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe. The project also has trained over 50 people from 14 countries in the SADC region on in situ conservation methodologies, predictive characterisation and pre-breeding, enhancing the scientific capacities within the SADC region to conserve CWR and to identify useful potential traits for climate change adaptation. The project developed five tools to guide and facilitate countries in CWR national conservation planning as well as in developing National Strategic Action Plans for the conservation and sustainable use of CWR (CWR NSAPs). One of the tools, the 'Interactive Toolkit for CWR Conservation Planning', was developed to assist other countries to prepare CWR NSAPs. An assessment of the cost that farmers are willing to invest in the conservation of CWR on farm and in neighbouring areas was also undertaken. The study has shown the willingness of farmers to contribute to in situ conservation as they realise the benefits they get from such investments. The three target countries (Mauritius, South Africa and Zambia) successfully developed CWR NSAPs that have been endorsed by the respective governments. The paper will discuss the experiences in implementing the project in the SADC region and the likely impact that the project has made in furthering the objectives of the GSPC, as well as Aichi Target 13 of CBD Strategic Plan and the Sustainable Development Goals (SDGs) – particularly SDG Goal 2, Target 5 to 'maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species'.

Wolke Tobón, A. Mastretta-Yanes, B. Goettsch, T. Urquiza-Haas, A. Cuervo-Robayo, M.A. Orjuela, E. Urquiza, E.P. Gómez Ruíz, O. Oliveros, J. Alarcón, F. Acevedo1 & P. Koleff:

Mesoamerican crop wild relatives: planning to safeguard genetic diversity

Wolke Tobón[1], A. Mastretta-Yanes[2], B. Goettsch[3], T. Urquiza-Haas[1], A. Cuervo-Robayo[1], M.A. Orjuela[1], E. Urquiza[1], E.P. Gómez Ruíz[4], O. Oliveros[1], J. Alarcón[1], F. Acevedo[1] & P. Koleff[1]

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Crop wild relatives (CWR) are wild plants that are the ancestors and close relatives of crops. They hold genetic diversity that can be vital for plant breeding programmes and the sustainability of agriculture, particularly given the current trends of threats, such as climate change. Conservation of CWR genetic diversity thus has become a global food security issue, and several countries are actively developing their own conservation strategies. Designing global and national strategies includes the generation of a national checklist and inventory of CWR, the assessment of current threat status and the identification of conservation and knowledge gaps and of key biodiversity areas to inform in situ and ex situ conservation actions, in particular for the establishment of genetic reserves.

Mesoamerica is one of the world's most important centers of origin, domestication and diversity of cultivated plants and their CWR. Mexico, Guatemala and El Salvador are collaborating in a project (http://www.psmesoamerica.org/en/) to contribute towards safeguarding Mesoamerican CWR. During the process, government agencies, local communities, universities and NGOs have identified a first list of 250 important CWR taxa and evaluated their extinction risks according to the ICUN Red List methodology. To guide the establishment of genetic reserves and other in situ conservation efforts, a systematic conservation planning framework was adopted by the working group, which generated potential distribution models for more than 120 CWR taxa that were validated by experts of each group. Further, to address the challenge of incorporating CWR genetic diversity and to overcome the lack of genetic data and analyses, we propose a novel approach to incorporate potential population differentiation based on the following criteria: (1) environmental variability, as given by climate, soil and topographic spatially defined variables; (2) historic differentiation, as shown by phylo-geographic patterns found in other species of the same habitat and region; and (3) diversity accumulation, as expected for long-term (glacial-interglacial) persistence areas. By integrating the information, we identified CWR biodiversity hotspots in Mexico using the Zonation conservation planning tool. Areas identified as important for CWR in situ conservation are located within sites of high cultural diversity and in areas where agriculture originated and traditional agriculture is ongoing. The results of this ongoing work represent a first national and regional guide to promote CWR in situ conservation and management that contributes towards achievement of the CBD Global Strategy for Plant Conservation, Sustainable Development Goals and Aichi Targets.

Danny Hunter, Teresa Borelli & **M. Ehsan Dulloo**:

Plants of the past, or crops for the future: biodiversity for food and nutrition is central to the 2030 agenda on sustainable development

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Food biodiversity is under threat worldwide. Current food production and consumption revolves around only 12 crops. Homogenous diets, limited food access and poorly developed markets for underutilised, nutrient-rich plant species guarantees the continued proliferation of malnutrition and poverty. The GEF-funded Biodiversity for Food and Nutrition (BFN) initiative is unique among global plant conservation approaches in that it's goal is to mainstream plant conservation and sustainable use for improved nutrition. It employs a use it or lose it approach. For the past six years, BFN has been the key vehicle for the implementation of the CBD's Cross Cutting Initiative on Biodiversity for Food and Nutrition. It has contributed significantly to Aichi and GSPC targets. It is pioneering a cross-sectoral, multi-level partnership approach in Brazil, Turkey, Kenya and Sri Lanka to increase production and consumption of underutilised plant species, which provides a practical model for other countries to consider in terms of implementation of both the GSPC and CBD. By developing innovative research partnerships, BFN has contributed to the development of national food composition tables for almost 200 underutilised, nutrient-rich plant species. Data that are now available through the FAO/INFOODS database. Much of these data highlight the nutritional superiority of this local plant diversity, compared to the more common exotic species that comprise modern diets and food systems. Using this evidence BFN has helped establish a number of relevant policy tools that provide incentives for the greater use of local, healthy food biodiversity such as Ordinance 163 in Brazil, which prioritises 100 underutilised, nutrient-rich plant species for food procurement. This knowledge has also ensured that the nutritional value of local food biodiversity is now central to the key messages of the recently revised food-based dietary guidelines in Brazil, and other BFN countries. Further, BFN has employed a range of novel approaches to mobilize this 'green gold', especially through the development of short supply chains, diversification of public food procurement and school feeding, as well as using chefs and high-end restaurants to embrace local food biodiversity and the gastronomy movement and food festivals in general as champions. Schools have been effective platforms to promote and raise awareness of food biodiversity through school gardens, diversifying curricula, improving nutrition and food literacy as well as eco-literacy and promoting healthy eating habits. Possibly the most impressive aspect of BFN is how it has harnessed this knowledge and partnership to improve the mainstreaming of biodiversity for improving nutrition into NBSAPs and CBD reporting processes. This provides lessons and good practice for other countries. BFN has also done much to bring attention to, and strengthen the linkages between, SDG15 and SDG2. However, this is only a modest beginning. Much more is required if we are to truly transform our food systems to be more inclusive of food biodiversity and which ensures greater plant conservation through more sustainable use. For this to become reality food biodiversity must be front and centre of the CBD's post-2020 biodiversity framework including any revised GSPC.

POSTER SESSION

Wednesday, 29 August 2018

PRESENTATIONS ON GSPC PROGRAMMES, PROGRESS AND IMPLEMENTATION AT THE NATIONAL LEVEL (continued)

Pierre-André Loizeau & Anouchka Maeder:

The impact of the GSPC on the biodiversity legislation and awareness in Switzerland

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Since 1997 the Federal Council of Switzerland has defined its priorities for implementing sustainable development in a quadrennial strategy. The 2030 Agenda for Sustainable Development (the Sustainable Development Goals, SDGs) was adopted in 2015. A comprehensive system for monitoring sustainable development was put in place in 2003, currently including 85 indicators, which are regularly updated. An assessment conducted in 2017 and presented to the UN in July 2018 shows that 39 indicators have a positive trend, 12 show no significant evolution, 14 show a negative trend, while for 20 no assessment was possible.

While the government's finding is generally positive on the SDGs of the 2030 Agenda, it remains strongly negative on the objectives related to the terrestrial environment. However, Switzerland developed a Swiss Biodiversity Strategy in 2012, followed by an action plan adopted by the Federal Council on 6 September 2017. Paradoxically, this strategy is not mentioned in the UN Report 2030 Agenda.

Switzerland has a large number of diverse natural environments, about half of which are endangered, particularly wet, dry and nutrient-poor environments. The ecological quality of most of these environments is constantly deteriorating. More than 36% of the species studied are considered threatened. The main causes of this depletion are the intensive use of soil and water, nitrogenous atmospheric deposition, mainly of agricultural origin, and the spread of invasive alien species.

The Swiss government sees Agenda 2030 as a new global reference framework to guide its actions and policy in general. The activities mentioned in the report on the state of the Agenda 2030 sees some important possibilities for action: to use biodiversity in a sustainable way; to estimate the value of ecosystem services; to build ecological infrastructure; to use land and forests in a sustainable manner, etc. This extremely positive point is counterbalanced by a dispersal of responsibilities for biodiversity, since the federal system entrusts its protection to the cantons (regional administrative units), as well as by staggering over a relatively long period (several years) the financial means devoted to its protection.

Libor Ulrych:

Global Strategy for Plant Conservation 2011–2020; implementation in Slovakia.

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The overview of incorporation the Global Strategy for Plant Conservation 2011–2020 in Slovakia is presented. The presentation will explain who are the key players in the field of plant diversity knowledge and preservation as well as outlining the current situation of plant conservation in Slovakia, following the main objectives of the GSPC.

Some examples of plant conservation using the biology of plant species and population ecology will also be included. In the presentation some experiences of invasive plant species eradication will be shared. Challenges of the system approach using another CBD decision concerning, for example, the ecosystem-based approach for climate change adaptation and mitigation are also mentioned.

Didik Widyatmoko, Rosniati, A. Risna, Danang, W. Purnoma, Didit O. Pribadi & Siti R. Ariati:

Implementation of the Global Strategy for Plant Conservation in Indonesia

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The Indonesian Government appointed the Director of Bogor Botanic Gardens as the ex officio national focal point (NFP) of the Global Strategy for Plant Conservation (GSPC) since the GSPC was adopted as an integral part of CBD implementation. As the NFP for GSPC, Bogor Botanic Gardens has been actively gathering information related

to GSPC Targets implementation in Indonesia, as well as contributing in updating NBSAP and CBD national report. However, lack of coordination among stakeholders and integrated-online data has become the main constraint in measuring success towards the GSPC Targets implementation. Based on the collected data related to each GSPC Target, we noted some progress on each target ranging from little to good progress compared to the 2014 status. The development of new botanic gardens in Indonesia as one of the national priority programmes has been identified as good progress supporting a significant contribution to achieve Targets 4 and 8. Several targets showed little progress and need to be accelerated, e.g. Target 5 concerning plant important area, Target 12 about wild-harvesting regulation, Target 2 that calls for conservation status of all plant species, and Target 1 to establish online flora. This review does not claim to be an in-depth review considering the complexity of the issues as well as the wide range of the government institutions and various stakeholders involved. The implementation of the GSPC targets in Indonesia indeed requires significant contribution from various stakeholders, such as strong coordination and communication, sectoral planning frameworks, and integrated data and information addressing the GSPC Goals and Targets.

Lillian Swee-Lian Chua:

Progress on the implementation of the Global Strategy for Plant Conservation in Malaysia

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- In line with the adoption of the Global Strategy for Plant Conservation (GSPC) in 2002, Malaysia prepared a National Strategy for Plant Conservation (NSPC) in 2009. The National Strategy outlines 17 targets on how to advance plant conservation, based on the framework of the GSPC. These targets deal with understanding the country's mega-diverse plant resources and the conservation, sustainable use thereof, as well as enhancing awareness and capacity building. The five objectives of the NSPC and GSPC are embraced in the National Policy for Biological Diversity 2016–2025.

