

# The frequency of polyploid speciation in vascular plants

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Edited by Peter R. Crane, University of Chicago, Chicago, IL, and approved June 23, 2009 (received for review November 13, 2008)

Since its discovery in 1907, polyploidy has been recognized as an important phenomenon in vascular plants, and several lines of evidence indicate that most, if not all, plant species ultimately have a polyploid ancestry. However, previous estimates of the frequency of polyploid speciation suggest that the formation and establishment of neopolyploid species is rare. By combining information from the botanical community's vast cytogenetic and phylogenetic databases, we establish that 15% of angiosperm and 31% of fern speciation events are accompanied by ploidy increase. These frequency estimates are higher by a factor of four than earlier estimates and lead to a standing incidence of polyploid species within genera of 35% ( $n = 1,506$ ). Despite this high incidence, we find no direct evidence that polyploid lines, once established, enjoy greater net species diversification. Thus, the widespread occurrence of polyploid taxa appears to result from the substantial contribution of polyploidy to cladogenesis, but not from subsequent increases in diversification rates of polyploid lines.

Polyploidy, the heritable increase in genome copy number, is a central feature of plant diversification (1–3). Polyploidy is captivating as a speciation mechanism for several reasons: (i) it is often associated with the defining features of neospecies, reproductive isolation and morphological differentiation, (ii) it can cause the saltational origin of new species, and (iii) it can have profound effects on subsequent lineage evolution because of genome duplication. Analyses of cytological, fossil and genomic data suggest that 47% to 100% of flowering plant species can be traced to a polyploid event at some point within the diversification of the angiosperm crown group (3–5). In ferns, high chromosome base numbers suggest that most extant taxa are derived from ancient polyploidy (6). However, these inferences tell us relatively little about the frequency of ongoing polyploid speciation, because they are compatible with both rare and frequent polyploid speciation. Current model-based estimates of speciation via polyploidy suggest that it is rare relative to homoploid divergence (7, 8). Here, we use phylogenetic data to obtain the first direct estimate of the frequency of polyploid speciation in flowering plants and ferns and to evaluate whether polyploid lineages diversify more rapidly.

## Results and Discussion

First, following Stebbins (9) and others (10–12), we used published chromosome counts to characterize polyploid incidence across a diverse sample of vascular plant genera. Across the entire dataset, 34.5% (9,795 of 28,406) of species are inferred to be polyploid relative to their generic base (see *Materials and Methods* and *Table S1*). We then grouped these data phylogenetically to examine dispersion in this index across the major lineages of vascular plants (13–16; Fig. 1). At this scale, the most striking feature is uniformity of the means across the groups: Phylogenetic taxonomy explains very little of the variation ( $\chi^2_7 = 380.73$ ,  $P < 0.0001$ ,  $R^2 = 0.010$ , with the ferns and lycophytes grouped and hereafter referred to as ferns). In

contrast, polyploid incidence is distributed less equitably among families ( $\chi^2_{198} = 4,259.41$ ,  $P < 0.00001$ ,  $R^2 = 0.116$ ). Overall, with the exception of the species-poor gymnosperms, vascular plant species derived from recent polyploid events are ubiquitous and represent a large fraction of named diversity, a pattern that also holds for bryophytes (12). Interestingly, generic base counts are negatively associated with polyploid incidence in angiosperms ( $\chi^2_3 = 2,798.01$ ,  $P < 0.00001$ ,  $R^2 = 0.085$ ; Fig. 2), but show no association in ferns ( $\chi^2_3 = 6.61$ ,  $P = 0.085$ ,  $R^2 = 0.002$ ). This result provides the first quantitative support for the hypothesis that chromosome number increase due to polyploidy limits subsequent diversification via genome duplication in flowering plants (3). In addition, this observation may help to explain the stark difference in mean chromosome number between homosporous ferns and angiosperms.

Assuming no speciation within polyploid lineages, the percentage of species that are infrageneric polyploids can be interpreted as an upper limit to the frequency of polyploid speciation. In contrast, published estimates of the frequency of polyploid speciation for flowering plants [2–4% (ref. 8) and 3.8% (ref. 7)] and ferns [7% (ref. 8)], set an approximate lower limit because they are derived from models that assume a minimum number of infrageneric ploidy shifts. A recent model for predicting polyploid abundance allows multiple, independent transitions to the same ploidy level (17), but it has been applied to only 10 flowering plant genera, all of which have numerous ploidy levels (>4) and are not representative of angiosperms as a whole.

To avoid the above assumptions, we directly estimated the frequency of polyploid speciation by tracking shifts in ploidy level across infrageneric plant phylogenetic trees. For angiosperms, we sampled 1,813 speciation events within 123 phylogenetic trees drawn from the plant systematic literature (*Table S2*; see *Fig. S1* for methodological diagram). Using an irreversible model of polyploid evolution, 272 of the 1,813 events ( $15.00 \pm 0.84\%$ ;  $\pm$  SE) were accompanied by a shift to a higher ploidy level. For ferns, we examined 204 speciation events within 20 infrageneric phylogenetic trees; 64 ( $31.37 \pm 3.26\%$ ) involved an increase in ploidy (*Table S3*). Although less biologically realistic, we also used simple parsimony to map shifts in ploidy level; under this model there were 232 ploidy transitions ( $12.80 \pm 0.78\%$ ) across the angiosperm dataset, and 61 ( $29.90 \pm 3.21\%$ ) across the ferns.

One concern is that our results may be biased because of uncertainty in the phylogenetic trees analyzed. To obtain a rough

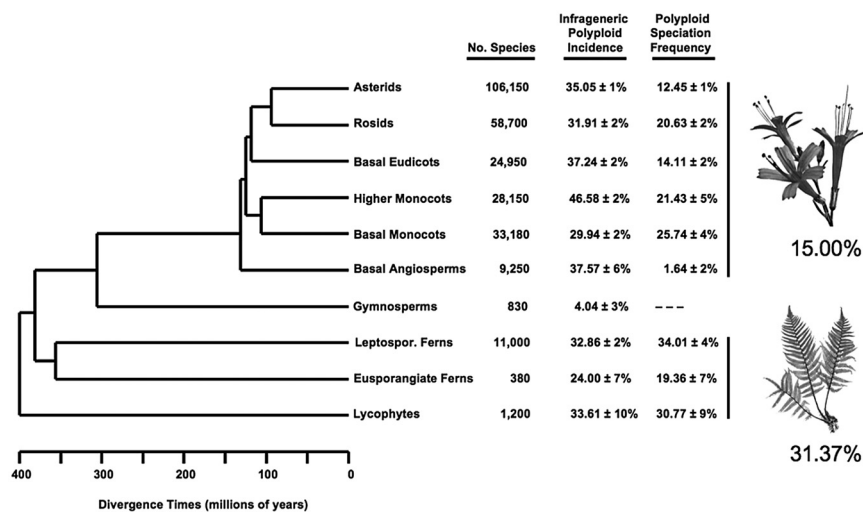
Author contributions: T.E.W. and L.H.R. designed research; T.E.W., N.T., M.S.B., I.M., P.B.G., and L.H.R. performed research; I.M. contributed new reagents/analytic tools; T.E.W., N.T., and I.M. analyzed data; and T.E.W. wrote the paper.

The authors declare no conflict of interest.

This article is a PNAS Direct Submission.

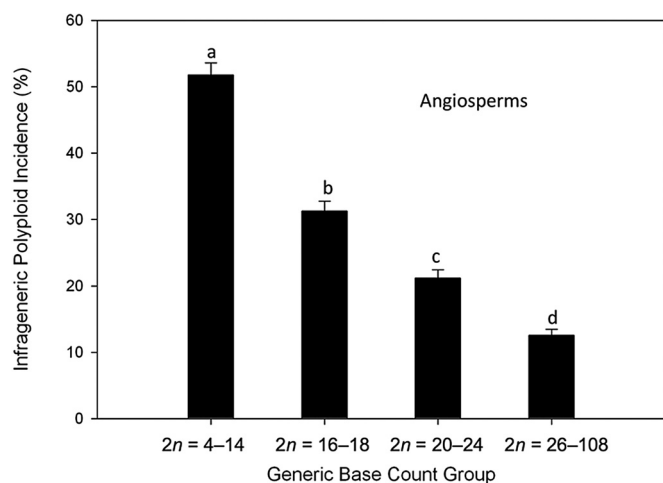
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This article contains supporting information online at [www.pnas.org/cgi/content/full/0811575106/DCSupplemental](http://www.pnas.org/cgi/content/full/0811575106/DCSupplemental).



