

State of the *Flora of Australia* 2018

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Summary

The *Flora of Australia* (the Flora) is the authoritative account of Australia's plant biodiversity. The Flora is now being delivered on an interactive online platform. This presents both opportunities and challenges for moving the Flora towards completion.

The 2018 State of the Flora Report presents the results of a snapshot assessment of Flora content as at July 2018, including gaps and updates required to existing content. The key findings are:

- The Flora contains profiles for around 11,600 families, genera and species.
- Of the 307 plant families listed in the Australian Plant Census (APC), 225 have been treated for the Flora and 31 of these are APC-compliant (that is, in line with current taxonomy).
- The majority of existing Flora content requires some level of revision, ranging from minor editorial review (43 families) to moderate review including addition of taxa described since publication of the Flora (87 families) and major revision including the addition of substantial numbers of taxa (60 families).
- Current gaps in the Flora include over 17,000 APC-accepted family, genus and species names that are yet to be treated for the Flora. There are 86 families that require complete treatments.
- Most of the plant families yet to be treated for the Flora (54%) are small (10 or fewer taxa).
- The ABRS has unpublished, partial treatments for 43 families not previously treated for the Flora. Some of these are currently being adapted for the online Flora.

This report provides a framework for updating and building Flora content, including options and considerations for setting priorities for future work.

Introduction

The Flora is the leading national account of Australia's plant biodiversity. The Flora provides authoritative information about native and naturalised plants occurring in Australia, including names, characteristics, distribution and habitat and diagnostic keys to enable identification. The Australian Biological Resources Study (ABRS), a program of the Australian Government Department of the Environment and Energy, is responsible for managing the production of the Flora using content contributed by Australian taxonomic botanists.

The Flora was published as a hard copy series from 1981 to 2015, with about half of the originally planned 60 volumes published. In 2017, a partnership between the ABRS, Council of Heads of Australasian Herbaria and the Atlas of Living Australia led the delivery of the Flora on a new digital platform (www.ausflora.org.au). On this platform, digital Flora treatments are managed as a collection of taxon profiles. Each profile includes descriptive text and linked data from other online Australian bioinformatics resources. Linked data include: classification and nomenclatural information from the National Species List (Australian Plant Name Index and the Australian Plant Census); diagnostic keys from Keybase; distribution maps from the Australasian Virtual Herbarium; taxonomically verified images from the Australian Plant Image Index; and other biodiversity data from the ALA. The linked data and descriptive text can be updated by ABRS-approved users, allowing the information presented in the digital Flora to be taxonomically up-to-date, while maintaining the scientific rigour and authority of the original hard copy series.

The move to online delivery has made the Flora discoverable, accessible and interactive and allows for more rapid updates as needed. For example, treatments at various ranks can now be included without waiting for a whole volume to be complete. This provides an opportunity to build momentum toward completing the Flora. A "complete" Flora would fully reflect the Australian Plant Census (APC). The APC is the Council of Heads of Australasian Herbaria approved checklist of the currently accepted scientific names of plants (including vascular plants and bryophytes) for Australia. A complete Flora is also seen as a desirable goal to help better serve the needs of the diverse range of users, including researchers, policy makers and all who need access to an authoritative, comprehensive biodiversity knowledge base.

The aim of the State of the Flora project was to assess the work required to complete the Flora, including current gaps and updates required to existing Flora content. This work builds on a previous assessment by Thiele (2016a, available on request). Results of this assessment will be used to inform priorities for future work. This assessment focuses on updates needed to descriptive text within Flora profiles, to harmonise content with the APC. The ABRS intends to review the status of linked data (e.g. maps, images) and updates needed at a later stage.

As the Flora is a national collaborative resource, the ABRS encourages feedback from the botanical community regarding future priorities for completing treatments to fill the identified gaps. The ABRS is excited to take advantage of the new, digital platform to tap into taxonomic knowledge from across the country and speed up the completion of the Flora.

Methods

ABRS conducted a snapshot assessment of the Flora content against the APC, as at July 2018. We did this by comparing a list of APC-accepted family, genus and species names (downloaded from <https://biodiversity.org.au/nsl/services/export/index>) with a list of Flora taxon names. The process is shown diagrammatically in Figure 1. Additional taxon profiles, including for minor ranks (e.g. subgenus, tribe) were not included in this assessment.