Being a mega-diverse country, new species and records of plants are constantly being discovered. Since 2011, 126 new species of plants have been published and have contributed to the World Online Flora. At least 18% of Peninsular Malaysia's flora has been assessed for its conservation status; for the Bornean states of Malaysia, the conservation statuses of 55% of the ± 4 000 tree species have been briefly described. Parallel efforts are ongoing to document the indigenous and traditional knowledge of native species.

Malaysia has long recognised that several terrestrial ecosystems and habitats that are hotspots for plant diversity and endemism are vulnerable and poorly conserved in the country. These include limestone and inland water habitats. Since 2016, there are focused efforts to inventorise limestone vegetation, as a prelude to the ultimate aim of identifying critical outcrops that need to be conserved, and, where appropriate, managed. The Important Plant Areas (IPAs) approach using the global criteria is being explored for mega-diverse states in Peninsular Malaysia. In addition, restoration programmes are being implemented in mangrove areas and selected inland water habitats as part of the mitigation measures to reduce coastal/inland erosion, impacts of climate change and loss of habitat.

As for in situ conservation of threatened plant species, at least 21% of the Critically Endangered and Endangered species of Dipterocarpaceae are conserved in Permanent Reserved Forests and other effective area-based conservation sites. This family is targeted because of its abundance and dominant roles in the ecological, functional and structural integrity of the evergreen tropical rain forests of Malaysia. Under ex situ conservation, more than 200 taxa of threatened plants are conserved in the network of national botanic gardens. The list continues to grow steadily with each general flowering season.

Since the 1950s, various approaches of forest management have been implemented in Malaysia's Permanent Reserved Forests, the latest being Sustainable Management of Tropical Forests (SFM), which has been practiced since the 1990s. The SFM follows the criteria and indicators developed by the International Tropical Timber Organisation (ITTO). In addition, compliance to forest management audits and certifications such as the Malaysian Timber Certification Scheme, Forest Stewardship Council and Programme for the Endorsement of Forest Certification are regularly upheld. In regard to population loss of species traded internationally, Malaysia, which is a party to CITES, is actively involved in regional agarwood initiatives that seek to enhance wild and planted populations and improve cross-border enforcement. As for national and state parks, these are legally protected and no harvesting is permitted.

Relevant agencies in the public sector and NGOs have been conducting numerous communication, education and public awareness (CEPA) programmes on the importance of biodiversity since the Rio Summit. Engagement with private land owners and commodity-based plantations is actively sought to create, implement and maintain effective area-based conservation sites. The Government of Malaysia has recently initiated work to assess the public's current level of awareness and knowledge, and based on fresh data, will update the national action plan for CEPA on biological diversity.

In the attempt to meet the targets set out by GSPC and Malaysia's NSPC, perpetual challenges are faced in the following issues:

- Mainstreaming of plant conservation into national development and sectoral policies and plans.
- Commitment of all stakeholders to conserve plant diversity.
- Availability of scientific expertise and appropriate facilities across related disciplines.

Joni Jackson:

Implementation of the Global Strategy for Plant Conservation in Jamaica

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Abstract unavailable.

Biljana Panjkovic & Jelena Dučić:

A review of progress in implementing the Global Strategy for Plant Conservation in the Republic of Serbia

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Serbia is located in southeast Europe and consists of two distinct geographical and orographic parts: the northcentral part of the Balkan Peninsula (one of the global centres of floristic diversity) and the southeastern part of the Carpathian Basin (Pannonian region). Regarding floristic richness, Serbia is characterised by a relatively large percentage of endemic species; 15% of which are Balkan endemics. Agrobiodiversity comprises 4 238 varieties of crop plants. There are 400 species of moss and 3 730 taxa of vascular plants registered in the national database. Most phytocenoses with endemic features are found within rocky areas, mountain glades and rock screes. In the Pannonian part, saline and steppic habitats are of special value.

A review of progress in the implementation of the GSPC in Serbia is based on information provided by the national reports to the CBD, which report on the state of nature in the Republic of Serbia for the period 2010–2014 and other available documents.

Although the GSPC hasn't been directly incorporated into Serbian legislation, several strategies contain parts that fulfil the objectives and targets of the GSPC. The most important is The Biodiversity Strategy of the Republic of Serbia for the period 2011–2018. The Law on Nature Protection (2009, 2010, 2016) defines the Strategy for Nature Conservation as a basic instrument for the implementation of ratified international agreements in the field of nature conservation. A Draft Strategy for Nature Conservation of the Republic of Serbia has been prepared for the period 2017–2027. The protection of plant biodiversity in Serbia is regulated by the Law on Nature Protection. Rulebooks on habitat and species protection recognise 630 strictly protected and 474 protected plant species, as well as 255 habitat types of national importance. The total protected area covers 7.4% of the state territory. The habitats of ecological importance that lie outside the protected areas are managed in accordance to the Decree on Ecological Network (2010) defining the manner of protection, management and financing of ecological network, i.e. core areas and ecological corridors. It is implemented through the sectorial and spatial plans. As a result of international initiatives, 62 areas are designated as IPAs (Important Plant Areas) (8.5%), while 61 sites have been selected for the 'Emerald Network' (11.54%).

More than 55% of Serbian land is arable, where all types of natural habitat are threatened by reduction, fragmentation and isolation. The most threatened species are often found in semi-natural or secondary (anthropogenic) habitats. Conservation of these habitats cannot be achieved by the declaration of protected natural resources, but instead, they should become parts of an ecological network. The Red Data Book of Flora of Serbia (1999) documents 171 Extinct and Critically Endangered plant taxa, which comprise approximately 5% of the Serbian flora. A Preliminary Red List of Flora of Serbia (2002) includes more than 1 000 threatened vascular plant species.

The most important tasks in plant protection in Serbia are increasing the protected area, establishment of the EU ecological network, Natura 2000, as well as applying necessary active protection and management based on the coordination of sectoral policies and through spatial planning.

James Mougal:

National overview of GSPC progress and perspectives in the Seychelles

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Abstract unavailable.

Camila de Sousa, Tereza Alvez & Hermenegildo Matimele:

The challenges and role of IIAM to contribute to achieving GSPC targets

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Mozambique is characterised by a considerable richness in terms of biodiversity due to the high diversity of the existing ecosystems. Recent studies shows that there are nearly 6 000 plant species of which about 800 are endemic or near endemic to the country. Of those, around 115 falls within threatened categories of the IUCN's Red List. In the last decades following the civil war there was a boost in the Mozambique's economic growth, based on the agriculture, logging, mining and infrastructure sectors, resulting in an increasing pressure on the ecosystems and degradation of biodiversity.

The national legal framework is characterised by a variety of instruments governing all activities related to biodiversity, including, but not limited to, the Laws on Environment, Land, Fisheries, Forestry and Wildlife, the Tourism and Conservation Areas, as well as a series of regulations associated with these laws. Examples are the Regulation of Environmental Impact Assessment, the General Regulation of Fisheries and Maritime Activities, and more recently in 2017, the regulation on the Protection, Conservation and Sustainable Use of Biodiversity.

Moreover, following the decisions adopted in the 10th Conference of the Parties (COP10) held in Nagoya, Japan, where the member states discussed and approved the Global Strategic Plan 2011–2020 and the Aichi Targets for biodiversity, Mozambique prepared its National Biodiversity Strategy and Action Plan (NBSAP) in 2015. It was done through national consultation with the financial support from the Global Environment Facility (GEF) through the United Nations Environment Programme (UNEP) and the technical support of the Convention Secretariat on Biological diversity.

Four strategic objectives (areas of focus) were prioritised with a total of 17 targets. The issues related to plant conservation are the following: 1) reducing the direct and indirect causes of degradation and loss of biodiversity; 2) improve the status of biodiversity by preserving the diversity of ecosystems, habitats, species and genes; 3) improve the benefits sharing from biodiversity and ecosystem services for all sectors of the Mozambican society; and 4) enhance implementation through participatory planning, knowledge management and training.

The National Agricultural Research Institute (IIAM) is one of the national institutions with the mandate to implement biodiversity activities related to plant conservation. In the last years, IIAM, in partnership with various national and international organisations (UEM, RBG-Kew, SANBI, Bioversity, PhytoTrade International), are implementing some programmes to help reach the targets set by Mozambique. For example projects aiming to: identify sites with high importance for plant conservation; evaluate communities' use of forest species and to determine if and how these activities affect key tree species; and identify potential non-timber forest product with commercial opportunities to improve communities' livelihoods. In the process of implementing these programmes, IIAM faces various challenges that need to be addressed.

PRESENTATIONS ON CROSS-CUTTING ISSUES IN THE GLOBAL STRATEGY FOR PLANT CONSERVATION

Paul Smith and **Kirsty Shaw**:

The Global Trees Campaign: an integrated approach to delivering the Global Strategy for Plant Conservation

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Launched in 1999, the Global Trees Campaign (GTC) is a joint initiative between Fauna & Flora International (FFI) and Botanic Gardens Conservation International (BGCI). The GTC is dedicated to saving the world's threatened tree species in their natural habitats. To date, we have supported conservation initiatives benefiting more than 180 tree species in more than 30 countries.

The GTC (http://www.globaltrees.org) encompasses an integrated approach to delivering the targets of the Global Strategy for Plant Conservation through the Global Tree Assessment (http://www.globaltreeassessment.org/). It prioritises tree species for conservation action (Target 2 of the GSPC), paying special attention to Critically Endangered taxa known to have fewer than 50 individuals remaining in the wild. Through conservation action on the ground it conserves threatened tree species in situ (Target 7) and ex situ (Target 8) and, by working with local communities, the

GTC helps to ensure that trees are used sustainably (Targets 11, 12 and 13).

The BGCI's mission is 'to mobilise botanic gardens and engage partners in securing plant diversity for the well-being of people and the planet', and its network of 500 botanical institutions worldwide shares a commitment to making sure that no plant species becomes extinct, with a combined workforce of many thousands of horticulturists and scientists working towards that end. In 2017, BGCI delivered training courses in tree conservation techniques to more than 110 institutions across the globe (Target 15). By creating partnerships, institutions in the network with technical expertise are helping to solve practical conservation problems for threatened trees in areas where expertise is lacking (Target 16). BGCI's public outreach programme (Target 14) highlights the status of the world's trees, helping to raise awareness of the need for conservation and catalyse increased action.

Using case studies from Africa, Europe, Asia and the Americas, the authors will demonstrate the value of the GSPC as a global framework for species-focused plant conservation action on the ground. They will also discuss the powerful data, tools and methodologies developed through the GTC, and how these can be used to galvanise urgent, scaled-up action to save all of the world's threatened tree species.

Chipper Wichman:

The Hawaii Strategy for Plant Conservation – implementing the GSPC in one of the most unique floristic regions of the world

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Hawaii is the most isolated land mass on earth. While geographically it is just a dot on the map of the world, it hosts over 28 000 endemic species, most of which have evolved rapidly over the past five million years on the existing high islands.

The flora of the Hawaiian Islands has one of the highest rates of endemism in the world (89% for angiosperms, 74% for ferns and lycophytes), with over half of all taxa at risk.

Approximately 10% of the flora is considered extinct, and over 30% of 1 360 species is federally listed as threatened or endangered. For these reasons, and because of the alarming rate of habitat loss, the Hawaiian Islands are part of the Polynesia/Micronesia biodiversity hotspot.

Although many agencies and NGOs have been working for decades to conserve the unique plants of Hawaii, this work has been largely under-recognised and often uncoordinated. All of the plant conservation organisations had developed unique databases that left their information in silos and not easily accessible to botanists outside of their immediate network, most of the flora had not been assessed as part of the IUCN Red List, and there was no clear way to track overall progress towards meeting the GSPC targets.

