

## From Engler to APGIV: a short history of the botanical arrangement of the Western Australian Herbarium collections

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### SHORT COMMUNICATION

Modern herbarium collections typically have one of three different systems of arrangement: alphabetical, phylogenetic, or a combination of the two. Originally Western Australia had three recognised botanical collections housed in separate institutions. It is not documented how the early collections were initially arranged by Bernard Henry Woodward, the Director of the Museum and Art Gallery herbarium collections (1894–1916), by the Forests Department Herbarium (established in 1916), or by the Bureau of Agriculture's first botanist Alexander Morrison in 1897; however it is likely they were all arranged in alphabetical order by family. In 1913, Frederick Stoward, Botanist and Pathologist of the Department of Agriculture (renamed in 1898 from Bureau), mentioned a need for rearrangement and cataloguing of the Herbarium, which was undertaken by assistant Mr [F.W.] Wakefield (Stoward 1913). In 1920, Desmond Andrew Herbert, appointed Economic Botanist and Pathologist, was assisted by Vera McNeilance Prowse in a further re-organisation of this herbarium. Numbering about 6,000 specimens, several collections the herbarium had received were combined, including those of James Drummond, William V. Fitzgerald, George Maxwell, and Ferdinand von Mueller (Gardner 1947; Green 1990; Underwood 2011).

The first documented systematic family arrangement of botanical collections of Western Australia commenced in July 1924 with the appointment of Charles Austin Gardner as Assistant Botanist in the Department of Agriculture and was completed by June 1926 (Carne 1925; Carne 1926). Being taken with the Englerian notion of arranging families in order of increasing flower complexity within monocotyledons and dicotyledons, Gardner arranged the families and genera in the Herbarium according to Engler's system published in Engler and Prantl's (1887–1915) *Die Natürlichen Pflanzenfamilien*.

When the State Herbarium was officially established in 1929 within the Department of Agriculture headquarters on St Georges Terrace (Fitzpatrick 2011), after the amalgamation of the Department of Agriculture Herbarium and Forests Department Herbarium, this classification system was continued. The collection was soon rehoused within the State Observatory in West Perth (December 1933 to 1959) (Underwood 2011). At about this time Gardner, now Government Botanist and Curator of the State Herbarium (Green 1990), allocated a consecutive number for every plant family in the world then recognised by Engler. Where a family had not been recorded for Western Australia, it was still allocated a number, despite there being no folders or specimens in the Western Australian Herbarium at the time. Gardner annotated a copy of J.C. Willis' (1919) 4<sup>th</sup> edition of *A Dictionary of the Flowering*

*Plants and Ferns*, a portable version of the Engler system, with his numbering system (Figure 1), presumably on the basis that *Die Natürlichen Pflanzenfamilien*, consisting of multiple, large volumes, was likely too unwieldy to manage.

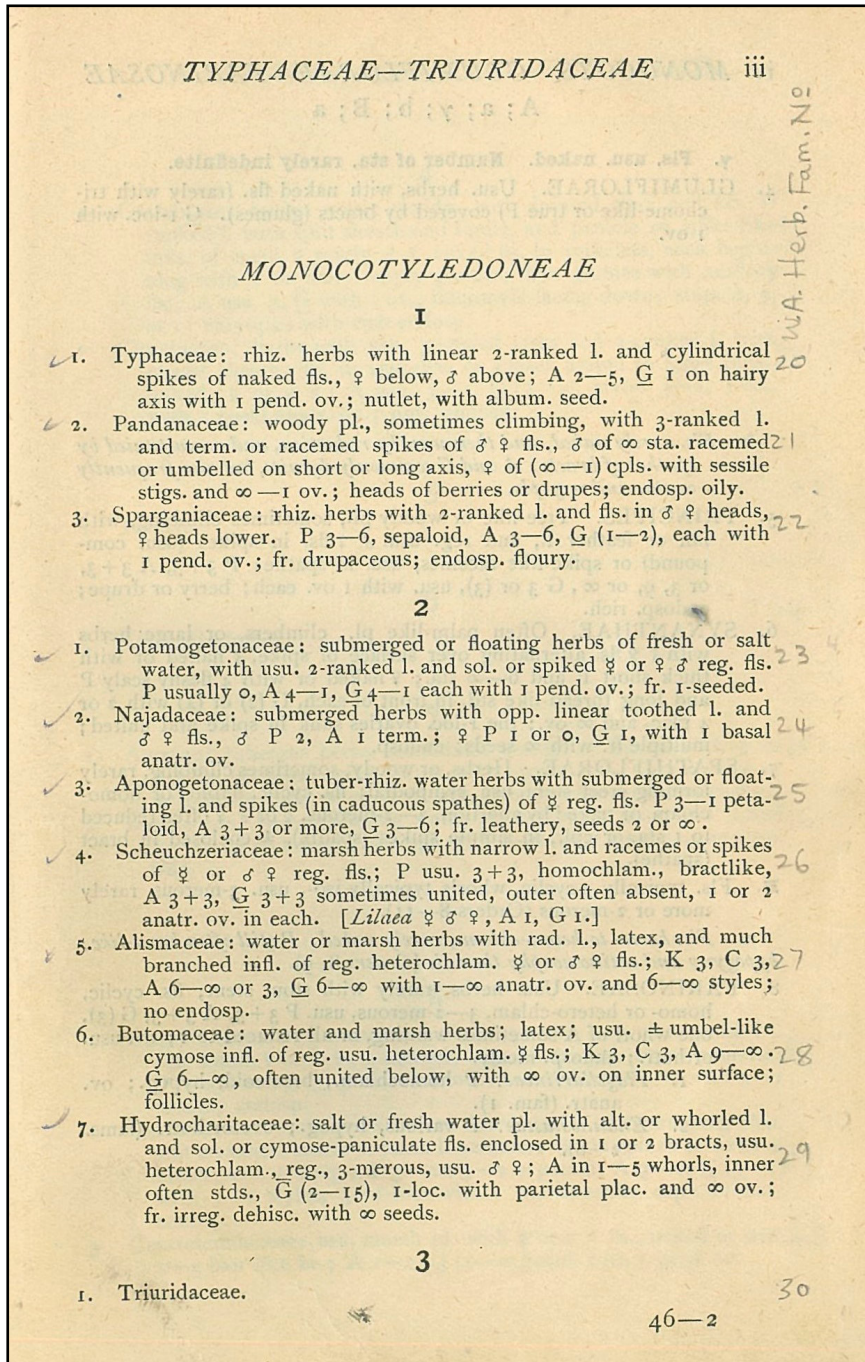


Figure 1. A copy of the 1919 4<sup>th</sup> edition of J.C. Willis' *A Dictionary of the Flowering Plants and Ferns* as annotated by C.A. Gardner, archived at the Department of Biodiversity, Conservation and Attractions Library, Perth.

In his *Enumeratio Plantarum Australiae Occidentalis*, Gardner (1930) only listed families and genera recorded for Western Australia, with the arrangement following Engler and Prantl (1887–1915), except for Leguminosae which he divided into three families (Mimosaceae, Caesalpiniaceae and Papilionaceae) as suggested by Hutchinson (1926) in his *The Families of Flowering Plants*. While families are not numbered in the publication, genera are numbered consecutively, again following Engler and Prantl (1887–1915).

A report written by Gardner (1947) states that the State Herbarium collection was arranged under the system adopted at the Herbarium of the Royal Botanic Gardens, Kew. Given the system adopted at Kew was based on Bentham and Hooker's *Genera Plantarum* (1862–1883), it is assumed that Gardner is referring to the concept of a phylogenetic arrangement of families, rather than the specific Kew arrangement.

The family numbers used to assist the physical organisation of the State Herbarium derived from Engler and Prantl (1887–1915) were not consecutive, but they formed the basis for a Dewey-type decimal system for genera later adopted by Gardner sometime in the decade between 1930 and 1940. The decimal number was unique to the family (whole number) and genus (decimal). For example, the Guttiferae (now Clusiaceae) was given the decimal number 233.000, the Elatinaceae was given decimal number 235.000, while the family number 234.000 for Dipterocarpaceae was not represented in Western Australia (Appendix 1). Genera within families were allocated a unique consecutive number like 233.001, 233.002, and so on, with the arrangement of genera following the arrangement in Engler and Prantl (1887–1915) (Gardner 1930). In the rare cases where a genus was not recognised in Engler and Prantl (1887–1915), Gardner would have allocated a decimal number using available references and his own conclusion on its morphological or phylogenetic affinities. The ferns, fern allies, and gymnosperms were allocated the numbers 1.000 to 19.000. Monocotyledons started at 20.000 and finished with the Orchidaceae (66.000), and the dicotyledons from Casuarinaceae (70.000) to the Compositae (now Asteraceae) (345.000). While family numbering included families not naturally found within Western Australia, generic numbering was based on the order of genera as presented in Gardner (1930) (Table 1). Letter suffixes were subsequently added as new families and genera became recognised due to changes in taxonomic circumscription, such as the splitting of a family (e.g., Liliaceae (Green 1985)) (Appendix 1).

The collections remained unmounted prior to 1938, but as of July 1946, all were mounted (Gardner 1947). Until around 1955, outer brown folders had the genus name, handwritten mostly by Gardner, on the lower left-hand side, and the genus initial with specific epithet written on the lower right side (Neville Marchant, pers. comm.). The arrangement number, unique to the family (whole number) and genus (decimal), was in the centre. In 1955, as a new Herbarium Assistant, Neville Marchant was tasked with replacing all the old folders with new ones that were labelled using the then newly available UNO pens and plastic stencils (Figure 2).

**Table 1.** Example of the Englerian and decimal numbering system implemented by Gardner as demonstrated by Sterculiaceae (now Malvaceae) (family 223).

| Genus              | Genus Number allocated in Engler & Prantl (1887–1915) | Order of listing in Gardner (1930) | Decimal number for Genus folders, and 1953 Herbarium Index |
|--------------------|---|------------------------------------|--|
| <i>Dicarpidium</i> | 13  | 4 <sup>th</sup>                    | 223.004  |
| <i>Waltheria</i>   | 14  | 5 <sup>th</sup>                    | 223.005  |
| <i>Rulingia</i>    | 15  | 6 <sup>th</sup>                    | 223.006  |
| <i>Commersonia</i> | 16  | 7 <sup>th</sup>                    | 223.007  |
| <i>Hannafordia</i> | 26  | 8 <sup>th</sup>                    | 223.008  |

The general arrangement of the collection within the 25 wooden cupboards in the State Observatory building has been documented (Figure 3). A bound herbarium index was typeset for the collections in order to physically locate taxa in cabinets and it was periodically updated based on taxonomic understanding at the time. Only the 1953 and 1959 editions remain. Constant reshuffling of specimens precluded the maintenance of these manually typed indexes until the advent of computer and database information technologies in the 1980s.

In 1957 the botanical collections of the Western Australian Museum were finally transferred to the State Herbarium and incorporated within the then designated arrangement. The State Herbarium was officially named as the Western Australian Herbarium, moved to the Department of Agriculture headquarters (B Block) in South Perth (1959–1970), and was given the *Index Herbariorum* (<http://sweetgum.nybg.org/science/ih/>) code PERTH in 1962.

In February 1981 John Green, then Curator of the Herbarium, published *Census of the Vascular Plants of Western Australia* (Green 1981) and for the first time the Gardner assigned family sequence numbers appeared formally in print (but not the genus numbers). Green (1985) followed this with a second edition and subsequent supplements.

In 1987, the Western Australian Herbarium was administratively transferred from the Department of Agriculture to the Department of Conservation and Land Management (CALM) (Fitzpatrick 2011). Changes in government resulted in subsequent administrative transfers to the Department of Environment and Conservation (2006–2013), Department of Parks and Wildlife (2013–2017), and now the Department of Biodiversity, Conservation and Attractions (2017–present).

