

GETTING THE MOST OUT OF YOUR BGCI PLANT UPLOAD

BGCI's PlantSearch database provides a unique tool for measuring progress towards Target 8 of the Global Strategy for Plant Conservation.



Paeonia suffruticosa v *papaveracea* *Vulnerable* (IUCN). Conservation status previously not recognized in the Arnold Arboretum living collections (Nancy Rose)

The public garden community has a daunting task at hand to answer the “call to arms” for plant conservation outlined in the Global Strategy for Plant Conservation (GSPC) (CBD, 2002) and, for gardens in North America, the North American Botanic Garden Strategy for Plant Conservation (NABGSPC) (BGCI, 2006). Such a task requires the integration of a variety of garden activities ranging from awareness-building and advocacy, to floristics work and *in situ* monitoring. Not to be discounted are well-documented living collections, which

are acknowledged in Target 8 of the GSPC (Box 1) as one of the greatest assets of public gardens. Many gardens, however, do not have access to vital information about their collections, including threat status of corresponding natural populations. Fortunately, BGCI's PlantSearch database (http://bgci.org/plant_search.php) offers a vital resource to aid gardens, and includes significant benefits for the botanical community. In light of this important resource, we offer this case study to provide insight into the Plant Upload process.

Box 1. Global Strategy for Plant Conservation: Target 8

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

Identifying threatened plants

The mission of the Arnold Arboretum of Harvard University (hereafter, the Arboretum) supports a “greater understanding, appreciation, and stewardship of the Earth's botanical diversity”. Like other gardens, the Arboretum includes plant conservation within the scope of its mission and has identified threatened plants as a priority in its Living Collections Policy (Living Collections Committee, 2007). To further these efforts, we are developing a novel conservation analysis that prioritizes threatened taxa within the collection for various curatorial actions. One of the initial steps is the identification of threatened taxa.

“ We used BGCI's PlantSearch database to help us identify threatened plants in our collections. ”

To help us identify threatened plants in our collection, we used the BGCI PlantSearch database to provide up-to-date IUCN Red List (IUCN, 2009) threatened species information. We followed the online Plant Upload

Table 1. Examples of Arnold Arboretum nomenclatural diversity* in required BGCI Plant Upload .CSV format**

genhyb	gen	sphyb	sp	isprk	isp	cul
,	ABELIA	,	chinensis	,	,	,
,	ABIES	X	borisii-regis	,	,	,
,	CRATAEGUS	,	oxyacantha	V	,	,
X	CUPRESSOCYPARIS	,	leylandii	,	,	Haggerston Grey
,	FOTHERGILLA	X	,	,	,	,
X	MAHOBERBERIS	,	neubertii	,	,	,
,	MALUS	X	robusta	V	persicifolia	,
,	MALUS	,	domestica	,	,	Antonovka
,	NYSSA	,	sp.	,	,	,
,	RHODODENDRON	X	(bakeri x viscosum)	,	,	,
,	SORBUS	,	aucuparia	F	albertiana	,
,	SPIRAEA	X	arguta	,	,	Compacta
,	TILIA	,	dasystyla	S	caucasica	,
,	TORREYA	,	taxifolia	,	,	,

* Refers to the variety of taxonomic entities present in the living collections and plant records database

** Names arranged by Plant Upload criteria: genhyb (generic hybrid), gen (genus), sphyb (specific hybrid), sp (specific epithet), isprk (infra-specific rank), isp (infra-specific epithet), and cul (cultivar). Commas present in fields not containing data.



Metasequoia glyptostroboides *Critically Endangered* (IUCN) (Arnold Arboretum Archives)

(e.g., *Picea glauca* var. *albertiana* f. *conica*), names without a specific epithet (e.g., *Weigela* 'Bristol Ruby' or *Nyssa* sp.), or even cultivars or hybrids could cause problems during the upload process.

Following the first upload, we contacted Meirion Jones, Head of Information Management at BGCI, to inquire about our experience. Through these discussions, we determined the need for further testing to identify potential problems between the types of plant names submitted and the upload results. We completed three unique data uploads in the summer of 2008, and repeated them again in the fall of 2009 (Table 1). They consisted of all taxa (Upload 1), all non-cultivar and non-hybrid taxa (Upload 2), and all taxa with a specific or hybrid epithet (Upload 3) in the Arboretum living collections. In addition to the "control" aspect of the

instructions (http://bgci.org/worldwide/plant_upload/) and submitted a .CSV (comma separated value) file containing a list of our taxa (Table 1) via our BGCI garden profile. Within 24 hours of the upload, the PlantSearch database verified each of our plant names using an automated IPNI (International Plant Names Index, www.ipni.org) query.

Heptacodium miconioides *Vulnerable* (IUCN), formally assigned conservation value as a result of the BGCI upload (Michael Dosmann)



The results: a list of "accepted" taxa with any associated IUCN Red List information available to download from our BGCI garden profile, and a list of taxa not recognized by IPNI or the PlantSearch database sent to us via e-mail.

Using BGCI's PlantSearch database

The first time we logged on to the Arboretum's BGCI profile in early 2008, we were surprised to find only 112 taxa listed on our plants list – 28 of them listed as threatened. We knew this was not an accurate representation of our collections so we commenced with the first upload attempt in 2008, and electronically submitted all 4,046 taxa in the Arboretum living collections. Upon reviewing the accepted and rejected taxa reported following the upload, we found that nearly 40% of the taxa we submitted were not included on either list and therefore missing (Table 2). A closer look at the data submitted to BGCI showed wide nomenclatural diversity (Table 1), and we hypothesized that some of the names may have caused ambiguous results via the IPNI query. For example, we wondered if names with multiple infra-specific ranks

first upload, Upload 2 sought to determine if hybrids and cultivars were problematic during the upload process, and Upload 3 attempted to establish if the presence or absence of a specific epithet made any difference in upload results.