In 2011, as we entered the second decade of the GSPC, two botanical gardens (National Tropical Botanical Garden and Lyon Arboretum) took the lead in developing a new more coordinated effort to the ex situ conservation of this important flora. This effort led to the first comprehensive assessment of the effectiveness of existing ex situ plant conservation efforts and facilities across the State in 2012 and ultimately to the creation of the Hawaii Strategy for Plant Conservation (HSPC) in 2014, which was framed around the new GSPC targets.

This presentation will highlight the planning process that was undertaken to develop the HSPC, the completing of the first two-year action plan, and the impressive results that have come from this new coordinated effort. It has been an exciting journey for the plant conservation community and it has yielded many important lessons that can be applied by other gardens around world as we collectively implement the GSPC targets.

Malin Rivers, Steven Bachman, Emily Beech, Abby Meyer, Suzanne Sharrock & Paul Smith:

Targets 2 and 8 – measuring progress towards conservation assessments for all plants and ex situ conservation of threatened species

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The Global Strategy for Plant Conservation (GSPC) Target 2 is an ambitious target to achieve conservation assessments for all known plant species by 2020. In response, BGCI and collaborators developed the ThreatSearch database to digitally consolidate all known available plant conservation assessments. In addition, the scientific names and assessment status were reconciled to predefined standards to provide a quantitative measure of progress toward this target.

Over 250 000 plant conservation assessments are recorded representing at least 111 824 accepted land plant species (vascular plants and bryophytes, not algae). About 90 000 species have been assessed at the global scale, representing 26% of known plant species. Of these plant species at least 32 500 are threatened.

The majority of the assessments in ThreatSearch are compiled from national and regional red lists.

ThreatSearch is not only a tool to monitor progress towards Target 2, but will also directly support GSPC targets (Targets 7 and 8) and plant conservation action. When assessing progress towards Target 8 – *at least 75% of threatened plant species in ex situ collections, preferably in country of origin* – collection data from botanic garden accessions from BGCI's database PlantSearch were analysed. They showed that 42% of known threatened species are found in ex situ collections of the world's botanic gardens. Of higher-level phylogenetic lineages only gymnosperms currently meet the threshold set in Target 8, and bryophytes are highly under-represented.

Both ThreatSearch (www.bgci.org/threat_search.php) and PlantSearch (www.bgci.org/plant_search.php) are accessible online and not only help to measure progress towards the GSPC targets, but can also provide guidance and support for national and regional GSPC implementation.

Although over one-quarter of a million plant assessments have been compiled to date, the majority of plant species are still unassessed and not represented in ex situ collections. The challenge is to continue to build on current progress and redouble efforts to better inform conservation action for our most threatened plant species.

Stuart Hall, Lansdowne, A., Holmes, P.M., Gaertner, M. & Esler, K.J.:

Understanding restoration needs at the ecosystem level: case studies from threatened vegetation types in South Africa's Fynbos Biome

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The vegetation of the Cape Lowlands is in dire need of conservation action since it has been highly impacted and fragmented by agriculture and urban development, and alien plants have invaded most of the remaining natural habitats. This has resulted in individual species and entire ecosystems and vegetation types being threatened with extinction, and therefore in situ restoration is vital to reach conservation targets. Restoration projects have been initiated in the past, but often with limited or no success, and therefore it is necessary to determine more effective protocols to understand restoration needs both on an individual species level as well as at the landscape scale.

This presentation draws on two aspects of restoration. Firstly, some smaller scale trial studies are described, focusing on reintroduction of individual species of conservation concern to appropriate habitat niches. The reintroduction of the charismatic species *Moraea aristata* to Rondebosch Common is used as an example. Secondly, large-scale habitat restoration is investigated by comparing alien plant clearing using novel passive (burning) treatments, as well as active restoration using seeding of multiple species representing different vegetation elements. Seeding was performed directly after burning, as well as delayed by a year until after the first follow-up alien clearing when seed was either pre-treated with a combination of heat and smoke or without. Treatments were compared in terms of success in restoring indigenous perennial shrub cover and diversity as well as decreased primary and secondary invasive plant cover. Treatment effectiveness was found to be dependent on habitat state at the time of initial clearing (percentage cover and species richness of indigenous perennial shrubs), but overall active sowing with pre-treated seed was most effective at restoring vegetation structure and habitat niches. Once established, this vegetation can allow for re-establishment of specialist species including those with threatened status, using the assistance of protocols such as that described for the species *Moraea aristata*. The outcomes of this study can be applied across a range of vegetation types locally and likely also more broadly.

Colin Clubbe:

Implementing GSPC Targets 2 and 5: Kew's Tropical Important Plant Areas programme

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Launched in 2015, Kew's Tropical Important Plant Areas (TIPAs) Programme works with partners in seven countries to identify the most important areas for wild species diversity, to help designate them as TIPAs and to support in-country prioritisation for the long-term protection of these key habitats, the plants they contain and the natural capital they supply.

The methodology used to identify TIPAs is the updated Important Plant Areas (IPA) methodology, which was

approved by the global botanical community after a consultation process conducted by Plantlife and Kew and published in the journal *Biodiversity and Conservation* in 2016. We are currently working closely with Plantlife to produce a manual to guide practitioners in identifying IPAs. This has re-invigorated the IPA process and is accelerating progress towards achieving Target 5 of the GSPC. key driver in identifying TIPAs is the presence of globally threatened species. Much of the preparatory work for their identification is completing red list assessments, which also enables progress towards achieving Target 2 of the GSPC. To co-ordinate and catalyse red listing work at Kew we have established a Plant Assessment Unit, which supports Kew and in-country partner staff with Red Listing, providing training in the Red Listing process where needed and helping get assessments through the review process and listed on the IUCN Red List of Threatened Species.

The talk will review current activities in the TIPAs Programme and the Plant Assessment Unit, drawing examples from those countries where we have progressed furthest, including the British Virgin Islands, Guinea and Mozambique. The identification of TIPAs and Red Listing of threatened species are both identified as key strategic activities within Kew's Science Strategy (2015–2020) and our recently published Collections Strategy (2018–2028), thus providing a key commitment to achieving GSPC Targets 2 and 5 in their current form to 2020 as well as post-2020, however we take these critical activities forward.

Porter P. Lowry II:

Contributions to GSPC Targets: examples of integrated conservation approaches from Africa and Madagascar

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Many initiatives in Africa and Madagascar offer informative examples of how significant contributions are being made toward the GSPC Targets. Taxonomic reviews coupled with meticulous data compilation provide reliable information on the floras of areas such as Madagascar and central and East Africa, contributing to the World Flora Online (Target 1).

Plant Specialist Groups/Red List Authorities in these areas have assessed the conservation status of thousands of species since 2010, benefiting from the integration of threat assessments into diverse initiatives, including: taxon- and ecosystem-based studies; impact assessments and mitigation efforts; the application of a High Conservation Value (HCV) approach in Central Africa; and the development of an R-based tool to perform rapid, preliminary assessments based on large datasets (Target 2). HCV work in central Africa is also identifying priority vegetation types to inform protection (Targets 4 & 5).

Innovative community-based conservation projects at key sites in Madagascar are meeting the twin objectives of conserving biodiversity in situ, while also improving human livelihoods and wellbeing (Targets 5 and 7). Efforts to ensure ex situ conservation of threatened plant species (Target 8) are also supported by these site-based efforts, as well as by a diversity of other novel approaches such a projects that aim to catalogue plants in highly threatened areas and bring living material into cultivation at dedicated facilities, the establishment of nurseries and restoration activities, and the implementation of a network of orchid shade houses in central Africa and Madagascar to document species (including many new to science) and conserve living plants as well as generate material for seed banks.

Mobilising botanical expertise to inform and guide impact assessments and mitigation programs for projects in the mining, agriculture and forestry sectors also contributes to several GSPC Targets (1, 2, 4, 5, 7 and 8, among others). An integrated project to stem the unsustainable and illegal harvest of precious woods in Madagascar (rosewood and ebony) for the international market, while promoting efforts to develop sustainable sources likewise contributes to several Targets (1, 2, 11 and 12). Together, all these activities generate valuable information for implementing the GSPC (Target 3), informing and educating a broad set of stakeholders (Target 14), and strengthening in-country capacity (Target 16).

PARALLEL WORKSHOPS (3)

1. Mainstreaming the GSPC into national biodiversity strategies and action plans (NBSAPs) and reporting (including aligning GSPC targets with the Aichi Targets, the Sustainable Development Goals and contributions to the Global Biodiversity Outlook – GBO-5)

2. Capacity building and support measures for plant conservation / GSPC implementation.

Suzanne Sharrock & Helen Miller:

Capacity building for plant conservation.

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Botanic Gardens Conservation International (BGCI) plays an important role in the implementation of the Global Strategy for Plant Conservation, both through supporting on-the-ground conservation projects, as well as building capacity for conservation amongst key groups of practitioners. In 2017, BGCI deployed experts in all areas of plant conservation from our extensive global network to train 957 conservation practitioners from 310 institutions from 48 countries.

To support its training activities, and in the framework of a small-scale funding agreement with the CBD Secretariat, BGCI is developing a range of capacity building materials focused around Red Listing, ecological restoration and seed conservation. These materials are freely available online and consist mainly of self-learning modules, available in a range of languages, supported by a series of videos, webinars, fact sheets and directories of expertise.

In relation to Red Listing, BGCI has focused its capacity building efforts on islands, developing a methodology for rapid species prioritisation and Red Listing (to IUCN standards) applicable for Small Island Developing States (SIDS). This has been applied with significant success in Fiji and Haiti. Training courses apply a 'learning-by-doing approach' with participants actively producing Red List assessments during such courses.

The focus of BGCI's work on ecological restoration is to build capacity for the use of native species in forest restoration programmes, with a number of training courses held across eastern and western Africa. BGCI has developed e-learning modules that help practitioners to plan forest restoration programmes, select species to be used for restoration and understand how to source material for forest restoration activities.

BGCI's work on seed conservation contributes to the Global Seed Conservation Challenge and aims to build capacity amongst small, less-well-resourced botanic gardens to collect and conserve seed of endemic and threatened species.

This presentation will introduce the capacity building materials that BGCI has developed and provide information of the progress made in training plant conservation practitioners in support of GSPC Targets 2, 4, 8 and 15.

Suvarna Parbhoo-Mohan, Z. Rabaney, I. Ebrahim & V. Zikishe:

Developing capacity to implement South Africa's Plant Conservation Strategy.

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South Africa's targets in the National Plant Conservation Strategy, in the context of a megadiverse country, outline achievable outcomes and activities with specific time-frames and clearly identified stakeholders. Furthermore, South Africa has initiated the Biodiversity Human Capital Development Strategy to ensure graduates are specifically skilled for the sector. We explore the experiences of individuals who entered the sector as students through to interns and progressed into positions of permanent employment.

This paper will explore the role of higher education institutes and citizen scientists in achieving Targets 14, 15 and 16, in that the importance of plant diversity is well communicated to the general public and increasing capacity of people in the biodiversity sector.

In response to plant conservation being a scarce skill, the CREW Programme has introduced the CREW Human Capital Development project. The project is designed for 2nd or 3rd year Botany, Environmental Science, Horticulture and Nature Conservation students at higher education institutions across the country. CREW staff conduct a one hour lecture covering topics of South Africa's biodiversity, Plant Conservation Strategy, Red Listing, the CREW Programme, iSpot/iNaturalist and job opportunities within the plant conservation field. In

addition, some universities request a fieldtrip either to monitor a threatened species or to learn plant families' characteristics.

