Report on the 1st Meeting of the Council of the World Flora Online (WFO) Thursday and Friday 14-15 November, 2013 Royal Botanic Garden Edinburgh, Scotland

DRAFT

Host: Professor Stephen Blackmore, Regius Keeper, Royal Botanic Garden Edinburgh

Chair: Dr Peter Wyse Jackson (President, Missouri Botanical Garden / Chair GPPC)

Participants: See Annex 1

1.0 INTRODUCTION

As Chairman of the Global Partnership for Plant Conservation and Interim Chair of the World Flora Online Council, Peter Wyse Jackson welcomed participants and introduced the meeting with a brief overview of the background to the WFO. He noted that the MOU had opened for signature in Jan, 2013 and that, to date, 20 organizations were now signatories (Annex 2). These organizations had been invited to nominate a member of the World Flora Council. A number of other institutions have expressed their intent to sign.

He also reported that the Convention on Biological Diversity (CBD) would undertake a Mid-Term Review of the Global Strategy for Plant Conservation and consider progress on the achievement of its 16 targets in 2014. He noted that the Global Partnership for Plant Conservation would be preparing and submitting a report to the CBD Secretariat as a contribution to the Mid-Term Review. He noted that the Council would have an opportunity to submit a report on the progress in the achievement of GSPC Target 1 on the World Flora Online for that review (due in February 2014). The meeting participants were asked to submit suggestions for input from the Council for the draft to the Convention.

1.1 Discussion of Next Meeting:

Dmitry Geltman has offered to host the next meeting of the World Flora Online Council in St. Petersburg, Russia, 26 to 27 June 2014 (when it could be held linked to the 300th anniversary celebrations for the Komarov Botanical Institute).

1.2 Apologies:

Apologies were received from the following Council members who were not able to attend the meeting: Warren Wagner (Smithsonian Institution, Washington D.C.); Judy West (Australian National Botanic Gardens, Canberra); Dmitry Geltman (Komarov Institute, St Petersburg) and Thomas Borsch (Berlin-Dahlem Botanical Museum and Garden).

2.0 INDIVIDUAL PRESENTATION SUMMARIES

Participants were invited to update the Council on progress made and other issues related to WFO from the perspectives of their institutions.

It was noted that Dick Brummitt, a supporter of WFO and organizer and founder of the Taxonomic Databases Working Group (TDWG) and Species Plantarum had passed away on September 18, 2013. The Council recognized his passing and his contributions to taxonomy over many decades (this was brought to the attention of the meeting by Jan Kirschner)

2.1 Jan Kirschner, *Institute of Botany, Pruhonice, The Czech Republic*

The Species Plantarum project can provide taxonomic revisions for a wide variety of plant group including the imperfectly known groups. If data are compiled without specific checks and oversight of specialists, it is unreliable.

Evaluations of current taxonomic data must take place to minimize errors and recognize natural entities. Current trends toward taxonomy-free science will increase the proportion of wrong data and incorrect assumptions.

WFO will help to demonstrate that taxonomy is important - and a "work package" should be included within the WFO to facilitate the research of taxonomists.

2.2 Gideon Smith, *South African National Biodiversity Institute, South Africa*

South Africa will meet its goal of 100% coverage in relation to Target 1 of the GSPC by 2020. There is support from the South African government to pursue its participation in WFO.

2.3 Eduardo Dalcin, *Instituto de Pesquisas, Jardim Botânico do Rio de Janeiro, Brazil*

The Brazilian plants checklist project has been completed and is online. A Flora project has been approved and is supported by Ministry of Science.

2.4 De-Zhu Li, *Kunming Institute of Botany, Chinese Academy of Sciences, People's Republic of China*

The *Flora of China* (FOC) project was completed in Sept 2013 and the final volumes are being made available on the Web by the end of 2013. China has established a National Germplasm Bank of Wild Species. The digitalization of FOC is proceeding and a DNA Barcoding Project was established in November 3, 2013.

2.5 Bob Magill, *Missouri Botanical Garden, USA*

Bob Magill provided an update of the plant groups of interest at the Missouri Botanical Garden which can form a key component of MBG's contributions to the WFO was presented as part of the Gap Analysis. A list of families and two other plant groups (bryophytes and ferns) was presented to indicate the anticipated participation of the staff scientists at Missouri and to provide an idea for others to collect similar information for their own institutions.

Similar lists have been developed at the New York Botanical Garden and at the Royal Botanic Gardens, Kew and there is therefore an urgent need to combine these list to form the initial basis of taxonomic expertise available to support the WFO..

