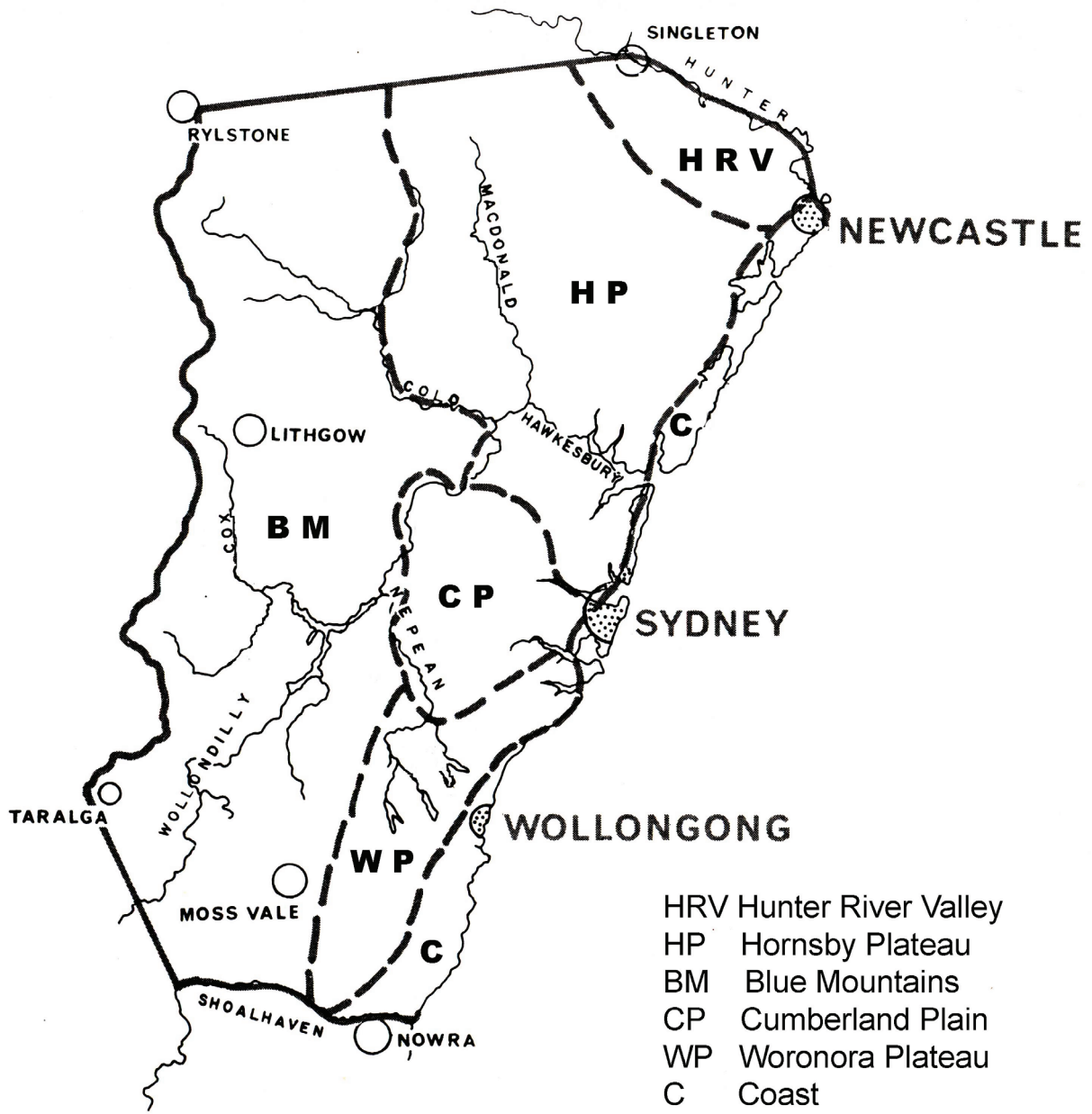


Flora of the
Sydney
Region



Flora of the Sydney Region

FIFTH EDITION

A Complete Revision by

Belinda J. Pellow

Murray J. Henwood

Roger C. Carolin

*The authors wish to acknowledge
the work of the previous authors*

Noel C. W. Beadle

Obed D. Evans

Mary D. Tindale



SYDNEY UNIVERSITY PRESS

Published 2009 by SYDNEY UNIVERSITY PRESS

University of Sydney Library

www.sup.usyd.edu.au

© Belinda J. Pellow, Murray J. Henwood, Roger C. Carolin 2009

© Sydney University Press 2009

Reproduction and Communication for other purposes

Except as permitted under the Act, no part of this edition may be reproduced, stored in a retrieval system, or communicated in any form or by any means without prior written permission. All requests for reproduction or communication should be made to Sydney University Press at the address below:

Sydney University Press
Fisher Library F03
University of Sydney NSW 2006 AUSTRALIA
Email: info@sup.usyd.edu.au

National Library of Australia Cataloguing-in-Publication entry

Author: Pellow, Belinda J. (Belinda Jane)
Title: Flora of the Sydney region : a complete revision / Belinda J. Pellow, Murray J. Henwood, Roger C. Carolin.
Edition: 5th ed.
ISBN: 9781920899301 (pbk.)
Notes: Includes index.
Bibliography.
Subjects: Botany--New South Wales--Sydney Region.
Other Authors/Contributors: Henwood, Murray J. (Murray James)
Carolin, R. C. (Roger Charles)
Dewey Number: 581.99441

Cover design and layout by Miguel Yamin, the University Publishing Service

Printed in Australia