Citizen science programmes such as the Custodians of Rare and Endangered Wildflowers (CREW) and iNaturalist serve as mechanisms of encouraging plant conservation and to bridge the gap between scientists and civil society. The CREW programme is a novel citizen science model inside a government department, yet closely collaborating with the Botanical Society NGO. Furthermore, the programme is regionally-based, ensuring citizen scientists receive hands-on training to ensure specific information is collected over a long-term. Each of the three CREW nodes organises specific hands-on training that will better enable the citizen scientists to achieve the programme's objectives.

Finally, the Botanical Society has, in its NGO capacity, worked with the National Department of Environmental Affairs in supporting the national cycad conservation strategy. The NGO has developed the cycad education support booklet which aligns with the school curriculum.

Vanessa Handley & Holly Forbes:

Progress through partnership: how small organizations can make meaningful GSPC contributions.

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With rich living collections and a depth of specialist expertise, botanical gardens are well suited to contribute towards GSPC implementation. Unfortunately, resource constraints often preclude gardens from developing comprehensive conservation programmes or even sometimes engaging in conservation activities. In this context, collaborations and strategic partnerships become crucial, an approach that has been particularly successful at the University of California Botanical Garden at Berkeley (UCBG).

UCBG is a diverse living museum displaying over 10 000 taxa, including many rare and endangered species; notably, the vast majority of UCBG's accessions are of documented, wild origin. This unique attribute potentiates research and educational use of the collections, two longstanding pillars of the garden's mission.

Over the last decade, plant conservation has emerged as an equally significant component of the mission. Despite the lack of a dedicated conservation department (or full-time conservation personnel), UCBG has developed a sustained and integrated conservation programme. Collaborations and partnerships have been central to the programme's evolution and consist of three main forms of cooperation:

- Partnerships with government agencies: UCBG has leveraged horticultural and taxonomic expertise to become a respected partner in State and Federal conservation projects. Since the garden's contributions are often contract-funded, this helps offset investments of staff time and other limited resources. Projects range from inventories and conservation assessments, to endangered plant reintroductions.
- Collaborative research on priority taxa: UCBG scientists collaborate with external researchers in investigations on rare, threatened and endangered taxa – i.e. genetic analysis of ex situ cycad populations. A significant attendant activity is capacity building through training of students/staff in techniques relevant to plant conservation.
- Consortium building with peer institutions: Given the strong alignment of programmes and priorities, other gardens are often ideal project partners. Multi-garden projects also facilitate integration of disparate (even duplicative) efforts into a comprehensive whole. A striking illustration of this is California Plant Rescue (CaPR), a botanical garden consortium in which UCBG is a founding member. CaPR has multiple objectives, but the preliminary goal is creation of a comprehensive seed bank of California's rare and threatened taxa. To this end, gardens across the state have coalesced to coordinate efforts, share expertise and accelerate progress.

The cooperative projects delineated above are complemented by independent activities that are also part of UCBG's integrated conservation efforts. These include careful stewardship of ex situ collections, botanical field explorations, and public education on the importance of plant diversity. In aggregate, this multi-faceted approach allows a small, regional institution to make meaningful contributions toward GSPC targets.

Kimberlie McCue & Bárbara Goettsch:

IUCN SSC Specialist Group-host institute collaborations advance GSPC Target 2: a case study.

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As of 2017, less than ten per cent of plant taxa have been assessed for the IUCN Red List of Threatened Species. This statistic stands in stark contrast to the GSPC Target 2 goal of 'an assessment of the conservation status of *all known plant species*…'. The work of IUCN SSC plant specialist groups have been instrumental in completing assessments for several key plant groups, including the conifers, cycads, and cacti. New specialist

group-host institute collaborations may prove a valuable part of accelerating the work to increase plant assessments. An example is the collaboration between the IUCN-SSC Cactus and Succulent Plants Specialist Group (CSSG) and Desert Botanical Garden (DBG). This collaboration was formalised in 2015 and is mutually beneficial, allowing development and achievement of common goals leveraging the increased capacity provided by the host institute. A priority goal agreed upon in the collaboration was assessment of all agaves and yuccas, both plant groups are highly utilised and of great economic importance. In mid-2017, a yearlong timeline was set for planning and convening a Red List assessment workshop in the geographic heart of agave diversity, Mexico. The CSSG Chair, based in the U.K., served as point person for organisation, planning and leading the workshop. Multiple DBG staff collaborated internally and with colleagues and institutions throughout the New World to generate a consensus taxonomy to guide the assessment, provide occurrence data for creation of distribution maps, and assisted with logistics. Funding support was provided through IUCN and DBG. In February 2018, 26 experts from eight countries convened in Querétaro, Mexico for a weeklong assessment workshop. Nearly 200 agave and yucca taxa were assessed, one determined to be extinct in the wild. Additional assessments were completed by DBG staff post-workshop. The success of the agave/yucca assessment illustrates the potential for advancing GSPC goals through IUCN-host institute collaborations.

3. Evaluation of the current global status of GSPC implementation and priorities for 2018-2020.

Thursday, 30 August 2018

PRESENTATIONS ON ACHIEVING INDIVIDUAL TARGETS OF THE GLOBAL STRATEGY FOR PLANT CONSERVATION

Target 1:
M. Marianne le Roux, Peter Wyse Jackson & Pierre-André Loizeau:

Building a World Flora Online.

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Target 1 of the updated Global Strategy for Plant Conservation (GSPC, 2011–2020) of the Convention on Biological Diversity (CBD) states the need for 'An online Flora of all known plants'. Its aim is to ensure that a coherent, comprehensive, accessible and authoritative baseline of knowledge will become available to support plant conservation efforts. Therefore, in January 2012 in St. Louis, Missouri, U.S.A, representatives from the Missouri Botanical Garden, the New York Botanical Garden, the Royal Botanic Garden Edinburgh, and the Royal Botanic Gardens, Kew (all members of the Global Partnership for Plant Conservation), took the initiative to organise a new global project to achieve this target. First steps included a proposed outline of the scope and content of a World Flora Online (WFO), as well as a decision to create an international Consortium of institutions and organisations to collaborate on providing its content.

The WFO project was subsequently launched in October 2012 at the 11th Conference of the Parties to the CBD in India. In January 2013, a Memorandum of Understanding (MoU) was opened for signature and a range of institutions and organisations worldwide were invited to participate in the WFO Consortium. To date, over 40 members form part of the WFO Consortium. The project is managed by a WFO Council which meets twice a year, supported by expert Working Groups.

The WFO aims to be an open-access, web-based compendium of the world's plant species. It will be a collaborative, international project, building upon existing knowledge and incorporating information drawn from published Floras, checklists and taxonomic and other revisions. It will also require the collection and generation of new information on poorly known plant groups and plants in unexplored regions. At its core is a taxonomic 'backbone', including a consensus classification, originally based on 'The Plant List', (version 1.1) (www.theplantlist.org). The taxonomic core is being actively reviewed, moderated and updated by a growing network of taxonomic experts and networks worldwide. Other data included are data sources, geographical distributions and information on the current status of each species. Where possible, existing keys and other identification tools are being incorporated, as well as vernacular names.

Work had progressed to deliver the WFO through a web portal (www.worldfloraonline.org) which was launched at the International Botanical Congress in Shenzhen, China in 2017. The portal already includes over 1.3 million plant names, 200 000 descriptions (representing over 100 000 taxa) and a growing body of other information. The project represents a major step forward in developing a consolidated global information service on the world's flora, available to support the achievement of the targets of the GSPC. It also provides an important forum and mechanism where the world's plant taxonomists can ensure that the results of their work are acknowledged and presented for use by the global community.

This paper will describe the progress made in the project to date and outline future plans and perspectives.

Target 2:
Steven Bachman & Malin Rivers:

A machine learning approach to assess the conservation status of all plants.

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The target of assessing the conservation status of all known plant species (GSPC Target 2) has proven to be particularly challenging. A recent review (Bachman, S.P., Nic Lughadha, E.M. & Rivers, M.C. 2018, Quantifying progress toward a conservation assessment for all plants. *Conservation Biology* 32: 516–524. doi:10.1111/cobi.13071) collated 241 919 unique assessments from the literature, and after accounting for accepted plant species, and considering only global scale assessments, estimated that these assessments represent between

73 081 and up to 90 321 (21–26%) known land plant species. As the first quantitative response to Target 2, this study revealed considerable progress had been made, based on many years of effort, often through the work of botanic gardens. However, the considerable remaining gaps and the fast approaching 2020 deadline suggest there is a need for urgent action including the investigation of alternative approaches to achieve this target.

Machine learning approaches such as the use of decision trees, have already been applied to predict threat status for plants and proved to be accurate at discriminating threatened from non-threatened species (Darrah, S.E., Bland, L.M., Bachman, S.P., Clubbe, C.P., Trias-Blasi, A. & Feeley, K. 2017, Using coarse-scale species distribution data to predict extinction risk in plants. *Diversity Distrib*. 23: 435–447. doi:10.1111/ddi.12532). Growth in plant occurrence data accessible via data aggregators such as GBIF (https://www.gbif.org/) combined with new data providers such as Plants of the World Online (http://www.plantsoftheworldonline.org/) open up the possibility of scaling up the prediction of threat status to all plants. Using the IUCN Red List of plants as a training set, we built a model to predict threat status for all accepted species of plants published in Plants of the World Online and classified each species as Threatened, Not Threatened and Data Deficient. The results are used to report a more comprehensive response to Target 2 prior to the 2020 deadline. Furthermore, the results can be disaggregated to inform conservation prioritisation efforts at regional scale.

Moving beyond the 2020 target, tools have been developed to automatically generate data files, meeting the minimum requirements for publication on the IUCN Red List, initially for Not threatened or Least Concern species, but with the expectation of moving towards automation of Threatened species in the future. This opens the possibility of, not only a conservation assessment for all species, but potential to achieve a global Red List of all plants.

Target 7:
Lize von Staden, Rupert Koopman & Ismail Ebrahim:

Achieving GSPC Target 7 in a megadiverse country.

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South Africa is the only mega-diverse country with a comprehensive plant Red List, which was completed in 2009, in time to meet Target 2 of the 2010 Global Strategy for Plant Conservation (GSPC). With the knowledge that more than 2 600 plant species (12% of the flora) are facing extinction, we are able to make significant progress towards achieving the GSPC's other targets aimed at securing better conservation for threatened species. This study focused on Target 7, which is to ensure that at least 75% of threatened species are conserved in situ.

An analysis of a fine-scale spatial dataset of threatened species occurrences, collated from georeferenced herbarium specimens, conservation agencies' monitoring programmes and citizen scientist contributions indicates that 62% of threatened plants have at least one population within a formally protected area.

We demonstrate that the most effective way to achieve Target 7 is to focus on sites where many currently unprotected species occur together, and that the target can be achieved with the addition of only 30 sites to the existing protected area network. These sites were identified and ranked according to conservation priority using systematic conservation planning, a method that designs a reserve network based on a conservation target in combination with minimising cost and area required.

Finally, we discuss how these priority sites were mainstreamed into national and provincial protected area expansion strategies, and report on progress to date.

Target 9:
Luigi Guarino:

Measuring progress in the conservation of crop diversity.

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The plant genetic resources for food and agriculture (PGRFA) community monitors global progress in the conservation of crop diversity via the mechanism established by FAO for the Global Plan of Action on PGRFA. Data collated by this mechanism is also used by FAO to report on SDG 2.5.1.

The Global Crop Diversity Trust's mission is to ensure the conservation and availability of crop diversity for food security worldwide. It does this by supporting the genebanks of the Consultative Group on International Agricultural Research (CGIAR) and globally significant national genebanks. It also supports the Svalbard Global Seed Vault, a long term seed storage facility that has the potential to conserve 4.5 million varieties of crops. Currently the vault holds more than 890 000 samples of landraces and cultivars originating from almost every country in the world.