It was suggested in the following discussion that the Taxonomic Working Group should include as part of its work to determine where there are experts available to help guide the inclusion of information for various groups/families in the WFO.

It was also suggested that the development of new online tools and an expanded web presence for the WFO would help facilitate the collection of this information and make the project and this Council's work better known throughout the botanical community.

3.0 WORKING GROUP PRESENTATION SUMMARIES

3.1 Technical Working Group Report

Presenter: Chuck Miller, *Missouri Botanical Garden, USA*

Chuck Miller reported on the work of the Technical Working Group since the first WFO meeting in St Louis in July 2012. He stressed that the Technical Working Group had agreed and accepted that the WFO project should take whatever data contributions it can get, building on existing information, rather than being driven by the results of new research. It was also acknowledged that the WFO project was intended to support plant conservation and to provide a means and basis for the implementation of the GSPC targets. Following discussion there was consensus that in many ways the project would be a synoptic flora online.

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It was also emphasized that WFO was not just a technical project and that considerable and innovative taxonomic work would be required for it to be successful. Nevertheless it was recognized that it would be dependent on the Technical Working Group to provide the vehicle for the presentation of the effort.

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Accomplishments:

The following accomplishments achieved since the July 2012 meeting were outlined:

- An online prototype had been developed as an initial proof of concept. In discussions, it was suggested that the prototype needs additional explanation and documentation as to its purpose and function if this is to be available as a resource for the WFO. The current prototype is limited in scope and content.
- A Use Cases document had been developed. The document provided an excellent good overview of the project covering a relatively comprehensive overview of potential users. It was pointed out in discussion that the Use Case document would require further review by stakeholders as it had been prepared only by the Council members. It was nevertheless agreed that the document will provide a good basis for further development of the technical aspects of the project.
- Development of a Data Model is in progress. The need to use Darwin Core was recognized as a primary component in these discussions.

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Current Status:

The technical system components of the WFO being discussed and planned at this time by the Technical Working Group are:

- A WFO Public Website with search, view, and feedback capabilities.
- A WFO Specialists Website with options for content input and editing.

- A Taxonomic Management System
- WFO Database design and implementation
- Files/Images handling specifications
- Spatial Database options
  - Countries
  - GIS
- Data, Registry and Index
- An OCR (Optical Character Recognition)/PDF Markup System
- Feedback Handling mechanism
- Project Status
- Global User Admin/Access & Control

WFO Components:

The key components of the WFO recognized at this time are:

- The WFO Consortium and Council.
- A taxonomic nomenclatural 'backbone' for the WFO.
- Content for inclusion in the WFO from all possible sources, including printed Floras, digital data, and structured data.

Next steps:

The following next steps were proposed for the Technical Working Group:

- No next steps for the Technical Working Group had yet been formally mandated by the Council, but next steps would be guided by the Council's decisions.
- Technical group has further work to do before some inputs from Council and other work groups can be fully utilized.
- The need for a timetable and deadlines was highlighted.
- The need for responses to the taxonomic gap analysis from more institutions was urgent, perhaps following the model proposed by Bob Magill from the Missouri Botanical Garden.
- Council will need to be proactive in asking institutions to step up to provide information/resources for the WFO.
- The ongoing debate as to whether the WFO would be maintained as a centralized or decentralized system needs to be resolved. It was pointed out that no one organization has the resources to house and maintain a centralized system. The predominant consensus of the meeting was that a decentralized system will be the best option (albeit with individual institutions accepting responsibilities to manage some key components of the WFO following the Council's mandate).
- Importance of having a standard format for data was stressed. The Technical Working Group needs to have the standard format available quickly.
- Decision on standard format will need to be made soon

The Report of the Technical Working Group was **ADOPTED.**

The members of the group were congratulated on the work accomplished so far but it was acknowledged that important and urgent work will be required during the next upcoming period before the next meeting of the Council.

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3.2 Use Case Report

Presenter: Mark Watson, *Royal Botanic Garden Edinburgh, U.K.*

A draft Use Case document had been prepared by Mark Watson at the request of the Technical Working Group. Comments and suggestions from the Group had been incorporated and it was presented to the Council for Adoption.