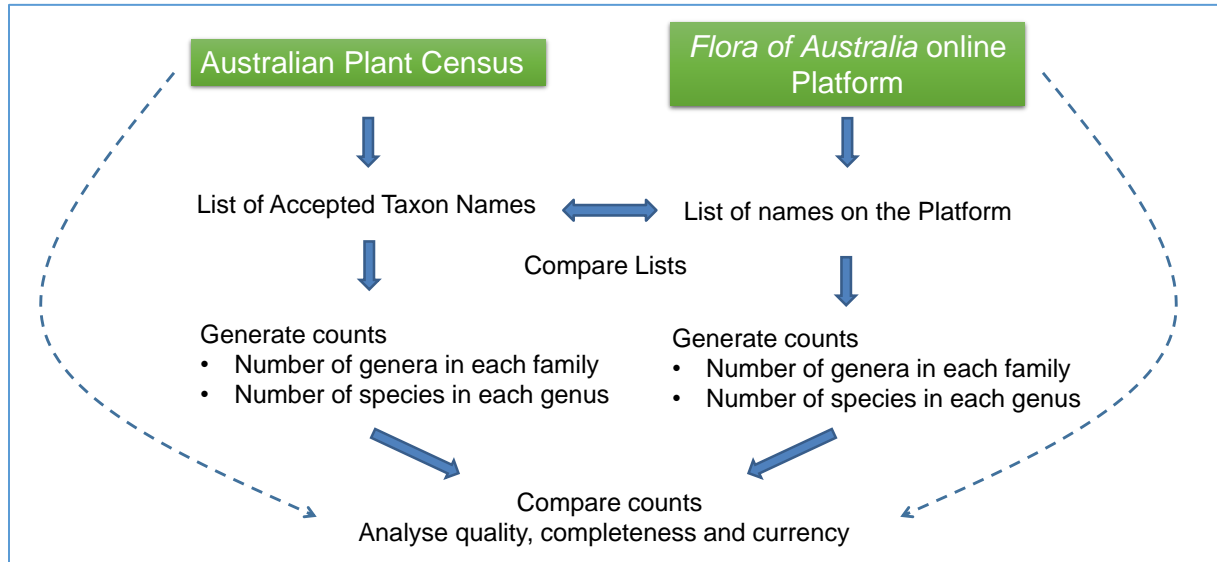



Figure 1. Diagrammatic representation of the method used to assess the state of the Flora.

The analysis identified which taxa had been treated for the Flora (existing content), which taxa had not yet been treated for the Flora (gaps) and which Flora taxon names were no longer APC-compliant. We also generated counts of the number of genera in each family and the number of species in each genus in the APC and on the Flora. By comparing the counts of APC-accepted names to the number of profiles on the *Platform* and by assessing the quality of the existing profiles manually, we identified where taxonomic changes had occurred since the treatments' hard copy publication and therefore where updates were required (updates).

To better understand the extent of updates required to harmonise existing Flora content with the APC, we categorised family-level treatments as outlined in Table 1. Appendix 1 contains examples of the types of editing required to complete the Flora treatment for families in each of these categories.

Since the first hard copy volume of the Flora was published in 1981, the ABRS has received numerous manuscripts for publication in planned, but as yet unpublished, Flora volumes. We included the taxa treated in these manuscripts in our assessment.

Table 1. Explanation of categories used to sort families into the level of updating required (for harmonisation with the APC).

CATEGORY OF UPDATE REQUIRED	DESCRIPTION OF UPDATES REQUIRED	AMOUNT OF WORK REQUIRED
APC-COMPLIANT	Flora treatments of these families are APC-compliant, as reflected by their matching taxonomies. These treatments may need some minor editorial revision.	 <p data-bbox="1273 432 1328 457">Less</p> <p data-bbox="1268 1142 1333 1167">More</p>
MINOR REVISION	Flora treatments of these families require only minor edits for harmonisation with the APC. For example, some editing of descriptive text, curation of linked data, and addition of new taxa described since the Flora treatment was published or last updated.	
MODERATE REVISION	In general, Flora treatments of these families have <20 missing taxa, and/or the treatment is estimated to be >50% complete.	
MAJOR REVISION	Flora treatments of these families have a large number of missing taxa and need more extensive revision. In general, the Flora treatments have >20 missing taxa (which may include a family-level taxon profile), and/or are estimated to be < 50% complete. For some families, pro-parte Flora treatments may have originally been treated in a different family, but have subsequently been taxonomically revised, e.g. splits and new combinations.	
COMPLETE TREATMENT	These families are yet to be treated the Flora (in entirety).	

Results

Existing Content: What's in the Flora?

Table 2 shows the number of APC-accepted names and the number of profiles in the Flora of Australia by rank. At the time of our assessment, the eFlora contained over 11,600 family, genus and species profiles (216 family, 1472 genus and 9,924 species), plus an additional 42 partial and unedited treatments on file at ABRS. Approximately 10,050 APC accepted species are partially represented (e.g. through *pro parte* synonymy) in the eFlora, including 9,147 with APC-compliant names (representing 37% of all APC species). There are at least partial eFlora treatments of 225 families (73% of all APC-listed families), including 183 with APC-compliant names. There are 1492 APC genera partially represented in the eFlora (48% of APC-listed genera), including 1,405 APC compliant names. *Updates: What revisions are required?*

The Flora currently includes taxon profiles with varying levels of completeness (e.g. empty profiles, taxa missing from family level treatment), currency and quality (data loading issues such as lost formatting, linked data curation).

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Figure 2. Extent of updates required to harmonise family-level *Flora of Australia* treatments with the *Australian Plant Census*.

Figure 2 shows the proportion and number of families that require different levels of revision to be brought into line with the APC. Of the 225 families that are already treated (at least partially) in the Flora, around 10% are APC-compliant, 14% need minor revision, 28% need moderate revision, and 20% require major revisions. The families in each category are listed in Appendix 2.

Gaps: What content is missing from the Flora?

There are approximately 16000 APC-accepted taxa that are yet to be treated for the Flora, even through synonymy. There are no digital or unpublished treatments for 86 APC accepted families, representing 862 genera. Figure 3 shows the distribution of families not yet treated in the Flora across size classes. Of the 86 families requiring a complete treatment in the Flora, most (51%) are small families with 10 or fewer taxa. Seventeen percent of the families yet to be treated for the Flora include more than 100 genera.

Figures 2 & 3 includes the unpublished manuscripts held on file by ABRS. Some of these manuscripts are yet to be edited, some will require updating in line with current taxonomy, and some are ready for delivery on the Flora. More details can be found in Appendix 3.

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Figure 3. Number of plant families (in the APC) in different size classes that are yet to be treated for the *Flora of Australia*

Table 2. Number of taxon names accepted in the APC, number of taxon profiles in the Flora and number of names missing from the Flora.