**Fig. 1.** Polyploid incidence and speciation frequencies across major groups of vascular plants. Polyploid speciation frequencies are the fractions of branching events that were accompanied by a ploidy shift across the studied phylogenetic trees for each group. The speciation frequencies reported here are based on an irreversible model of polyploid evolution. A binomial standard error follows each incidence and frequency estimate. See Fig. S1 for a diagrammatic explanation of estimation methods for polyploid speciation frequencies. Phylogenetic hypothesis/timescale modified from (13), and based on clades defined in refs. 13–16; clade species richness from refs. 13 and 34. The Higher Monocots are represented by Arecales, Commelinales, Poales, Proteales, Zingiberales; the Basal Monocots by Alistmatales, Asparagales, Dioscoreales, Liliales, Pandanales.

estimate of the sensitivity of our angiosperm result to phylogenetic uncertainty, we recorded the minimum number of ploidy transitions across published topologies derived from different data partitions for all studies that reported them and that included 2 or more polyploid species ( $n = 30$ ). The number of ploidy shifts is slightly lower in the partitioned data (123 versus 139 for the irreversible case), resulting in a  $\approx 3\%$  decrease in the polyploid speciation frequency estimate for angiosperms. This decrease is primarily due to the lower resolution of trees derived from fewer data: Groupings of polyploid/diploid species on trees derived from combined data are collapsed into polytomies, thus fewer shifts are inferred. Given that many of the sampled phylogenetic trees from the full data also contain polytomies, our estimates may be best considered conservative.



**Fig. 2.** Dependence of infrageneric polyploid incidence on the minimum number of chromosomes reported for angiosperm genera (generic base count). Shown are mean percentages ( $\pm$  SE) of polyploid species within genera. Means with different letters are significantly different [ $P < 0.05$  when evaluated within a logistic model and with nonparametric (rank sums) tests]. ( $N(I - r) = 320, 323, 370, 354$ ).

Another worry is that aneuploidy can make patterns of chromosomal evolution more complex, and thus, the tracking of ploidy state transitions can become somewhat subjective (see *Materials and Methods*). Although aneuploid variation was not substantial in the fern dataset, we identified 16 angiosperm groups where significant aneuploidy was present. To validate our inferences of the number of ploidy shifts in these groups, we used a recently developed model to infer the number of ploidy shifts in 12 of the 16 taxa that exhibit substantial aneuploidy (see *SI Methods*). The number of ploidy shifts inferred with the model-based approach is slightly higher across the 12 groups compared with our more conservative method (62 versus 55; Table S4 and Table S5). This was anticipated because the model-based approach estimates the expected number of polyploid events, taking into account multiple events along a single branch. In addition, even if sister species have the same number of chromosomes, the probabilistic model may infer that they are separated by one or more ploidy transitions, particularly if the branches separating the species are long and the aneuploid and polyploid transition rates are high across the tree (see *SI Methods*).

The phylogenetic trees used here represent 63 of  $\approx 400$  recognized angiosperm families (18) and 10 of  $\approx 40$  fern families (16). This broad sample demonstrates that ongoing polyploid speciation is substantially more common in vascular plants than the current estimates suggest (7, 8). Our species-level estimates are bolstered by the frequency of infraspecific polyploidy: 12–13% of angiosperm and 17% of fern species harbor multiple ploidy levels (see *Materials and Methods*, and ref. 19). But how do polyploid lineages fare over longer timeframes?

Several researchers have presented a positive relationship between generic species richness and polyploid incidence in angiosperms as indirect evidence that genome doubling is associated with increased net diversification rate (8, 20, 21), a result we corroborate here across 1,271 genera. However, polyploid incidence explains only a small portion of the variance in generic species richness across the entire angiosperm dataset ( $F_{1,1269} = 73.90$ ,  $P < 0.0001$ ,  $R^2 = 0.055$ ), although the relationship is tighter when only those genera for which we have chromosome counts for  $\geq 50\%$  of the species are included ( $F_{1,488} = 82.86$ ,  $P <$





Triploid counts are excluded from these estimates. We report the fern and angiosperm estimates in the results as single point estimates.

**Polypliod Incidence and Species Richness.** The relationship between polypliod incidence and generic species richness estimates was evaluated with ANOVA. Species richness was natural log transformed. In cases where the number of species in the richness estimate was lower than the number of species for which we had count data, we set species richness equal to the number of species with data. The data used for this analysis are included in [Table S1](#).

**Phylogenetic Analysis of the Frequency of Polypliod Speciation. Angiosperms.** We selected published phylogenetic trees from the plant systematic literature: *American Journal of Botany* (2004–2006), *Plant Systematics and Evolution* (2004–2005), *Systematic Botany* (2001–2006), and *Taxon* (2003–2004). Those studies that included  $\approx 25\%$  or more of the recognized taxa of the most intensively sampled group (e.g., a section of a genus) were included. On average 44.5% of recognized species of the focal groups were sampled for phylogenetic analysis and had chromosome counts (sampling intensity). Regression of the number of ploidy shifts per speciation event on sampling intensity is not significant ( $F_{1,122} = 1.03$ ,  $P = 0.313$ ,  $R^2 = 0.008$ ).

Most studies were based on multiple data partitions and presented more than one topology; when possible, we selected the tree that was inferred from the most data. We used chromosome counts from the seed plant dataset, the IPCN volume 1975–78 (28), and Federov (30), and counts reported with the phylogenetic analyses to infer ploidy level. In the few cases where there was a conflict between counts reported with the phylogenetic analysis and those from compendia, we used exclusively the count data reported with the phylogenetic analysis to infer ploidy level.

We coded ploidy states by treating each discrete group of counts separated by a gap more than or equal to the lowest count as a separate ploidy state. For example,  $n = 9$  and  $n = 18$  coded as 2 different ploidy states (0, 1);  $n = 9$ –13 and  $n = 22$  coded as 2 different ploidy states (0, 1);  $n = 8$ ,  $n = 16$ , and  $n = 24$  coded as 3 different ploidy states (0, 1, 2). The numbers of character state transitions were inferred with unordered optimization. Thus, for the last, 3-state example, if a species with state 0 (for  $n = 8$ ) were sister to a species with state 2 (for  $n = 24$ ), this was counted as a single step, i.e., a single polypliod event. Speciation events that did not involve doubling but that were inferred to involve an addition of a complete chromosome set, were counted as polypliod events, e.g., transitions from state 1 to state 2 in the 3-state example.

For most taxa, the above methods were sufficient; however, for some groups ( $n = 16$ ), aneuploid variation (loss or gain of chromosomes without change in ploidy) was substantial and made ploidy state inference more difficult because gaps between ploidy states were blurred. For a subset of these phylogenetic trees ( $n = 12$ ), we used a likelihood approach that assessed the fit of various models that allowed for both aneuploid (gain or loss of single chromosomes) and polypliod changes to infer the number of ploidy shifts across a tree (see [SI Methods](#) for details). In general, the best-fit model inferred more ploidy shifts than our approach based on more subjective scoring of ploidy states in groups with aneuploidy. A comparison of the results is presented in [Table S4](#). The results reported in [Fig. 1](#) are based on the scoring approach described in the previous paragraph rather than the likelihood model results, because the model could not be applied to all phylogenies.

In this analysis, the number of speciation events per phylogenetic hypothesis is equal to the number of species with count data minus one. Thus, our estimate of the frequency of polypliod speciation is the fraction of speciation events that are accompanied by a transition in ploidy. This method ignores extinction and assumes that ploidy transitions are directly associated with speciation, an assumption that is consistent with the observation that ploidy transitions are accompanied by reproductive isolation. However, by ignoring extinction, we may be overestimating the contribution of polypliodity to cladogenesis.

We first determined the numbers of ploidy transitions with an irreversible model with unordered states, where the deepest node in the tree was constrained to the lowest ploidy state in the group and ploidy level decreases were not allowed. This model is in accord with the consensus view that polyhaploidy is likely very rare in nature. When necessary, we used MacClade 4.06 to determine the number of ploidy state changes (33). Because the irreversible model cannot be implemented in MacClade unless all nodes are dichotomous, we resolved polytomies to minimize ploidy state changes (most parsimonious solution of a “soft” polytomy). We also inferred the number of ploidy transitions with parsimony, again with unordered states. We report a binomial standard error for our

estimates of the frequency of polypliod speciation. [Table S2](#) lists the phylogenies, with associated data, used for this analysis.