CONTENTS

Preface to the Fifth Edition	i	22 Schizaeaceae	35
Preface to Fourth Edition (1994)	i	23 Thelypteridaceae	36
Acknowledgements	iii	24 Vittariaceae	37
How to use a Flora	iv	25 Marsileaceae	38
The Identification Process	iv	26 Azollaceae	39
The Scientific Names	vi	27 Salviniaceae	39
How to use this Flora	vi	3 Cycadophyta	40
The Arrangement of the Flora	vi	28 Zamiaceae	40
Glossary	viii	4 Pinophyta	41
Abbreviations	xxi	29 Araucariaceae	41
Illustrations	xxii	30 Cupressaceae	41
Key to the Phyla of Vascular Plants	1	31 Pinaceae	42
Key to the Lycopodiophyta and		32 Podocarpaceae	43
Monilophyta Families	2	5 Magnoliophyta	43
1 Lycopodiophyta	5	Magnoliopsida	44
1 Selaginellaceae	5	Liliopsida	58
2 Lycopodiaceae	5	Vegetative Key to	
2 Monilophyta	7	Magnoliophyta Families	65
3 Equisetaceae	7	Descriptions of	
4 Psilotaceae	7	Magnoliophyta Families	93
5 Ophioglossaceae	8	33 Nymphaeaceae	93
6 Adiantaceae	9	34 Cabombaceae	93
7 Aspleniaceae	11	35 Ceratophyllaceae	94
8 Athyriaceae	13	36 Winteraceae	94
9 Blechnaceae	14	37 Atherospermataceae	94
10 Cyatheaceae	17	38 Lauraceae	95
11 Davalliaceae	18	39 Monimiaceae	98
12 Dennstaedtiaceae	19	40 Eupomatiaceae	99
13 Dicksoniaceae	21	41 Piperaceae	99
14 Dryopteridaceae	22	42 Proteaceae	99
15 Gleicheniaceae	25	43 Berberidaceae	116
16 Grammitidaceae	27	44 Menispermaceae	116
17 Hymenophyllaceae	28	45 Papaveraceae	118
18 Lindsaeaceae	30	46 Ranunculaceae	119
19 Osmundaceae	31	47 Dilleniaceae	122
20 Polypodiaceae	32	48 Aizoaceae	126
21 Pteridaceae	34	49 Chenopodiaceae	129
		50 Amaranthaceae	136
		51 Basellaceae	140