RANK	APC ACCEPTED NAMES	NAMES IN EFLORA	APC COMPLIANT NAMES IN EFLORA	APC TAXA REPRESENTED IN EFLORA THROUGH SYNONYMY AND TAXONOMIC CHANGES
FAMILY	307	216	183	221
GENUS	3,092	1,472	1,405	1,492
SPECIES	24,381	9,924	9,147	c. 10,050
INFRA-SPECIFIC TAXA	4,184	2,080	1,698	Not calculated

Case Studies

The existing Flora family treatments will require varying levels of revision to harmonise them with the APC. The following examples demonstrate how the State of the Flora project revealed what type of updating is required for each family.

Example 1: Solanaceae

Our results showed that the Flora treatment of Solanaceae only included 22 of the now 26 APC-accepted genera, and only 198 of the 316 APC-accepted species. This means more than 100 additional Flora species treatments (taxon profiles) are needed to align the Flora Solanaceae treatment with the current APC concept of the family. This reflects taxonomic revision to this family since the original publication of the Flora treatment (Purdie *et al.* 1982). Due to the large number of missing taxa, we categorised Solanaceae as requiring major revisions. This example demonstrates the value of generating genera and species counts to quickly identify gaps in the Flora.

Example 2: Banksia and Dryandra

The APC currently accepts 176 species in *Banksia*, a genus in Proteaceae. Results of our analysis showed that the Flora treatment of *Banksia* currently includes 78 *Banksia* species. Based on this number, it could be assumed that the Flora treatment requires substantial revision to include 98 extra species. However, around 90 species now classified as *Banksia* were previously treated in the Flora as *Dryandra* (Mast and Thiele 2007). These *Dryandra* profiles require minimal revision other than an updated name to bring them into *Banksia* and into line with the APC. At the family level, however, the Flora treatment of Proteaceae requires major revisions to become aligned with the APC as 62 species are yet to be treated and three genus profiles require revision. This example demonstrates the limitations of simple taxon counts in comparing the Flora to the APC, and the importance of applying an understanding of taxonomy to the analysis.

Example 3: Chenopodiaceae

Our assessment showed that as at July 2018, both the APC and the Flora treated 26 genera in the family Chenopodiaceae. This suggests that the Flora treatment should be APC-compliant, with all the APC-listed genera for Chenopodiaceae present in the Flora. However, this is a data processing error. The original Flora treatment (Wilson 1984) treated 32 genera, of which 6 have since been combined into *Tecticornia*. As the electronic platform reflects the APC taxonomy, this was not immediately obvious. The Flora is also missing several new taxa that have been described in Chenopodiaceae since the Flora treatment was published. This example demonstrates the importance of supplementing the analysis of taxon counts with manual analysis to identify gaps in the Flora.

Priorities for future work

Below we outline some considerations and options for prioritising future work to build and update the Flora. This includes a proposed set of five year priorities, which will likely be pursued concurrently. ABRS invites feedback on this report to inform these priorities. These priorities may change depending on available resources and based on some of the considerations outlined below.

ABRS five year priorities

Over the next five years, the ABRS intends to focus on the following priorities:

- Updating existing content, initially focusing on small and medium families (<15 taxa) for which information is available in the literature/other floras (see Appendix 2)
- Working with relevant authors to make previously submitted (unpublished) treatments available, either publicly (if publication-ready) or in draft (accessed on the Flora platform with ABRS permission)
- Following a top-down approach to fill gaps in the Flora. This may be undertaken by working with managers of other Floras, and with the botanical taxonomic community, to share available data.

Updating existing Flora content

Existing Flora treatments include content originally published in the hard copy Flora series and newly added treatments. Some of the new content is derived from treatments previously submitted to the ABRS for inclusion in planned, but as yet unpublished, hard copy Flora volumes (Appendix 3). As the Flora hard copy series was published over a 40 year period, some of the content lifted from the hard copy books is now out of date. The ABRS considers working to harmonise existing Flora content with the APC as a priority for future work as this will help simplify governance and workflow processes and reduce confusion for users.

Varying levels of updates are required to harmonise existing content with the APC. Our results showed that, of the 221 families already treated for the Flora, 31 (10%) were considered APC-compliant, 43(14%) require minor editorial review, 87 (28.3%) require a moderate level of revision and 60 (19.5%) require a major level of revision. These results show that there may be some easy wins for harmonising the Flora with the APC, such as focusing initially on the 43 family treatments requiring minimal updates. Families requiring more extensive revision may be updated over time in consultation with the botanical taxonomic community and as new treatments or revisions are published.

As demonstrated by our case studies (above), identifying what level of revision is required for each treatment requires expert and systematic review of each profile. The APC-compliant Flora content may still require some editorial review and curation of linked data, for example, to ensure distribution maps (delivered from the AVH) accurately reflect the treatment presented. Linked data and images from other databases are important parts of Flora treatments but were not addressed in this analysis. In the future, the ABRS may review which taxa are poorly represented in the Australian Plant Image Index to encourage new contributions. Flora treatments currently require inclusion of dichotomous keys to support identification. In the future, we may look at new ways of linking other types of keys such as matrix-based keys (e.g. existing Lucid keys).

An important part of harmonising Flora content with the APC will be to make previously submitted but as yet unpublished manuscripts available, either publicly (where publication-ready) or in draft form. The ABRS will work with relevant authors to edit and publish them.