**Ferns and lycophytes.** We identified published phylogenetic trees using a variety of scientific indices and chose twenty studies for inclusion. All of the selected phylogenetic trees contained at least 4 species with count data. In all but 1 case (*Dryopteris*), the studies were focused on small genera or small clades within genera. On average, 83.1% of recognized species of the focal groups were sampled for phylogenetic analysis and had chromosome counts (sampling intensity). In most cases, the authors of the study considered ploidy variation explicitly, and we used the count data presented in the study to infer the number of ploidy transitions. In this sample, aneuploid variation was not significant. In some cases, the comprehensive dataset used for the Perl analysis was used as a supplement, and, as with the angiosperm analysis, we resolved conflicts between data reported in the article and in our dataset in favor of the former. The frequency of polypliod speciation was calculated as for the angiosperms. For this sample, there is a significant, positive relationship between polypliod speciation frequency and sampling intensity ( $F_{1,19} = 5.08$ ,  $P = 0.037$ ,  $R^2 = 0.22$ ). The leverage comes from 4 phylogenetic trees with no polypliod events and incomplete chromosome count data. In total, these 4 studies contain 25 speciation events. [Table S3](#) lists the phylogenetic studies and associated data used for this analysis.

**Polypliodity and the Evolution of Genera.** We performed this analysis in the manner described above for the phylogenetic analyses of polypliod speciation frequencies. Phylogenies were drawn from the *American Journal of Botany* (2004–2006) and *International Journal of Plant Sciences* (2006) and represent 28 families. It is expected that a portion of the genera scored as polypliod contain unsampled diploid species, thus our estimate of the number of polypliod genera is biased upward. [Table S6](#) lists the phylogenies and associated data used for this analysis.

**Polypliodity and Net Diversification Rate. Nonnested sister group contrasts.** We examined all angiosperm phylogenies included in the polypliod speciation frequency analysis for contrasts between sister lineages that were each monomorphic for ploidy level but separated by a ploidy shift. To increase sample size, we then searched for phylogenetic hypotheses for genera that were relatively well characterized cytogenetically within the first half of Federov (30) and/or in our chromosome count dataset (these studies constitute the “Nonrandom” (NR) studies in [Table S7](#)). For many of the studies examined, sampling is incomplete: Either all species within a clade were not sampled, or cytogenetic data were not available for all species; or sampling was incomplete in both respects. In general, we only included contrasts where chromosome count data were available for all sampled taxa on either side of a single ploidy shift. In the included studies with missing count data, the sign of the contrast (e.g., more polypliod species) is robust to new data, although the species numbers may not be (e.g., 5:1 may change to 2:1). We do include contrasts where phylogenetic sampling is incomplete (all recognized species not included). When these latter studies are excluded, the difference between polypliod and diploid lineages remains insignificant. [Table S7](#) lists the studies and associated data used for this analysis.

**Whole-tree asymmetry.** We used SymmeTREE to determine whether a subset of the published angiosperm trees used to track ploidy changes contain statistically significant shifts in diversification rates (23). This program compares species diversity differences across all nodes within a topology and compares these differences, based on a variety of asymmetry metrics, to a null distribution derived from simulations. If a given tree contained a significant shift in diversification rate based on any one of the test statistics (without correcting for multiple tests), we then identified the node at which this shift occurred to determine whether it coincides with a ploidy shift. For this analysis we focused on those trees for which  $\geq 80\%$  of recognized species were sampled and which contained  $\geq 2$  polypliod species. SymmeTREE can accommodate polytomies by resolving them randomly, however, trees that exhibited significant asymmetry only within randomly resolved polytomies were not scored as asymmetric.

**ACKNOWLEDGMENTS.** We thank Robert Magjill of the Missouri Botanical Garden for facilitating the assembly of the chromosome count datasets; Takuya Nakazato for assisting with the assembly of the fern chromosome count dataset; Gerald Gastony, Shirin Glander, Joachim Kurtz, Sally Otto, Gisep Rauch, Thorsten Reusch, and Tobias Schneider for helpful comments on an earlier version of the manuscript; Arne Mooers and Brian Moore for technical assistance; and 2 anonymous reviewers for detailed and insightful suggestions that improved this research report. This work was supported by National Center for Research Resources Grant 2P20RR016466 (to N.T.), National Science Foundation Grant DEB-0640520 (to N.T.), National Institute of Health Grant GM09065 (to L.H.R.), and National Sciences and Engineering Research Council of Canada Grant 327475.

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**Table S1.** Polyploid incidence within vascular plant genera. For each genus, the lowest reported 2n count, the generic base count group, the number of recognized species, the number of species inferred to be polyploid and the number of species with at least one chromosome count is reported. Generic base count group refers to the grouping used for the analysis reported in Fig2.

Group	Family	Genus	Lowest 2n Count	Generic Base Count Group	Species Richness	Polyploid Species	Total Species
Asterids	Acanthaceae	<i>Anisacanthus</i>	36	high	8	0	6
Asterids	Acanthaceae	<i>Aphelandra</i>	28	high	175	0	20
Asterids	Acanthaceae	<i>Carlowrightia</i>	34	high	23	0	11
Asterids	Acanthaceae	<i>Dicliptera</i>	26	high	150	15	20
Asterids	Acanthaceae	<i>Dyschoriste</i>	30	high	65	1	5
Asterids	Acanthaceae	<i>Elytraria</i>	22	med high	17	1	4
Asterids	Acanthaceae	<i>Holographis</i>	26	high	10	2	7
Asterids	Acanthaceae	<i>Hypoestes</i>	30	high	40	1	5
Asterids	Acanthaceae	<i>Justicia</i>	14	low	600	53	76
Asterids	Acanthaceae	<i>Lepidagathis</i>	20	med high	100	1	5
Asterids	Acanthaceae	<i>Phaulopsis</i>	32	high	20	1	10
Asterids	Acanthaceae	<i>Pseuderanthemum</i>	42	high	60	0	5
Asterids	Acanthaceae	<i>Siphonoglossa</i>	22	med high	7	0	4
Asterids	Acanthaceae	<i>Strobilanthes</i>	18	medium low	250	14	22
Asterids	Acanthaceae	<i>Tetramerium</i>	36	high	28	0	16
Asterids	Acanthaceae	<i>Thunbergia</i>	16	medium low	90	4	6
Asterids	Actinidiaceae	<i>Actinidia</i>	58	high	40	5	29
Asterids	Apiaceae	<i>Aciphylla</i>	22	med high	39	0	21
Asterids	Apiaceae	<i>Aegopodium</i>	22	med high	7	3	4
Asterids	Apiaceae	<i>Anisotome</i>	22	med high	15	0	9
Asterids	Apiaceae	<i>Anthriscus</i>	14	low	11	0	9
Asterids	Apiaceae	<i>Apium</i>	14	low	25	5	6
Asterids	Apiaceae	<i>Astrantia</i>	14	low	8	0	8