By the 2000s, Gardner's arrangement was becoming increasingly out of step with the modern understanding of vascular plant systematics and the changing Herbarium strategic priorities. The Western Australian Herbarium was able to undertake a significant update to the arrangement of its collections as part of the move in 2009 to new premises at the Keiran McNamara Conservation Science Centre in Kensington. The collections were reorganised to largely reflect systematic relationships recognised by the Angiosperm Phylogeny Group (2009) following the linear sequence of Haston *et al.* (2009). The Gardner numbering system was disbanded, and the PERTH Linear Sequence Number (Appendix 1) was implemented only as a numerical system to manage taxon names data. The changes reflected the vastly improved modern knowledge of flowering plant relationships resulting from the Angiosperm Phylogeny Group projects (Angiosperm Phylogeny Group 1998, 2003, 2009) and other taxonomic work around the world. Along with the opportunity for reordering the physical collection, the taxonomic hierarchy within the associated Western Australian Plant Census database and collections management system was updated.

In 2018 the Herbarium implemented the APG IV (Angiosperm Phylogeny Group 2016) phylogenetic arrangement of families. Based on a wide range of evidence and repeatable analysis methods, this arrangement (Appendix 1), with several exceptions adopted by PERTH's Taxonomic Review Committee (TRC) following recommendations by specialists, is expected to remain relatively stable for the immediate future, although further changes are always possible as new evidence comes to light. The APG III (Angiosperm Phylogeny Group 2009) and APG IV (Angiosperm Phylogeny Group 2016) systems involved numerous family level changes. Some of these required the simple merging of one or more families whilst others necessitated more complex changes to family circumscriptions. Genera and species remain alphabetically arranged within a family for ease of collections management, particularly given the vast number of users of the collection that would find phylogenetic arrangement cumbersome and would result in increased misfiling of the collections.



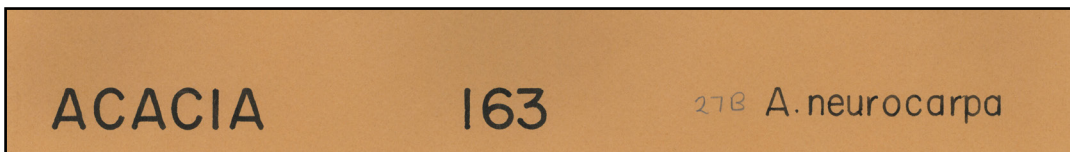


Figure 2. An example of the annotation of brown outer folders with the genus name, family number and species drawn using the stencil, implemented after 1955. Family 163 was Mimosaceae (now Fabaceae), and the genus decimal no longer used. The pencil annotation is a curatorial addition.

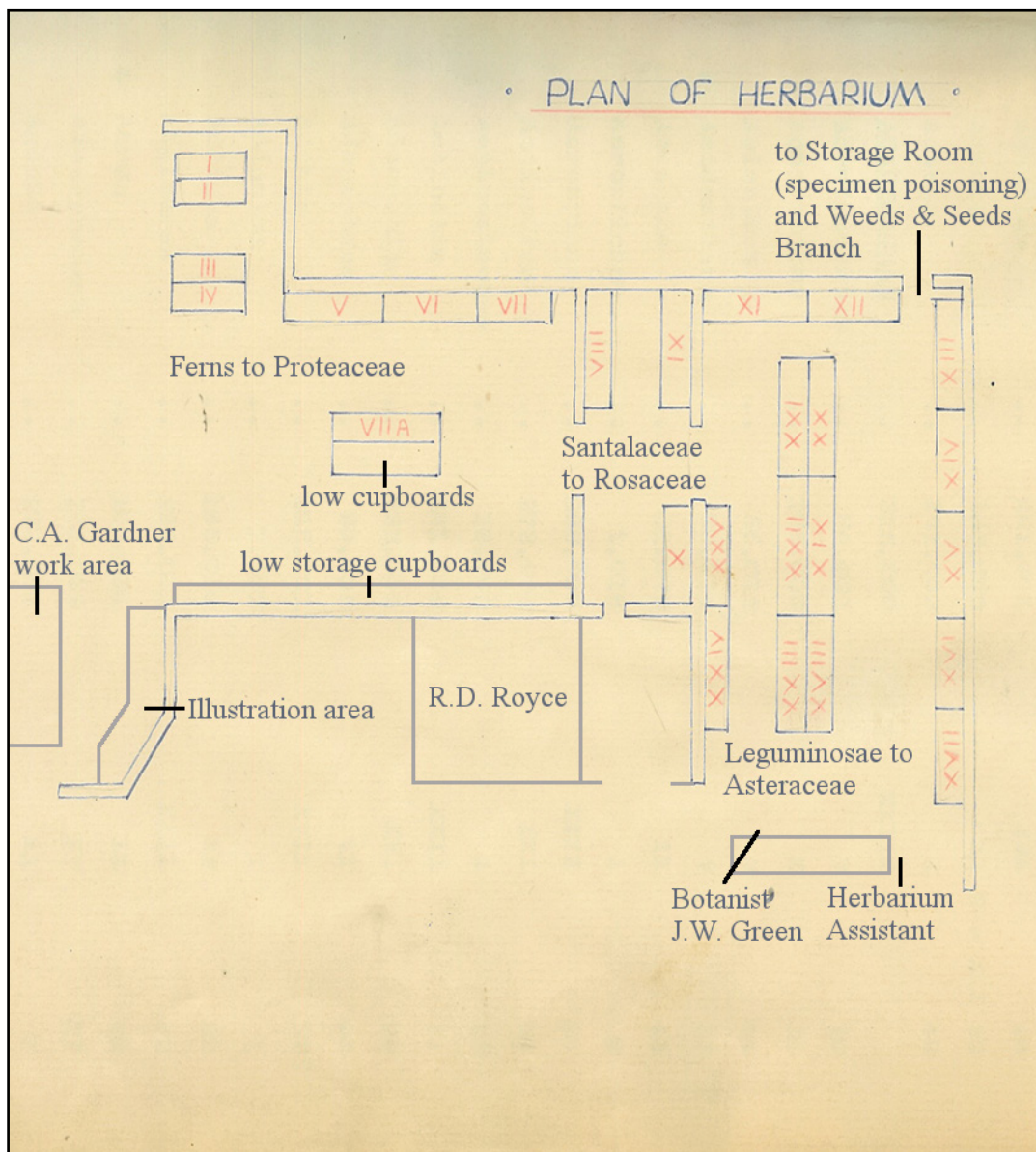


Figure 3. A sketch of the layout in the State Observatory Building, West Perth, around 1933–1959. At the time, herbarium specimens were housed in 25 wooden cabinets.

For the ferns, fern allies, and gymnosperms, PERTH previously utilised the arrangement as published in *Mabberley's Plant-Book* (Mabberley 2008). Mabberley (2008) in turn used Smith *et al.* (2006) as his reference for fern phylogeny. Most recently, the PPG I (Pteridophyte Phylogeny Group 2016) family linear sequence was published, which formed the basis for the classification of Australian fern taxa (Field 2020). The PPG I classification was implemented within the PERTH collections in 2020. Arrangements for gymnosperms follows Christenhusz *et al.* (2011).

The Western Australian Herbarium research collections are now housed in four main vaults (Figure 4), and a fifth smaller Types Vault. A sixth vault houses specimens on loan to PERTH. Herbarium indexes, similar to those in the former buildings, are produced electronically with location information for ease of specimen discovery within the collection spaces. In 2022, PERTH continues to replace now acidic folders with archival-quality pH-buffered folders, with taxon names being pencilled in the lower right corner of folders. The collection is secondarily arranged using coloured folders for Australian States and Territories and extra-Australian collections; further geographic division within Western Australia has not been uniformly implemented. Non-vascular plants, including algae, fungi, lichens, mosses, liverworts and hornworts, remain arranged alphabetically by genus due to continued high-level taxonomic instability and for ease of management. However, family circumscriptions currently (2022) follow that accepted by *AlgaeBase* (<https://www.algaebase.org/>), The *National Species List* (<https://biodiversity.org.au/nsl/>) and *Mycobank* (<https://www.mycobank.org/>).

The type and historical collections of the Western Australian Herbarium are separately housed within a dedicated vault, with increased security and fire protection. Both collections are alphabetically arranged by currently recognised families. The type collection is stored alphabetically by the typified name or basionym. Type specimens were originally housed as part of the main collections, and documented by way of a physical type register. Significant historical collections, made prior to 1829, such as those of Robert Brown, Joseph Banks and Daniel Solander, William Baxter, Allan Cunningham, James Drummond and Archibald Menzies, have also been relocated from the main collections due to their fragility and are stored alphabetically by currently accepted name in the Types Vault.

Several other collections within the Western Australian Herbarium are housed and arranged separately due to current management efficiencies. The wet or spirit collections are arranged by jar or bottle size and systematically by accession number. The carpological collection is stored in boxes at the end of the associated family. The type photographic collection is arranged in the same way as the type specimen collection but housed outside the Type Vault, photographic slides are arranged in filing cabinets, and digital images are stored within a Departmental digital repository. Microscope slide collections and molecular tissue collections are currently being developed and are not yet systematically arranged.

PERTH has adopted a 'punctuated equilibrium model' whereby future linear family rearrangements of the collections will be based on widely available collaborative taxonomic syntheses such as those mentioned here, best practice for storage, and community consensus rather than on the very latest research as it is published. Numbering systems are no longer implemented. In this way we can provide step-wise improvement in systematic knowledge while providing stable, documented research and reference collections. Appendix 1 and 2 list the vascular plant families that have been changed in Western Australia and the Herbarium over time (and hence as discoverable via the online platform *Florabase* (<https://florabase.dpaw.wa.gov.au/>)) and outline the most recently implemented classification and organisation of vascular plant families within the Western Australian Herbarium.