Committed to the International Treaty on PGRFA and the multilateral system, the Crop Trust works with partners

to measure and address gaps in ex situ collections of crop wild relatives and more recently, socio-economically important wild species and crop landraces.

Target 13:
Christopher Dunn & Peter Wyse Jackson:

Traditional knowledge conservation and the GSPC: progress and perspectives.

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For conservation targets to be meaningful and capable of being achieved, they ideally should be quantifiable and measureable. Many of the CBD's Aichi targets and those of the Global Strategy for Plant Conservation (GSPC) are, indeed, measurable. However, some such as Aichi Target 18 and Target 13 of the GSPC, are more problematic. Both targets refer to maintaining and supporting the relationship between biological (specifically, botanical with reference to the GSPC) diversity and local and indigenous knowledge, and aim to ensure that traditional knowledge is respected and reflected in implementation of the CBD and the GSPC. In some sense, these two targets are more of a sentiment than a goal. With respect to Target 13 of the GSPC, not only is progress and achievement difficult to measure, but also is gaining a basic understanding of the current situation. As discussions begin regarding a third phase of the GSPC, it is important to take stock of what various countries, regions, and organisations such as botanic gardens are doing that is expressly related to achieving GSPC Target 13. We review progress to date and provide some suggestions for promoting further action and progress recognising that a target does not have to be met to promote action.

Target 13:
Tom Suchanandan & **Carol van Wyk**:

The National Recordal System - An initiative of the Department of Science and Technology towards the protection, promotion, development and management of indigenous knowledge.

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Over the past 15 years in South Africa, the national government has increasingly prioritised indigenous knowledge (IK) resulting in several policies, legislation and regulations towards its protection, promotion, development and management. The National Research and Development Strategy (NRDS) of 2002 recognised indigenous knowledge systems (IKS) as a scientific area of obvious knowledge advantage, by stipulating that 'clearly the collective inherited and evolving knowledge systems of indigenous communities constitute a competitive advantage' (NRDS, 2002: 68). As far back as 2002, government had initiated the following actions:

- The implementation of a policy framework relating to indigenous knowledge and draft legislation;
- Alignment of indigenous knowledge processes with the United Nations Convention of Biological Diversity;
- Engagement in World Intellectual Property (WIPO) negotiations on issues related to indigenous knowledge, biodiversity and publically financed research; and,
- The establishment of a working group of government departments impacted by, or relevant to, indigenous knowledge and intellectual property issues to meet on a regular basis to respond to changes in this dynamic domain (NRDS, 2002: 91).

The actions listed above took forward the finalisation of the IKS Policy. Chapter 8 of the IKS Policy (2004: 33) highlights 'the need to create an IK Information and Research Infrastructure' – a technology platform for collecting, managing, promoting, developing, and protecting oral IK. This platform was conceptualised and developed as the National Recordal System (NRS). The NRS comprises different components such as IKS Documentation Centres, and a digital knowledge repository (i.e. National Indigenous Knowledge Management System (NIKMAS)), which supports documentation processes that enable methods of documenting, storing, transmission and management of IK multimedia holdings in order to support long-term preservation, protection and access to IK for R&D and continued use. The NRS initiative currently supports communities and IK holders to document IK of traditional medicine and indigenous food that are closely associated with biodiversity. In view of the close association of IK with biodiversity, scientific authentication of plants used by local and rural communities are important in order to determine legal certainty over the knowledge that is documented in NIKMAS. One way of achieving the latter is by collecting plant samples of plant species, which enables the South African National Biodiversity Institute (SANBI) to identify the plant species according to scientific taxonomies. The scientific name and the vernacular name of the plant are then recorded in the system – aligned to the indigenous use and associated community who holds the particular IK. The NRS has been deployed in 92 villages across the country and is locally managed by 9 IKS Documentation Centres. The knowledge holdings documented on the system to date includes 14 778 IK entries on traditional food and traditional medicine.

POSTER ABSTRACTS

Sefra Alexandra Levin:

The Seed Huntress: 'On The Hunt to Save The Genetic Biodiversity of Our Earth'

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In an effort to fulfil the GSPC vision to conserve and use sustainably the world's immense wealth of plant diversity, we must come together in a design charette to map how we can accomplish this from a local, national, regional and global scale. As a Genebank Impacts Fellow to the Crop Trust, I am charged with evaluating CePaCT in Fiji to see how we may allocate and advance fiscal resource availability, to allow the germplasm repository to carry out its full mission as delineated by the International Treaty on Plant Genetic Resources for Food and Agriculture (IT PGRFA).

When we have a more comprehensive strategy of how to elucidate interest and funding for accessions acquisition, multiplication conservation and distribution, the GSPC will have greater influence on a global scale to make the world understand the poignant importance as well as critical time scale these issues face. More funding will equal the ability to protect accessions and distribute to all who request. When conducting a genebank valuation, nuance amongst the varying techniques for conservation (ex situ, in situ and in vitro) need to be documented to understand which technique is most viable for monitoring phenotypic and morphological variation, whilst reducing redundancy in accessions. Special attention must be directed towards the plant genetic resource sharing of crop wild relatives (CWR). From an ethnobotanical perspective, CWR contain the greatest potential for reviving vigour and promoting resilience and seed sovereignty in the face of changing climates for both environmental (natural disasters) and anthropocentric calamities.

This conference of the Global Partnership for Plant Conservation is the penultimate opportunity to allow time, discussion and design of how to facilitate and implement a worldwide effort to drive interest, resources and accessions to the invaluable organisations poised to champion GSPC. The Seed Huntress wants to design a global game of mentoring citizen scientists to go forth, identify, steward and submit crop wild relatives – the magic embryos – to make the ancient art of seed preservation not only more prevalent but a worldwide celebration of the landraces of our ancestors to be shared with all future generations. Save seeds – seeds save.

Diana Milena Arango Uribe:

Introducing trees to increase biodiversity and decrease pollution in the metropolitan area and the Andean region.

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Medellín Botanical Garden is a non-profit foundation with 46 years of institutional history, being a point of reference in Medellín city. It is creating encounter and coexistence experiences for its visitors, integrated with research, conservation, education, and culture strategies, with a focus on biodiversity and the relationship between human beings and the environment. Furthermore in 2020, the Medellín Botanical Garden will be recognised as the leading institution in the transformation of the city, promoting experiences and living scenarios of education, which will lead to positive changes in the relationship of people with the environment within the framework of sustainable development. Within its strategic plan, the Medellín Botanical Garden includes four strategic axes: a garden that investigates and preserves, a garden that transforms, a garden for the city meeting, and garden with institutional strength.

Medellín Botanical Garden is located in the Andean central range in a narrow valley. The valley is habited by 4 million people with little green space per habitant and high air pollution. The botanical garden is open free to the public and annually receives approximately 2.5 million visitors and impacts near 140 000 people with specific educational programs. The garden has an area of 13.2 ha with a living collection of 4 700 trees (more than 765 species) out of which we highlight a rich collection of orchids (113 species), zamias (13 species), magnolias (12 species) and also palms (70 species). During the last eight years, in collaboration with governmental and nongovernmental institutions, the Medellín Botanical Garden have led forestry and landscaping programmes in the city with the goals of increase green space and biodiversity, and recently to decrease air pollution. More than 200 tree native species have been propagated and introduced to urban and rural areas. Particularly, trees introduced to the city since then have been monitored with a permanent programme of the municipality that has software that allows tree registration. We have presented the first results of the tree adaptation to the urban conditions, recognising our success in some cases but also our failures.

We also have alliances with international institutions to boost the conservation of different plant species – those projects involved the local community in order to diffuse the importance and the correct actions for ecosystem

preservation. Besides fulfilling the conservation component that our mission has, we have taken a shift in the strategic decision making turning the foundation in a highly profitable entity in the past three years, which allows us to continue investing in conservation of native and endangered species.

Tamaz Darchidze, Tinatin Barblishvili & Tsira Mikatadze-Pantsulaia:

Plant conservation in Georgia - strategic targets of the National Botanical Garden of Georgia for 2030.

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The National Botanical Garden of Georgia (NBGG) is currently undergoing the process of transformation from the closed institution of the post-soviet model, towards a botanical garden of a modern type. Through this transformation, NBGG is focused on the implementation of targets of the Global Strategy of Plant Conservation (GSPC) and responds to the tasks assigned to the botanical gardens in the contemporary world.

NBGG – one of the oldest scientific institutions of the Caucasus – has been studying the diverse flora of the Caucasus region and establishing living collections of plants since the mid of the 19th century. Much has been done for the development of the gardening sphere in Georgia, as well as to the study and solving of problems in a forestry, plant protection and urban greening.

Plant conservation is one of the most important priorities of the National Botanical Garden of Georgia. Changes introduced to NBGG's Organisational Charter in 2015 have strengthened tasks and targets of the Botanical Garden in terms of plant conservation, based on the principles of the Global Strategy for Plant Conservation. Plant conservation is identified as the main priority of NBGG in the Strategic Development Plan for 2018–2030 as well.

This Strategic Development Plan is the first document of a modern type, which has been developed with the involvement of a wide international community of botanic gardens and with participation of the leading experts in this field – experts from BGCI, RBG Kew, Chicago Botanic Garden, Missouri Botanical Garden and Morton Arboretum. It declares the main principles and targets in plant conservation to be achieved until 2030.

Georgia is a part of Caucasus ecoregion, internationally recognised as holding a remarkable reservoir of biodiversity, and high levels of endemism. The Caucasus are home to about 6 400 plant species of which more than 25% are endemic – the highest level of endemism in the temperate world. Within the Georgian flora alone 4 130 species of vascular plant are registered. Considering that nearly third of plant species of the Caucasus region have direct economic importance, and respectively, diverse uses, ex situ and in situ conservation of threatened species has a paramount importance. Botanic gardens have an important and unique role to play in this process.

In the Strategic Development Plan of NBGG the following targets are due to be achieved by 2025:

- NBGG is formally recognised by government as the authority for plants. This implies its active involvement in the preparation of legislative documents, among them for future revisions of the National Biodiversity Action Plan;
- Collections policy is completed and initiated;
- Ethnobotanical uses are documented and published in widely accessible formats for the mountainous areas of East Georgia (Mtskheta-Mtianeti Region) with particular focus on those plants used for food, medicine, dyes and traditional crafts;
- 45% of the native flora of Georgia is conserved in the seed bank;
- 25 taxa of globally significant crop wild relatives (CWR) are added to the existing CWR collections in the seed bank;
- Greening programmes in Tbilisi and Georgia are significantly improved with advice from the National Botanical Garden of Georgia;
- A network of Georgian botanical gardens is established under the coordination of NBGG; and,
- International collaboration is intensified in research, conservation and environmental education with at least two of the world's leading botanical gardens.

Key Performance Indicators	Results	Forecast	Target	Target	Target
Period results	2016	2017	2018–20	2021–25	2026–30
Red List Assessments	0	1	30	50	50
Propagation protocols developed for native, endangered species	6	2	5	10	15
Number of native species reintroduced	1	1	3	5	7
Cumulative % of Georgian native flora conserved in the seed bank	37.5%	40.5%	45%	55%	65%

The table on page 32 presents NBGG's Strategic Targets in plant conservation and Key Performance Indicators:

Figures given in the table may not seem too impressive, but considering the current state of the National Botanical Garden, fulfilment of these targets is realistic and this will make an important contribution to the conservation of plant biodiversity in Georgia.