Asterids	Apiaceae	<i>Aulacospermum</i>	18	medium low	12	0	4
Asterids	Apiaceae	<i>Bunium</i>	12	low	48	6	26
Asterids	Apiaceae	<i>Chaerophyllum</i>	14	low	35	18	20
Asterids	Apiaceae	<i>Cnidium</i>	20	med high		0	6
Asterids	Apiaceae	<i>Conioselinum</i>	22	med high	10	1	5
Asterids	Apiaceae	<i>Daucus</i>	18	medium low	22	1	15
Asterids	Apiaceae	<i>Elaeoselinum</i>	22	med high	4	0	4
Asterids	Apiaceae	<i>Elaeosticta</i>	20	med high	24	0	6
Asterids	Apiaceae	<i>Eryngium</i>	14	low	240	6	45
Asterids	Apiaceae	<i>Ferula</i>	22	med high	172	0	36
Asterids	Apiaceae	<i>Ferulago</i>	22	med high	43	0	9
Asterids	Apiaceae	<i>Galagania</i>	22	med high		0	5
Asterids	Apiaceae	<i>Gingidia</i>	22	med high	10	0	5
Asterids	Apiaceae	<i>Heracleum</i>	22	med high	65	8	52
Asterids	Apiaceae	<i>Heteromorpha</i>	22	med high	8	0	4
Asterids	Apiaceae	<i>Hydrocotyle</i>	18	medium low	130	14	23
Asterids	Apiaceae	<i>Johrenia</i>	22	med high	15	0	5
Asterids	Apiaceae	<i>Laserpitium</i>	22	med high	35	0	9
Asterids	Apiaceae	<i>Libanotis</i>	22	med high		1	7
Asterids	Apiaceae	<i>Ligusticopsis</i>	22	med high	14	0	7
Asterids	Apiaceae	<i>Ligusticum</i>	20	med high	45	1	15
Asterids	Apiaceae	<i>Lomatium</i>	22	med high	74	0	16
Asterids	Apiaceae	<i>Malabaila</i>	20	med high	9	0	5
Asterids	Apiaceae	<i>Oenanthe</i>	20	med high	40	0	13
Asterids	Apiaceae	<i>Ostericum</i>	18	medium low		0	5
Asterids	Apiaceae	<i>Pastinaca</i>	22	med high	14	1	6
Asterids	Apiaceae	<i>Peucedanum</i>	22	med high	110	4	49
Asterids	Apiaceae	<i>Pimpinella</i>	16	medium low	150	1	46
Asterids	Apiaceae	<i>Pleurospermum</i>	18	medium low	5	0	5
Asterids	Apiaceae	<i>Prangos</i>	22	med high	38	1	6

Asterids	Apiaceae	<i>Prionosciadium</i>	42	high	8	0	4
Asterids	Apiaceae	<i>Sanicula</i>	16	medium low	39	0	4
Asterids	Apiaceae	<i>Schizeilema</i>	32	high	11	1	6
Asterids	Apiaceae	<i>Schrenkia</i>	22	med high	12	0	5
Asterids	Apiaceae	<i>Selinum</i>	22	med high	6	0	6
Asterids	Apiaceae	<i>Seseli</i>	16	medium low	110	1	46
Asterids	Apiaceae	<i>Sium</i>	12	low	14	1	5
Asterids	Apiaceae	<i>Thapsia</i>	22	med high	4	0	4
Asterids	Apiaceae	<i>Tordylium</i>	18	medium low	18	0	5
Asterids	Apiaceae	<i>Torilis</i>	12	low	15	2	6
Asterids	Apiaceae	<i>Trinia</i>	18	medium low	10	0	8
Asterids	Apiaceae	<i>Vicatia</i>	20	med high	5	0	5
Asterids	Apocynaceae	<i>Alstonia</i>	22	med high	43	2	4
Asterids	Apocynaceae	<i>Amsonia</i>	22	med high	20	0	6
Asterids	Apocynaceae	<i>Carissa</i>	22	med high	37	1	8
Asterids	Apocynaceae	<i>Landolphia</i>	22	med high	60	0	4
Asterids	Apocynaceae	<i>Pachypodium</i>	18	medium low	13	0	4
Asterids	Apocynaceae	<i>Rauvolfia</i>	22	med high	60	3	9
Asterids	Apocynaceae	<i>Vinca</i>	16	medium low	7	4	6
Asterids	Aquifoliaceae	<i>Ilex</i>	34	high	400	0	9
Asterids	Araliaceae	<i>Aralia</i>	24	med high	36	1	7
Asterids	Araliaceae	<i>Eleutherococcus</i>	48	high	30	0	4
Asterids	Araliaceae	<i>Panax</i>	24	med high	6	3	5
Asterids	Asclepiadaceae	<i>Asclepias</i>	22	med high	100	0	5
Asterids	Asclepiadaceae	<i>Brachystelma</i>	22	med high	100	0	11
Asterids	Asclepiadaceae	<i>Caralluma</i>	22	med high	56	5	43
Asterids	Asclepiadaceae	<i>Ceropegia</i>	20	med high	160	2	15
Asterids	Asclepiadaceae	<i>Duvalia</i>	22	med high	14	4	14
Asterids	Asclepiadaceae	<i>Echidnopsis</i>	22	med high	19	0	5
Asterids	Asclepiadaceae	<i>Hoodia</i>	22	med high	13	0	5



Asterids	Asclepiadaceae	<i>Hoya</i>	22	med high	70	0	37
Asterids	Asclepiadaceae	<i>Huernia</i>	22	med high	64	5	35
Asterids	Asclepiadaceae	<i>Microloma</i>	20	med high	10	0	6
Asterids	Asclepiadaceae	<i>Orbea</i>	22	med high	20	3	9
Asterids	Asclepiadaceae	<i>Orbeopsis</i>	22	med high	10	1	5
Asterids	Asclepiadaceae	<i>Pachycymbium</i>	22	med high	32	0	5
Asterids	Asclepiadaceae	<i>Pectinaria</i>	22	med high	5	0	5
Asterids	Asclepiadaceae	<i>Piaranthus</i>	22	med high	5	0	4
Asterids	Asclepiadaceae	<i>Quaqua</i>	22	med high	13	0	7
Asterids	Asclepiadaceae	<i>Sarcostemma</i>	18	medium low	34	0	14
Asterids	Asclepiadaceae	<i>Stapelia</i>	22	med high	45	2	45
Asterids	Asclepiadaceae	<i>Stapelianthus</i>	22	med high	8	0	5
Asterids	Asclepiadaceae	<i>Stapeliopsis</i>	22	med high	6	0	4
Asterids	Asclepiadaceae	<i>Trichocaulon</i>	22	med high	15	0	12
Asterids	Asclepiadaceae	<i>Tridentea</i>	22	med high	17	0	9
Asterids	Asclepiadaceae	<i>Vincetoxicum</i>	22	med high	15	0	7
Asterids	Asteraceae	<i>Abrotanella</i>	18	medium low	20	1	10
Asterids	Asteraceae	<i>Achillea</i>	18	medium low	115	19	75
Asterids	Asteraceae	<i>Achyrophorus</i>	10	low		0	4
Asterids	Asteraceae	<i>Acmella</i>	24	med high	30	11	23
Asterids	Asteraceae	<i>Acritopappus</i>	18	medium low	13	0	4
Asterids	Asteraceae	<i>Adenostemma</i>	20	med high	24	0	7
Asterids	Asteraceae	<i>Ageratum</i>	20	med high	44	1	7
Asterids	Asteraceae	<i>Agoseris</i>	18	medium low	17	2	5
Asterids	Asteraceae	<i>Ainsliaea</i>	24	med high	40	0	5
Asterids	Asteraceae	<i>Ajania</i>	18	medium low	34	6	12
Asterids	Asteraceae	<i>Amberboa</i>	26	high	6	1	4
Asterids	Asteraceae	<i>Anacyclus</i>	18	medium low	12	0	12
Asterids	Asteraceae	<i>Anaphalis</i>	26	high	110	0	8
Asterids	Asteraceae	<i>Andryala</i>	18	medium low	20	0	7