Filling gaps in the Flora – new treatments

Appendix 2 lists the 86 families not yet treated in the Flora that can be considered gaps. This includes 44 small families (less than 10 taxa), 27 medium-sized families (11-100 taxa), 10 large families (101-400 taxa) and 5 very large families (more than 400 taxa). The ABRS welcomes contribution of new Flora content from taxonomic botanists.

In 2016, Thiele (2016a) analysed the contents of the Flora of Australia Online¹ and the *Flora of Australia* books and found that the Flora is 43% complete at genus level and 34% complete at species level. The results presented here are broadly consistent with Thiele's (2016a) analysis, but our analysis suggests the Flora is more complete, at least partially representing 48% of genera and 41% of species. The ABRS will seek to fill gaps in the Flora through multiple avenues. The ABRS will work to: adapt treatments from available scientific literature, share data with other Floras, engage the taxonomic community to provide content and fund the creation of new content through the National Taxonomy Research Grant Program. The ABRS has identified some priority families for new treatments (available on the ABRS Research Grants webpage <http://www.environment.gov.au/science/abrs/grants/research-grants>).

This report shows that many of the current gaps include small families (< 10 taxa), which could be a priority for future work. Alternatively, a few larger families might be selected as priorities or priorities could be set according other criteria. Considerations for prioritising new treatments for inclusion in the Flora (addition of new Flora content) may include:

- Taxonomic stability (add the most taxonomically stable taxa first)
- Work being done in the Australian taxonomic community (add the taxa that contributors are currently working on first)
- Availability of data in state-based floras (add the taxa that have treatments in state-based floras first)
- The contribution a family treatment would make to the comprehensiveness of Australia's floristic information (add the taxa which would substantially increase the comprehensiveness of Australia's floristic information because the taxa are not yet treated in other publications first).

A Top-Down Approach

As suggested by Thiele (2016c), the ABRS has adopted a top-down approach to completing the Flora, focusing first on completing family-level taxon profiles, then genus-level then species-level profiles. This will progressively build a framework for the Flora onto which the later additions can be built. Figure 2 shows a proposed timeline for completion of family- and genus-level profiles. Appendix 4 contains a list of family level profiles that are currently contracted for completion by early 2019. While the family and genus-level profiles are being added, contributors are encouraged to contribute treatments for partial or whole families to a species and infra-specific taxa level.

¹ The Flora of Australia Online was a precursor to the Flora of Australia online platform (the Platform).

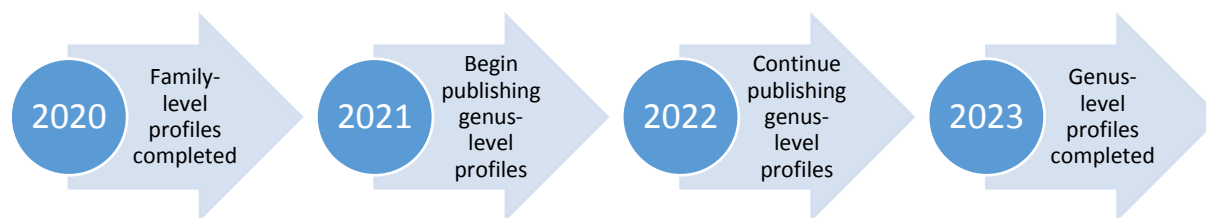


Figure 2 Timeline for completing family and genus-level profiles.

Capacity Building

The ABRS will provide assistance and training to any interested or potential Flora contributors regarding managing Flora content (including curating linked data) on the digital platform. Please contact the ABRS at abrs@environment.gov.au for more information, including a copy of the Flora Contributor Guidelines.

Limitations and future reports

This analysis provides a snapshot view of the Flora at one point in time. Given the dynamic nature of the new online Flora, the state of the Flora will need to be updated periodically to examine progress made over time and allow for the re-assessment of priorities for future work. This first State of the Flora report provides a baseline on which future assessments can build. The ABRS plans to review the state of the Flora in 2021.

Conclusion

This report provides a snapshot assessment of the Flora, including what gaps are present and what existing content needs to be updated. There are 86 families that are not yet treated in the Flora and most of the treated families require editing or revision. ABRS considers aligning existing content with the APC, filling gaps and publishing manuscripts submitted for planned, but unpublished, Flora volumes as priorities for future work.

The new *Flora of Australia* online platform provides an exciting opportunity to engage the botanical community in gap-filling and update of the Flora. Now that we understand the state of the Flora as of July 2018, ABRS can strategically build the Flora in partnership with the Australian botanical community. Future State of the Flora assessments will measure the degree of progress made against this report, allowing ABRS and partners to more efficiently and effectively target resources to complete the Flora for the benefit of all users.

Acknowledgments

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- Rex Croft conducted data analysis for this report.
- Kevin Thiele provided previous reports and analyses regarding the *Flora of Australia*, including the references cited below.
- The Flora of Australia Advisory Group provided ongoing guidance and support.

References

Purdie, R.W., Symon, D.E., Haegi, L. (1982) Solanaceae. In: *Flora of Australia* Volume 29: 1-2. Australian Biological Resources Study, Department of the Environment and Energy and CSIRO, Canberra.

Mast, A.R. & Thiele, K.R. (2007) The transfer of *Dryandra* R.Br. to *Banksia* L.f. (Proteaceae). *Australian Systematic Botany* 20(1): 66.