The following points were made:

- The Use Case document will help to determine what will be achievable for the WFO by 2020.
- It was suggested that the current draft omits 'evolutionary biologists' and some other potential stakeholders, such as border control officials, etc. but is a good start in identifying the communities involved.
- Common names. Discussions continue as to what should be included in the WFO in relation to common (vernacular) names and whether they are important for inclusion. Further work will be necessary to determine this on a country by country basis and to which stakeholder sectors they are important.
- The Chair pointed out that the WFO cannot be an "all things to all people" resource and suggested that it is important to highlight the primary actors, particularly within the context of the GSPC.

The Use Case document DRAFT was **ACCEPTED** by the Council. The Technical Working Group was congratulated on this work and encouraged to finalize it as soon as possible.

The draft Use Case document is included as Annex 3.

3.3 Taxonomic Working Group Report

Presenter: Jim Miller, *New York Botanic Garden, USA*

Jim Miller presented an update of the work of the Taxonomic Working Group since the last meeting in July 2012 (St Louis).

- A Drop box had been created for the relevant WFO documents, including the Use Case report. The Drop Box is available to all Council members, contact needed for invitation to enter.
- The Council was reminded that at the St Louis meeting, two related working groups had been created – a Data Acquisition Group and a Taxonomy Group. It was proposed that these two groups merge as there is substantial overlap between them. The merged group will be called the Taxonomic Working Group.
- For production of a World Flora Online - to differentiate from other products - expertise within the group can provide a greater contribution at the species level and in the future, good solid communication by members will be very important.
- It was decided that WFO needed an effective means to disseminate information from the meetings of its Council and its working groups to the taxonomic community.
- The Council needs to consider further the ways in which individuals and organizations can be acknowledged for their contributions to the WFO. This could also include the attribution and inclusion of unpublished information in the WFO. Ensuring that scientists receive academic credit for their inputs is an important aspect of the work. It will also be important to ensure that

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the status of the project itself is held in the highest possible regard to encourage broad international collaboration and institutional commitments.

- The Taxonomic Working Group also discussed some aspects of what the taxonomic community can contribute. This could include decisions of accepted names used, alternative taxonomies; but the WFO needs to ensure that the decision makers are the best possible experts consulted.
- The Taxonomic Working Group stressed the need for clear directions in moving forward the project, guidance and direction which could now be provided by the WFO Council.
- It was agreed that taxonomists will be the primary people called upon to ensure the quality of the WFO. Other specialists will be the authorities consulted on matters relating to conservation status, distributions and use and sustainability of particular species.
- In order to achieve a comprehensive WFO, it will be necessary to build a network of specialists from an increasing range of partner institutions.
- The Working Group also stressed that it is important to address the question of how to recruit additional participating organizations and expert individuals.
- It was proposed that with the next upcoming period all relevant institutions will be asked to provide names of people who can participate and in order to prepare a preliminary list of world experts for each plant family.
- Local floras will be helpful for conservation assessments and should also be included as appropriate and possible.
- The WFO Council needs to communicate with the International Association of Plant Taxonomists (IAPT) and similar organizations to promote the WFO and help with buy-in from the botanical and taxonomic communities.
- The gap analysis was discussed and also a list of families with recent treatments that may not need an expert was also reviewed. It was agreed that a full forthcoming gap analysis needs to be made available on the Web.
- A next priority for the Working Group will be to flesh out groups of experts on all vascular plants – and identify experts as primary points of contact for particular groups.
- The Taxonomic Working Group pointed out that very clear guidance (guidelines) for experts should be established and that there was a need for further \discussion on the means necessary to reach consensus classifications.

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The Council APPROVED the merger of the Data Sources and Taxonomic Working Groups.

The report of the Taxonomic Working Group was **ADOPTED.**

3.4 Governance and Resource Mobilization Report

Presenter: Peter Wyse Jackson, *Missouri Botanical Garden, USA*

The main role of this group since the last meeting had been to take forward the drafting and agreement of the Memorandum of Understanding (MoU) through which the WFO Consortium and Council has been convened. This had included the circulation of drafts of the MOU to relevant institutions and the incorporation of their comments into the final MoU before it was opened for signature in January 2013.

The Group had also worked with the GPPC and its Secretariat (provided by Botanic Gardens Conservation International) to establish a web presence for the WFO. Preliminary materials, including the text of the MoU had now been made available on the www.plants2020.net website.

3.5 The Plant List

Presenter: Alan Paton, *Royal Botanic Gardens Kew, U.K.*

An overview of the current status of The Plant List (TPL) was provided including information on the pending release of the next updated version.

The ongoing arrangements and partnership between TPL and the WFO was discussed. It was agreed that if The Plant List is to be adopted as the taxonomic nomenclatural backbone for the World Flora Online then its governance needs to become a component of the World Flora Online project, including broad partner participation to ensure dynamic updating and maintenance of TPL.