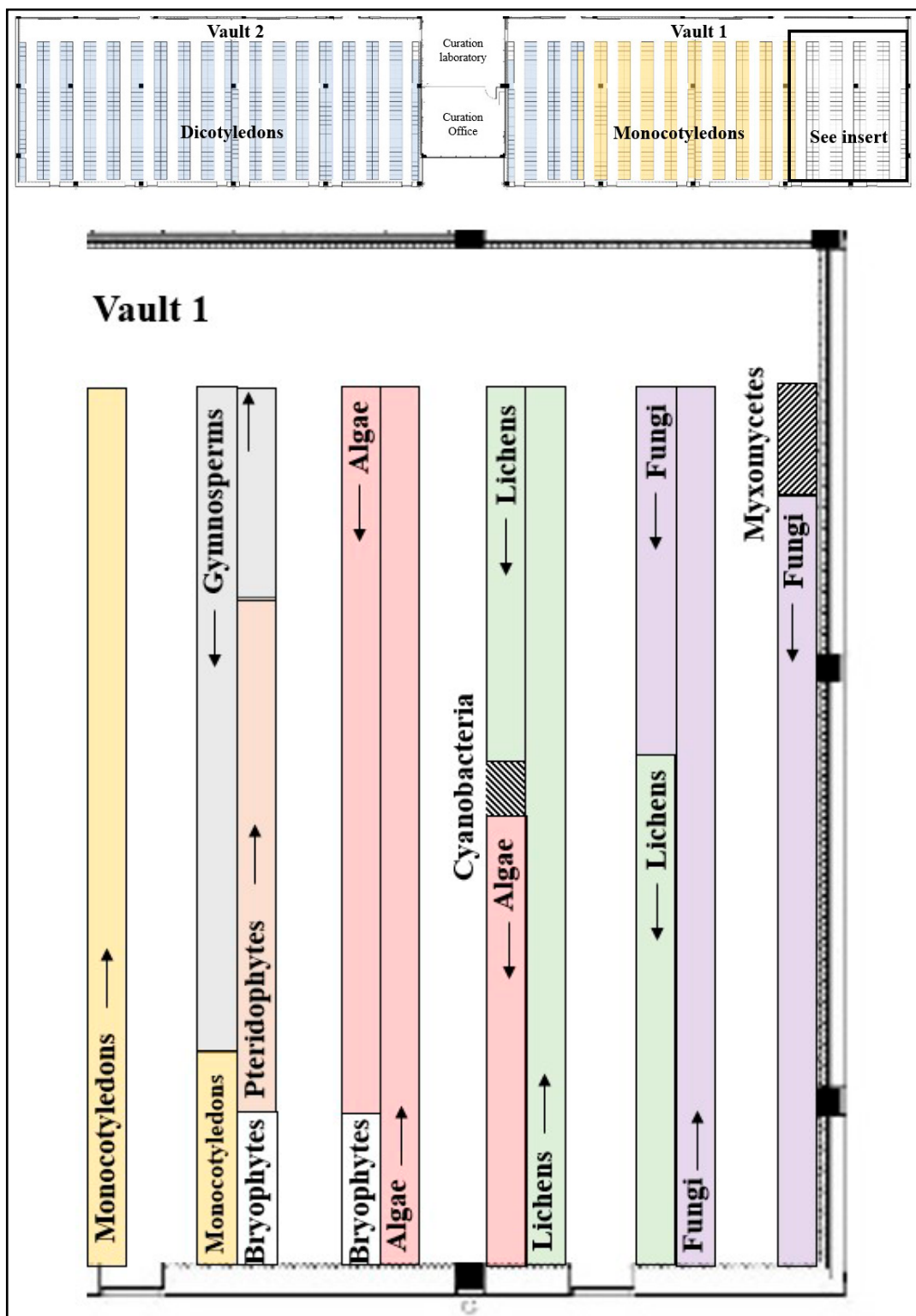


Figure 4. Floor plan of the Western Australian Herbarium in 2022 indicating the arrangement of the major plant groups. Only Vaults 1 and 2 (Floor 1) of the Keiran McNamara Conservation Science Centre are shown; Vaults 3 and 4 contain Dicotyledons only.

## Acknowledgements

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**Appendix 1.** The current PERTH Linear Sequence reflecting the phylogenetic arrangement for vascular plant families held in the Western Australian Herbarium in 2022 and summary of previous arrangements. \* = not considered native or naturalised in Western Australia but represented in herbarium collections; ^ = excluded name, currently not regarded as occurring in WA; APG IV = Angiosperm Phylogeny Group (2016); PPG I = Pteridophyte Phylogeny Group (2016); TRC = Taxonomic Review Committee (PERTH); APC = Australian Plant Census. Note that the current linear sequence number is for internal data management; specimens are not annotated with these numbers. Missing numbers indicate a current lack of representation of those families at PERTH. Blue columns indicate the current arrangement at PERTH.

| Gardner annotation in Willis (1919) | PERTH                           |                                    |                          | PERTH Linear Sequence Number [2018–] | PERTH Family [2018–] | PERTH Order [2018–] | PERTH Source | Family in APG IV/PPG I/Christenhusz <i>et al.</i> (2011) |
|-------------------------------------|---------------------------------|------------------------------------|--------------------------|--------------------------------------|----------------------|---------------------|--------------|--|
|                                     | PERTH Family Number [1953–1958] | PERTH Family Number [c. 1930–2009] | PERTH Family [2010–2017] |                                      |                      |                     |              |  |
|                                     | 8.000                           | 002                                | Lycopodiaceae            | 1                                    | Lycopodiaceae        | Lycopodiales        | PPG I        | Lycopodiaceae  |
|                                     | 11.000                          | 004                                | Isoetaceae               | 2                                    | Isoetaceae           | Isoetales           | PPG I        | Isoetaceae   |
|                                     | 9.000                           | 003                                | Selaginellaceae          | 3                                    | Selaginellaceae      | Selaginellales      | PPG I        | Selaginellaceae  |
| Fern allies                         |                                 |                                    |                          |                                      |                      |                     |              |  |
|                                     |                                 | 004A                               |                          | 4                                    | Equisetaceae *       | Equisetales         | PPG I        | Equisetaceae   |
|                                     | 10.000                          | 001                                | Psilotaceae              | 5                                    | Psilotaceae          | Psilotales          | PPG I        | Psilotaceae  |
|                                     | 5.000                           | 005                                | Ophioglossaceae          | 6                                    | Ophioglossaceae      | Ophioglossales      | PPG I        | Ophioglossaceae  |
|                                     |                                 | 006C                               |                          | 7                                    | Marattiaceae *       | Marattiales         | PPG I        | Marattiaceae   |
|                                     |                                 | 005A                               |                          | 8                                    | Osmundaceae *        | Osmundales          | PPG I        | Osmundaceae  |
|                                     |                                 | 013B                               |                          | 9                                    | Hymenophyllaceae *   | Hymenophyllales     | PPG I        | Hymenophyllaceae   |
|                                     | 2.000                           | 009                                | Gleicheniaceae           | 12                                   | Gleicheniaceae       | Gleicheniales       | PPG I        | Gleicheniaceae   |
|                                     |                                 | 006A                               | Lygodiaceae              | 13                                   | Lygodiaceae          | Schizaceales        | PPG I        | Lygodiaceae  |
|                                     | 4.000                           | 006                                | Schizaceae               | 14                                   | Schizaceae           | Schizaceales        | PPG I        | Schizaceae   |
|                                     | 7.000                           | 014                                | Salviniaceae             | 16                                   | Salviniaceae         | Salviniales         | PPG I        | Salviniaceae   |
|                                     | 6.000                           | 013                                | Marsileaceae             | 17                                   | Marsileaceae         | Salviniales         | PPG I        | Marsileaceae   |
|                                     |                                 | 013A                               |                          | 24                                   | Dicksoniaceae *      | Cyatheales          | PPG I        | Dicksoniaceae  |
| Ferns                               |                                 |                                    |                          |                                      |                      |                     |              |  |

| Gardner annotation in Willis (1919) | PERTH Family Number [1953–1958] | PERTH Family Number [c. 1930–2009] | PERTH Family [2010–2017] | PERTH Linear Sequence Number [2018–] | PERTH Family [2018–] | PERTH Order [2018–] | PERTH Source                      | Family in APG IV/PPGI/Christenhusz <i>et al.</i> (2011) |
|-------------------------------------|---------------------------------|------------------------------------|--------------------------|--------------------------------------|----------------------|---------------------|-----------------------------------|---|
|                                     |                                 | 011A                               | Cyatheaceae              | 25                                   | Cyatheaceae          | Cyatheales          | PPGI                              | Cyatheaceae   |
|                                     |                                 | 011D                               | Lindsaeaceae             | 29                                   | Lindsaeaceae         | Polypodiales        | PPGI                              | Lindsaeaceae  |
|                                     |                                 | 008                                | Pteridaceae              | 30                                   | Pteridaceae          | Polypodiales        | PPGI                              | Pteridaceae   |
|                                     |                                 | 011C                               | Dennstaedtiaceae         | 31                                   | Dennstaedtiaceae     | Polypodiales        | PPGI                              | Dennstaedtiaceae  |
|                                     |                                 | 011E                               | Aspleniaceae             | 37                                   | Aspleniaceae         | Polypodiales        | PPGI                              | Aspleniaceae  |
|                                     |                                 | 012C                               |                          | 38                                   |                      | Polypodiales        | PPGI                              | Woodsiaceae   |
|                                     |                                 | 011G                               | Blechnaceae              | 40                                   | Blechnaceae          | Polypodiales        | PPGI                              | Blechnaceae   |
|                                     |                                 | 012B                               |                          | 41                                   | Athyriaceae *        | Polypodiales        | PPGI                              | Athyriaceae   |
|                                     |                                 | 011B                               | Thelypteridaceae         | 42                                   | Thelypteridaceae     | Polypodiales        | PPGI                              | Thelypteridaceae  |
|                                     |                                 | 011F                               | Dryopteridaceae          | 45                                   | Dryopteridaceae      | Polypodiales        | PPGI                              | Dryopteridaceae   |
|                                     |                                 | 014B                               | Lomariopsidaceae         | 46                                   | Nephrolepidaceae     | Polypodiales        | PPGI                              | Nephrolepidaceae  |
|                                     |                                 |                                    |                          | 47                                   | Lomariopsidaceae     | Polypodiales        | PPGI                              | Lomariopsidaceae  |
|                                     |                                 | 011H                               |                          | 48                                   | Tectariaceae *       | Polypodiales        | PPGI                              | Tectariaceae  |
|                                     |                                 | 014A                               |                          | 49                                   |                      | Polypodiales        | PPGI                              | Oleandraceae  |
|                                     |                                 |                                    |                          | 50                                   | Davalliaceae *       | Polypodiales        | PPGI                              | Davalliaceae  |
|                                     | 1.000                           | 010                                | Polypodiaceae            | 51                                   | Polypodiaceae        | Polypodiales        | PPGI                              | Polypodiaceae   |
| Gymnosperms                         |                                 |                                    |                          |                                      |                      |                     |                                   |   |
|                                     | 14.000                          | 016                                | Cycadaceae               | 52                                   | Cycadaceae           | Cycadales           | Christenhusz <i>et al.</i> (2011) | Cycadaceae  |
|                                     |                                 | 016A                               | Zamiaceae                | 53                                   | Zamiaceae            | Cycadales           | Christenhusz <i>et al.</i> (2011) | Zamiaceae   |

| Gardner annotation in Wil-lis (1919) | PERTH Family Number [1953–1958] | PERTH Family Number [c. 1930–2009] | PERTH Family [2010–2017] | PERTH Linear Sequence Number [2018–] | PERTH Family [2018–] | PERTH Order [2018–] | PERTH Source                      | Family in APG IV/PPG I/Christenhusz <i>et al.</i> (2011) |
|--------------------------------------|---------------------------------|------------------------------------|--------------------------|--------------------------------------|----------------------|---------------------|-----------------------------------|--|
|                                      |                                 |                                    |                          | 55                                   |                      | Pinales             | Christenhusz <i>et al.</i> (2011) | Welwitschiaceae  |
|                                      |                                 | 017A                               | Pinaceae                 | 58                                   | Pinaceae             | Pinales             | Christenhusz <i>et al.</i> (2011) | Pinaceae   |
|                                      | 15.000                          | 017                                | Podocarpaceae            | 60                                   | Podocarpaceae        | Pinales             | Christenhusz <i>et al.</i> (2011) | Podocarpaceae  |
|                                      | 16.000                          | 018                                | Cupressaceae             | 62                                   | Cupressaceae         | Pinales             | Christenhusz <i>et al.</i> (2011) | Cupressaceae   |
|                                      |                                 | 018                                |                          | 63                                   |                      | Pinales             | Christenhusz <i>et al.</i> (2011) | Taxaceae   |
| Basal angiosperms                    |                                 |                                    |                          |                                      |                      |                     |                                   |  |
|                                      |                                 | 040A                               | Hydatellaceae            | 65                                   | Hydatellaceae        | Nymphaeales         | APG IV                            | Hydatellaceae  |
|                                      |                                 |                                    |                          | 66                                   | Cabombaceae *        | Nymphaeales         | APG IV                            | Cabombaceae  |
| 115                                  | 115.000                         | 115                                | Nymphaeaceae             | 67                                   | Nymphaeaceae         | Nymphaeales         | APG IV                            | Nymphaeaceae   |
|                                      |                                 |                                    |                          | 69                                   | Trimeniaceae *       | Austrobaileyles     | APG IV                            | Trimeniaceae   |
| Magnoliids                           |                                 |                                    |                          |                                      |                      |                     |                                   |  |
| 71                                   |                                 | 123A                               |                          | 72                                   | Winteraceae *        | Canellales          | APG IV                            | Winteraceae  |
| 72                                   |                                 | 072                                | Piperaceae               | 74                                   | Piperaceae           | Piperales           | APG IV                            | Saururaceae  |
| 100                                  |                                 | 100                                | Aristolochiaceae         | 75                                   | Aristolochiaceae     | Piperales           | APG IV                            | Aristolochiaceae   |
| 128                                  | 128.000                         | 128                                | Myristicaceae            | 76                                   | Myristicaceae        | Magnoliales         | APG IV                            | Myristicaceae  |