Peta Hardy:

Prioritising areas for conservation management: putting theory into practice.

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Most forestry plantations in South Africa have significant areas of unplanted, natural vegetation on the Estate. Environmental practitioners and managers need to know what areas are of high value for conservation, in order to apply appropriate management practices. For forestry certification purposes, plantation managers need to have knowledge of where Red Listed plant and animal species are present on their plantations, if there are any threatened ecosystems present and if so, how best to manage them.

A number of tools are available that are useful for identifying high priority areas within the province. Using the Mpumalanga Conservation Sector Plans for aquatic and terrestrial habitats, a good indication can be obtained on where the high priority areas are to be found. Other information sources such as the NFEPA database (National Freshwater Ecosystem Priority Areas) and Threatened Ecosystems coverage can also be used to confirm the high priority status.

Using GIS (Geographic Information Systems), Sappi have scrutinised all non-commercial areas on their plantations and assigned values to them in order to identify high conservation value ecosystems, including grasslands, forests and wetlands. In addition to this, local knowledge and ground-truthing is used to confirm and possible identify areas that may not be covered by GIS information. Knowing what is truly important within the plantation landscape assists managers to prioritise the allocation of funds to ensure that environmental management activities are carried out consistently in priority areas.

From this knowledge base, Sappi have identified 39 sites having extremely important conservation values. Working with the SANBI Grasslands Programme, Sappi have set aside almost 5 000 hectares of pristine grassland for conservation in the Mpumalanga Province, resulting in the proclamation of four nature reserves.

Thus corporate forestry in South Africa can contribute to the conservation management of flora and fauna.

Sean Hoban, Emma Spence, Bethany Zumwalde, Nicole Cavender, M. Patrick Griffith, Michael Bruford, Gernot Segelbacher & **Gerard Donnelly**:

Achieving two GSPC targets by documenting existing genetic diversity and developing best practices for preserving it.

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Genetic diversity is one of three primary elements of biodiversity, along with diversity of species and ecosystems. Genetic diversity is essential to a species' ability to adapt and is fundamental for sustaining ecosystem resilience and ensuring successful habitat restoration. There are also thousands of plant species whose genetic resources can contribute economically to horticulture, agriculture, forestry and medicine. The Morton Arboretum Conservation Biology programme is working towards achieving two GSPC targets that mention genetic variation: Target 5 (effective management in place for conserving ... genetic diversity) and Target 9 (70 per cent of the genetic diversity of crops ... and other socio-economically valuable plant species is conserved). First, we quantify the degree to which botanic gardens, arboreta, seed banks, and other collections have sufficiently preserved genetic variation for an array of tree and shrub species including oaks, ash, cycads, palms, and magnolias. Second, we determine how collections can be improved by developing scientifically-grounded guidelines for minimum numbers of populations, individuals, and seeds to preserve in ex situ collections or in *situ* genetic reserves, as well as demonstrating best practice for managing conservation collections into the future. Third, we document locations having the highest genetic diversity within and across species in order to prioritise the most genetically variable or unique locations for protection. Fourth, we work to aggregate thousands of individual studies of plant genetic diversity into summary indicators which can be used to determine regional and global progress on Target 9. Lastly, we lead two global networks for preserving genetic diversity: the IUCN Conservation Genetics Specialist Group and the Genetics Working Group of GEO BON (Group on Earth Observations Biodiversity Observation Network). By developing practical tools and recommendations, we aim to enable monitoring, protection, sustainable use, and responsible stewardship of plant genetic diversity, with tangible benefits to ecosystems and society.

Peter M. Hollingsworth:

Using DNA for plant identification to support conservation and sustainable use.

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Telling plant species apart is a fundamentally important step in the global conservation of botanical resources. Understanding the diversity and distribution of plant species underpins the designation of protected areas and species-based conservation programmes. Being able to identify and detect invasive species underpins control measures. Being able to identify the species origin of plant products in trade can determine whether they are being traded legally or illegally, and hence supports enforcement of wildlife legislation. Being able to identify plant parts or juvenile material (e.g. pollen or seedlings) supports understanding of ecological processes, such as reproduction and regeneration which can be critical for development of optimal management plans. Being able to identify plant species in medicines, food and other consumer products supports the development of sustainable utilisation programmes, as well as providing consumer protection and confidence.

This multiplicity of uses for plant identification has driven the global DNA barcoding programme. It is based on the premise that an inability to tell plant species apart regularly acts as a barrier to the understanding, conservation and sustainable utilisation of plants. In this presentation, I will discuss the strengths and limitations of DNA barcoding in plants as a tool for species discovery and species identification, and how it has been deployed to support plant conservation. I will also review the potential (and challenges) of extending DNA barcoding to greater genomic coverage. Increasing genomic coverage of DNA barcoding can increase discriminatory power, and offers exciting opportunities for transformative abilities for telling plant species apart and enhancing fundamental knowledge of the genomic natural history of species differences. However, the shift from DNA barcoding to genomic DNA barcoding when deployed on a large scale also increases costs and logistical complexity. Collectively this results in a combined challenge and opportunity for the most effective deployment of new sequencing chemistries and platforms to support global plant conservation challenges.

Lerato N. Hoveka, Michelle van der Bank, Bezeng S. Bezeng & Jonathan Davies:

Barriers to conserving South Africa's endemic flora: a gap analysis.

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One of the greatest challenges for biodiversity conservation is providing conservation planners with ways to prioritise conservation efforts. Gap analysis is a useful tool for priority setting, and can identify biological features that currently lack conservation protection. Here, we evaluate current knowledge of South Africa's endemic flora and the degree to which the flora is conserved within the country's Protected Areas Network by: 1) mapping the geographical and phylogenetic distribution of current knowledge; 2) modelling the potential distribution of species and species richness; and 3) analysing the efficiency of the current Protected Areas Network in conserving threatened taxa. The results paint a bleak image about the conservation of the South Africa's endemic flora. A large proportion of taxa lack distribution and genetic data that is important for their inclusion in conservation planning. The current Protected Areas Network does not adequately protect threatened and data-deficient taxa and there are serious biodiversity knowledge short falls. We show that there is an urgent need for plant collection; taxonomic and molecular work; and the expansion of the Protected Areas Network to adequately conserve South Africa's endemic taxa.

M.M. le Roux, Ronell R. Klopper & Janine E. Victor:

The e-Flora of South Africa – achievements and progress of the past four years.

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Conservation is implemented to protect known, formally recognised biodiversity. It is therefore critical to ensure that our biodiversity is well-studied and documented in scientific literature. Taxonomic information is usually distributed throughout a vast array of books, journals and electronic sources. One of the important publication types of plant taxonomic information is a Flora (usually published in the form of a series of books or nowadays an electronic source), which provide taxonomic data for all plant species within a defined geographic region. Floras are traditionally compiled by one to several authors and usually take a long time to complete. Hard-

copy versions quickly become outdated after publication with difficulty of printing updates. With the availability of electronic tools, Flora compilation can be practised in innovative ways to improve the accuracy of data, which cannot easily be accomplished outside of an electronic environment.

South Africa is currently building an electronic Flora to provide taxonomic data for the country's known plant diversity. Information will be published online, in open access. The purpose of this project is to fulfil South Africa's obligation towards the Global Strategy for Plant Conservation (GSPC), Target 1 (World Flora Online) by 2020. To complete a national Flora by the deadline, South Africa has to embrace a new method of Flora compilation by using electronic tools and following an aggregator portal approach. This approach supports the use of existing, published information by acquiring permission from copyright holders, digitising the material where it only exists in hard copy, mining the required data from the publication, aggregating it into a database and publishing it online.

The e-Flora of South Africa will be a dynamic system that can be updated as often as necessary to reflect current, up-to-date information as guided by the South African National Plant Checklist. South Africa is making good progress with information collected for almost 85% of species. The first set of data will be submitted to the World Flora Online portal and will be available in 2018. Regional conspectuses currently being compiled and other ongoing taxonomic research will provide taxonomic information for the remaining 15%. A brief overview of Flora compilation in South Africa is presented including the past four years' activities.

Lee, Cheul Ho; Shin, Hyun Tak; Kim, Dong-Kap & Kwon, Hye Jin:

A review of progress in implementation of the Korea Strategy for Plant Conservation (KSPC) 2020 by the Korea National Arboretum.

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There is a growing awareness amongst the global community about the close interconnection between biodiversity and sustainable development. In particular, plants are primarily producers in the Earth's ecosystem and indispensable elements in the lives of all creatures. According to Korea Plant Names Index (KPNI), the number of plants in Korea is 14 900 species; i.e. native (4 172), exotics (321 naturalised, 465 introduced) and crops (9 942). In 2008, Korea National Arboretum (KNA) developed the Korea Strategy for Plant Conservation (KSPC) and was and remains involved in various key activities in its implementation, including development of checklist of national flora, restoration of rare plants, ex situ conservation, securing of protected areas and so on. After that, the strategy was revised as KSPC 2020, correlated with GSPC 2020. Various studies and projects to achieve objectives of each target were subsequently developed and implementation undertaken. This review covers all results of activities conducted by KNA from 2011 to 2015 and outlines future actions for successful accomplishment of the defined target by 2020.

Korea National Arboretum (KNA) is located in Gwangneung forest, between Namyangju-si and Pocheon-si, in Gyeonggi Province. Gwangneung was a royal forest, which surrounding the mausoleum of King Sejo of Joseon dynasty. Thus, over the last 500 years it has been strictly managed in order to minimise human disturbance. The Gwangneung arboretum, affiliated to the Korea Forest Research Institute, was established in 1987 and has been open to the public since then. On 24 May 1999, it became the Korea National Arboretum. In KNA, there are various specialised gardens as well as facilities including a Forest Museum, the Korea National Herbarium and a Seed Bank. KNA was designated as a UNESCO biosphere reserve in June 2010. The missions of the Korea National Arboretum are to conserve and to develop plant resources through comprehensive research, and to promote public understanding of forests.

Eva Martens & **Colin Clubbe**:

The Millennium Seed Bank Partnership: its role in global plant conservation.

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The Millennium Seed Bank Partnership (MSBP), managed by the Royal Botanic Gardens Kew, is the largest global network dedicated to conserving wild plant seeds in the world. The world class expertise of Kew's Millennium Seed Bank (MSB) and that of its partners enabled it to conserve ex situ, high quality seeds from 39 200 different species from 189 countries and across all 35 biodiversity hotspots. The MSBP has made a significant contribution to the achievement of Target 8 of the Global Strategy for Plant Conservation. Within the broader framework of biodiversity conservation, the work of the MSBP is contributing to Targets 12 (conservation status of known threatened species improved), 13 (safeguarding genetic diversity) and 19 (knowledge and technologies shared) of the Strategic Plan for Biodiversity 2011–2020 and Goal 15, specifically 15.6 relating to access and benefits sharing, of the 2030 Agenda for Sustainable Development.

Working through the MSBP network, we can achieve far greater outcomes than by operating as isolated entities. The MSBP has a global reach in its contribution to plant conservation, sharing knowledge and technology and linking practitioners from across the globe. We operate numerous large seed conservation projects through which the genetic resources of plant species are conserved, and further benefits shared through training and research outputs. One such project is the Global Tree Seed Bank project with partners in 27 countries, aiming to conserve seeds of 3 000 tree species, which started in 2014. Saving the Flora of the Caucasus is another strategic project, which, to date, has conserved seeds from 1 370 important species of the Caucasus region.