Asterids	Asteraceae	<i>Antennaria</i>	28	high	71	34	67
Asterids	Asteraceae	<i>Anthemis</i>	16	medium low	210	17	79
Asterids	Asteraceae	<i>Aphanostephus</i>	6	low	4	0	4
Asterids	Asteraceae	<i>Arctotis</i>	18	medium low	50	0	7
Asterids	Asteraceae	<i>Argyranthemum</i>	18	medium low	24	0	4
Asterids	Asteraceae	<i>Arnica</i>	36	high	32	6	24
Asterids	Asteraceae	<i>Artemisia</i>	16	medium low	350	50	171
Asterids	Asteraceae	<i>Aster</i>	8	low	250	154	176
Asterids	Asteraceae	<i>Asteriscus</i>	10	low	4	0	4
Asterids	Asteraceae	<i>Athanasia</i>	16	medium low	40	0	9
Asterids	Asteraceae	<i>Atractylis</i>	20	med high	14	0	6
Asterids	Asteraceae	<i>Bellis</i>	18	medium low	8	2	6
Asterids	Asteraceae	<i>Bidens</i>	20	med high	240	28	52
Asterids	Asteraceae	<i>Blainvillea</i>	34	high	10	0	4
Asterids	Asteraceae	<i>Blumea</i>	16	medium low	100	5	28
Asterids	Asteraceae	<i>Brachyscome</i>	4	low	69	60	69
Asterids	Asteraceae	<i>Brickellia</i>	18	medium low	110	0	18
Asterids	Asteraceae	<i>Calendula</i>	14	low	12	6	9
Asterids	Asteraceae	<i>Calotis</i>	8	low	26	10	12
Asterids	Asteraceae	<i>Camchaya</i>	20	med high	5	0	5
Asterids	Asteraceae	<i>Carduncellus</i>	24	med high	29	7	20
Asterids	Asteraceae	<i>Carduus</i>	16	medium low	91	11	49
Asterids	Asteraceae	<i>Carlina</i>	18	medium low	22	0	22
Asterids	Asteraceae	<i>Carthamus</i>	20	med high	19	4	19
Asterids	Asteraceae	<i>Celmisia</i>	108	high	65	1	65
Asterids	Asteraceae	<i>Centaurea</i>	14	low	500	81	288
Asterids	Asteraceae	<i>Centratherum</i>	18	medium low	11	1	11
Asterids	Asteraceae	<i>Cephalorrhynchus</i>	16	medium low	15	0	4
Asterids	Asteraceae	<i>Chaenactis</i>	10	low	40	0	6
Asterids	Asteraceae	<i>Chaetopappa</i>	16	medium low	10	0	7

Asterids	Asteraceae	<i>Chamaemelum</i>	18	medium low	6	0	4
Asterids	Asteraceae	<i>Chaptalia</i>	48	high	60	1	4
Asterids	Asteraceae	<i>Chondrilla</i>	10	low	25	0	4
Asterids	Asteraceae	<i>Chromolaena</i>	18	medium low	165	2	8
Asterids	Asteraceae	<i>Chrysanthellum</i>	16	medium low	13	0	4
Asterids	Asteraceae	<i>Chrysanthemum</i>	18	medium low		12	27
Asterids	Asteraceae	<i>Chrysocoma</i>	18	medium low	18	1	4
Asterids	Asteraceae	<i>Chrysopsis</i>	8	low	10	2	7
Asterids	Asteraceae	<i>Chrysothamnus</i>	18	medium low	15	0	4
Asterids	Asteraceae	<i>Chuquiraga</i>	54	high	20	1	7
Asterids	Asteraceae	<i>Cicerbita</i>	16	medium low	18	0	4
Asterids	Asteraceae	<i>Cineraria</i>	20	med high	30	4	7
Asterids	Asteraceae	<i>Cirsium</i>	18	medium low	250	62	75
Asterids	Asteraceae	<i>Clibadium</i>	28	high	40	0	17
Asterids	Asteraceae	<i>Conyza</i>	18	medium low	60	10	24
Asterids	Asteraceae	<i>Coreocarpus</i>	18	medium low	10	0	10
Asterids	Asteraceae	<i>Coreopsis</i>	20	med high	50	4	28
Asterids	Asteraceae	<i>Corethrogyne</i>	10	low		0	4
Asterids	Asteraceae	<i>Cosmos</i>	24	med high	26	1	7
Asterids	Asteraceae	<i>Cotula</i>	18	medium low	55	15	19
Asterids	Asteraceae	<i>Cousinia</i>	22	med high	500	0	60
Asterids	Asteraceae	<i>Craspedia</i>	22	med high	11	2	6
Asterids	Asteraceae	<i>Crassocephalum</i>	20	med high	24	1	9
Asterids	Asteraceae	<i>Crepidiastrum</i>	10	low	15	0	7
Asterids	Asteraceae	<i>Cynara</i>	34	high	8	0	5
Asterids	Asteraceae	<i>Dahlia</i>	32	high	29	3	15
Asterids	Asteraceae	<i>Dendranthema</i>	18	medium low	37	12	21
Asterids	Asteraceae	<i>Dendrosenecio</i>	100	high	6	0	6
Asterids	Asteraceae	<i>Dichrocephala</i>	18	medium low	4	0	4
Asterids	Asteraceae	<i>Doronicum</i>	30	high	40	11	13

Asterids	Asteraceae	<i>Dubautia</i>	26	high	21	0	20
Asterids	Asteraceae	<i>Echinops</i>	28	high	120	0	28
Asterids	Asteraceae	<i>Elephantopus</i>	22	med high	30	0	4
Asterids	Asteraceae	<i>Emilia</i>	10	low	100	5	9
Asterids	Asteraceae	<i>Encelia</i>	36	high	15	0	5
Asterids	Asteraceae	<i>Ericameria</i>	18	medium low	27	0	7
Asterids	Asteraceae	<i>Erigeron</i>	18	medium low	150	23	133
Asterids	Asteraceae	<i>Eriophyllum</i>	8	low	11	8	11
Asterids	Asteraceae	<i>Eupatorium</i>	20	med high	69	23	69
Asterids	Asteraceae	<i>Euthamia</i>	18	medium low	9	1	9
Asterids	Asteraceae	<i>Ewartia</i>	28	high	5	1	5
Asterids	Asteraceae	<i>Filago</i>	28	high	41	0	6
Asterids	Asteraceae	<i>Flaveria</i>	34	high	21	0	7
Asterids	Asteraceae	<i>Flourensia</i>	36	high	17	0	17
Asterids	Asteraceae	<i>Gaillardia</i>	34	high	28	1	7
Asterids	Asteraceae	<i>Galatella</i>	18	medium low	25	2	4
Asterids	Asteraceae	<i>Galinsoga</i>	16	medium low	13	6	11
Asterids	Asteraceae	<i>Gnaphalium</i>	14	low	50	22	31
Asterids	Asteraceae	<i>Gonospermum</i>	18	medium low	6	0	4
Asterids	Asteraceae	<i>Grindelia</i>	12	low	55	4	40
Asterids	Asteraceae	<i>Gutenbergia</i>	20	med high	25	1	5
Asterids	Asteraceae	<i>Gutierrezia</i>	8	low	27	4	19
Asterids	Asteraceae	<i>Haplopappus</i>	4	low	70	53	54
Asterids	Asteraceae	<i>Hedypnois</i>	6	low	4	1	4
Asterids	Asteraceae	<i>Helenium</i>	24	med high	40	2	4
Asterids	Asteraceae	<i>Helianthus</i>	34	high	50	5	31
Asterids	Asteraceae	<i>Helichrysum</i>	14	low	600	28	35
Asterids	Asteraceae	<i>Heliomeris</i>	16	medium low	6	1	4
Asterids	Asteraceae	<i>Helipterum</i>	14	low		1	6
Asterids	Asteraceae	<i>Hemizonia</i>	18	medium low	30	0	4

Asterids	Asteraceae	<i>Heteropappus</i>	18	medium low	20	2	9
Asterids	Asteraceae	<i>Heterotheca</i>	18	medium low	25	4	22
Asterids	Asteraceae	<i>Hieracium</i>	18	medium low	139	94	139
Asterids	Asteraceae	<i>Hymenopappus</i>	34	high	14	0	6
Asterids	Asteraceae	<i>Hymenothrix</i>	24	med high	5	1	5
Asterids	Asteraceae	<i>Hyoseris</i>	16	medium low	5	0	4
Asterids	Asteraceae	<i>Hypochaeris</i>	6	low	60	3	26
Asterids	Asteraceae	<i>Inula</i>	16	medium low	90	1	24
Asterids	Asteraceae	<i>Isocoma</i>	12	low	16	3	8
Asterids	Asteraceae	<i>Ixeris</i>	10	low	20	3	14
Asterids	Asteraceae	<i>Jaegeria</i>	18	medium low	6	1	4
Asterids	Asteraceae	<i>Jurinea</i>	30	high	200	0	10
Asterids	Asteraceae	<i>Kalimeris</i>	18	medium low	10	6	10
Asterids	Asteraceae	<i>Koanophyllon</i>	20	med high	120	1	6
Asterids	Asteraceae	<i>Krigia</i>	8	low	10	3	10
Asterids	Asteraceae	<i>Lactuca</i>	16	medium low	75	5	42
Asterids	Asteraceae	<i>Laennecia</i>	18	medium low	16	0	6
Asterids	Asteraceae	<i>Laggera</i>	20	med high	17	1	5
Asterids	Asteraceae	<i>Lapsana</i>	14	low	9	1	6
Asterids	Asteraceae	<i>Lasallea</i>	8	low		3	11
Asterids	Asteraceae	<i>Lasthenia</i>	8	low	17	3	6
Asterids	Asteraceae	<i>Launaea</i>	12	low	30	3	20
Asterids	Asteraceae	<i>Layia</i>	12	low	15	1	5
Asterids	Asteraceae	<i>Leontodon</i>	8	low	50	6	33
Asterids	Asteraceae	<i>Leontopodium</i>	24	med high	58	4	6
Asterids	Asteraceae	<i>Leucanthemum</i>	18	medium low	33	14	33
Asterids	Asteraceae	<i>Leucheria</i>	38	high	46	0	10
Asterids	Asteraceae	<i>Liabum</i>	18	medium low	38	9	12
Asterids	Asteraceae	<i>Liatris</i>	20	med high	43	0	5
Asterids	Asteraceae	<i>Lipochaeta</i>	30	high	20	8	20