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|-------------------------------------|---------------------------------|------------------------------------|--------------------------|--------------------------------------|----------------------|---------------------|--------------|--|
| 123                                 |                                 | 123                                |                          | 77                                   | Magnoliaceae *       | Magnoliales         | APG IV       | Magnoliaceae   |
| 127                                 |                                 |                                    |                          | 80                                   | Eupomatiaceae *      | Magnoliales         | APG IV       | Eupomatiaceae  |
| 126                                 |                                 | 126                                | Annonaceae               | 81                                   | Annonaceae           | Magnoliales         | APG IV       | Annonaceae   |
| 124                                 |                                 |                                    |                          | 82                                   | Calycanthaceae *     | Laurales            | APG IV       | Calycanthaceae   |
| 129                                 |                                 |                                    |                          | 84                                   |                      | Laurales            | APG IV       | Gomortegaceae  |
|                                     |                                 |                                    |                          | 85                                   | Atherospermataceae * | Laurales            | APG IV       | Atherospermataceae                                       |
| 132                                 | 132.000                         | 132                                | Hernandiaceae            | 86                                   | Hernandiaceae        | Laurales            | APG IV       | Hernandiaceae  |
| 130                                 |                                 | 130                                |                          | 87                                   | Monimiaceae *        | Laurales            | APG IV       | Monimiaceae  |
| 131                                 | 131.000                         | 131                                | Lauraceae                | 88                                   | Lauraceae            | Laurales            | APG IV       | Lauraceae  |
| 73                                  |                                 |                                    |                          | 89                                   |                      | Chloranthales       | APG IV       | Chloranthaceae   |
| Monocots                            |                                 |                                    |                          |                                      |                      |                     |              |  |
| 35                                  | 35.000                          | 035                                | Araceae                  | 91                                   | Araceae              | Alismatales         | APG IV       | Araceae  |
| 27                                  | 27.000                          | 027                                | Alismataceae             | 93                                   | Alismataceae         | Alismatales         | APG IV       | Alismataceae   |
| 28                                  |                                 | 028                                |                          | 94                                   |                      | Alismatales         | APG IV       | Butomaceae   |
| 29                                  | 29.000 [as Vallisneriaceae]     | 029                                | Hydrocharitaceae         | 95                                   | Hydrocharitaceae     | Alismatales         | APG IV       | Hydrocharitaceae   |
| 25                                  | 25.000                          | 025                                | Aponogetonaceae          | 97                                   | Aponogetonaceae      | Alismatales         | APG IV       | Aponogetonaceae  |
| 26 [as Scheuchzeriaceae]            | 26.000 [as Scheuchzeriaceae]    | 026                                | Juncaginaceae            | 98                                   | Juncaginaceae        | Alismatales         | APG IV       | Juncaginaceae  |
|                                     |                                 | 023D                               | Zosteraceae              | 100                                  | Zosteraceae          | Alismatales         | APG IV       | Zosteraceae  |
| 23                                  | 23.000                          | 023                                | Potamogetonaceae         | 101                                  | Potamogetonaceae     | Alismatales         | APG IV       | Potamogetonaceae   |
|                                     | 23.000                          | 023B                               | Posidoniaceae            | 102                                  | Posidoniaceae        | Alismatales         | APG IV       | Posidoniaceae  |

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|--------------------------------------|---------------------------------|------------------------------------|--------------------------|--------------------------------------|----------------------|---------------------|--------------|--|
|                                      | 23.000                          | 023E                               | Ruppiaceae               | 103                                  | Ruppiaceae           | Alismatales         | APG IV       | Ruppiaceae   |
|                                      |                                 | 023C                               | Cymodoceaceae            | 104                                  | Cymodoceaceae        | Alismatales         | APG IV       | Cymodoceaceae  |
| 65                                   | 65.000                          | 065                                | Burmanniaceae            | 107                                  | Burmanniaceae        | Dioscoreales        | APG IV       | Burmanniaceae  |
| 58                                   | 58.000                          | 058                                | Taccaceae                | 108                                  | Taccaceae            | Dioscoreales        | TRC          |  |
| 59                                   | 59.000                          | 059                                | Dioscoreaceae            | 109                                  | Dioscoreaceae        | Dioscoreales        | APG IV       | Dioscoreaceae  |
| 30                                   |                                 |                                    |                          | 110                                  |                      | Pandanales          | APG IV       | Triuridaceae   |
| 57                                   |                                 |                                    |                          | 111                                  |                      | Pandanales          | APG IV       | Velloziaceae   |
| 53                                   |                                 | 053                                | Stemonaceae              | 112                                  | Stemonaceae          | Pandanales          | APG IV       | Stemonaceae  |
| 34                                   |                                 |                                    |                          | 113                                  |                      | Pandanales          | APG IV       | Cyclanthaceae  |
| 21                                   | 21.000                          | 021                                | Pandanaceae              | 114                                  | Pandanaceae          | Pandanales          | APG IV       | Pandanaceae  |
|                                      |                                 | 054R                               |                          | 117                                  | Melanthiaceae *      | Liliales            | APG IV       | Melanthiaceae  |
|                                      |                                 | 054K                               | Alstroemeriaceae         | 119                                  | Alstroemeriaceae     | Liliales            | APG IV       | Alstroemeriaceae   |
|                                      |                                 | 054J                               | Colchicaceae             | 120                                  | Colchicaceae         | Liliales            | APG IV       | Colchicaceae   |
|                                      | 54A.000<br>[as Philesiaceae]    |                                    |                          | 121                                  |                      | Liliales            | APG IV       | Philesiaceae   |
|                                      |                                 | 054A                               | Smilacaceae              | 123                                  | Smilacaceae          | Liliales            | APG IV       | Smilacaceae  |
| 54                                   | 54.000                          | 054                                |                          | 124                                  | Liliaceae            | Liliales            | APG IV       | Liliaceae  |
| 66                                   | 66.000                          | 066                                | Orchidaceae              | 125                                  | Orchidaceae          | Asparagales         | APG IV       | Orchidaceae  |
|                                      |                                 | 054L                               | Boryaceae                | 126                                  | Boryaceae            | Asparagales         | APG IV       | Boryaceae  |
|                                      |                                 | 054N                               |                          | 128                                  | Asteliaceae *        | Asparagales         | APG IV       | Asteliaceae  |
|                                      |                                 | 056A                               | Hypoxidaceae             | 130                                  | Hypoxidaceae         | Asparagales         | APG IV       | Hypoxidaceae   |
|                                      |                                 | 055A                               | Tecophilaeaceae          | 133                                  | Tecophilaeaceae      | Asparagales         | APG IV       | Tecophilaeaceae  |



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|---|---------------------------------------|---|-----------------------------|--|-------------------------|------------------------|-----------------|--|
| 60  | 60.000                                | 060   | Iridaceae                   | 134  | Iridaceae               | Asparagales            | APG IV          | Iridaceae  |
|   |                                       | 054D  | Xanthorrhoeaceae            | 136  | Xanthorrhoeaceae        | Asparagales            | TRC             |  |
|   |                                       | 054G  | Asphodelaceae               | 137  | Asphodelaceae           | Asparagales            | TRC             | Asphodelaceae  |
|   |                                       | 054P  | Hemerocallida-<br>ceae      | 138  | Hemerocallidaceae       | Asparagales            | TRC             |  |
| 56  | 56.000                                | 056   | Amaryllidaceae              | 139  | Amaryllidaceae          | Asparagales            | APG IV          | Amaryllidaceae   |
|   |                                       | 054Q  | Agapanthaceae               | 140  | Agapanthaceae           | Asparagales            | TRC             |  |
|   |                                       | 054J  | Alliaceae                   | 141  | Alliaceae               | Asparagales            | TRC             |  |
|   |                                       | 054B  | Asparagaceae                | 142  | Asparagaceae            | Asparagales            | APG IV          | Asparagaceae   |
|   |                                       | 054C  | Dasyopogonaceae             | 143  | Dasyopogonaceae         | Arecales               | APG IV          | Dasyopogonaceae  |
| 33<br>[as Palmae]                           | 33.000<br>[as Palmae]                 | 033   | Areaceae                    | 144  | Areaceae                | Arecales               | APG IV          | Areaceae   |
| 47  | 47.000                                | 047   | Commelinaceae               | 146  | Commelinaceae           | Commelinales           | APG IV          | Commelinaceae  |
| 50  | 50.000                                | 050   | Philydraceae                | 147  | Philydraceae            | Commelinales           | APG IV          | Philydraceae   |
| 48  | 48.000                                | 048   | Pontederiaceae              | 148  | Pontederiaceae          | Commelinales           | APG IV          | Pontederiaceae   |
| 55  | 55.000                                | 055   | Haemodoraceae               | 149  | Haemodoraceae           | Commelinales           | APG IV          | Haemodoraceae  |
|   |                                       |   |                             | 150  | Strelitziaceae *        | Zingiberales           | APG IV          | Strelitziaceae   |
| 61  |                                       | 061   | Musaceae                    | 153  | Musaceae                | Zingiberales           | APG IV          | Musaceae   |
| 63  |                                       | 063   | Cannaceae                   | 154  | Cannaceae               | Zingiberales           | APG IV          | Cannaceae  |
| 64  |                                       |   | Marantaceae                 | 155  | Marantaceae             | Zingiberales           | APG IV          | Marantaceae  |
| 62  |                                       |   |                             | 157  |                         | Zingiberales           | APG IV          | Zingiberaceae  |
| 20  | 20.000                                | 020   | Typhaceae                   | 158  | Typhaceae               | Poales                 | APG IV          | Typhaceae  |
| 46  |                                       |   |                             | 159  |                         | Poales                 | APG IV          | Bromeliaceae   |