We conducted an analysis of MSB collections and assessed their conservation value. The results demonstrated the importance of the MSBP work in implementing international goals and targets. Seventy-eight per cent of all MSBP collections are either endemic, endangered and/or have an economic, ecological, social, cultural or scientific value. In the coming years, the MSBP will focus on developing projects with community and livelihoods elements as well as targeting species recognised to be of considerable benefit to ecosystems and humanity such as tree species, plants with medicinal value and crop wild relative species.

Kim Norton Taylor, Barney L. Lipscomb & Edward Schneider:

Assessing progress towards Targets 1 and 2 of the GSPC 2020 objectives in Texas, U.S.A.

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The state of Texas has 292 globally rare plant taxa, with a NatureServe Conservation Status Rank of G1 or G2. This is the fifth most of any state in the United States, yet no plant specific conservation strategy exists for the state. A state-wide strategy targeted at preventing plant extinction in Texas is needed to address the specific challenges faced in the state. An assessment of progress towards the Global Strategy for Plant Conservation (GSPC) 2020 objectives will help shape priorities for the state-wide strategy.

Significant work towards Target 1, an online flora of all known plants, is underway. State-wide floristic treatments in book form have been published or are in progress, complete with keys and descriptions, for several major taxonomic groups, including ferns and lycophytes, grasses, orchids, woody plants and legumes. Regional floras also exist for several areas of the state, though notable regions are missing and many of the existing floras are out of date. A complete Texas flora was published in 1970, but has not been updated and is missing a number of taxa. An atlas of Texas plants was published in 2003, representing the most recent checklist of Texas plants, but this was based on only a subset of herbarium specimens and lacks both keys and species descriptions. The *Flora of the Trans Pecos and Adjacent Regions* is due out November 2018, complete with keys and descriptions. The Trans Pecos is one of 12 major regions within the state, but the treatment covers almost half of the state's flora and globally rare species. Despite the significant progress made towards understanding the state's flora, all of these works are static documents in print format. An online, interactive version is not available and updates are rarely made. An online Symbiota portal for the Texas Oklahoma Regional Consortium of Herbaria (TORCH) houses herbarium specimen data for the state, and digitization efforts are underway. Significant portions of the records are in need of additional transcription. Significant challenges exist which threaten to halt progress, most notably a lack of funding and of new botanists being trained.

Progress towards Target 2, an assessment of the conservation status of all known plant species, will also be discussed, with a focus on the particular challenges faced in reaching this target. While Texas is the second largest state in the U.S., both in land mass, spanning 695 662 km^2, and population, with almost 30 million inhabitants, it ranks 32nd in the U.S. in terms of population density. Texas is truly a state of 'wide open spaces', over 95 per cent of which is held by private landowners. The large land mass, relatively low population density, rapid population growth, politically conservative policies, scarcity of public lands, and distinctive culture of the state, pose unique challenges and opportunities for plant conservationists. Examination of progress towards 2020 objectives, as well as the challenges faced in implementation of the GSPC, will help shape future objectives and GSPC implementation strategies.

J.C. Onyango, Seline Omondi & Mary O.A. Onyango:

Plant conservation strategies using botanic garden model checklist and photochemistry analysis for classification and herbal medicine usage.

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The University Botanic Garden, Maseno (UBGM), was established in 2001 through the Biota-East Africa research programme supported by the German Ministry of Education and Research. This was in support of the mitigation needed to conserve plants of high value in Western Kenya, especially Kakamega forest that were

exposed to projected extinction due to uncontrolled harvest for various uses. The communities around the UBGM and students had accepted the importance of the garden for recreational and educational purposes. It is on the basis of such acceptance that the study was carried out at the UBGM. The study was carried out over a period of one year. The main objective of the study was to identify and provide a checklist of vascular plants, determine phytochemical analysis for classification relationship, and document the educational and economic values of the UBGM as a model for plant conservation for controlled usage amongst the communities. During field surveys, observations were made, interviews conducted and notes taken on plant morphological characteristics and habits. Some plants were identified through taxonomic keys and by the aid of the herbarium specimens in the UBGM. Unidentified plants were collected, pressed, dried, preserved, mounted and identified at the National Museums of Kenya herbarium. Voucher specimens of the same were deposited in the university botanic garden herbarium. Phytochemical screening of five medicinal plant extracts in each of the ten selected plant families based on frequency of appearance in the UBGM was done using various reagents. Interviews based on the questionnaire were administered to members of the surrounding communities and workers in the garden. The questionnaires were also issued to the botany staff and students. Through it, economic and educational values of the university botanic garden and conservation strategies of threatened plants ex situ in the garden were gathered. It was found that there are 235 plant species in the botanic garden belonging to 66 families. For each plant species, species name, common and local community name (where available), family, habit and usage were provided. Trees were 31%, shrubs 32% and herbs 37%. Out of 235 plants, 30% were medicinal, 12% were ornamental, 7% for food provision and 2.5% for building materials. The other 48% had more than one usage. The phytochemical analysis revealed that saponins were the most abundant phytochemicals found, constituting 32.43%, followed by alkaloids (27.03%), flavanoids (14.86%), steroids (12.16%), terpenes (10.81%) and anthraquinones (2.70%). Chi-square analysis and ANOVA at $P \leq 0.05$ revealed that plant families in which the plants are grouped are dependent on the phytochemicals present in plants. Conservation measures include the raising of propagules, education and domestication of wild plants, especially in community gardening. This information is vital to the local community members who still rely on plants for the provision of herbal medicine. This study has made significant contribution towards accounting for conservation strategies and listing of plant families conserved in the garden, and involving the garden stakeholders in the importance of plant conservation.

Anjum Perveen, Shazia Mansuri & Saifullah Khan:

Assessment of *Pulicaria boisseri* Hook.f. (A rare and endemic plant of Sindh, Pakistan).

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The genus *Pulicaria* belongs to the tribe Inulae of the family Compositae and is represented by 14 species in Pakistan. Among these species, *Pulicaria boissieri* Hook.f. is a rare and endemic plant of Sindh. It is a dwarf shrub and the leaves are simple, villose and spathulate. The florets are bisexual and do not contain any ray florets. In the on-going research pharmacognostic assessment of the leaves of *P. boissieri* has been undertaken. The evaluation of this rare plant is done for the first time in Pakistan. Physico-chemical assessment of the leaves show more extractive capability of methanol as compare to chloroform, ash value 32.25 ± 0.59, water soluble ash 37.41 ± 0.38 and acid insoluble ash 19.25 ± 0.25. Phytochemical studies of the plant show the presence of alkaloids, glycosides, phenolic compounds, carbohydrates, phenolic compounds, saponins and many others. Quantitative analysis of the leaves shows carbohydrates 765.3 µg/ml, Phenols 179.6 µg/ml and proteins 140.4 µg/ml. The pharmacognostic studies of this rare endemic plant provide new information in drug formation.

Ing. Tomáš Peš:

Czech Native Flora Project in the Zoological and Botanical Garden of Plzen.

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In 2010, working with the Pilsen Region Nature Conservation, the botanic garden started the project 'Conservation of threatened plant taxa of Pilsen Region'. The garden was asked to cultivate ex situ seven species, mostly Critically Endangered species. This was beginning of a Czech Native Flora Project, with the aim to achieve the Target 8 of GSPC for Czech threatened plant species by 2020. All the plants arriving to the garden were well documented and preferably collected as seed in the wild or obtained from other seed banks. Since the beginning we worked closely with Prague Botanical Garden where many of the collections are duplicated.

The Pilsen Garden is built on a biogeographical concept. Native plant biotopes are part of Palearctic region. They are planted mostly with plants collected in one locality. Until now, 25 biotopes are presented to the public. Each one has an information panel with a biotope description,

a description of the threats it faces, a distribution map and a category logo from the Czech Red Book of Biotopes. The Plant Nursery is the other place where the native plant collection is located. Threatened species, preferably annuals, are cultivated there in larger numbers with the aim to collect seed under controlled conditions for seed banking or for use in recovery programmes.

By the end of 2017 we had in the collection 838 taxa of native plants (31% of the Czech flora which is 2 706 taxa of vascular plants, including archeophytes). Last year a new Red List of Vascular Plants of Czech Republic was published, using for the first time standard IUCN criteria and categories. According this list we have living plants or seed of 295 threatened taxa, which is 32.5% of all threatened taxa, including apomictic species like *Taraxacum*, *Hieracium* etc.

In accordance with Target 14 of GSPC, the work of the garden was presented in three books published both in Czech and English languages:

- Biodiversity Hotspot in the Heart of Europe – explaining the biodiversity on examples from Pilsen Garden;
- The Garden full of Treasures – list of all plant and animals taxa in the collection of Zoological and Botanical Garden Plzen; and,
- Islands – our specialisation and main area of conservation work both ex situ and in situ.

S. Rivière, J.V. Müller, E. Breman, A. Carta, M. Kiehn & M. Miranto:

Progress report towards meeting 2020 GSPC Targets 8 & 9 in Europe – implementation and subsequent recommendations.

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As a follow-up to the European Native Seed Conservation Network (ENSCONET), funded by the European Commission between 2004 and 2009, the ENSCONET Consortium was established in 2010, and currently consists of 32 member organisations from 18 European countries that collaborate on European seed conservation and research.

A comparison of the list of seed accession holdings in European seed banks, as uploaded into the ENSCONET database (ENSCOBASE), with both, the most up-to-date version of the IUCN Red List and the 2011 European Red List of Vascular Plants showed a coverage of 54.8% towards GSPC target 8, far below the 75% proposed target threshold. Regarding GSPC target 9, the comparison with the Harlan and de Wet Crop Wild Relative Inventory checklist, the 2014 IUCN European Red List of Medicinal Plants and the 1995 catalogue of the wild relatives of cultivated plants native to Europe showed a coverage of 77.9%, which was above the 70% proposed threshold.

Based on this comparison, the authors of this paper, on behalf of the ENSCONET Consortium, developed recommendations and a collections strategy outlining which European threatened plant species needed to be collected as a priority if the GSPC target 8 was to be reached by 2020.

Here we present in detail the progress made towards meeting 2020 GSPC Targets 8 and 9, as well as our priority-setting method designed to guide collecting strategies by country. A key result is a country-based checklist of European threatened plant taxa to be collected and stored ex situ across the seed banks of the ENSCONET Consortium by 2020.

The collection plan has been shared with the Members of the ENSCONET Consortium and with the European Botanic Gardens Consortium who are encouraged to design annual seed collection programs according to this plan. The collection plan will keep being updated as new priority taxa get collected and new versions of the IUCN Red List are released. Updates of the collection plan will be shared with the Members of the Consortium and are also made available to other interested audiences so that collected taxa will – as much as possible – match the European Threatened taxa list by 2020.

Emiliano Sánchez Martínez, Beatriz Maruri Aguilar & María Magdalena Hernández Martínez:

The botanical gardens of Mexico and their commitment to plant conservation plans and strategies.

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The Mexican Association of Botanical Gardens affiliates about 40 institutes that work tirelessly throughout our vast and biodiverse country; all of them are strongly committed to the effective fulfilment of the objectives of plant conservation. Our members have contributed

significantly to the development of the National Biodiversity Strategy and Action Plan 2016–2030 of the Government of Mexico, as well as to the design and consummation of the six strategic objectives and 33 goals of the Mexican Plant Conservation Strategy 2012–2030. These strategies and plans runs in parallel and entirely support the Global Strategy for Plant Conservation 2011–2020, in which, one way or another, they are inspired by. Our objective is also to develop and consolidate ex situ conservation mechanisms and programmes to ensure on-site conservation.