Asterids	Asteraceae	<i>Lygodesmia</i>	18	medium low	8	0	8
Asterids	Asteraceae	<i>Machaeranthera</i>	4	low	36	22	26
Asterids	Asteraceae	<i>Malacothrix</i>	14	low	16	2	11
Asterids	Asteraceae	<i>Marshallia</i>	18	medium low	7	1	7
Asterids	Asteraceae	<i>Matricaria</i>	18	medium low	11	3	11
Asterids	Asteraceae	<i>Melampodium</i>	18	medium low	37	1	11
Asterids	Asteraceae	<i>Melanthera</i>	30	high	20	0	5
Asterids	Asteraceae	<i>Metalasia</i>	16	medium low	52	0	4
Asterids	Asteraceae	<i>Microseris</i>	18	medium low	14	2	8
Asterids	Asteraceae	<i>Mikania</i>	34	high	430	3	25
Asterids	Asteraceae	<i>Minuria</i>	18	medium low	11	1	4
Asterids	Asteraceae	<i>Monactis</i>	54	high	9	0	5
Asterids	Asteraceae	<i>Montanoa</i>	38	high	25	3	12
Asterids	Asteraceae	<i>Munnozia</i>	18	medium low	43	0	8
Asterids	Asteraceae	<i>Mutisia</i>	46	high	59	0	12
Asterids	Asteraceae	<i>Nassauvia</i>	22	med high	39	2	9
Asterids	Asteraceae	<i>Neomirandea</i>	34	high	27	0	4
Asterids	Asteraceae	<i>Olearia</i>	18	medium low	100	20	34
Asterids	Asteraceae	<i>Onopordum</i>	34	high	60	0	12
Asterids	Asteraceae	<i>Ophryosporus</i>	20	med high	37	1	4
Asterids	Asteraceae	<i>Oyedaea</i>	28	high	14	2	5
Asterids	Asteraceae	<i>Palafoxia</i>	20	med high	12	0	12
Asterids	Asteraceae	<i>Pectis</i>	24	med high	100	11	43
Asterids	Asteraceae	<i>Perityle</i>	34	high	63	1	6
Asterids	Asteraceae	<i>Perymenium</i>	28	high	41	3	13
Asterids	Asteraceae	<i>Petasites</i>	60	high	19	0	10
Asterids	Asteraceae	<i>Phagnalon</i>	18	medium low	43	0	11
Asterids	Asteraceae	<i>Picris</i>	10	low	40	0	20
Asterids	Asteraceae	<i>Pilosella</i>	18	medium low	50	2	4
Asterids	Asteraceae	<i>Pinaropappus</i>	18	medium low	6	0	4

Asterids	Asteraceae	<i>Piptocarpha</i>	34	high	45	0	6
Asterids	Asteraceae	<i>Pityopsis</i>	18	medium low	8	1	8
Asterids	Asteraceae	<i>Pluchea</i>	20	med high	40	3	20
Asterids	Asteraceae	<i>Polymnia</i>	30	high	7	2	7
Asterids	Asteraceae	<i>Porophyllum</i>	22	med high	28	2	7
Asterids	Asteraceae	<i>Prenanthes</i>	16	medium low	30	2	12
Asterids	Asteraceae	<i>Ptarmica</i>	18	medium low		3	5
Asterids	Asteraceae	<i>Ptilostemon</i>	32	high	14	0	8
Asterids	Asteraceae	<i>Pulicaria</i>	12	low	80	0	16
Asterids	Asteraceae	<i>Pyrethrum</i>	18	medium low		1	9
Asterids	Asteraceae	<i>Pyrrhopappus</i>	12	low	4	1	4
Asterids	Asteraceae	<i>Pyrrocoma</i>	12	low	10	0	4
Asterids	Asteraceae	<i>Raoulia</i>	28	high	20	4	20
Asterids	Asteraceae	<i>Reichardia</i>	14	low	8	0	6
Asterids	Asteraceae	<i>Rhaponticum</i>	24	med high		0	5
Asterids	Asteraceae	<i>Rudbeckia</i>	36	high	15	1	4
Asterids	Asteraceae	<i>Santolina</i>	18	medium low	18	0	7
Asterids	Asteraceae	<i>Schistocarpha</i>	16	medium low	10	0	5
Asterids	Asteraceae	<i>Sclerocarpus</i>	22	med high	8	0	4
Asterids	Asteraceae	<i>Scorzonera</i>	12	low	175	5	52
Asterids	Asteraceae	<i>Senecio</i>	10	low	1250	249	254
Asterids	Asteraceae	<i>Serratula</i>	22	med high	70	4	23
Asterids	Asteraceae	<i>Sigesbeckia</i>	30	high	7	1	7
Asterids	Asteraceae	<i>Silphium</i>	14	low	23	0	11
Asterids	Asteraceae	<i>Simsia</i>	34	high	24	0	24
Asterids	Asteraceae	<i>Smallanthus</i>	32	high	19	3	8
Asterids	Asteraceae	<i>Solidago</i>	18	medium low	89	10	89
Asterids	Asteraceae	<i>Sonchus</i>	14	low	62	3	21
Asterids	Asteraceae	<i>Sphaeranthus</i>	20	med high	38	0	4
Asterids	Asteraceae	<i>Spilanthes</i>	24	med high	22	11	22

Asterids	Asteraceae	<i>Stephanomeria</i>	16	medium low	17	1	7
Asterids	Asteraceae	<i>Steptorhamphus</i>	16	medium low	7	0	4
Asterids	Asteraceae	<i>Stevia</i>	20	med high	235	5	42
Asterids	Asteraceae	<i>Tagetes</i>	22	med high	50	3	14
Asterids	Asteraceae	<i>Tephrosieris</i>	46	high	50	1	7
Asterids	Asteraceae	<i>Tessaria</i>	20	med high	4	0	4
Asterids	Asteraceae	<i>Tetramolopium</i>	18	medium low	37	0	7
Asterids	Asteraceae	<i>Thelesperma</i>	18	medium low	15	1	5
Asterids	Asteraceae	<i>Tolpis</i>	18	medium low	20	1	11
Asterids	Asteraceae	<i>Tomanthea</i>	18	medium low		0	4
Asterids	Asteraceae	<i>Townsendia</i>	18	medium low	25	1	7
Asterids	Asteraceae	<i>Tragopogon</i>	12	low	110	6	42
Asterids	Asteraceae	<i>Trichogonia</i>	20	med high	30	1	6
Asterids	Asteraceae	<i>Tridax</i>	18	medium low	30	2	9
Asterids	Asteraceae	<i>Tripleurospermum</i>	18	medium low	38	1	7
Asterids	Asteraceae	<i>Ursinia</i>	16	medium low	38	0	8
Asterids	Asteraceae	<i>Viguiera</i>	16	medium low	180	42	44
Asterids	Asteraceae	<i>Virgulus</i>	8	low		6	16
Asterids	Asteraceae	<i>Vittadinia</i>	18	medium low	29	0	7
Asterids	Asteraceae	<i>Volutaria</i>	24	med high	16	1	10
Asterids	Asteraceae	<i>Wedelia</i>	22	med high	100	13	29
Asterids	Asteraceae	<i>Xanthium</i>	34	high	7	0	7
Asterids	Asteraceae	<i>Youngia</i>	10	low	40	1	9
Asterids	Asteraceae	<i>Zaluzania</i>	36	high	10	1	8
Asterids	Asteraceae	<i>Zinnia</i>	20	med high	12	1	12
Asterids	Balsaminaceae	<i>Impatiens</i>	6	low	850	119	124
Asterids	Bignoniaceae	<i>Tabebuia</i>	40	high	100	1	4
Asterids	Bignoniaceae	<i>Tecoma</i>	34	high	13	0	5
Asterids	Boraginaceae	<i>Alkanna</i>	20	med high	28	0	4
Asterids	Boraginaceae	<i>Cerithe</i>	16	medium low	10	0	6