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| 45                                  |                                 |                                    |                                 | 160                                  |                      | Poales              | APG IV       | Rapateaceae  |
| 42                                  | 42.000                          | 042                                | Xyridaceae                      | 161                                  | Xyridaceae           | Poales              | APG IV       | Xyridaceae   |
| 43                                  | 43.000                          | 043                                | Eriocaulaceae                   | 162                                  | Eriocaulaceae        | Poales              | APG IV       | Eriocaulaceae  |
| 41                                  |                                 |                                    |                                 | 163                                  |                      | Poales              | APG IV       | Mayaceae   |
| 44                                  |                                 |                                    |                                 | 164                                  |                      | Poales              | APG IV       | Thurniaceae  |
| 52                                  | 52.000                          | 052                                | Juncaceae                       | 165                                  | Juncaceae            | Poales              | APG IV       | Juncaceae  |
| 32                                  | 32.000                          | 032                                | Cyperaceae                      | 166                                  | Cyperaceae           | Poales              | APG IV       | Cyperaceae   |
| 39                                  | 39.000                          | 039                                | Restionaceae                    | 167                                  | Restionaceae         | Poales              | APG IV       | Restionaceae   |
|                                     |                                 | 039B                               | Anarthriaceae                   | 168                                  | Anarthriaceae        | Poales              | TRC          |  |
| 40                                  | 40.000                          | 040                                | Centrolepidaceae                | 169                                  | Centrolepidaceae     | Poales              | TRC          |  |
| 38                                  | 38.000                          | 038                                | Flagellariaceae                 | 170                                  | Flagellariaceae      | Poales              | APG IV       | Flagellariaceae  |
|                                     |                                 | 039A                               | Ecdetocoleaceae                 | 172                                  | Ecdetocoleaceae      | Poales              | APG IV       | Ecdetocoleaceae  |
| 31                                  | 31.000                          | 031                                | Poaceae                         | 173                                  | Poaceae              | Poales              | APG IV       | Poaceae  |
| [as Gramineae]                      | [as Gramineae]                  |                                    |                                 |                                      |                      |                     |              |  |
| Eudicots                            |                                 |                                    |                                 |                                      |                      |                     |              |  |
| 116                                 |                                 | 116                                | Ceratophyllaceae                | 174                                  | Ceratophyllaceae     | Ceratophyllales     | APG IV       | Ceratophyllaceae   |
| 135                                 | 135.000                         | 135                                | Papaveraceae                    | 176                                  | Papaveraceae         | Ranunculales        | APG IV       | Papaveraceae   |
| 120                                 |                                 |                                    |                                 | 178                                  |                      | Ranunculales        | APG IV       | Lardizabalaceae  |
| 122                                 | 122.000                         | 122                                | Menispermaceae                  | 179                                  | Menispermaceae       | Ranunculales        | APG IV       | Menispermaceae   |
| 121                                 |                                 |                                    |                                 | 180                                  | Berberidaceae        | Ranunculales        | APG IV       | Berberidaceae  |
| 119                                 | 119.000                         | 119                                | Ranunculaceae                   | 181                                  | Ranunculaceae        | Ranunculales        | APG IV       | Ranunculaceae  |
| 208                                 |                                 |                                    |                                 | 182                                  |                      | Proteales           | APG IV       | Sabiaceae  |
|                                     |                                 | 114                                | Nelumbonaceae *                 | 183                                  | Nelumbonaceae *      | Proteales           | APG IV       | Nelumbonaceae  |

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|-------------------------------------|---------------------------------|------------------------------------|--------------------------|--------------------------------------|----------------------|---------------------|--------------|--|
| 159                                 |                                 | 159                                | Platanaceae              | 184                                  | Platanaceae          | Proteales           | APG IV       | Platanaceae  |
| 90                                  | 90.000                          | 090                                | Proteaceae               | 185                                  | Proteaceae           | Proteales           | APG IV       | Proteaceae   |
| 117                                 |                                 |                                    |                          | 186                                  |                      | Trochodendrales     | APG IV       | Trochodendraceae   |
| 190                                 |                                 |                                    |                          | 187                                  |                      | Buxales             | APG IV       | Buxaceae   |
| Core eudicots                       |                                 |                                    |                          |                                      |                      |                     |              |  |
| 226                                 | 226.000                         | 226                                | Dilleniaceae             | 190                                  | Dilleniaceae         | Dilleniales         | APG IV       | Dilleniaceae   |
| Superrosids                         |                                 |                                    |                          |                                      |                      |                     |              |  |
| 46                                  |                                 | 046                                |                          | 193                                  |                      | Saxifragales        | APG IV       | Altingiaceae   |
| 156                                 |                                 | 156                                |                          | 194                                  | Hamamelidaceae *     | Saxifragales        | APG IV       | Hamamelidaceae   |
| 118                                 |                                 |                                    |                          | 195                                  |                      | Saxifragales        | APG IV       | Cercidiphyllaceae  |
| 151                                 | 151.000                         | 151                                |                          | 199                                  | Saxifragaceae *      | Saxifragales        | APG IV       | Saxifragaceae  |
| 149                                 | 149.000                         | 149                                | Crassulaceae             | 200                                  | Crassulaceae         | Saxifragales        | APG IV       | Crassulaceae   |
|                                     |                                 | 155A                               | Aphanopetalaceae         | 201                                  | Aphanopetalaceae     | Saxifragales        | APG IV       | Aphanopetalaceae   |
| 276                                 | 276.000                         | 276                                | Haloragaceae             | 204                                  | Haloragaceae         | Saxifragales        | APG IV       | Haloragaceae   |
| Rosids                              |                                 |                                    |                          |                                      |                      |                     |              |  |
| 216                                 | 216.000                         | 216                                | Vitaceae                 | 206                                  | Vitaceae             | Vitales             | APG IV       | Vitaceae   |
| 173                                 | 173.000                         | 173                                | Zygophyllaceae           | 208                                  | Zygophyllaceae       | Zygophyllales       | APG IV       | Zygophyllaceae   |
|                                     |                                 | 162                                | Fabaceae                 | 210                                  | Fabaceae             | Fabales             | APG IV       | Fabaceae   |
|                                     |                                 | 160A                               | Surianaceae              | 211                                  | Surianaceae          | Fabales             | APG IV       | Surianaceae  |
| 183                                 | 183.000                         | 183                                | Polygalaceae             | 212                                  | Polygalaceae         | Fabales             | APG IV       | Polygalaceae   |
| 161                                 | 161.000                         | 161                                | Rosaceae                 | 213                                  | Rosaceae             | Rosales             | APG IV       | Rosaceae   |
| 264                                 |                                 |                                    |                          | 216                                  |                      | Rosales             | APG IV       | Elaeagnaceae   |

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|-----|--|---------------------------------|------------------------------------|--------------------------|--------------------------------------|-------------------------|---------------------|------------------|--|
|     |  |                                 |                                    |                          |                                      |                         |                     |                  |  |
| 215 | 215.000                                    | 215                             |                                    | Rhamnaceae               | 217                                  | Rhamnaceae              | Rosales             | APG IV           | Rhamnaceae   |
| 86  | 87.000                                     | 086                             |                                    |                          | 218                                  | Ulmaceae                | Rosales             | APG IV           | Ulmaceae   |
| 87  | 87.000<br>[as Ulmaceae]                    | 086B<br>087                     |                                    | Cannabaceae<br>Moraceae  | 219<br>220                           | Cannabaceae<br>Moraceae | Rosales<br>Rosales  | APG IV<br>APG IV | Cannabaceae<br>Moraceae                                  |
| 88  | 88.000                                     | 088                             |                                    | Urticaceae               | 221                                  | Urticaceae              | Rosales             | APG IV           | Urticaceae   |
| 84  |  | 085                             |                                    |                          | 222                                  | Nothofagaceae *         | Fagales             | APG IV           | Nothofagaceae  |
| 77  |  | 084                             |                                    |                          | 223                                  | Fagaceae                | Fagales             | APG IV           | Fagaceae   |
| 80  |  | 077                             |                                    |                          | 224                                  | Myricaceae *            | Fagales             | APG IV           | Myricaceae   |
| 70  | 70.000                                     | 080                             |                                    | Casuarinaceae            | 225                                  | Juglandaceae *          | Fagales             | APG IV           | Juglandaceae   |
| 83  |  | 070                             |                                    |                          | 226                                  | Casuarinaceae           | Fagales             | APG IV           | Casuarinaceae  |
| 197 |  | 101A                            |                                    | Apodanthaceae            | 228                                  |                         | Fagales             | APG IV           | Betulaceae   |
| 192 |  |                                 |                                    |                          | 229                                  | Apodanthaceae           | Cucurbitales        | APG IV           | Apodanthaceae  |
| 337 | 337.000                                    | 337                             |                                    | Cucurbitaceae            | 231                                  |                         | Cucurbitales        | APG IV           | Corynocarpaceae  |
| 252 |  |                                 |                                    |                          | 232                                  |                         | Cucurbitales        | APG IV           | Coriariaceae   |
| 253 |  |                                 |                                    |                          | 233                                  | Cucurbitaceae           | Cucurbitales        | APG IV           | Cucurbitaceae  |
| 199 | 199.000                                    | 199                             |                                    | Celastraceae             | 235                                  |                         | Cucurbitales        | APG IV           | Datisaceae   |
| 168 | 168.000                                    | 168                             |                                    | Oxalidaceae              | 236                                  |                         | Cucurbitales        | APG IV           | Begoniaceae  |
| 155 | 155.000                                    | 155                             |                                    |                          | 238                                  | Celastraceae            | Celastrales         | APG IV           | Celastraceae   |
| 217 |  | 217                             |                                    | Elaeocarpaceae           | 241                                  | Oxalidaceae             | Oxalidales          | APG IV           | Oxalidaceae  |
| 150 | 150.000                                    | 150                             |                                    | Cephalotaceae            | 242                                  | Cunoniaceae *           | Oxalidales          | APG IV           | Cunoniaceae  |
|     |  |                                 |                                    |                          | 243                                  | Elaeocarpaceae          | Oxalidales          | APG IV           | Elaeocarpaceae   |
|     |  |                                 |                                    |                          | 244                                  | Cephalotaceae           | Oxalidales          | APG IV           | Cephalotaceae  |

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|---|---------------------------------------|---|-----------------------------|--|-------------------------|------------------------|-----------------|--|
|   |                                       |   |                             |  |                         |                        |                 |  |
| 153   |                                       |   |                             | 245  |                         | Oxalidales             | APG IV          | Brunelliaceae  |
| 166   |                                       |   |                             | 246  |                         | Malpighiales           | APG IV          | Pandaceae  |
| 269   | 269.000                               | 269   | Rhizophoraceae              | 249  |                         | Malpighiales           | APG IV          | Rhizophoraceae   |
| 172   |                                       | 172   | Erythroxylaceae             | 250  |                         | Malpighiales           | APG IV          | Erythroxylaceae  |
| 228   |                                       |   |                             | 251  |                         | Malpighiales           | APG IV          | Ochnaceae  |
| 233<br>[as Guttiferae]                      | 233.000<br>[as Guttiferae]            | 233   | Clusiaceae                  | 253  |                         | Malpighiales           | APG IV          | Clusiaceae   |
| 140   |                                       | 140   | Podostemaceae               | 255  |                         | Malpighiales           | APG IV          | Podostemaceae  |
| 232 [as Theaceae]                           |                                       | 232   | Hypericaceae                | 256  |                         | Malpighiales           | APG IV          | Hypericaceae   |
| 229   |                                       |   |                             | 257  |                         | Malpighiales           | APG IV          | Caryocaraceae  |
|   |                                       | 185C  | Putranjivaceae              | 259  |                         | Malpighiales           | APG IV          | Putranjivaceae   |
| 235   | 235.000                               | 235   | Elatinaceae                 | 261  |                         | Malpighiales           | APG IV          | Elatinaceae  |
| 179   |                                       | 179   |                             | 262  |                         | Malpighiales *         | APG IV          | Malpighiaceae  |
| 78  |                                       |   |                             | 263  |                         | Malpighiales           | APG IV          | Balanopaceae   |
| 180   |                                       |   |                             | 264  |                         | Malpighiales           | APG IV          | Trigonaceae  |
| 184   |                                       |   |                             | 265  |                         | Malpighiales           | APG IV          | Dichapetalaceae  |
|   |                                       | 161A  | Chrysobalanaceae            | 267  |                         | Malpighiales           | APG IV          | Chrysobalanaceae   |
| 171   |                                       |   |                             | 268  |                         | Malpighiales           | APG IV          | Humiriaceae  |
| 249   |                                       |   |                             | 269  |                         | Malpighiales           | APG IV          | Achariaceae  |
| 243   | 243.000                               | 243   | Violaceae                   | 270  |                         | Malpighiales           | APG IV          | Violaceae  |
| 248   | 248.000                               | 248   | Passifloraceae              | 272  |                         | Malpighiales           | APG IV          | Passifloraceae   |
| 246   |                                       | 246   | Turneraceae                 | 273  |                         | Malpighiales           | TRC             |  |