3.6 e-Monocot

Presenter: Paul Wilkin, *Royal Botanic Garden Kew, U.K.*

A demonstration of the new e-Monocot system and its functionality and options was provided. The Council agreed that many features of the system provide useful models that might be applied through the WFO.

3.7 Development of a Data Markup and Ingestion Tool

Presenter: Steve Kappel, *Missouri Botanic Garden, USA*

A presentation was made on data collection. This focused on the development of a new markup and ingestion tool for capturing and parsing data from floras and monographs in a standard format to transfer to the WFO database when it is ready. Descriptive data parsed into primary data elements that can be used more efficiently to format and more finely parse data.

The markup tool was discussed and welcomed by the Council.

It was suggested that some elements of crowd sourcing might help with the formatting of raw data.

It was decided that the Taxonomic Working Group should decide on priority groups and regions where there would be a need to convert existing Floras available in print format only into digital data. This will need to be completed soon, and journals and descriptions of flora held by Council member organizations could be helpful with this task. The comprehensive list of items and an overview of what is needed will become the guidelines for how to move forward with the WFO project. The need for a standardized format for the WFO was discussed and that it needs to be incorporated into the ingestion tool. The need for a system for institutions that have monographs or flora that need to be digitized was discussed, as this type of content will be very work-intensive.

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4.0 BREAKOUT SESSIONS

4.1 TAXONOMIC WORKING GROUP BREAKOUT SESSION

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The Taxonomic Working Group met on both days during the meeting following a dynamic agenda. The results of the Breakout Session were presented to the full Council, summarized below:

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The need for the development of a standard format for taxa included in the WFO was evident. A timeframe for development and acceptance of such a format would be helpful. It will be important that the format also be compatible with existing (eg. Darwin Core, GBIF) standards.

The Plant List version 1.1 was due to go live shortly after the WFO Meetings and there were on-going discussions about how it would be used or incorporated as the nomenclatural backbone for the WFO.

A suggestion was made that WFO should link e-Monocot to its website, but a concern was raised that it should be clear that WFO will not be a series of links to other databases but instead will itself be an authoritative overview of the World's Flora. However, links to other sites would provide a starting point of determining what data are quickly and easily available for inclusion in the WFO, as collecting metadata from other sites would cover a lot of the flora.

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There is a sense of urgency developing to show progress on the WFO project. It was agreed that the www.plants2020.net website seems to be the best place to house demonstrative data. Documents such as the Use Case document (Appendix 3) could make an impact and showcase the project, and encourage input from others. An earlier Gap Analysis document (prepared by the Royal Botanic Gardens Kew in 2008) is not available on the web. Floristic and Taxonomic gaps have been discussed but data at the national and regional level have not been updated.

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ACTION ITEM - Make a gap analysis document available online and then distribute to taxonomy group

Discussion turned to the elements that should be included in the WFO and which elements are outside of the core 'essential' elements. It was determined that a key outcome for the next meeting should be to prepare a roadmap for the project and determine which elements are to be included in the first release. The Use Case document (Appendix 3) will be an important element in determining the direction. A roadmap needs to identify benchmarks and outline what needs to happen to get to the next step. There is a need for a position paper showing how data will be kept, linked and credited. This paper should encourage participants to store data in formats that will be transferable when the system is ready to accept it. It is important to assemble a list of demonstration projects showcasing the user interface and to highlight WFO objectives. Video conferencing may provide an important venue for outreach.

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It was purposed that "marketing" and showcasing the project to show future participants how they can contribute to the WFO would help not only to highlight the project but also give consistent information to all organizations who are considering participation. A "toolkit" of promotional materials should be developed to help market the WFO to potential participants and generate interest. The toolkit should be developed in several languages to help increase participation around the world. It is also important to assemble a list of demonstration projects showcasing the user interface and to highlight WFO objectives.

David Simpson, Royal Botanic Garden, Kew presented an overview of the deliberations of the Taxonomic Working Group to the full Council and summarized the following upcoming Goals:

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- A standard format should be ready and agreed upon before the next Council meeting in June 2014.
- The Technical Working Group should develop a Web presence to demonstrate the project and showcase the potential of WFO. Any web presence should be in multiple languages.
- Completion of the taxonomic and geographic gap analysis is urgent and options for determining who can/will work on which plant groups and families need to be worked out.