52 Cactaceae	140	97 Resedaceae	316
53 Caryophyllaceae	141	98 Tropaeolaceae	316
54 Droseraceae	148	99 Malvaceae	316
55 Nyctaginaceae	148	100 Thymelaeaceae	324
56 Phytolaccaceae	149	101 Anacardiaceae	326
57 Plumbaginaceae	150	102 Meliaceae	327
58 Polygonaceae	150	103 Rutaceae	328
59 Portulacaceae	155	104 Sapindaceae	339
60 Olacaceae	156	105 Simaroubaceae	342
61 Loranthaceae	156	106 Balsaminaceae	343
62 Santalaceae	158	107 Ebenaceae	343
63 Aphanopetalaceae	161	108 Ericaceae	343
64 Crassulaceae	161	109 Myrsinaceae	355
65 Haloragaceae	163	110 Polemoniaceae	356
66 Vitaceae	166	111 Sapotaceae	357
67 Geraniaceae	168	112 Symplocaceae	357
68 Lythraceae	170	113 Theophrastaceae	357
69 Myrtaceae	171	114 Boraginaceae	358
70 Onagraceae	210	115 Apocynaceae	361
71 Zygophyllaceae	213	116 Gelsemiaceae	366
72 Celastraceae	214	117 Gentianaceae	366
73 Cucurbitaceae	216	118 Loganiaceae	368
74 Fabaceae	217	119 Rubiaceae	369
75 Polygalaceae	264	120 Acanthaceae	374
76 Casuarinaceae	265	121 Bignoniaceae	376
77 Elatinaceae	267	122 Gesneriaceae	378
78 Euphorbiaceae	268	123 Lamiaceae	378
79 Phyllanthaceae	274	124 Lentibulariaceae	390
80 Hypericaceae	278	125 Martyniaceae	391
81 Linaceae	278	126 Oleaceae	392
82 Ochnaceae	279	127 Plantaginaceae	393
83 Passifloraceae	279	128 Buddlejaceae	395
84 Salicaceae	280	129 Callitrichaceae	395
85 Violaceae	282	130 Selaginaceae	395
86 Cunoniaceae	284	131 Myoporaceae	396
87 Elaeocarpaceae	286	132 Scrophulariaceae	397
88 Oxalidaceae	289	133 Verbenaceae	405
89 Cannabaceae	290	134 Convolvulaceae	407
90 Moraceae	291	135 Solanaceae	410
91 Rhamnaceae	293	136 Polyosmaceae	418
92 Rosaceae	299	137 Quintiniaceae	418
93 Urticaceae	304	138 Apiaceae	418
94 Brassicaceae	306	139 Araliaceae	424
95 Capparaceae	315	140 Pennantiaceae	428
96 Gyrostemonaceae	315	141 Pittosporaceae	429