This poster reveals successful progress and challenges to meet in the diverse conservation activities that the botanical gardens of Mexico have assumed. We include examples of:

1. Understanding the national plant biological diversity and evaluating its state of conservation, with examples of endemic, endangered or emblematic taxa on the edge of extinction;
2. Efforts to quantify the efficiency of the collections of Mexican botanical gardens to represent and protect endangered species referred to in the Official Mexican Standard 059-SEMARNAT-2010;
3. Success stories in the propagation of species of scientific, economic, ecological or social concern; especially the reproduction of species for the rehabilitation and restoration of terrestrial ecosystems of Mexico;
4. Initiatives to protect plant germplasm in the country's only National Genetic Resources Centre, which – inappropriately – is oriented mostly to agricultural crops;
5. National and international alliances to consolidate a system of recovery of deteriorated or altered ecosystems, in the rural and urban environments;
6. National tactics to prevent, reduce or control the threats that loom over plant diversity with study cases and control experiences of invasive species and responses to the international traffic of Mexican species historically looted from their habitats;
7. Presentation of the Code of Conduct of the Mexican Botanical Gardens and other mechanisms of social presence to contribute to the fair and equitable sharing of the goods of biological diversity;
8. A permanent contribution to the culture of affection for the planet through a paradigm of austerity that entails moderate consumption and altruism for human life and nature; and,
9. Rational synchronisation of humanity to increase commitment to nature.

Our conclusion is that in spite of the prevailing challenges, the plant conservation obligation is indeclinable and must be sustained beyond 2020 and until ecological stability on the planet is reached.

Raviraja Shetty G.:

Efforts to conserve endangered and economically useful medicinal plants of the Western Ghats of India.

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The Western Ghats of India is among the world's most ecologically rich regions and one of the major repositories of tropical medicinal plants that are used in traditional medicinal treatments. Out of the large variety of species available in the Western Ghats, about 100 species hold a very high value in folk and herbal health forms for the treatment of different ailments. It can be noted that the plants that were very common in the area when they were first studied have got into the IUCN Red List over the years. *Rauvolfia serpentina*, *Saraca asoca*, *Gymnema sylvestre*, *Gloriosa superba*, *Celastus paniculatus*, *Decalepsis hamiltoni*, etc. are included in the list which are very important for their medicinal properties, but are on the verge of extinction. There is an urgent need to develop efficient ex situ conservation strategies for these species to prevent further genetic erosion. In the present study, several endangered medicinal plants, viz. *Holostemma-ada-kodien*, *Gloriosa superba*, *Salacia reticulata*, *Tinospora* and *Decalepis hamiltonii* were explored, collected and conserved for sustainable utilisation. The species are selected considering their status in terms of threat, use in traditional medicine and demand in the pharmaceutical industry. Plants were collected and their growth parameters were recorded. Medicinal plants collected and conserved in the Field Gene Bank were characterised using species specific descriptors. Variability existed in accessions of different species in terms of flower, fruit and seeds. Based on the observations, a database was developed to record this documentation. Periodical observations on the plants in cultivation were made and recorded on morphological characters, reproductive characters and pest and disease occurrence. The seed and vegetative propagation studies on all the species collected have been undertaken. The results of the experiment are found to be useful for further multiplication and conservation of these medicinal plants to support their sustainable use. Education programmes, such as trainings, seminars and exhibitions on the conservation of medicinal plants, were conducted for students and the general public to foster ecological responsibility and to encourage joyful interaction with the natural world.

Ulyana Spirina & Yuri Naumtsev:

Bryophyte horticulture as ex situ conservation method: Case study of the Botanical Garden of Tver State University (Russia).

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According to the GSPC targets, one of the important goals of botanical gardens is the study and ex situ conservation of biodiversity. The creation of modern seed and spore banks is undoubtedly necessary for such conservation work. However, is there any guarantee that the material that has been stored in such banks for several decades will be able to adapt successfully to real environmental conditions in the future? Another way for rare and endangered species to be conserved is through ex situ methods based on horticulture. This allows plants to adapt gradually to environmental changes and, importantly, it allows these plants to be displayed to people in the garden and for stories about plant vulnerability to be told.

Bryophytes are the second most numerous group of land plants, and many of them are threatened. However, people are generally not familiar with them, even botanists. This group is highly specialised, rather difficult in taxonomy and horticulture, but can give new opportunities to botanical gardens.

Since 1994, the Botanical Garden of Tver State University has conducted experiments on ex situ conservation of rare and endangered plants of the Tver region. The living collection was developed on scientific principles and aimed to determine the possibility of ex situ conservation of rare species of mosses and liverworts of the Tver region. Horticultural techniques have been developed for all 51 species of the bryophyte species included in our living plants collection. Alongside rare and endangered bryophytes, we also grow common species representing vulnerable ecological groups. Initially, the bryophytes were grown in the nursery. Later they were planted out in the garden displays, imitating the natural vegetation of the Tver region. Finally a special display 'Secret Garden' dedicated to bryophytes and other spore plants was created.

Ex situ conservation and cultivation of bryophytes allows the Botanical Garden of Tver State University to carry out the following activities at a new, higher level:

1. To implement programs of ex situ conservation for rare species from the regional flora;
2. To conduct scientific research on biology, ecology and taxonomy;
3. To conduct school and university training in biological, environmental sciences and in landscape design using live material of all taxonomic and ecological groups of biodiversity of the region;
4. To acquaint garden visitors with the biologically and aesthetically unique originality of the region's flora, to demonstrate fully-fledged displays and to influence aesthetic taste; and,
5. To use investment funds for the implementation of multipurpose projects.

Through having a living bryophyte collection in the garden, we are able to combine scientific experiments on ex situ conservation and in situ studies of bryophytes with educational and outreach work. The mission of our garden is to open the world of plants for visitors and to promote harmonious relations between man and nature and this could not be carried out completely without our work on bryophytes.

F. Tarquini, M. Pepe, A. Spoletini, G. Fabrini, L. Varone & L. Gratani:

Plant conservation strategy of the Botanical Garden of Rome.

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The Botanical Garden of Rome covers an area of 12 hectares on the bank of the Tiber. The plain area reflects the structure of the historic Garden of Riario-Corsini Palace enriched with tree species, including many palms. The hill area is occupied by the Ferns Collection, Bamboo Collection, Rose Garden, Rock Garden, Australian species Collection, Japanese Garden, Mediterranean Wood and the Gymnosperms Collection. Inside the Botanical Garden there are more than 300 ultra-centenarian plants, among which *Quercus suber* L., *Cedrus deodara* (Roxb. ex D.Don) G.Don, *Cladrastis kentukea* (Dum. Cours.) Rudd and *Nannorrhops ritchieana* (Griff.) Aitch. The primary function of the Botanical Garden of Rome is the storage of plant species, grown in greenhouses or outdoors, with specific techniques that maintain, over time, the plant structural and physiological traits and the reproductive capability found in the places of origin. In particular, the botanical garden cultivates rare species and those included in the IUCN Red List, in accordance with the Action Plan of Botanic Gardens Conservation International (BGCI). The Botanical Garden is a centre for the reception of plant material subjected to illegal trade, confiscated by the competent authorities, which is conserved in the CITES Greenhouse. The Germplasm Bank of the garden is one of the nodes of the Italian Network Germplasm Bank for the ex situ conservation of the Italian flora (RIBES). The Bank has 1 300 accessions divided into 137 families, 603 genera and 992 species, most of them included in the IUCN Red List. The botanical garden is also involved in experiments on the propagation and cultivation of threatened species in

order to reintroduce them in their natural environment or to increase the numbers of individuals, ensuring their biodiversity conservation. The reintroduction of plant species into natural habitats has become an increasingly important strategy for conservation, especially when wild population numbers are small and when habitat is fragmented. Through a careful management policy, the botanical garden spreads information on plant species, their environments of origin and the importance of in situ and ex situ plant conservation. Moreover, particular attention is given to environmental education aimed to increase the student awareness regards the importance of plant biodiversity conservation. During the year, expositions for the public and guided tours for individuals, groups and schools of all level are organised.

Gene-Sheng, Tung, Chih-Liang, Chao, Tsung-Yu, Hung & Huan-Yu, Lin:

To enhance the flora conservation of botanical gardens based on participatory citizen science approach in Taiwan.

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Taiwan has the good name of Formosa, which means the beautiful island. More than 73% of the land consist of hills and mountains, with the highest peak close to 4 000 m, with 60% of the land covered by forest. Because of its diverse topography and warm, humid climate, there are over 4 200 vascular species, of which 1 052 (22.9%) are endemic to Taiwan. The Red List of Taiwanese Vascular Plants was published in 2012 and is kept updated. It lists 908 of 4 200 species as threatened (CR–VU). One of the research purposes is to display a geo-referenced database with 1.4 million occurrence data to assess current distribution of threatened and endemic species, and overlay it with the localities of botanical gardens, nurseries, and indigenous communities to reveal the optimal framework for ex situ conservation. The result demonstrated that the union of botanical gardens and nurseries covers most habitats of the target species. However, local communities/indigenous communities could be a considerable assistance to fill the gap in high-altitudinal and remote regions.

Based on the above reasons, Project for Future Green was proposed and applied the public participatory and citizen sciences methods to be the second focus of this research. Local/indigenous people develop a sustainable Traditional Ecological Knowledge (TEK) by their long-term interactive accumulated life experience with local plants. Using the local production system and ecological knowledge is the most important way to protect the diverse values of ecology, culture and biodiversity in a specific area. A total of 49 kinds of indigenous men's forest hunting-methods related to plants were recorded, such as the production of traps and hunting, gunpowder, firewood, food, equipment, medicinal plants and bait plants for prey. The varieties of hunting-related plants were also selected and are going to be cultivated in their chosen hunter trail. According to the practice of tribal plant collection, an innovative connection among botanical gardens, forestry nurseries and local and indigenous communities have been formed to consolidate the ex situ conservation network in Taiwan. It not only preserves important plant species on the site of indigenous tribes, but also activates local nurseries in the public sector and enhances the important regional cultural values of these plants. The final discussion of how citizen science methods strengthen the conservation value of ex situ conservation and help to facilitate gardens to become more effective agents for global flora conservation is provided.

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Towards achieving the GSPC targets for trees through global collaboration.

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The success of the GSPC hinges on effective partnerships – locally, regionally and globally. The Global Tree Conservation Program at The Morton Arboretum leads a broad and integrated portfolio of conservation projects, which are guided by and aligned with the targets of the GSPC. Oaks (genus *Quercus*) are ecologically valuable keystone species found in a wide range of ecosystems around the world, and their conservation is a major focus of the program. Many oak species are threatened with extinction, and oak-dominated ecosystems are in decline. We are identifying and prioritising species of highest concern by compiling threat assessments using the standards set out by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Target 2). Our goal is to determine the threat status of all of the world's approximately 450 species of oak by 2020.

Conservation gap analyses are conducted to determine the most urgent, effective, and efficient conservation actions needed to protect and recover threatened species and populations (Target 3). We develop, execute, and support in situ conservation projects (e.g. seed collection, propagation and reintroduction) for priority threatened species (Target 7) in oak diversity hotspots, like the US, Mexico and Southeast Asia, where we forge valuable collaborations with local partners from a variety of sectors. We also ensure that threatened species are preserved in coordinated ex situ conservation collections

(i.e. botanical gardens and arboreta) that are genetically diverse and representative of the species, to safeguard against extinction in the wild (Target 8). To ensure long-term success, we coordinate and participate in several networks and collaborations aimed at advancing tree conservation, such as Arbnet and the Oaks of the Americas Conservation Network (Target 16). The tools, resources and guidelines we produce are shared widely with the global community of garden experts, academics, and conservation practitioners to build capacity and catalyse conservation action for threatened trees around the world.

NOTES

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