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- The Taxonomic Working Group will also consider the ways in which large plant groups can be managed and who will be called upon to help.
- A Roadmap is needed for the achievement of 2020 goals and should be discussed at June, 2014 meeting.
- There is a need to discuss fundraising strategies

4.2 TECHNICAL WORKING GROUP BREAKOUT SESSION

The Technical Working Group also met on both days and Chuck Miller, Missouri Botanical Garden summarized the results of their discussions..

The Technical Working Group has set its goals for the June, 2014 meeting and they will be available on Google Docs.

GOALS:

- Minimum requirement to participate:
- Minimum standard:
- Control Vocabulary
- Standardize values

The Technical Working Group is developing an options/outcomes matrix which will include placing ownership on taxonomists to "scrub" data and to determine a time frame for which data will appear on WFO.

- Data exchange standard – needed prior to any system or data stores etc.
- A commitment to "if you put into standard format, data is able to be used".
- What will it take to get to a data exchange standard?
- Use case document
  - Statement of what WFO is going to do functionally
  - Within use case document - there is a data definition
  - Going to double check and validate use cases
  - Need to identify which use cases are core and which are non-core
  - Another spread sheet will be created to determine core/non core
- Resolve continuing discussion - how Darwin Core Archive would be structured - no decision made at this point - once core/non core is decided upon
- Recommendation on proposed data exchange standard will be prepared in time for the next Council meeting.

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Bob Alkin (RBG Kew) highlighted difficulties for both working groups in moving forward because of uncertainties in decision making. The Chair reminded the meeting that this is the first time that the Council of the WFO had met and that its decision making process is now taking shape, working to achieve broad consensus amongst the partnership. David Bramwell (Las Palmas, Spain) suggested that an executive group was needed to help quickly make decisions. The Chair pointed out that the Memorandum of Understanding provides for such an Executive Committee. Leng Guan Saw (FRIM, Malaysia) suggested that having a grasp on a budget would be helpful, and that perhaps the Council should develop an anticipated budget for what will be needed to deploy the WFO.

5.0 RESOLUTIONS

The Council **RESOLVED** that the development of a series of materials that will showcase the format criteria of the World Flora Online and to guide expectations for potential participating organizations are needed. These will be used to help "market" and generate interest in the WFO project.

The Council **ADOPTED** the following resolution:

The Council of the World Flora Online recognizes that institutions from the South shall be supported at each Council meeting and that all partners are equal participants in the World Flora Online Consortium, regardless of size.

The Council **ADOPTED** the following Terms of Reference for Taxonomists and Organizations contributing/wanting to contribute to the WFO:

The World Flora Online project will be the fundamental, verified online resource documenting all known plants in the world. It will provide search capabilities with verified information and new data and will link with other existing species databases and catalogs.

The effort is being undertaken as a response to Target 1 of the CBD's Global Strategy for Plant Conservation, which states that by 2020 plant diversity should be well understood, documented and recognized. The targets of this objective are:

- *"an online flora of all known plants"*
- *"an assessment of the conservation status of all known plants"*
- *"Information, research and associated outputs, developed and shared"*

To achieve this goal, the project needs the expertise of collaborative networks and individual taxonomists to develop a consensus classification.

In exchange for attribution and involvement in the project, the Council acknowledges that contributing organizations are asked to help to:

- *Determine the accepted species names, and the synonyms of each accepted name*
- *Identify sources of and provide accurate treatments of each species from both floras and monographs*

The World Flora Online Council is developing a taxonomic nomenclatural backbone based on existing resources. In addition to opportunities to provide content, experts will also be provided with ways and means to be involved in reviewing data included.

The Council highlights that an incentive for participation in the World Flora Online will be the fact that contributors' taxonomic work will be presented to a wider audience than ever before and contribute to an important initiative endorsed and welcomed at the highest possible global levels.

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6.0 CONCLUSIONS

ANNEX 3 Draft Use Case document.

World Flora Online – Technical Report on Use Cases

Version 5
26 July 2013

Introduction

The formulation of use cases for the World Flora Online (WFO) goes hand in hand with defining the scope and content of the WFO. The broad scope of the WFO sets the foundation for deciding which use cases are appropriate, and in turn, the use cases help define and prioritise which data are stored in the WFO and how they are managed. Defining the scope of the WFO and documenting the use cases is important in both the technical design of the WFO, but also in managing expectations of future users.

This use case report concentrates on the 'contributors' of data to the WFO and the 'consumers' of WFO data. Although it is recognised that there will be other actors involved the WFO workflows/data pipelines, and that extra functionality will be needed to support the use cases for these additional actors - these will be detailed later.