142	Cardiopteridaceae	431	187	Arecaceae	558
143	Asteraceae	432	188	Haemodoraceae	559
144	Campanulaceae	479	189	Commelinaceae	560
145	Goodeniaceae	483	190	Philydraceae	562
146	Menyanthaceae	488	191	Pontederiaceae	562
147	Rousseaceae	489	192	Centrolepidaceae	562
148	Stylidiaceae	490	193	Cyperaceae	562
149	Adoxaceae	491	194	Eriocaulaceae	588
150	Caprifoliaceae	492	195	Flagellariaceae	588
151	Dipsacaceae	492	196	Juncaceae	588
152	Valerianaceae	493	197	Poaceae	593
153	Alismataceae	493	198	Restionaceae	654
154	Aponogetonaceae	494	199	Sparganiaceae	657
155	Araceae	494	200	Typhaceae	658
156	Lemnaceae	496	201	Xyridaceae	658
157	Hydrocharitaceae	497	202	Cannaceae	659
158	Juncaginaceae	500	203	Zingiberaceae	659
159	Posidoniaceae	501			
160	Potamogetonaceae	501	Bibliography	661	
161	Zannichelliaceae	502	General (References Relevant to Multiple Families).	661	
162	Zosteraceae	503	Lycopodiophyta, Monilophyta, Cycadophyta, Pinophyta	662	
163	Alliaceae	503	Magnoliophyta (by Family)	662	
164	Agapanthaceae	504			
165	Asparagaceae	504			
166	Agavaceae	505			
167	Anthericaceae	505			
168	Amaryllidaceae	509			
169	Asphodelaceae	510			
170	Asteliaceae	511			
171	Blandfordiaceae	511			
172	Doryanthaceae	512			
173	Hemerocallidaceae	512			
174	Hypoxidaceae	514			
175	Iridaceae	515			
176	Orchidaceae	521			
177	Lomandraceae	551			
178	Xanthorrhoeaceae	553			
179	Burmanniaceae	555			
180	Dioscoreaceae	555			
181	Alstroemeriaceae	555			
182	Colchicaceae	555			
183	Liliaceae	557			
184	Philesiaceae	557			
185	Ripogonaceae	557			
186	Smilacaceae	558			

PREFACE TO THE FIFTH EDITION

Since its publication as the *Handbook of the Vascular Plants of the Sydney District and Blue Mountains* in 1962, the Flora has maintained a tradition of improvement and refinement. Designed originally as a teaching aid for botany students at the University of Sydney, the Flora was rapidly adopted by professional and amateur botanists as an adjunct to the *Flora of New South Wales* (Moore and Betche 1893) and *Maiden's Forest Flora* (1903 – 1925).

From its inception, the *Flora of the Sydney Region* has been continuously updated and improved to reflect the outcomes from taxonomic research of the day. The region covered in the fifth edition is unaltered from the fourth edition but is now known to contain over 3000 native and naturalized species. Similarly, the Flora has always been the product of a collaboration between several taxonomists. The fifth edition of the *Flora of the Sydney Region* maintains this tradition, and represents a partnership between the John Ray Herbarium (The University of Sydney), the University of Sydney Library and the Janet Cosh Herbarium (University of Wollongong).

As with previous editions, this edition is very much a product of its time. In 2005, support from the University of Wollongong Educational Strategies Development Fund (ESDF) was provided to revise four of the larger angiosperm families in the Sydney region. Then, in 2006, the NSW Environment Trust provided funds to complete the current revision and to present it in an electronic format, the eFlora. In 2009 further support from University of Wollongong ESDF enabled the completion and publication of the print-on-demand format of the Flora. As a result, the fifth edition of the *Flora of the Sydney Region* will be the first to be available in two formats; electronically and in the more familiar print form.

The arrangement and content of the fifth edition reflects recent taxonomic research. Much of this progress has been provided by the routine use of nucleotide sequences to offer insights into the evolutionary relationships within and between plant families. In the flowering plants, for example, we have seen the Epacridaceae become a subfamily of Ericaceae, and genera like *Trachymene* and *Hydrocotyle* move from Apiaceae to Araliaceae. Where such changes have been endorsed by the taxonomic community we have rewritten keys and descriptions accordingly. Where the outcomes of taxonomic research are more equivocal, we have maintained traditional definitions of taxa.

The fifth edition of the Flora is completely revised. There are, however, two threads present in the current edition that have consistently run through the Flora since its origin. The first of those threads is the intention of the authors 'to provide complete keys to the identification of all species of vascular plants known to occur in this region'. The second thread is the presence of Associate Professor Roger Carolin as co-author. As can be seen in the preface to the fourth edition Roger Carolin and Mary Tindale have maintained a 40-year connection with the *Flora of the Sydney Region*. It is a testament to their taxonomic skills that much of the Fifth Edition of the *Flora of the Sydney Region* is based on their keys from the fourth edition.