Taxonomy Decadal Plan Working Group. (2018) *Discovering Biodiversity: A Decadal Plan for Taxonomy and Biosystematics in Australia and New Zealand 2018-2027*. Australian Academy of Science and Royal Society Te Apārangi: Canberra and Wellington. (www.science.org.au/support/analysis/decadal-plans-science/discovering-biodiversity-decadal-plan-taxonomy)

Thiele, K. (2016a) *Analysis of Flora of Australia profiles and harmonisation with the Australian Plant Census: A report for Australian Biological Resources Study*. EuBio Consulting, Inglewood, WA (available on request).

Thiele, K. (2016b) *The eFlora of Australia – dealing with legacy Flora of Australia content*. EuBio Consulting, Inglewood, WA (available on request).

Thiele, K. (2016c) *A mixed model for completion of the eFlora of Australia*. EuBio Consulting, Inglewood, WA (available on request).

Appendix 1: Examples to Demonstrate Analysis Method

The following section presents examples of families that fall into each category.

APC Compliant

Table 3 shows an example output for Lygoniaceae, Ruppiaceae and Sphenocleaceae. These are examples of families that are APC-compliant on the Platform, although both Lygoniaceae and Ruppiaceae will require small revisions. Sphenocleaceae has recently been updated and unless there is taxonomic movement in that family in the future it should not need to be reviewed.

Table 3 Examples of families categorised as APC-compliant.

Family Name	APC-Accepted?	Family-level Flora Profile	APC Genus Count	Flora Genus Count	APC Species Count	Flora Species Count	Work required	Notes
Lygoniaceae	Yes	Yes	1	1	4	4	APC Compliant	Editorial review needed
Ruppiaceae	Yes	Yes	1	1	4	4	APC Compliant	Genus profile is a stub
Sphenocleaceae	Yes	Yes	1	1	1	1	APC Compliant	Updated

Minor revision

Flacourtiaceae, Frankeniaceae and Gelsemiaceae are examples of families requiring review (Table 4). They will require an expert to make changes to existing profiles but these changes are not substantial.

Table 4 Examples of families categorised as needing review.

Family Name	APC-Accepted?	Family-level Flora Profile	APC Genus Count	Flora Genus Count	APC Species Count	Flora Species Count	Work required	Notes
Flacourtiaceae	No	Yes	0	0	0	0	Minor revisions	Family no longer APC compliant, remove profile.
Frankeniaceae	Yes	Yes	1	1	45	49	Minor revisions	Family profile states 47 species. Subtaxa placement on platform is inconsistent.
Gelsemiaceae	Yes	Yes (draft)	1	1	1	1	Minor revisions	Family profile is a stub.

								Profiles need editorial review.
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Moderate revision

Costaceae, Cyatheaceae and Dasypogonaceae are examples of families requiring moderate revision (Table 5). They are all missing a small to medium number of species and have a few errors that will need to be corrected, either in content or in the way the profiles are displaying on the Platform.

Table 5 Examples of families categorised as needing revision.

Family Name	APC-Accepted?	Family-level Flora Profile	APC Genus Count	Flora Genus Count	APC Species Count	Flora Species Count	Work required	Notes
Costaceae	Yes	Yes	3	3	3	2	Moderate revision	<i>Costus dubius</i> missing, family profiles states 2 genera, one genera not mapping to family
Cyatheaceae	Yes	Yes	1	1	17	12	Moderate revision	Several species missing
Dasypogonaceae	Yes	No	4	4	17	8	Moderate revision	Family level profile does not exist; <i>Calectasia</i> has 9 species missing

Major Revisions

Example 1: Solanaceae

Table 6 shows the output of Solanaceae. There is a discrepancy between the APC and the Flora in this case, indicating that there has been taxonomic revision to this family since its publication. Due to the large number of missing taxa (100+ species), Solanaceae was classified as requiring a major revision.

Table 6 Output for Solanaceae, a family categorised as requiring a major revision.

Family Name	APC-Accepted?	Family-level Flora Profile	APC Genus Count	Flora Genus Count	APC Species Count	Flora Species Count	Work required
Solanaceae	Yes	Yes	26	22	316	198	Major revision

Example 2: Banksia and Dryandra

There are 176 *Banksia* species names accepted by the APC (Table 7). This includes over 90 species that were previously classified as *Dryandra* species. The Flora contains profiles for almost all *Banksia* species although over 90 of those retain the name *Dryandra*. These profiles will only require a name change to become APC compliant, but given the number of profiles requiring editing and the number of species from other genera that need to be added, Proteaceae is categorised as requiring a major revision.

Table 7 Output for Proteaceae, a family categorised as requiring a major revision.

Family Name	APC-Accepted?	Family-level Flora Profile	APC Genus Count	Flora Genus Count	APC Species Count	Flora Species Count	Work required
Proteaceae	Yes	Yes	49	49	1173	1111	Major revision
Genus Name	APC-Accepted?	Genus-level Flora Profile	APC Genus Count	Flora Genus Count	APC Species Count	Flora Species Count	
<i>Banksia</i>	Yes	Yes	1	1	176	78	
<i>Dryandra</i>	No	Yes	0	1	0	94	

Example 3: Chenopodiaceae

While the number of genera in the APC and in the Flora for Chenopodiaceae is the same (Table 8), there are combined and missing genera in this family. There are a large number of missing species, so this family will require major revision.

Table 8 Output for Chenopodiaceae, a family categorised as requiring a major revision.

Family Name	APC-Accepted?	Family-level Flora Profile	APC Genus Count	Flora Genus Count	APC Species Count	Flora Species Count	Work required
Chenopodiaceae	Yes	Yes	26	26	346	304	Major revision

Complete Treatment

Table 9 shows an example output for Convolvulaceae and Cyathodiaceae, examples of a large and small family, respectively, requiring a complete treatment. Although Convolvulaceae has a draft family-level profile, it is categorised as requiring a complete treatment.