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|---|---------------------------------------|---|-----------------------------|--|-------------------------|------------------------|-----------------|--|
|   |                                       |   |                             |  |                         |                        |                 |  |
| 74  |                                       |   |                             | 274  |                         | Malpighiales           | APG IV          | Laciniaceae  |
| 75  |                                       | 075   | Salicaceae                  | 275  | Salicaceae              | Malpighiales           | APG IV          | Salicaceae   |
| 101   | 101.000                               | 101   |                             | 277  |                         | Malpighiales           | APG IV          | Rafflesiaceae  |
| 185   | 185.000                               | 185   | Euphorbiaceae               | 278  | Euphorbiaceae           | Malpighiales           | APG IV          | Euphorbiaceae  |
| 170   | 170.000                               | 170   | Linaceae                    | 279  | Linaceae                | Malpighiales           | APG IV          | Linaceae   |
|   |                                       | 185B  | Picrodendraceae             | 281  | Picrodendraceae         | Malpighiales           | APG IV          | Picrodendraceae  |
| 167   | 167.000                               | 185A  | Phyllanthaceae              | 282  | Phyllanthaceae          | Malpighiales           | APG IV          | Phyllanthaceae   |
| 209   |                                       | 167   | Geraniaceae                 | 283  | Geraniaceae             | Geraniales             | APG IV          | Geraniaceae  |
|   |                                       |   | Melastomataceae             | 284  | Francoaceae             | Geraniales             | APG IV          | Francoaceae  |
| 272   | 272.000                               | 272   | Combretaceae                | 285  | Combretaceae            | Myrtales               | APG IV          | Combretaceae   |
| 265   | 265.000                               | 265   | Lythraceae                  | 286  | Lythraceae              | Myrtales               | APG IV          | Lythraceae   |
| 275   | 275.000                               | 275   | Onagraceae                  | 287  | Onagraceae              | Myrtales               | APG IV          | Onagraceae   |
| 181   |                                       |   |                             | 288  |                         | Myrtales               | APG IV          | Voehysiaceae   |
| 273   | 273.000                               | 273   | Myrtaceae                   | 289  | Myrtaceae               | Myrtales               | APG IV          | Myrtaceae  |
| 274   |                                       | 274   | Melastomataceae             | 290  | Melastomataceae         | Myrtales               | APG IV          | Melastomataceae  |
|   |                                       |   |                             | 291  | Crypteroniaceae *       | Myrtales               | APG IV          | Crypteroniaceae  |
| 261   |                                       |   |                             | 293  |                         | Myrtales               | APG IV          | Penaeaceae   |
| 260   |                                       |   |                             | 295  |                         | Crossosomatales        | APG IV          | Geissolomataceae   |
| 203   |                                       |   |                             | 297  |                         | Crossosomatales        | APG IV          | Staphyleaceae  |
| 245   |                                       |   |                             | 299  |                         | Crossosomatales        | APG IV          | Stachyuraceae  |
| 160   |                                       | 160   |                             | 300  |                         | Crossosomatales        | APG IV          | Crossosomataceae   |

| Gardner<br>annotation in Wil-<br>lis (1919) | PERTH<br>Family<br>Number<br>[1953–1958] | PERTH<br>Family<br>Number<br>[c. 1930–<br>2009] | PERTH Family<br>[2010–2017] | PERTH<br>Linear<br>Sequence<br>Number<br>[2018–] | PERTH Family<br>[2018–] | PERTH Order<br>[2018–] | PERTH<br>Source | Family in APG IV/PPG I/<br>Christenhusz <i>et al.</i> (2011) |
|---|--|---|-----------------------------|--|-------------------------|------------------------|-----------------|--|
|   |  | 175A  | Nitriaceae                  | 307  | Nitriaceae              | Sapindales             | APG IV          | Nitriaceae   |
| 177   | 177.000                                  | 177   | Bursaceae                   | 309  | Bursaceae               | Sapindales             | APG IV          | Bursaceae  |
| 194   | 194.000                                  | 194   | Anacardiaceae               | 310  | Anacardiaceae           | Sapindales             | APG IV          | Anacardiaceae  |
| 207   | 207.000                                  | 207   | Sapindaceae                 | 311  | Sapindaceae             | Sapindales             | APG IV          | Sapindaceae  |
| 175   | 175.000                                  | 175   | Rutaceae                    | 312  | Rutaceae                | Sapindales             | APG IV          | Rutaceae   |
| 176   |  | 176   | Simaroubaceae               | 313  | Simaroubaceae           | Sapindales             | APG IV          | Simaroubaceae  |
| 178   | 178.000                                  | 178   | Meliaceae                   | 314  | Meliaceae               | Sapindales             | APG IV          | Meliaceae  |
|   |  | 221A  |                             | 316  | Muntingiaceae *         | Malvales               | APG IV          | Muntingiaceae  |
| 221   | 221.000                                  | 221   | Malvaceae                   | 318  | Malvaceae               | Malvales               | APG IV          | Malvaceae  |
| 263   | 263.000                                  | 263   | Thymelaeaceae               | 320  | Thymelaeaceae           | Malvales               | APG IV          | Thymelaeaceae  |
| 240   |  | 240   | Bixaceae                    | 321  | Bixaceae                | Malvales               | APG IV          | Bixaceae   |
| 239   |  |   |                             | 322  |                         | Malvales               | APG IV          | Cistaceae  |
| 234   |  |   |                             | 324  |                         | Malvales               | APG IV          | Dipterocarpaceae   |
| 169   | 169.000                                  | 169   | Tropaeolaceae               | 326  | Tropaeolaceae           | Brassicales            | APG IV          | Tropaeolaceae  |
| 141   |  | 141   | Moringaceae                 | 327  | Moringaceae             | Brassicales            | APG IV          | Moringaceae  |
| 250   |  | 250   |                             | 328  | Caricaceae              | Brassicales            | APG IV          | Caricaceae   |
| 193   |  |   |                             | 329  |                         | Brassicales            | APG IV          | Limnanthaceae  |
| 81 [as Batidaceae]                          |  | 081   | Bataceae                    | 332  | Bataceae                | Brassicales            | APG IV          | Bataceae   |
| 201   |  |   |                             | 333  |                         | Brassicales            | APG IV          | Salvadoraceae  |
| 137b  |  | 137B  | Emblingiaceae               | 334  | Emblingiaceae           | Brassicales            | APG IV          | Emblingiaceae  |
| 138a  |  |   |                             | 335  |                         | Brassicales            | APG IV          | Tovariaceae  |

| Gardner annotation in Willis (1919)            | PERTH Family Number [1953–1958] | PERTH Family Number [c. 1930–2009] | PERTH Family [2010–2017]   | PERTH Linear Sequence Number [2018–] | PERTH Family [2018–]       | PERTH Order [2018–]        | PERTH Source     | Family in APG IV/PPG I/Christenhusz <i>et al.</i> (2011) |
|--|---------------------------------|------------------------------------|----------------------------|--------------------------------------|----------------------------|----------------------------|------------------|--|
| 108  |                                 | 108                                | Gyrostemonaceae            | 337                                  | Gyrostemonaceae            | Brassicales                | APG IV           | Gyrostemonaceae  |
| 139  | 139.000                         | 139                                | Resedaceae                 | 338                                  | Resedaceae                 | Brassicales                | APG IV           | Resedaceae   |
| 137<br>[as orthographic variant Capparidaceae] | 137.000                         | 137A                               | Capparaceae                | 339                                  | Capparaceae                | Brassicales                | APG IV           | Capparaceae  |
| 138<br>[as Cruciferae]                         | 138.000<br>[as Cruciferae]      | 137C<br>138                        | Cleomaceae<br>Brassicaceae | 340<br>341                           | Cleomaceae<br>Brassicaceae | Brassicales<br>Brassicales | APG IV<br>APG IV | Cleomaceae<br>Brassicaceae                               |
| Superasterids                                  |                                 |                                    |                            |                                      |                            |                            |                  |  |
| 342<br>[as Brunoniaceae]                       | 342.000<br>[as Brunoniaceae]    |                                    |                            | 342                                  |                            | Berberidopsidales          | APG IV           | Aextoxicaceae  |
| 95   | 95.000                          | 095                                | Oleaceae                   | 344                                  | Oleaceae                   | Santalales                 | APG IV           | Oleaceae   |
| 93   | 93.000                          | 093                                | Opiliaceae                 | 345                                  | Opiliaceae                 | Santalales                 | APG IV           | Opiliaceae   |
| 98   |                                 |                                    |                            | 346                                  |                            | Santalales                 | APG IV           | Balanophoraceae  |
| 92   | 92.000                          | 092                                | Santalaceae                | 347                                  | Santalaceae                | Santalales                 | APG IV           | Santalaceae  |
| 97   | 97.000                          | 097                                | Loranthaceae               | 350                                  | Loranthaceae               | Santalales                 | APG IV           | Loranthaceae   |
| 236  | 236.000                         | 236                                | Frankeniaceae              | 351                                  | Frankeniaceae              | Caryophyllales             | APG IV           | Frankeniaceae  |
| 237  |                                 | 237                                | Tamaricaceae               | 352                                  | Tamaricaceae               | Caryophyllales             | APG IV           | Tamaricaceae   |
| 294  | 294.000                         | 294                                | Plumbaginaceae             | 353                                  | Plumbaginaceae             | Caryophyllales             | APG IV           | Plumbaginaceae   |
| 103  | 103.000                         | 103                                | Polygonaceae               | 354                                  | Polygonaceae               | Caryophyllales             | APG IV           | Polygonaceae   |
| 143  | 143.000                         | 143                                | Droseraceae                | 355                                  | Droseraceae                | Caryophyllales             | APG IV           | Droseraceae  |
| 142  |                                 | 142                                |                            | 356                                  | Nepenthaceae *             | Caryophyllales             | APG IV           | Nepenthaceae   |
| 254  |                                 |                                    |                            | 359                                  |                            | Caryophyllales             | APG IV           | Ancistrocladaceae  |