Preface to Fourth Edition (1994)

Thirty years ago the first edition of this Flora appeared with the title *Handbook of the Vascular Plants of the Sydney District and Blue Mountains*. The initiative for this came some ten years previously when the then Professor of Botany at the University of Sydney, Prof. N.A. Burges, suggested to members of the Botany School that an up-to-date method for identifying plants of the Sydney district was needed for classes held in the School. At the time a series of duplicated laboratory notes, prepared by Dr Patrick Brough and Dr John McLuckie, and based upon the *Flora of New South Wales* by Charles Moore and Ernst Betche published in 1893 was used for this purpose. *The Handbook* was eventually completed by Prof. N.C.W. Beadle, O.D. Evans and R.C. Carolin with sections written by Dr. M.D. Tindale in 1962.

In 1972 the area covered was extended to the Sydney basin, as defined by current geological research, and the publication renamed the *Flora of the Sydney Region*. The intention was, and still is, to provide complete keys to the identification of all species of vascular plants known to occur in this region. In terms

of floristics, this region is one of the richest in Australia with over 2500 native species as well as over 500 exotic species to be found in the region. A revision of the *Flora* was produced in 1982 to bring it up-to-date with current research at the time.

Since that date, the pace of taxonomic research in Australia has substantially increased. Notably, thirteen volumes of the *Flora of Australia* have been published and, as this *Flora* goes to press, three volumes of the four volumes of the *Flora of New South Wales* have appeared with the fourth in press. In addition a large number of technical papers of importance to the flora of the region have appeared. The research towards these publications has changed the situation drastically with numerous new taxa recognized and published as well as taxa not previously found in the region but now known to occur there. In addition a number of name changes have been made necessary by the International Code of Botanical Nomenclature. The previous edition of the *Flora of the Sydney Region* is now very much out-of-date.

The present complete revision has offered the opportunity to change the format from an indented key to a bracketed key. There are advantages in both these formats. The saving in space and the simplification of typesetting were considerations in the change, but in addition, it has brought the alternatives in the key together so that immediate comparisons are easier.

The present publication is not meant as a substitute for the semi-monographic floras, such as *Flora of Australia* and the *Flora of New South Wales*. It covers a much smaller area than either of these and, in addition, the descriptions given only cover the main diagnostic characters which distinguish the species concerned. It does, however, include the most populated parts of New South Wales and the single volume is more convenient to use in the field.

ACKNOWLEDGEMENTS

We would like to acknowledge our debt to Noel Beadle, Obed Evans and Mary Tindale who constructed many of the keys used in the previous editions of this work. Although the format of the keys has changed, their contribution is still apparent in many of them. Funding for the project was provided by the Environment Trust of New South Wales, the University of Wollongong and the University of Sydney.

We would like to thank the management committee of the Janet Cosh Herbarium for supporting the project particularly in the early days when funding was being sought. The staff of the National Herbarium of New South Wales provided their expertise and use of their facilities. In particular Louisa Murray, Peter Weston, Darren Crayn, Barry Conn, Surrey Jacobs, Karen Wilson, Peter Wilson and Elizabeth Brown. Marco Duretto from the Tasmanian Herbarium assisted with aspects of the Rutaceae. Keven Theile from the Western Australian Herbarium assisted with *Viola*.