It is recognised that it is highly unlikely that all of the use cases listed in this report will be achievable in the short term, due to the coverage of data and the lack of highly atomised data needed to fulfil the more advanced use cases. However, these advanced use cases are recorded for future use.

Broad Scope of WFO

The WFO will be an information discovery portal, bringing together floristic data on all known plant species that are available in various electronic formats. WFO will include baseline information on plant names, distributions, descriptions, etc. It will provide a single consensus classification, and give the user expert guidance on reliability, accuracy and completeness. The WFO aims to primarily be a reference for conservationists, especially those working towards GSPC Targets and those involved in other CDB activities (CITES, Ramsar, etc.).

Assuming that *'we will take what we can get'*...

In the long term, WFO will:

- be a free, open access[1], online web-based resource, enabling access to floristic data on a global scale;
- provide a global overview of the diversity of plant species on the planet;
- be comprehensive and authoritative, and include vascular plants and bryophytes;
- be a synoptic Flora[2] with a defined data set on all the world's plant species;

[1] Open Access, as defined by the *Budapest Open Access Initiative* (2001, www.budapestopenaccessinitiative.org), is that users must be able to "read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited."

- publish future versions of *The Plant List* - static, citable updates to the working list of all plant species, *www.theplantlist.org*; [This highlighted section is awaiting confirmation by Kew/Missouri TPL consortium]
- largely contain pre-existing data from national/regional Floras (in the absence of Flora treatments checklist information may be used) and monographs;
- primarily provide information at the rank of species, although information at other ranks will be accommodated;
- include geographic distributions for each species, and thus provide baseline data[3] on plant diversity in each country;
- primarily be in English, at least initially, although data will be maintained in the languages in which it was originally provided.

WFO *will not*:

- be a critical, monographic revision of each of the world's plant species
- be a detailed local Flora with vouchered distributional data
- include algae, fungi, or plants only known as fossils
- be comprehensively multi-lingual – at least in the first phases

Actor definitions

Initially, during the creation of the WFO, the main users (actors) for WFO will be those contributing, managing and editing data. Use cases based on their requirements will shape the system design and functionality. However, use cases for consumers of the data also need to be identified at this stage to shape which data are stored in the WFO, and interfaces to those data. Thus the actors are grouped according to these main classes, although it is expected that individuals will have several roles in these classes.

A. Consumers

1) Conservationists

Especially those who are working on GSPC Targets and other CDB areas.

- Conservation Scientists
- Conservation Planners/Policy Makers
- Invasive species researchers
- Sustainable use researchers
- Economic Botanists/Ethnobotanists

2) Plant Taxonomists

Those involved in producing floristic and monographic treatments.

3) Other Scientists

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[2] A Synoptic Flora is considered to contain information on:

- Nomenclature (accepted scientific names, synonyms, references)
- Description (morphology and sometimes habitat)
- Identification (keys, illustrations, photographs)
- Distribution (country occurrences, altitude)

[3] Baseline data for conservation is considered to be information on what species occur in what countries, what they look like and what are their scientific names.

- Ecologists
- Anthropologists
- Archaeologists
- Pharmacologists

4) General Interest Groups
Natural historians, citizen scientists, etc.

B. Contributors

1) Primary data providers
People who hold floristic, monographic or checklist information, at least at country level.

2) **Information converters**
People who convert unstructured information, like OCR text and PDFs, into structured data or who convert structured data into uniform, standardized data for further review and classification.

3) **Taxonomic curators**
People who collate, synthesise and update the taxonomic backbone consensus classification[4] and maintain the taxon concept relationships[5] between alternative classifications[6].

4) **Expert taxonomic reviewers**
Experts in a particular taxonomic group or region who peer review, or otherwise comment on quality and coverage of data, from primary data providers and information converters, which is provided in the WFO.

5) **Technical data/system managers**
Informatics experts managing the WFO systems - harvest, store and standardize data.

C. Other stakeholders

1) **Institutional interests**
People representing institutional interests of the institutions or organisations that have committed resources to provide sustainable technical or editorial support for the production and maintenance of the WFO. The interests are primarily in the areas of organisation, partition of work, acquisition of funding, and governance of the WFO.

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[4] Taxonomic Backbone will be a fully synonymised classification hierarchy of all scientific names of plants included within WFO. The backbone above generic level, and at least initially also on generic level and below will be populated from the second version of *The Plant List*, and from then on edited and updated by WFO's network of taxonomic experts. The Taxonomic Backbone will represent the consensus classification of accepted names, and synonyms, as agreed by the WFO taxonomic experts, and wherever possible, taxon concepts and the relationships between them.