| Gardner<br>annotation in Wil-<br>lis (1919) | PERTH<br>Family<br>Number<br>[1953–1958] | PERTH<br>Family<br>Number<br>[c. 1930–<br>2009] | PERTH Family<br>[2010–2017] | PERTH<br>Linear<br>Sequence<br>Number<br>[2018–] | PERTH Family<br>[2018–] | PERTH Order<br>[2018–] | PERTH<br>Source | Family in APG IV/PPG I/<br>Christenhusz <i>et al.</i> (2011) |
|---|--|---|-----------------------------|--|-------------------------|------------------------|-----------------|--|
|   |  | 187   |                             | 361  | Simmondsiaceae *        | Caryophyllales         | APG IV          | Simmondsiaceae   |
|   |  |   |                             | 364  | Macarthuriaceae         | Caryophyllales         | APG IV          | Macarthuriaceae  |
| 113   | 113.000                                  | 113   | Caryophyllaceae             | 366  | Caryophyllaceae         | Caryophyllales         | APG IV          | Caryophyllaceae  |
| 106   | 106.000                                  | 106   | Amaranthaceae               | 368  | Amaranthaceae           | Caryophyllales         | APG IV          | Amaranthaceae  |
| 105   | 105.000                                  | 105   | Chenopodiaceae              | 369  | Chenopodiaceae          | Caryophyllales         |                 |  |
| 110   | 110.000                                  | 110   | Aizoaceae                   | 376  | Aizoaceae               | Caryophyllales         | APG IV          | Aizoaceae  |
| 109   | 109.000                                  | 109   | Phytolaccaceae              | 377  | Phytolaccaceae          | Caryophyllales         | APG IV          | Phytolaccaceae   |
| 107   | 107.000                                  | 107   | Nyctaginaceae               | 380  | Nyctaginaceae           | Caryophyllales         | APG IV          | Nyctaginaceae  |
|   |  | 110A  | Molluginaceae               | 381  | Molluginaceae           | Caryophyllales         | APG IV          | Molluginaceae  |
|   |  |   |                             | 382  | Montiaceae              | Caryophyllales         | APG IV          | Montiaceae   |
|   |  | 111A  |                             | 383  | Didiereaceae            | Caryophyllales         | APG IV          | Didiereaceae   |
| 112   |  | 112   | Basellaceae                 | 384  | Basellaceae             | Caryophyllales         | APG IV          | Basellaceae  |
| 111   | 111.000                                  | 111   | Portulacaceae               | 387  | Portulacaceae           | Caryophyllales         | APG IV          | Portulacaceae  |
| 256   | 256.000                                  | 256   | Cactaceae                   | 388  | Anacampserotaceae       | Caryophyllales         | APG IV          | Anacampserotaceae  |
|   |  |   |                             | 389  | Cactaceae               | Caryophyllales         | APG IV          | Cactaceae  |
| Asterids                                    |  |   |                             |  |                         |                        |                 |  |
| 270   |  |   |                             | 390  |                         | Cornales               | APG IV          | Nyssaceae  |
| 148   |  |   |                             | 391  |                         | Cornales               | APG IV          | Hydrostachyaceae   |
| 251   |  |   | Hydrangeaceae               | 392  | Hydrangeaceae           | Cornales               | APG IV          | Hydrangeaceae  |
| 94  |  |   |                             | 393  |                         | Cornales               | APG IV          | Loasaceae  |
| 282   |  |   |                             | 395  | Grubbiaceae *           | Cornales               | APG IV          | Grubbiaceae  |
|   |  |   |                             | 396  |                         | Cornales               | APG IV          | Cornaceae  |

| Gardner annotation in <i>Willis</i> (1919) | PERTH Family Number [1953–1958] | PERTH Family Number [c. 1930–2009] | PERTH Family [2010–2017] | PERTH Linear Sequence Number [2018–] | PERTH Family [2018–] | PERTH Order [2018–] | PERTH Source | Family in APG IV/PPG I/Christenhusz <i>et al.</i> (2011) |
|--|---------------------------------|------------------------------------|--------------------------|--------------------------------------|----------------------|---------------------|--------------|--|
| 210  |                                 | 210                                | Balsaminaceae            | 397                                  | Balsaminaceae        | Ericales            | APG IV       | Balsaminaceae  |
| 230  |                                 |                                    |                          | 398                                  |                      | Ericales            | APG IV       | Marcgraviaceae   |
| 238  |                                 |                                    |                          | 400                                  |                      | Ericales            | APG IV       | Fouquieriaceae   |
| 308  | 308.000                         | 308                                | Polemoniaceae            | 401                                  | Polemoniaceae        | Ericales            | APG IV       | Polemoniaceae  |
| 268  | 268.000                         | 268                                | Lecythidaceae            | 402                                  | Lecythidaceae        | Ericales            | APG IV       | Lecythidaceae  |
| 196  |                                 |                                    |                          | 404                                  | Pentaphylacaceae *   | Ericales            | APG IV       | Pentaphylacaceae   |
| 296  | 296.000                         | 296                                | Sapotaceae               | 405                                  | Sapotaceae           | Ericales            | APG IV       | Sapotaceae   |
| 297  | 297.000                         | 297                                | Ebenaceae                | 406                                  | Ebenaceae            | Ericales            | APG IV       | Ebenaceae  |
| 293  | 293.000                         | 293                                | Primulaceae              | 407                                  | Primulaceae          | Ericales            | APG IV       | Primulaceae  |
| 298  |                                 | 298                                |                          | 409                                  | Symplocaceae *       | Ericales            | APG IV       | Symplocaceae   |
| 289  |                                 |                                    |                          | 410                                  |                      | Ericales            | APG IV       | Diapensiaceae  |
| 299  |                                 |                                    |                          | 411                                  |                      | Ericales            | APG IV       | Styracaceae  |
| 141  |                                 |                                    |                          | 412                                  |                      | Ericales            | APG IV       | Sarraceniaceae   |
| [Sarraceniaceae and Moringaceae]           |                                 |                                    |                          |                                      |                      |                     |              |  |
| 284  |                                 |                                    |                          | 415                                  |                      | Ericales            | APG IV       | Clethraceae  |
| 195  |                                 |                                    |                          | 416                                  |                      | Ericales            | APG IV       | Cyrtillaceae   |
| 287  |                                 | 287                                | Ericaceae                | 417                                  | Ericaceae            | Ericales            | APG IV       | Ericaceae  |
| 204  |                                 |                                    |                          | 420                                  |                      | Isocarinales        | APG IV       | Isocarinales   |
| 158  |                                 |                                    |                          | 422                                  |                      | Garryales           | APG IV       | Eucommiaceae   |
| 76   |                                 |                                    |                          | 423                                  |                      | Garryales           | APG IV       | Garryaceae   |
| 331  | 331.000                         | 331                                | Rubiaceae                | 424                                  | Rubiaceae            | Gentianales         | APG IV       | Rubiaceae  |
| 303  | 303.000                         | 303                                | Gentianaceae             | 425                                  | Gentianaceae         | Gentianales         | APG IV       | Gentianaceae   |



| Gardner<br>annotation in Wil-<br>lis (1919) | PERTH Family<br>Number<br>[1953–1958] | PERTH<br>Family<br>Number<br>[c. 1930–<br>2009] | PERTH Family<br>[2010–2017] | PERTH<br>Linear<br>Sequence<br>Number<br>[2018–] | PERTH Family<br>[2018–] | PERTH Order<br>[2018–] | PERTH<br>Source | Family in APG IV/PPG I/<br>Christenhusz <i>et al.</i> (2011) |
|---|---------------------------------------|---|-----------------------------|--|-------------------------|------------------------|-----------------|--|
| 302   | 302.000                               | 302   | Loganiaceae                 | 426  | Loganiaceae             | Gentianales            | APG IV          | Loganiaceae  |
| 304   | 304.000                               | 304   | Apocynaceae                 | 428  | Apocynaceae             | Gentianales            | APG IV          | Apocynaceae  |
| 310   | 310.000                               | 310   | Boraginaceae                | 429  | Boraginaceae            | Boraginales            | APG IV          | Boraginaceae   |
| 307   | 307.000                               | 307   | Convolvulaceae              | 431  | Convolvulaceae          | Solanales              | APG IV          | Convolvulaceae   |
| 315   | 315.000                               | 315   | Solanaceae                  | 432  | Solanaceae              | Solanales              | APG IV          | Solanaceae   |
| 338   |                                       | 338   | Sphenocleaceae              | 434  | Sphenocleaceae          | Solanales              | APG IV          | Sphenocleaceae   |
|   |                                       | 314   | Hydroleaceae                | 435  | Hydroleaceae            | Solanales              | APG IV          | Hydroleaceae   |
| 301   | 301.000                               | 301   | Oleaceae                    | 438  | Oleaceae                | Lamiales               | APG IV          | Oleaceae   |
|   |                                       | 321A  | Calceolariaceae             | 440  | Calceolariaceae         | Lamiales               | APG IV          | Calceolariaceae  |
| 321   |                                       | 321   |                             | 441  | Gesneriaceae *          | Lamiales               | APG IV          | Gesneriaceae   |
| 329   | 329.000                               | 329   | Plantaginaceae              | 442  | Plantaginaceae          | Lamiales               | APG IV          | Plantaginaceae   |
| 316   | 316.000                               | 316   | Scrophulariaceae            | 443  | Scrophulariaceae        | Lamiales               | APG IV          | Scrophulariaceae   |
|   |                                       | 330   | Linderniaceae               | 445  | Linderniaceae           | Lamiales               | APG IV          | Linderniaceae  |
| 154 [as<br>Myrothamnaceae]                  | 154.000                               | 154   | Byblidaceae                 | 446  | Byblidaceae             | Lamiales               | APG IV          | Byblidaceae  |
| 319   |                                       | 319   | Martyniaceae                | 447  | Martyniaceae            | Lamiales               | APG IV          | Martyniaceae   |
| 318   | 318.000                               | 318   | Pedaliaceae                 | 448  | Pedaliaceae             | Lamiales               | APG IV          | Pedaliaceae  |
| 325   | 325.000                               | 325   | Acanthaceae                 | 449  | Acanthaceae             | Lamiales               | APG IV          | Acanthaceae  |
| 317   | 317.000                               | 317   | Bignoniaceae                | 450  | Bignoniaceae            | Lamiales               | APG IV          | Bignoniaceae   |
| 323   | 323.000                               | 323   | Lentibulariaceae            | 451  | Lentibulariaceae        | Lamiales               | APG IV          | Lentibulariaceae   |
| 311   | 311.000                               | 311   | Verbenaceae                 | 454  | Verbenaceae             | Lamiales               | APG IV          | Verbenaceae  |
| 312<br>[as Labiatae]                        | 312.000<br>[as Labiatae]              | 313   | Lamiaceae                   | 455  | Lamiaceae               | Lamiales               | APG IV          | Lamiaceae  |

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|-------------------------------------|---------------------------------|------------------------------------|--------------------------|--------------------------------------|----------------------|---------------------|--------------|--|
| 327                                 |                                 | 327                                | Phrymaceae               | 457                                  | Phrymaceae           | Lamiales            | APG IV       | Phrymaceae   |
| 320                                 | 320.000                         | 320                                | Orobanchaceae            | 459                                  | Orobanchaceae        | Lamiales            | APG IV       | Orobanchaceae  |
| 198                                 | 198.000                         | 198                                | Aquifoliaceae            | 464                                  | Aquifoliaceae        | Aquifoliales        | APG IV       | Aquifoliaceae  |
|                                     |                                 | 151C                               |                          | 465                                  | Rousseaceae *        | Asterales           | APG IV       | Rousseaceae  |
| 339                                 | 339.000                         | 339                                | Campanulaceae            | 466                                  | Campanulaceae        | Asterales           | APG IV       | Campanulaceae  |
| 343                                 | 343.000                         | 343                                | Stylidiaceae             | 468                                  | Stylidiaceae         | Asterales           | APG IV       | Stylidiaceae   |
|                                     |                                 | 343A                               |                          | 469                                  | Donatiaceae *        | Asterales           | TRC          |  |
|                                     |                                 |                                    |                          | 470                                  | Alseuosmiaceae *     | Asterales           | APG IV       | Alseuosmiaceae   |
|                                     |                                 |                                    |                          | 472                                  | Argophyllaceae *     | Asterales           | APG IV       | Argophyllaceae   |
|                                     |                                 | 303A                               | Menyanthaceae            | 473                                  | Menyanthaceae        | Asterales           | APG IV       | Menyanthaceae  |
| 341                                 | 341.000                         | 341                                | Goodeniaceae             | 474                                  | Goodeniaceae         | Asterales           | APG IV       | Goodeniaceae   |
| 344                                 |                                 |                                    |                          | 475                                  |                      | Asterales           | APG IV       | Calyceraceae   |
| 345                                 | 345.000 [as Compositae]         | 345                                | Asteraceae               | 476                                  | Asteraceae           | Asterales           | APG IV       | Asteraceae   |
|                                     |                                 | 151B                               |                          | 477                                  | Escalloniaceae *     | Escalloniales       | APG IV       | Escalloniaceae   |
|                                     |                                 | 151A                               | Eremosynaceae            | 478                                  | Eremosynaceae        | Escalloniales       | TRC          |  |
| 322                                 |                                 |                                    |                          | 479                                  |                      | Bruniales           | APG IV       | Columelliaceae   |
| 157                                 |                                 |                                    |                          | 480                                  | Bruniaceae *         | Bruniales           | APG IV       | Bruniaceae   |
|                                     |                                 | 154A                               | Paracryphiaceae *        | 481                                  | Paracryphiaceae *    | Paracryphiales      | APG IV       | Paracryphiaceae  |
| 333                                 |                                 | 333                                | Adoxaceae *              | 482                                  | Adoxaceae *          | Dipsacales          | APG IV       | Adoxaceae  |
| 332                                 |                                 | 332                                | Caprifoliaceae           | 483                                  | Caprifoliaceae       | Dipsacales          | APG IV       | Caprifoliaceae   |