Franklinia alatamaha Extinct in the Wild (IUCN), the Arnold Arboretum has the oldest and largest specimens in North America (Nancy Rose)

Lessons learnt

What did we learn from these various upload strategies? Simply conducting an upload in the first place resulted in the largest increase: Upload 1 in 2008 yielded numbers of cultivated and threatened taxa approximately 20- and 8-times greater than before, respectively (Table 2). A comparison of Upload 1 results between 2008 and 2009 also showed significant improvements in the numbers of accepted and missing taxa. It is probable that upgrades to the IPNI, BGCI, and the Arboretum plant records

Box 2. North American Botanic Garden Strategy for Plant Conservation, Target B4, Sub-Target 3:

75% of gardens that maintain plant record databases participate by sharing their plant collections list with the global BGCI database of plants in cultivation.

databases were responsible for these noticeable changes, as new information acquired, data cleaned, etc. Among the three upload versions, results demonstrate relative stability in the return of threatened taxa. However, with a goal of submitting as broad a sample of our plant records data to maximize taxonomic representation both on the BGCI database and in our conservation analysis, Uploads 1 and 3 seem to be the most effective. Finally, the differences between the two years, even if minor, illustrate the importance of updating our data regularly.

“ It is clearly important to update your records regularly. ”

Box 3. To get the most out of your PlantSearch Upload, we suggest the following tips:

- First, check your garden's BGCI profile! Is the number of taxa listed representative of your garden's current living collections?
- Consider the taxonomic composition of your garden's living collections. Do the taxa agree with the IPNI database? Can any obscure names be updated or removed from your list? Inspect the data you submit to the Plant Upload, and possibly do some data cleaning.
- Update your garden's Plant Upload on an annual basis – gardens and threat ranks change!

Beyond our own institution-specific need to identify the Arboretum's globally threatened holdings, this process benefits others as well. Our collections information is now part of BGCI's PlantSearch database and is available online to anyone. Although our plant inventory is already accessible online, this provides yet another resource and helps us achieve NABGSPC Target B4, Sub-Target 3 (Box 2). Furthermore, our



Magnolia amoena Vulnerable (IUCN) (Arnold Arboretum Archives)

Table 2. 2008-2009 BGCI Plant Upload tests for the Arnold Arboretum Living Collections

Year	Upload Version	Submitted ^a	Accepted ^b	Threatened ^c	Rejected ^d	Missing ^e
Pre-2008	Unknown	-	112	28	-	-
2008	Upload 1 – All taxa in the living collections	4,046	2,365	247	234	1,447
	Upload 2 – All non-cultivar, non-hybrid taxa: species or infra-specific (sub-species, varieties and formae)	2,201	2,047	257	138	16
	Upload 3 – All taxa with a specific or hybrid epithet: species, hybrids, cultivars or infra-specific (sub-species, varieties and formae)	3,601	3,421	267	144	36
2009	Upload 1 – All taxa in the living collection	3,989	3,412	258	476	101
	Upload 2 – All non-cultivar, non-hybrid taxa: species or infra-specific (sub-species, varieties and formae)	2,203	2,077	255	114	12
	Upload 3 – All taxa with a specific or hybrid epithet: species, hybrids, cultivars or infra-specific (sub-species, varieties and formae)	3,592	3,348	258	142	102

a Number of taxa submitted to the upload; b Number of taxa accepted via the upload IPNI query;

c Number of taxa assigned an IUCN Red List rank via the upload; d Number of taxa rejected via the upload IPNI query;

e Number of taxa not included as 'accepted' or 'rejected' via the upload.

threatened taxa can be included in global assessments like the Target 8 assessment of the 2009 Plant Conservation Report (CBD, 2009).

Lastly, this process facilitated a number of very fruitful conversations among Arboretum staff, IPNI, and BGCI representatives that have helped improve all of our efforts.

Key points:

Dynamic collections, Dynamic world

With respect to the differences in the total taxa we submitted (4,046 vs. 3,989) in 2008 and 2009 (Table 1), it is vital to note that living collections are constantly in flux, as are threat ranks (IUCN updates Red List threat ranks on an annual basis). Thus, the Plant Upload should be conducted by gardens annually to ensure all datasets are up to date.

Accurate conservation information

We compared the threatened names reported via the Upload, with IUCN data obtained independently, and found approximately 95% congruency. This confirms the valuable benefits of using the Upload.

Data updates by Gardens

Perhaps the most important take-home message from this small case study

relates to our initial increase from 28 to nearly 250 known globally threatened taxa in our living collections. This begs the questions: How many other gardens face similar circumstances? Are we underestimating species richness and genetic diversity of cultivated plants in public gardens simply because of insufficient data? And, even if you have recently uploaded your garden's collection data to the database, how complete and representative are they?

Call to Gardens

Based on our experience, we wholeheartedly advocate for a specific "call to gardens". To have a significant impact upon global *ex situ* plant conservation efforts, contribute your garden's plant records to the BGCI PlantSearch database. The benefits are twofold: a greater understanding of the conservation value of your own garden's collections, and an increase in the known world's cultivated taxa and *ex situ* conservation holdings.

References

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The BGCI PlantSearch database provides collections information about gardens worldwide and enables beneficial exchanges within the botanical community

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