Asterids	Boraginaceae	<i>Cordia</i>	16	medium low	320	15	19
Asterids	Boraginaceae	<i>Cryptantha</i>	14	low	100	17	21
Asterids	Boraginaceae	<i>Cynoglossum</i>	24	med high	75	0	15
Asterids	Boraginaceae	<i>Eritrichium</i>	24	med high	30	1	4
Asterids	Boraginaceae	<i>Heliotropium</i>	14	low	250	15	27
Asterids	Boraginaceae	<i>Lappula</i>	22	med high	40	3	8
Asterids	Boraginaceae	<i>Lithodora</i>	16	medium low	7	2	5
Asterids	Boraginaceae	<i>Lithospermum</i>	14	low	45	4	6
Asterids	Boraginaceae	<i>Mertensia</i>	24	med high	45	3	9
Asterids	Boraginaceae	<i>Nonea</i>	14	low	35	5	9
Asterids	Boraginaceae	<i>Onosma</i>	12	low	150	12	41
Asterids	Boraginaceae	<i>Plagiobothrys</i>	24	med high	70	0	5
Asterids	Boraginaceae	<i>Pulmonaria</i>	14	low	18	1	17
Asterids	Boraginaceae	<i>Symphytum</i>	18	medium low	35	9	12
Asterids	Boraginaceae	<i>Tiquilia</i>	16	medium low	27	10	20
Asterids	Bruniaceae	<i>Berzelia</i>	40	high	12	1	7
Asterids	Callitrichaceae	<i>Callitriche</i>	6	low	19	9	19
Asterids	Campanulaceae	<i>Adenophora</i>	34	high	40	3	24
Asterids	Campanulaceae	<i>Asyneuma</i>	20	med high	50	0	4
Asterids	Campanulaceae	<i>Campanula</i>	14	low	300	81	99
Asterids	Campanulaceae	<i>Clermontia</i>	28	high	22	0	7
Asterids	Campanulaceae	<i>Codonopsis</i>	16	medium low	30	0	7
Asterids	Campanulaceae	<i>Cyanea</i>	28	high	64	0	5
Asterids	Campanulaceae	<i>Isotoma</i>	14	low		2	7
Asterids	Campanulaceae	<i>Jasione</i>	12	low	20	1	5
Asterids	Campanulaceae	<i>Lobelia</i>	14	low	300	29	48
Asterids	Campanulaceae	<i>Phyteuma</i>	22	med high	40	0	7
Asterids	Campanulaceae	<i>Pratia</i>	14	low		8	12
Asterids	Campanulaceae	<i>Trachelium</i>	32	high	7	0	4
Asterids	Campanulaceae	<i>Wahlenbergia</i>	16	medium low	200	22	39

Asterids	Caprifoliaceae	<i>Abelia</i>	18	medium low	30	3	4
Asterids	Caprifoliaceae	<i>Lonicera</i>	18	medium low	180	12	49
Asterids	Caprifoliaceae	<i>Symphoricarpos</i>	18	medium low	17	2	4
Asterids	Caprifoliaceae	<i>Triosteum</i>	18	medium low	5	0	4
Asterids	Caprifoliaceae	<i>Viburnum</i>	16	medium low	150	2	34
Asterids	Caprifoliaceae	<i>Weigela</i>	36	high	10	0	4
Asterids	Convolvulaceae	<i>Argyrea</i>	28	high	90	0	4
Asterids	Convolvulaceae	<i>Calystegia</i>	22	med high	25	0	7
Asterids	Convolvulaceae	<i>Convolvulus</i>	18	medium low	100	6	28
Asterids	Convolvulaceae	<i>Ipomoea</i>	28	high	650	4	60
Asterids	Convolvulaceae	<i>Merremia</i>	30	high	70	1	8
Asterids	Cornaceae	<i>Alangium</i>	18	medium low	21	0	4
Asterids	Cornaceae	<i>Cornus</i>	18	medium low	65	1	18
Asterids	Dipsacaceae	<i>Cephalaria</i>	10	low	65	23	25
Asterids	Dipsacaceae	<i>Dipsacus</i>	16	medium low	15	0	10
Asterids	Dipsacaceae	<i>Knautia</i>	16	medium low	60	8	22
Asterids	Dipsacaceae	<i>Pteroccephalus</i>	16	medium low	25	1	18
Asterids	Dipsacaceae	<i>Scabiosa</i>	16	medium low	80	1	61
Asterids	Dipsacaceae	<i>Succisa</i>	20	med high	4	0	4
Asterids	Ebenaceae	<i>Diospyros</i>	30	high	475	4	40
Asterids	Ebenaceae	<i>Euclea</i>	30	high	12	0	9
Asterids	Ericaceae	<i>Agapetes</i>	24	med high	95	3	5
Asterids	Ericaceae	<i>Arctostaphylos</i>	26	high	50	1	12
Asterids	Ericaceae	<i>Dimorphanthera</i>	72	high	68	0	4
Asterids	Ericaceae	<i>Diplycosia</i>	34	high	99	0	4
Asterids	Ericaceae	<i>Erica</i>	24	med high	735	0	7
Asterids	Ericaceae	<i>Gaultheria</i>	22	med high	134	15	23
Asterids	Ericaceae	<i>Lyonia</i>	24	med high	35	0	6
Asterids	Ericaceae	<i>Rhododendron</i>	26	high	850	0	41
Asterids	Ericaceae	<i>Vaccinium</i>	24	med high	450	9	38



Asterids	Gentianaceae	<i>Canscora</i>	38	high	30	2	8
Asterids	Gentianaceae	<i>Gentiana</i>	10	low	361	123	132
Asterids	Gentianaceae	<i>Gentianopsis</i>	26	high	20	3	6
Asterids	Gentianaceae	<i>Halenia</i>	22	med high	70	0	5
Asterids	Geraniaceae	<i>Erodium</i>	16	medium low	60	11	45
Asterids	Geraniaceae	<i>Geranium</i>	18	medium low	300	11	49
Asterids	Gesneriaceae	<i>Aeschynanthus</i>	32	high	140	0	4
Asterids	Gesneriaceae	<i>Chirita</i>	18	medium low	130	1	6
Asterids	Gesneriaceae	<i>Columnnea</i>	18	medium low	75	0	18
Asterids	Gesneriaceae	<i>Cyrtandra</i>	34	high	550	0	4
Asterids	Gesneriaceae	<i>Didymocarpus</i>	20	med high	180	0	5
Asterids	Gesneriaceae	<i>Henckelia</i>	18	medium low		1	47
Asterids	Gesneriaceae	<i>Monophyllaea</i>	20	med high	20	1	8
Asterids	Gesneriaceae	<i>Rhynchotechum</i>	18	medium low	12	0	4
Asterids	Gesneriaceae	<i>Ridleyandra</i>	32	high		0	6
Asterids	Gesneriaceae	<i>Saintpaulia</i>	28	high	20	0	17
Asterids	Gesneriaceae	<i>Streptocarpus</i>	30	high	125	2	10
Asterids	Gesneriaceae	<i>Whytockia</i>	18	medium low	4	0	4
Asterids	Globulariaceae	<i>Globularia</i>	16	medium low	22	2	11
Asterids	Hydrangeaceae	<i>Deutzia</i>	26	high	60	2	10
Asterids	Hydrophyllaceae	<i>Hydrophyllum</i>	18	medium low	8	0	8
Asterids	Hydrophyllaceae	<i>Nama</i>	14	low	45	3	32
Asterids	Hydrophyllaceae	<i>Phacelia</i>	10	low	150	21	23
Asterids	Lamiaceae	<i>Acinos</i>	18	medium low		0	8
Asterids	Lamiaceae	<i>Aeolanthus</i>	32	high		0	8
Asterids	Lamiaceae	<i>Agastache</i>	18	medium low	22	0	19
Asterids	Lamiaceae	<i>Anisochilus</i>	28	high	20	1	4
Asterids	Lamiaceae	<i>Clinopodium</i>	16	medium low	20	4	8
Asterids	Lamiaceae	<i>Coleus</i>	26	high		2	9
Asterids	Lamiaceae	<i>Dicerandra</i>	32	high	8	0	7