[5] Taxon concepts are taxon names with an associated taxonomic circumscription. Taxon concept relationships are statements of equivalence or otherwise between taxon concepts.

[6] Alternative Classifications are alternative names, and alternative classification hierarchies, that have been linked to data within WFO. In most cases they are the names, and classifications, given by primary data providers when they supplied data to WFO, which do not agree with accepted names in the WFO Taxonomic Backbone.

2) **Taxonomic research planners and evaluators**
People involved in formulating floristic and monographic research programmes, setting research priorities and evaluating outputs.

A. Consumer Use Cases

A minimum set of Use Cases common to all kinds of consumer would be, I would like to,...

- have free, open web-based access to the WFO with multiple browsers
- be able to print and/or download data, regardless of size
- search for plant species according to one or both of:
    - scientific plant name
    - country (region, i.e. including range)
- be advised on a single, accepted scientific name for a species
- be advised on synonyms of the accepted name
- be advised on the scientific name, and synonyms, submitted by the data provider
- see descriptive information of a plant (text)
- see images of a plant (photos, drawings, etc.)
- find identification tools (keys) to the plants in a country/region
- be advised on the most appropriate description where multiple descriptions are available
- see identification tools associated with a plant (keys)
- be advised on the countries for which this plant is recorded within WFO (list, map)
- see the source of the data (with links back to original data)
- be advised on the reliability of the data in data sources
- be advised on the conflicts/discrepancies between data sources when there are more than one available
- annotate/rate data sources which I have found most useful
- annotate data with my comments
- use the data in an interoperable manner with other systems (e.g. Map of Life, GBIF, VertNet, etc. – i.e. conform to standards such as DarwinCore)

As a Conservationist, I also want to...

- search according to one or more of the following additional criteria:
    - altitudinal range
    - conservation status (IUCN Category)
    - conservation status (IUCN Category) through time
    - kind of known threat (included in IUCN Category)
    - occurrence within a predefined polygon (country level and above)
    - occurrence within a polygon the user submits (country level and above)
- be advised on the altitudinal data on a plant species
- be advised on the ecological/habitat data on a plant species
- be advised on the conservation status for a plant species
- be able get statistical data (quantities, percentages, charts) for:

- taxon[7] name – how many genera within a family, how many species within a genus
- geographic region – how many families/genera/species (world, continent, country, user-defined polygon)
- habitat/ecosystem – how many families/genera/species
- conservation status – how many species
- endemic status - how many families/genera/species

As a Plant Taxonomist, I also want to...

- be able to search for and retrieve floristic/monographic accounts using the following additional criteria:
  - content type (checklist, flora, or monograph)
  - format (atomised data, unstructured text, pdf-text, pdf-scan)
- be able to view multiple regional floras and multiple monographic information for a taxon on the same page
- be advised on taxon concept relationships between alternative classifications
- be able to show different taxa on the same map with different colours, add overlay layers for elevation, climate, etc.
- discover classification/nomenclature knowledge gaps to help direct future research
- discover description knowledge gaps to help direct future research
- discover floristic/distributional knowledge gaps to help direct future research
- be able use data in WFO to help fill known knowledge gaps:
  - be able to create a 'checklist' for a country/region and download
  - be able to create a 'proto-flora' for a country/region and download
  - be able to create a 'proto-monograph' for a taxon and download
- find out how I can be involved in the WFO global community
- register my area of expertise/ongoing floristic/monographic work with the WFO
- be informed about on-going efforts to create floristic/monographic accounts
- be notified when a floristic/monographic account is added to the WFO
  - for a taxon (family/genus/species)
  - covering a country/region
- apply for access as a Taxonomic Curator or Expert Taxonomic Reviewer
- be able to submit feedback to the WFO Taxonomic Curators/Expert Taxonomic Reviewers

As an Ecologist, I also want to...

- search according to one or more of the following additional criteria:
  - ecological trait [NOT CORE]
  - habitat/ecosystem [NOT CORE]
- be advised on ecosystem information [NOT CORE, but maybe included in free text general description statements]
- be advised on ecological trait information [NOT CORE, but maybe included in free text general description statements]

As an additional user, I also want to...

- be able to search by common/vernacular name [NOT CORE]
- be able to search by name assigned in pharmacology [pharmacologist] [NOT CORE]

[7] A Taxon is a taxonomic group at any rank, e.g. family, subfamily, genus, subgenus, species, subspecies (pleural taxa).