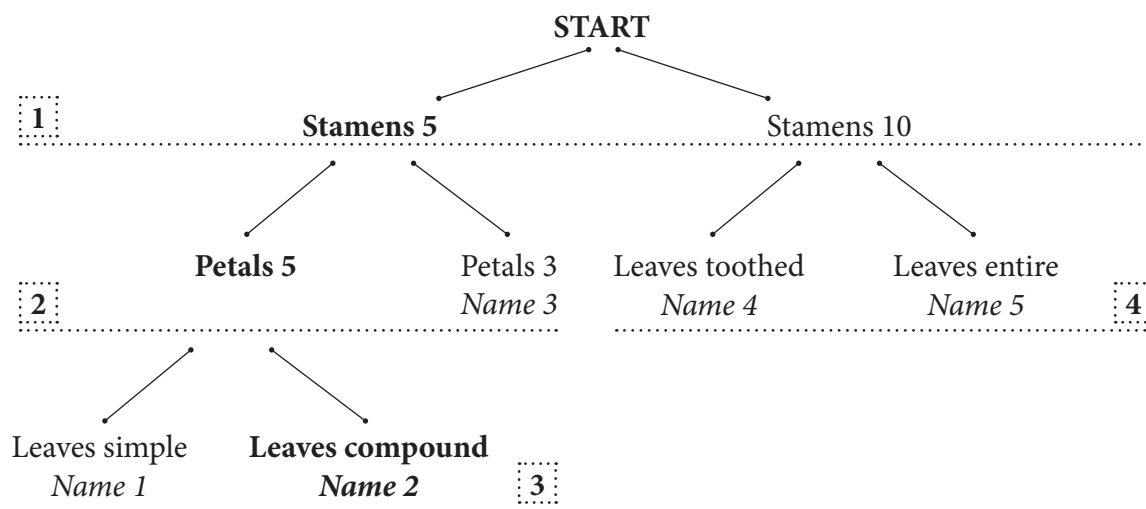
The support of Mary Peat, Su Hanfling and Rowan Brownlee from the University of Sydney and Kris French from the University of Wollongong has been essential for the execution of this project. David Keith, Janice Hughes, Elizabeth Rosser and Jean Clarke provided support and constructive comment.

HOW TO USE A FLORA

The Identification Process

Possibly everyone starts identifying plants by ‘matching’ the unknown plants with authentically identified specimens or pictures. The most important drawback to this method is probably the fact that many different, authentically identified specimens or images have to be compared before a particular specimen can be identified with accuracy. Over 3000 species occur in the Sydney Region and so this method is, at best, very time-consuming with such large numbers of possibilities to compare. In fact, this method is only useful when dealing with a small number of possibilities or when the user already has knowledge of the plant species which may reduce the number of choices available.

Keys, on the other hand, are devices that progressively eliminate numbers of possibilities. A key asks you to determine which one of a number of contrasting characteristics occurs in the unknown specimen. For example, how many stamens are present in the flower: 1, or 3, or 5, or 10 and so on. Having determined the answer to that question, a number of the initial set of potential species are rejected and you proceed to determine which one of another pair of contrasting characteristics occurs in the unknown specimen, and so on until the choice is narrowed to one and the plant is identified. A key, then, is like a tree; each branching point represents an alternative route through the key and is defined by contrasting characteristics. You follow the branches by selecting one of two contrasting characteristics until you arrive at the last branch that represents the identification – the name. In most keys there is only a pair of contrasting characteristics at each step (branching). We can draw up the key as in the diagram below in which the tree is presented starting at the top of the diagram (the **bold** words in the caption represent the identification path of a plant with five stamens, five petals and compound leaves). However, this is not an efficient use of space when such a tree is printed.



Bracketed Key

1 Stamens 5	2
1 Stamens 10	4
2 Petals 5	3
2 Petals 3	Name 3
3 Leaves simple	Name 1
3 Leaves compound	Name 2
4 Leaves toothed	Name 4
4 Leaves entire	Name 5

In this edition of the *Flora of the Sydney Region* we use a bracketed key. We have opted to use the bracketed format here primarily because pairs of contrasting characters are brought together which removes the need to flick through a number of pages to locate and compare the characters and because this format also suits the presentation of the text electronically.

The keys in this book continue to species level. In some plant guides the keys only go to the family or generic level and then are replaced by a matching system. Since matching is a subjective method and relies very much on personal judgement, we consider the objective, analytical key method to be inherently more accurate than matching, provided the information in the key is correct.