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|---|---------------------------------------|---|-----------------------------|--|-------------------------|------------------------|-----------------|---|
| 152   | 152.000                               | 152   | Pittosporaceae              | 487  | Pittosporaceae          | Apiales                | APG IV          | Pittosporaceae  |
| 280   | 280.000                               | 280   | Araliaceae                  | 488  | Araliaceae              | Apiales                | APG IV          | Araliaceae  |
| 281   | 281.000<br>[as<br>Umbelliferae]       | 281   | Apiaceae                    | 490  | Apiaceae                | Apiales                | APG IV          | Apiaceae  |

**Appendix 2.** Summary of families synonymised during the APG II, III and IV (Angiosperm Phylogeny Group 2003; 2009; 2016) rearrangements with their historical numbers. For source of current family adopted at PERTH, see Appendix 1; \* = not considered native or naturalised in Western Australia but represented in herbarium collections. Blue columns indicate the current arrangement at PERTH.

| Gardner annotation in Willis (1919) | PERTH Family Number [1953–1958] | PERTH Family Number [c. 1930–2009] | PERTH Family [c. 1930–2009] | PERTH Family [2018–] | PERTH Linear Sequence Number [2018–] |
|-------------------------------------|---------------------------------|------------------------------------|-----------------------------|----------------------|--------------------------------------|
|                                     |                                 | 006B                               | Angiopteridaceae            | Marattiaceae *       | 7                                    |
|                                     |                                 | 007                                | Adiantaceae                 | Pteridaceae          | 30                                   |
|                                     | 3.000                           | 007A                               | Parkeriaceae                | Pteridaceae          | 30                                   |
|                                     |                                 | 008A                               | Vittariaceae                | Pteridaceae          | 30                                   |
|                                     |                                 | 009A                               | Grammitidaceae              | Polypodiaceae        | 51                                   |
|                                     |                                 | 009B                               | Platyzomataceae             | Pteridaceae          | 30                                   |
|                                     |                                 | 012A                               | Aspidiaceae                 | Dryopteridaceae      | 45                                   |
|                                     |                                 | 015                                | Azollaceae                  | Salviniaceae         | 16                                   |
|                                     |                                 | 018A                               | Taxodiaceae                 | Cupressaceae         | 62                                   |
|                                     |                                 | 023A                               | Zannichelliaceae            | Potamogetonaceae     | 101                                  |
| 24                                  | 24.000                          | 024                                | Najadaceae                  | Hydrocharitaceae     | 95                                   |
| 36                                  | 36.000                          | 036                                | Lemnaceae                   | Araceae              | 91                                   |
|                                     |                                 | 054E                               | Phormiaceae                 | Hemerocallidaceae    | 138                                  |
|                                     |                                 | 054F                               | Anthericaceae               | Asparagaceae         | 142                                  |
|                                     |                                 | 054H                               | Hyacinthaceae               | Asparagaceae         | 142                                  |
|                                     |                                 | 054O                               | Trilliaceae                 | Melanthiaceae *      | 117                                  |
|                                     |                                 | 056B                               | Agavaceae                   | Asparagaceae         | 142                                  |
|                                     |                                 | 056C                               | Aloeaceae                   | Asphodelaceae        | 137                                  |
|                                     |                                 | 097A                               | Viscaceae                   | Santalaceae          | 347                                  |
| 136                                 | 136.000                         | 136                                | Fumariaceae                 | Papaveraceae         | 176                                  |
| 163                                 | 163.000                         | 163                                | Mimosaceae                  | Fabaceae             | 210                                  |
| 164                                 | 164.000                         | 164                                | Caesalpiniaceae             | Fabaceae             | 210                                  |
| 165                                 | 165.000<br>[as Leguminosae]     | 165                                | Papilionaceae               | Fabaceae             | 210                                  |
| 182                                 | 182.000                         | 182                                | Tremandraceae               | Elaeocarpaceae       | 243                                  |
| 186                                 | 186.000                         | 186                                | Callitrichaceae             | Plantaginaceae       | 442                                  |
| 200                                 |                                 | 200                                | Hippocrateaceae             | Celastraceae         | 238                                  |
| 202                                 | 202.000                         | 202                                | Stackhousiaceae             | Celastraceae         | 238                                  |
| 209                                 |                                 | 209                                | Melianthaceae               | Francoaceae          | 284                                  |
| 220                                 | 220.000                         | 220                                | Tiliaceae                   | Malvaceae            | 318                                  |
| 222                                 | 222.000                         | 222                                | Bombacaceae                 | Malvaceae            | 318                                  |
| 223                                 | 223.000                         | 223                                | Sterculiaceae               | Malvaceae            | 318                                  |
| 227                                 |                                 | 227                                | Eucryphiaceae               | Cunoniaceae *        | 242                                  |

| Gardner annotation in Willis (1919) | PERTH Family Number [1953–1958] | PERTH Family Number [c. 1930–2009] | PERTH Family [c. 1930–2009] | PERTH Family [2018–] | PERTH Linear Sequence Number [2018–] |
|-------------------------------------|---------------------------------|------------------------------------|-----------------------------|----------------------|--------------------------------------|
|                                     |                                 | 006B                               | Angiopteridaceae            | Marattiaceae *       | 7                                    |
|                                     |                                 | 007                                | Adiantaceae                 | Pteridaceae          | 30                                   |
|                                     | 3.000                           | 007A                               | Parkeriaceae                | Pteridaceae          | 30                                   |
|                                     |                                 | 008A                               | Vittariaceae                | Pteridaceae          | 30                                   |
|                                     |                                 | 009A                               | Grammitidaceae              | Polypodiaceae        | 51                                   |
|                                     |                                 | 009B                               | Platyzomataceae             | Pteridaceae          | 30                                   |
|                                     |                                 | 012A                               | Aspidiaceae                 | Dryopteridaceae      | 45                                   |
|                                     |                                 | 015                                | Azollaceae                  | Salviniaceae         | 16                                   |
|                                     |                                 | 018A                               | Taxodiaceae                 | Cupressaceae         | 62                                   |
|                                     |                                 | 023A                               | Zannichelliaceae            | Potamogetonaceae     | 101                                  |
| 24                                  | 24.000                          | 024                                | Najadaceae                  | Hydrocharitaceae     | 95                                   |
| 36                                  | 36.000                          | 036                                | Lemnaceae                   | Araceae              | 91                                   |
|                                     |                                 | 054E                               | Phormiaceae                 | Hemerocallidaceae    | 138                                  |
|                                     |                                 | 054F                               | Antheriaceae                | Asparagaceae         | 142                                  |
|                                     |                                 | 054H                               | Hyacinthaceae               | Asparagaceae         | 142                                  |
|                                     |                                 | 054O                               | Trilliaceae                 | Melanthiaceae *      | 117                                  |
|                                     |                                 | 056B                               | Agavaceae                   | Asparagaceae         | 142                                  |
|                                     |                                 | 056C                               | Aloeaceae                   | Asphodelaceae        | 137                                  |
|                                     |                                 | 097A                               | Viscaceae                   | Santalaceae          | 347                                  |
| 136                                 | 136.000                         | 136                                | Fumariaceae                 | Papaveraceae         | 176                                  |
| 163                                 | 163.000                         | 163                                | Mimosaceae                  | Fabaceae             | 210                                  |
| 164                                 | 164.000                         | 164                                | Caesalpiniaceae             | Fabaceae             | 210                                  |
| 165                                 | 165.000<br>[as Leguminosae]     | 165                                | Papilionaceae               | Fabaceae             | 210                                  |
| 182                                 | 182.000                         | 182                                | Tremandraceae               | Elaeocarpaceae       | 243                                  |
| 186                                 | 186.000                         | 186                                | Callitrichaceae             | Plantaginaceae       | 442                                  |
| 200                                 |                                 | 200                                | Hippocrateaceae             | Celastraceae         | 238                                  |
| 202                                 | 202.000                         | 202                                | Stackhousiaceae             | Celastraceae         | 238                                  |
| 209                                 |                                 | 209                                | Melianthaceae               | Francoaceae          | 284                                  |
| 220                                 | 220.000                         | 220                                | Tiliaceae                   | Malvaceae            | 318                                  |
| 222                                 | 222.000                         | 222                                | Bombacaceae                 | Malvaceae            | 318                                  |
| 223                                 | 223.000                         | 223                                | Sterculiaceae               | Malvaceae            | 318                                  |
| 227                                 |                                 | 227                                | Eucryphiaceae               | Cunoniaceae *        | 242                                  |
| 241                                 | 241.000                         | 241                                | Cochlospermaceae            | Bixaceae             | 321                                  |
| 244                                 |                                 | 244                                | Flacourtiaceae              | Salicaceae           | 275                                  |
| 266                                 | 266.000                         | 267                                | Sonneratiaceae              | Lythraceae           | 286                                  |

| <b>Gardner<br/>annotation<br/>in<br/>Willis<br/>(1919)</b> | <b>PERTH Family<br/>Number<br/>[1953–1958]</b> | <b>PERTH Family<br/>Number<br/>[c. 1930–2009]</b> | <b>PERTH Family<br/>[c. 1930–2009]</b> | <b>PERTH Family<br/>[2018–]</b> | <b>PERTH<br/>Linear<br/>Sequence<br/>Number<br/>[2018–]</b> |
|--|--|---|--|---------------------------------|---|
| 288  | 288.000  | 288   | Epacridaceae                           | Ericaceae                       | 417   |
| 291  |  | 291   | Theophrastaceae                        | Primulaceae                     | 407   |
| 292  | 292.000  | 292   | Myrsinaceae                            | Primulaceae                     | 407   |
|  |  | 302A  | Buddlejaceae                           | Scrophulariaceae                | 443   |
| 305  | 305.000  | 305   | Asclepiadaceae                         | Apocynaceae                     | 428   |
|  |  | 307A  | Cuscutaceae                            | Convolvulaceae                  | 431   |
| 309  | 309.000  | 309   | Hydrophyllaceae                        | Boraginaceae                    | 429   |
|  |  | 311A  | Chloanthaceae                          | Lamiaceae                       | 455   |
| 312  | 311.000a                                       | 312   | Avicenniaceae                          | Acanthaceae                     | 449   |
| 326  | 326.000  | 326   | Myoporaceae                            | Scrophulariaceae                | 443   |
| 334  |  | 334   | Valerianaceae                          | Caprifoliaceae                  | 483   |
| 336  | 336.000  | 336   | Dipsacaceae                            | Caprifoliaceae                  | 483   |
| 340  | 340.000  | 340   | Lobeliaceae                            | Campanulaceae                   | 466   |