Table 9 Examples of the output for families categorised as requiring a complete treatment.

Family Name	APC- Accepted?	Family -level Flora Profile	APC Genus Count	Flora Genus Count	APC Species Count	Flora Species Count	Work required
Convolvulaceae	Yes	Yes (draft)	23	0	162	0	Complete treatment
Cyathodiaceae	Yes	No	1	0	1	0	Complete treatment

Appendix 2

The following lists give a broad indication of the amount of updates each family requires.

Complete Treatment - These families are missing from the Flora. They can be considered gaps. They may have a draft profile at the family level, but taxa within the family still need to be treated. Families marked with an * are families of <15 taxa and restricted to a single state. These families may be particularly easy to add to the Flora.

Acanthaceae	Ericaceae	Orchidaceae
Adoxaceae	Eriocaulaceae	Orobanchaceae
Aphanopetalaceae	Erythroxylaceae	Oxalidaceae
Apiaceae	Escalloniaceae	Paulowniaceae*
Araliaceae	Geraniaceae	Pedaliaceae
Argophyllaceae	Gesneriaceae	Pentaphragmaceae
Begoniaceae*	Griselinaceae*	Phrymaceae
Bignoniaceae	Grossulariaceae	Pittosporaceae
Burmanniaceae	Heliconiaceae*	Plantaginaceae
Byblidaceae	Hydrangeaceae	Polemoniaceae
Calceolariaceae	Hydroleaceae*	Polygalaceae
Campanulaceae	Hypericaceae	Polygonaceae
Caprifoliaceae	Juglandaceae	Portulacaceae
Caricaceae	Juncaceae	Primulaceae
Cephalotaceae*	Lamiaceae	Putranjivaceae
Chrysobalanaceae	Lardizabalaceae*	Rosaceae
Commelinaceae	Lentibulariaceae	Rousseaceae
Connaraceae*	Linaceae	Rubiaceae
Convolvulaceae	Linderniaceae	Sapotaceae
Crassulaceae	Malpighiaceae*	Sarraceniaceae*
Cunoniaceae	Malvaceae	Saxifragaceae
Cyperaceae	Marantaceae*	Strelitziaceae*
Didiereaceae*	Martyniaceae	Surianaceae
Dilleniaceae	Mayacaceae*	Symplocaceae
Ebenaceae	Menyanthaceae	Tetrachondraceae
Ecdeiocoleaceae*	Muntingiaceae	Thismiaceae
Elaeocarpaceae	Myodocarpaceae	Vitaceae
Elatinaceae	Neuradaceae	Xyridaceae
Emblingiaceae*	Oleaceae	

Major revision - These families have a large number of missing taxa and will require a full review.

Achariaceae	Asteraceae	Chenopodiaceae
Aizoaceae	Berberidopsidaceae	Cistaceae
Amaranthaceae	Betulaceae	Cleomaceae
Amaryllidaceae	Boraginaceae	Cucurbitaceae
Apocynaceae	Brassicaceae	Cupressaceae
Araceae	Cactaceae	Droseraceae
Areaceae	Caryophyllaceae	Euphorbiaceae

Fabaceae
Fagaceae
Flagellariaceae
Gentianaceae
Goodeniaceae
Grammitidaceae
Haloragaceae
Hymenophyllaceae
Liliaceae
Loranthaceae
Lythraceae
Marattiaceae
Melastomataceae

Meliaceae
Moraceae
Myrtaceae
Nyctaginaceae
Pandanaeae
Paracryphiaceae
Passifloraceae
Phyllanthaceae
Picrodendraceae
Poaceae
Podostemaceae
Polypodiaceae
Proteaceae

Ranunculaceae
Restionaceae
Rhamnaceae
Rutaceae
Salicaceae
Sapindaceae
Scrophulariaceae
Simaroubaceae
Solanaceae
Stylidiaceae
Thymelaeaceae
Urticaceae
Violaceae

Moderate Revision - These families have missing taxa. These families may have some taxa that do not need revision.

Alismataceae
Alliaceae
Anacardiaceae
Annonaceae
Apodanthaceae
Araucariaceae
Aristolochiaceae
Asparagaceae
Asphodelaceae
Aspleniaceae
Asteliaceae
Balanophoraceae
Balsaminaceae
Bixaceae
Blechnaceae
Boryaceae
Burseraceae
Campynemataceae
Cannabaceae
Capparaceae
Casuarinaceae
Celastraceae
Centrolepidaceae
Ceratophyllaceae
Colchicaceae
Combretaceae
Cornaceae
Corynocarpaceae
Costaceae

Cyatheaceae
Cycadaceae
Dasypogonaceae
Dioscoreaceae
Doryanthaceae
Elaeagnaceae
Equisetaceae
Gleicheniaceae
Gyrostemonaceae
Haemodoraceae
Hemerocallidaceae
Hernandiaceae
Hydatellaceae
Hydrocharitaceae
Iridaceae
Isoetaceae
Juncaginaceae
Lauraceae
Lecythydaceae
Limeaceae
Lindsaeaceae
Loganiaceae
Lomariopsidaceae
Lycopodiaceae
Marsileaceae
Menispermaceae
Monimiaceae
Musaceae
Nepenthaceae

Nymphaeaceae
Ochnaceae
Onagraceae
Osmundaceae
Papaveraceae
Pennantiaceae
Petermanniaceae
Phytolaccaceae
Pinaceae
Piperaceae
Plumbaginaceae
Podocarpaceae
Pontederiaceae
Potamogetonaceae
Pteridaceae
Resedaceae
Rhizophoraceae
Santalaceae
Selaginellaceae
Smilacaceae
Tamaricaceae
Tectariaceae
Thelypteridaceae
Ulmaceae
Verbenaceae
Winteraceae
Woodsiaceae
Xanthorrhoeaceae
Zamiaceae

Minor Revision - These families require someone to correct errors in the treatments, such as inconsistencies between the stated number of taxa and the actual number. There may be nomenclatural issues, such as incorrect links between the Flora and the APC, which require attention. However, these families generally have most of the taxa on the platform. There may be a few missing taxa. Some families in the “minor revision” category have APC-compliant treatments on the Platform in draft form only which will need to be reviewed to release them to public view.