The main problem with keys of any type is the communication between the writer and the user. The user must understand what the writer is saying. For this reason special words have evolved to describe the features of plants, and often ordinary vernacular English words have been assigned special meanings. These we have defined in the glossary and many of them are illustrated. DON'T BE AFRAID OF THESE WORDS. Just look them up when you encounter them in the text and eventually you will remember what they mean. Once you have mastered them you should be able to go to any English-speaking country, pick up the local plant key and identify the plants of that country. Furthermore, since so many of the words are common to botanical books written in other European languages, albeit with slight variations in spelling, you will be well on the way to understanding the keys written in these languages too! So you see, it is worth the effort to master botanical terminology if you are interested in plants and plant identification.

The Scientific Names

The scientific name of a species consists of the generic name and a species "epithet" which is a qualifier, often an adjective. Both are written in Latin or Greek form, eg

Cryptocarya **obovata** The *Cryptocarya* (with) obovate (shaped leaves). **Adjective**

Ranunculus **repens** The creeping *Ranunculus*. **Adjective**

Eucalyptus **smithii** Smith's *Eucalyptus*. **Genitive noun**

Acacia **clunies rossiae** The *Acacia* of Clunies-Ross. **Genitive noun**

(N.B. In these examples, the generic nouns are written in italic letters, specific epithets in bold italics, and the form of the epithet in bold letter).

A guide to the pronunciation of botanical names may be found in Hall and Johnson (1993).

Abbreviations of personnel names, or the names themselves, follow the generic specific and subspecific names. These refer to the persons responsible for the publication of the name. e.g.

- (i) *Eucalyptus punctata* DC.: De Candolle (abbreviated to DC.) was the first person to publish this name and use it for this species and we have continued to do so.
- (ii) *Coriarpia leptopetala* (F.Muell.) Domin: F. Mueller (abbreviated to F.Muell.) first published the epithet "*leptopetala*" for this species but placed it in a different genus. Domin decided that this species belonged to the genus *Coriarpia*, and was the first person to publish this combination of generic name and specific epithet together. It is this combination that we recognize as the name for this species.
- (iii) *Pultenaea aristata* Sieber ex DC.: Sieber suggested the name (in this case by writing it on his preserved specimens of this species), but never published it. De Candolle (abbreviated DC.) was the first person to publish the name and use it for this species.

Since different authors, by mistake, might use the same combination of generic name and specific epithet for quite different species, the authorities for a name may assume some importance. Generally speaking they are not referred to all the time, but in publications they should be referenced, either by citing them or indicating a reference book that has been used to identify the material in question.

How to Use this Flora

Start at the Key to phyla and using the method outlined above, determine the phyla to which the unknown plant belongs. With practice you will soon be able to recognise the phylum a plant belongs to without using the Phyla Key.

Proceed to the appropriate phylum and using the key determine what family the plant belongs to. Once you have determined the family you can move to the next key by turning to the family indicated.

Working through the family key you will be able to determine the genus the plant belongs in. The genus will be numbered so turn to the appropriate name and number and then use the key provided to determine the species name for the plant.

It is always useful to check your identification by matching it against an authentically identified herbarium specimen or photograph.

The Arrangement of the Flora

Previous editions of the Flora have used the classification system of Cronquist (1988). Many changes in our understanding of the evolution of plants have occurred since this system was published. The Angiosperm Phylogeny Group publishes the latest additions to our knowledge of angiosperm phylogeny on their webpage and in most cases the numerical arrangement of families within this edition reflects their representation. However for simplicity Cronquist's major grouping of dicotyledons and monocotyledons has been maintained in this edition. Family circumscriptions considered by the authors to be in a state of flux at the time of writing have not been applied. The arrangement of genera within families and species within genera has not been substantially changed since the previous edition.

As far as possible, similar families and genera follow each other in the book, although opinion differs amongst botanists as to both the composition and the arrangement of many families and genera.

All known species of native or naturalized plants occurring in the geographic area covered by this flora have been included. Recent changes in nomenclature have been recorded in the index and synonyms may be accessed by referring to it.

Species listed under the NSW Threatened Species Act (1995) are indicated using the following terms: Vulnerable, Endangered, Critically Endangered and Extinct.

Authorities follow the Australian Plant Name Index and recent updates.