- be advised on the use of species [anthropologist/archaeologist] [NOT CORE, but maybe included in free text general description statements]
- be able to search for chemical constituents [pharmacologist, phytochemist] [NOT CORE]

B. Contributor Use Cases

As a Primary Data Provider, I want to...

- understand the aims and scope of the WFO
- know what kinds of data are stored/cached by WFO
- know what content is stored/cached by WFO
- know if data on my groups/region is already stored/cached within WFO
- know how my data will visually appear online
- know that the accepted name, and synonymy, that I provide will be shown with my data
- understand the creation/purpose of the taxonomic backbone consensus classification
- know the data elements/structure needed to contribute my data
- know what WFO will change or do with my data
- know the technical process and format to contribute my data
- register my dataset with the WFO
- upload my data with metadata
- access the contribution/upload system via the web using multiple browsers
- know how to contribute updates to my data
- know the use policy for data I am contributing
- know statistics on the use of my data
- know how my data will be attributed
- know how to provide attribution data[8]
- have links back to my original data, e.g. online Floras
- have my data visible to others online after a defined release date
- be informed when comments/feedback are made on my data

As an Information Converter, I want to...

- access the contribution system via the web using multiple browsers
- store information sets submitted by Primary Data Providers
- open information sets, manipulate them, and store work-in-process
- work with a variety of information sets – unstructured, semi-structured, well-structured
- work with regional flora, monographic (generic or family), checklists, occurrence lists, conservation status lists, habitat/native/endemic/etc lists, and common name lists.
- work with a variety of web services which can be used for data structuring, tagging, data cleaning, linking, etc.
- see a list of all my and others' work-in-process and work completed
- have tools and a "workbench" to perform data refinement and merger tasks/steps
- have standardization data and tools to apply them to the data refinement and merger process
- have tools to assess the quality, standardization, conformance of work-in-process
- merge standardized, conformant data to the WFO master datasets

[8] Attribution Data is considered to include information on: data provider as source, original dataset publication and date, acceptance source/publication and date, synonymy source/publication and date, author, editor, illustrator.

As a Taxonomic Curator, I want to...

- access the data management system via the web using multiple browsers
- change the taxonomic status[9] of names in the taxonomic backbone consensus classification and provide required reference(s)
- discover unresolved names that need further work
- add new names with status and reference(s) into the taxonomic backbone consensus classification
- make or revise the relationships between names in the taxonomic backbone consensus classification
- compare alternative classifications and identify conflicts
- make or revise relationships between taxa in alternative classifications
- record attribution for the Taxonomic Curator
- see a log of taxon classification change activity, by whom and when

As an Expert Taxonomic Reviewer, I want to...

- access the data management system via the web using multiple browsers
- annotate data sources for a taxon or taxonomic group to indicate reliability of the data
- record attribution for the Expert Taxonomic Reviewer
- see a log of taxon change activity, by whom and when

As a Technical Data/Systems Manager, I want to...

- access the data management system via the web using multiple browsers
- ingest data from *Information Converters* workbenches
- harvest/ingest data from *Primary Data Providers* who have been established as updating data sources
- provide the system tools[10] for use by those involved in WFO
- provide single-sign-on system controls and security to enable access by contributing users to the WFO systems
- administer users
- operate the servers, disks and network access

C. Other stakeholders Use Cases

As a person representing institutional interests, I want to...

- influence decisions made with respect to WFO
- be informed, and possibly part of, funding initiatives aiming at the establishment and maintenance of the WFO
- be able to contribute and enhance my institution's research interests through collaboration in the WFO
- enhance my institutions standing through collaboration with the WFO
- develop infrastructural, methodological and research synergies with other partners in the WFO consortium.
-

As a person planning and evaluating taxonomic research programmes, I want to...

- discover taxonomic knowledge gaps to help direct future research
- discover description knowledge gaps to help direct future research
- discover floristic/distributional knowledge gaps to help direct future research

[9] Taxonomic Status of a name is the opinion that it is either an accepted name, a synonyms of an accepted name, or an unresolved name. It is not the Nomenclatural Status of a name, e.g. invalidly published, illegitimate, etc.
[10] System Tools include; markup tools for Information Converters; classification tools for Taxonomic Curators; editorial tools for Expert Taxonomic Reviewers

- promote research projects aimed at data creation to fill gaps in taxonomy, descriptions, and distributions