Actinidiaceae	Corsiaceae	Nitrariaceae
Agapanthaceae	Cymodoceaceae	Nothofagaceae
Agavaceae	Davalliaceae	Olacaceae
Akaniaceae	Dennstaedtiaceae	Oleandraceae
Alseuosmiaceae	Dichapetalaceae	Philydraceae
Alstroemeriaceae	Dryopteridaceae	Platanaceae
Aquifoliaceae	Frankeniaceae	Psilotaceae
Atherospermataceae	Gelsemiaceae	Ripogonaceae
Austrobaileyaceae	Hypoxidaceae	Salviniaceae
Basellaceae	Icacinaceae	Tecophilaeaceae
Bataceae	Luzuriagaceae	Theaceae
Calycanthaceae	Molluginaceae	Zingiberaceae
Cannaceae	Moringaceae	Zosteraceae
Cardiopteridaceae	Myristicaceae	
Clusiaceae	Nelumbonaceae	

APC-Compliant - These families can be considered taxonomically up-to-date. The genera and species in the Flora match those accepted by the APC. These families may still require editorial review to fix formatting, punctuation, images etc.

<u>Anarthriaceae</u>	<u>Gunneraceae</u>	<u>Sparganiaceae</u>
<u>Aponogetonaceae</u>	<u>Hamamelidaceae</u>	<u>Sphenocleaceae</u>
<u>Balanopaceae</u>	<u>Hanguanaceae</u>	<u>Stemonaceae</u>
<u>Berberidaceae</u>	<u>Himantandraceae</u>	<u>Taccaceae</u>
<u>Blandfordiaceae</u>	<u>Lygodiaceae</u>	<u>Trimeniaceae</u>
<u>Bromeliaceae</u>	<u>Melianthaceae</u>	<u>Triuridaceae</u>
<u>Cabombaceae</u>	<u>Ophioglossaceae</u>	<u>Tropaeolaceae</u>
<u>Datisceae</u>	<u>Opiliaceae</u>	<u>Typhaceae</u>
<u>Dicksoniaceae</u>	<u>Posidoniaceae</u>	<u>Zygophyllaceae</u>
<u>Dipteridaceae</u>	<u>Ruppiaceae</u>	
<u>Eupomatiaceae</u>	<u>Schizaeaceae</u>	

Appendix 3

The following table contains notes about the partial treatments stored with the ABRS. All unpublished treatments require review prior to publication. Some treatments are currently being edited and placed onto the platform by ABRS staff and contributors. This list does not include several liverwort treatments that ABRS has on file, which are currently considered out of scope for the Flora.

Table 10 Families with partial treatments stored with the ABRS.

FAMILY	UNPUBLISHED MANUSCRIPTS SUMMARY AND NOTES
ACANTHACEAE	Unedited treatment of 22+ genera. 2008 treatment of <i>Avicennia</i> (2 species; 3 subspecies) is being edited for release on the Flora (in draft).
ALSEUOSMIACEAE	Family treatment currently being edited for release on the Flora (in draft)
AMARANTHACEAE	<i>Ptilotus</i> (genus; 96 species).
ASTERACEAE	10 genera, subtribe Ecliptinae and tribes: Heliantheae, Anthemideae, Coreopsideae, Neurolaeneae, Helianthinae, Montanoineae, Verbesininae, Spilanthinae, Zinniinae, Amprosiinae, Millerieae and Eupatorieae. Unedited treatments last modified between 2012 and 2015.
BORAGINACEAE	<i>Heliotropium</i> – edited manuscript. Amsinck (incomplete); Boraginaceae <i>sens. str.</i> ; <i>Halgania</i> .
CARYOPHYLLACEAE	Most genera, currently being edited for release on the Flora (in draft) <i>Scleranthus</i> (genus; 9 species) edited.
CENTROLEPIDACEAE	Treatment loaded to the Flora (in draft).
CEPHALOTACEAE	Whole family, edited treatment.
CHRYSOBALANACEAE	Whole family, edited treatment.
COMMELINACEAE	<i>Cartonema</i> – unedited 2017. Commelinaceae manuscript.
CONNARACEAE	Whole family, edited treatment.
CONVOLVULACEAE	20 genera and ~120 species; 145-page document.
CYPERACEAE	<i>Abildgaardia</i> , <i>Crosslandia</i> , <i>Trachystylis</i> . Unedited treatments.
ERICACEAE	Tribe Epacridae (including 5 genera and 29 species), <i>Rhododendron</i> (edited in 2016) and <i>Styphelia</i> .
EUPHORBIACEAE	Family treatment is almost complete and currently being edited for release on the Flora.
FABACEAE	24 genera and the following tribes: Aeschynomeneae, Sophoreae, Dalbergieae, Abreae, Robineae, Phaseoleae, Galegeae, Coronilleae, Hedysareae, Cicereae, Genisteae, Bossiaeeae.
FLAGELLARIACEAE	A manuscript compiled prior to the family's complete revision by Wepfer and Linder (2014).
GESNERIACEAE	1990 treatment needs revision.
HYPERICACEAE	<i>Hypericum</i> and <i>Triadenum</i> (Kodela & Barrett revised version pending)
LENTIBULARIACEAE	56 species (APC listed 80 in 2010).
LINACEAE	<i>Hugonia</i> (Family; 1 genus; 1 species, 2004); Linaceae (2 genera; 6 species, 2004).
MACARTHURIACEAE	11 Taxa edited and formatted for release on the Flora.
MALPIGHIACEAE	Family; 4 genera; 4 species; 2009.
MALVACEAE	Tiliaceae (family; 9 genera; 116 species).

MARTYNIACEAE	Whole family, edited and formatted for the Flora.
MENYANTHACEAE	<i>Liparophyllum</i> , <i>Nymphoides</i> and <i>Villarsia</i> . Unedited treatments. (Will require nomenclatural edits e.g. <i>Villarsia</i> taxa to <i>Liparophyllum</i>).
MYRTACEAE	50+ genera, Tribe Chamelaucieae and the following groups: <i>Astartea</i> , <i>Baeckea</i> , <i>Micromyrtus</i> .
ORCHIDACEAE	<i>Thelymitra</i> , <i>Corybas</i> , <i>Chiloglottis</i> and <i>Calochilus</i> .
PITTOSPORACEAE	9 genera and an unknown number of species; 100-page document. Partial edits.
PLANTAGINACEAE	Callitrichaceae.
POACEAE	35+ genera.
POLYGALACEAE	Xanthophyllaceae (family; 1 genus; 2 species; 2009) edited.
POLYGONACEAE	Family; 11 genera; 60 species.
PRIMULACEAE	4 genera; 29 species. (ABRS is working with I. Telford on a revised version of this treatment; also Myrsinaceae treatment to be incorporated and new family profile is required)
RESTIONACEAE	<i>Chordifex</i> unedited treatment.
RHAMNACEAE	15 genera; Tribes: Gouanieae, Ventilagineae, Paliureae, Rhamneae, Colletieae, Phliceae, <i>Noltea</i> from 2005.
ROSACEAE	7 genera.
RUBIACEAE	Unedited treatments for 24 genera, Tribes Anthospermeae and Rubieae.
SCROPHULARIACEAE	<i>Calamphoreus</i> , <i>Diocirea</i> , <i>Eremophila</i> . Buddlejaceae, Callitrichaceae and Myoporaceae which are now part of this family.
STYLIDIACEAE	Edited treatment for <i>Donatia</i> is loaded to the Flora in draft.
VERBENACEAE	Treatment for 26 genera. APC lists 8 genera. (Edited by Barry Conn; currently being added to the Flora)
VITACEAE	Family; 5 genera; 31 species, 1994.

Appendix 4

The following lists indicates the work currently contracted or being undertaken by the ABRS.

Taxa being edited/updated

Acacia

Avicennia

Euphorbiaceae

Pittosporaceae

Hibiscus p.p.

Hypericaceae

Verbenaceae

Family Level Profiles

Apiaceae	Ebenaceae	Namaceae (tbc)	Saxifragaceae
Araliaceae	Ehretiaceae (tbc)	Neuradaceae	Symplocaceae
Griselinaceae	Elaeocarpaceae	Nitrariaceae	Tecophyliaaceae
Myodocarpaceae	Emblingiaceae	Nothofagaceae	Tecophilaeaceae
Adoxaceae	Erythroxylaceae	Oleaceae	Tectariaceae
Aphanopetalaceae	Escalloniaceae	Oleandraceae	Tetrachondraceae
Argophyllaceae	Euphorbiaceae s. str. (tbc)	Orchidaceae	Vitaceae
Begoniaceae	Fabaceae	Orobanchaceae	Xyridaceae
Bignoniaceae	Flagellariaceae	Oxalidaceae	<u>Updates</u>
Boraginaceae s.str.	Gelsemiaceae	Paracryphiaceae	Alismataceae
Burmanniaceae	Geraniaceae	Paulowniaceae	Apocynaceae
Byblidaceae	Gesneriaceae	Pedaliaceae	Apodanthaceae
Calceolariaceae	Grossulariaceae	Pennantiaceae	Asteraceae
Campanulaceae	Hydrangeaceae	Pentaphylacaceae	Asteraceae
Campynemataceae	Heliotropaceae (tbc)	Phrymaceae	Berberidopsidaceae
Caprifoliaceae	Hydroleaceae	Plantaginaceae	Calycanthaceae
Caricaceae	Hydrophyllaceae (tbc)	Polemoniaceae	Celastraceae
Cleomaceae	Juglandaceae	Polygalaceae	Cornaceae
Convolvulaceae	Juncaceae	Polygonaceae	Fagaceae (excl. <i>Nothofagus</i>)
Cordiaceae (tbc)	Lamiaceae	Primulaceae (tbc)	Goodeniaceae
Crassulaceae	Lentibulariaceae	Putranjivaceae (tbc)	Lythraceae
Cunoniaceae	Linderniaceae	Rosaceae	Proteaceae
Cyperaceae	Malvaceae	Rousseaceae	Pteridaceae
Didiereaceae	Marantaceae	Rubiaceae	Salicaceae
Dilleniaceae	Menyanthaceae	Sapotaceae	Santalaceae