Asterids	Lamiaceae	<i>Dracocephalum</i>	10	low	45	4	24
Asterids	Lamiaceae	<i>Elsholtzia</i>	16	medium low	35	0	11
Asterids	Lamiaceae	<i>Eremostachys</i>	22	med high	5	0	4
Asterids	Lamiaceae	<i>Galeobdolon</i>	18	medium low		2	4
Asterids	Lamiaceae	<i>Galeopsis</i>	16	medium low	10	3	8
Asterids	Lamiaceae	<i>Hedeoma</i>	34	high	38	2	23
Asterids	Lamiaceae	<i>Leonurus</i>	16	medium low	10	0	10
Asterids	Lamiaceae	<i>Leucas</i>	22	med high	150	0	26
Asterids	Lamiaceae	<i>Lycopus</i>	22	med high	11	1	11
Asterids	Lamiaceae	<i>Mentha</i>	18	medium low	28	19	28
Asterids	Lamiaceae	<i>Micromeria</i>	20	med high	90	4	7
Asterids	Lamiaceae	<i>Mosla</i>	18	medium low	10	0	6
Asterids	Lamiaceae	<i>Nepeta</i>	14	low	250	9	41
Asterids	Lamiaceae	<i>Origanum</i>	28	high	36	0	6
Asterids	Lamiaceae	<i>Orthosiphon</i>	22	med high	40	1	9
Asterids	Lamiaceae	<i>Panzerina</i>	18	medium low	6	0	4
Asterids	Lamiaceae	<i>Perilla</i>	20	med high	6	1	5
Asterids	Lamiaceae	<i>Phlomis</i>	10	low	100	18	22
Asterids	Lamiaceae	<i>Plectranthus</i>	24	med high	200	2	25
Asterids	Lamiaceae	<i>Pogostemon</i>	32	high	96	4	18
Asterids	Lamiaceae	<i>Salvia</i>	12	low	900	51	117
Asterids	Lamiaceae	<i>Satureja</i>	18	medium low	30	2	9
Asterids	Lamiaceae	<i>Sideritis</i>	16	medium low	150	58	60
Asterids	Lamiaceae	<i>Stachys</i>	10	low	300	83	88
Asterids	Lamiaceae	<i>Teucrium</i>	14	low	100	72	76
Asterids	Lecythidaceae	<i>Eschweilera</i>	32	high	90	0	6
Asterids	Lecythidaceae	<i>Gustavia</i>	34	high	41	1	4
Asterids	Lentibulariaceae	<i>Utricularia</i>	16	medium low	180	6	8
Asterids	Loasaceae	<i>Caiophora</i>	16	medium low	65	0	8
Asterids	Loasaceae	<i>Mentzelia</i>	18	medium low	60	0	17

Asterids	Loganiaceae	<i>Buddleja</i>	38	high	100	6	15
Asterids	Loganiaceae	<i>Labordia</i>	80	high	15	0	8
Asterids	Menyanthaceae	<i>Nymphoides</i>	18	medium low	20	2	5
Asterids	Myrsinaceae	<i>Myrsine</i>	46	high	7	1	7
Asterids	Oleaceae	<i>Forsythia</i>	28	high	7	0	7
Asterids	Oleaceae	<i>Fraxinus</i>	46	high	65	1	12
Asterids	Oleaceae	<i>Jasminum</i>	24	med high	200	2	34
Asterids	Oleaceae	<i>Linociera</i>	46	high		0	4
Asterids	Oleaceae	<i>Nestegis</i>	46	high	5	0	4
Asterids	Oleaceae	<i>Olea</i>	46	high	30	0	4
Asterids	Oleaceae	<i>Osmanthus</i>	46	high	15	0	4
Asterids	Oleaceae	<i>Syringa</i>	44	high	23	0	12
Asterids	Orobanchaceae	<i>Cistanche</i>	40	high	16	0	5
Asterids	Pedaliaceae	<i>Sesamum</i>	26	high	15	0	5
Asterids	Pittosporaceae	<i>Pittosporum</i>	24	med high	150	0	8
Asterids	Plantaginaceae	<i>Plantago</i>	8	low	270	25	76
Asterids	Polemoniaceae	<i>Collomia</i>	16	medium low	15	1	8
Asterids	Polemoniaceae	<i>Gilia</i>	16	medium low	25	5	21
Asterids	Polemoniaceae	<i>Ipomopsis</i>	14	low	26	0	12
Asterids	Polemoniaceae	<i>Linanthus</i>	18	medium low	35	2	21
Asterids	Polemoniaceae	<i>Phlox</i>	14	low	67	0	5
Asterids	Polemoniaceae	<i>Polemonium</i>	18	medium low	25	0	19
Asterids	Primulaceae	<i>Anagallis</i>	20	med high	28	1	5
Asterids	Primulaceae	<i>Androsace</i>	18	medium low	100	3	23
Asterids	Primulaceae	<i>Cortusa</i>	24	med high	8	0	4
Asterids	Primulaceae	<i>Cyclamen</i>	20	med high	19	1	10
Asterids	Primulaceae	<i>Dodecatheon</i>	22	med high	13	5	7
Asterids	Primulaceae	<i>Lysimachia</i>	16	medium low	150	15	37
Asterids	Primulaceae	<i>Primula</i>	16	medium low	400	28	98
Asterids	Primulaceae	<i>Soldanella</i>	38	high	10	0	7

Asterids	Pyrolaceae	<i>Pyrola</i>	46	high	35	0	5
Asterids	Rubiaceae	<i>Anthospermum</i>	22	med high	40	0	26
Asterids	Rubiaceae	<i>Asperula</i>	20	med high	90	6	26
Asterids	Rubiaceae	<i>Borreria</i>	28	high		3	7
Asterids	Rubiaceae	<i>Canthium</i>	42	high	50	0	7
Asterids	Rubiaceae	<i>Carpacoce</i>	22	med high	7	0	4
Asterids	Rubiaceae	<i>Cinchona</i>	34	high	40	0	6
Asterids	Rubiaceae	<i>Coccocypselum</i>	20	med high	20	2	5
Asterids	Rubiaceae	<i>Coffea</i>	22	med high	90	1	8
Asterids	Rubiaceae	<i>Crucianella</i>	22	med high	30	1	8
Asterids	Rubiaceae	<i>Ernodea</i>	14	low	9	0	4
Asterids	Rubiaceae	<i>Exostema</i>	24	med high	45	0	4
Asterids	Rubiaceae	<i>Galium</i>	20	med high	300	40	131
Asterids	Rubiaceae	<i>Galopina</i>	22	med high	4	0	4
Asterids	Rubiaceae	<i>Gardenia</i>	22	med high	60	0	9
Asterids	Rubiaceae	<i>Hedyotis</i>	22	med high	250	6	15
Asterids	Rubiaceae	<i>Houstonia</i>	16	medium low		1	4
Asterids	Rubiaceae	<i>Ixora</i>	22	med high	300	0	16
Asterids	Rubiaceae	<i>Knoxia</i>	20	med high	7	0	4
Asterids	Rubiaceae	<i>Kohautia</i>	18	medium low	60	3	6
Asterids	Rubiaceae	<i>Mussaenda</i>	22	med high	100	0	13
Asterids	Rubiaceae	<i>Nenax</i>	22	med high	9	2	8
Asterids	Rubiaceae	<i>Oldenlandia</i>	18	medium low	300	7	16
Asterids	Rubiaceae	<i>Ophiorrhiza</i>	22	med high	150	0	9
Asterids	Rubiaceae	<i>Otiophora</i>	34	high	20	0	4
Asterids	Rubiaceae	<i>Paederia</i>	20	med high	30	7	19
Asterids	Rubiaceae	<i>Pavetta</i>	22	med high	400	2	11
Asterids	Rubiaceae	<i>Pentas</i>	20	med high	34	0	7
Asterids	Rubiaceae	<i>Psychotria</i>	22	med high	1150	19	30
Asterids	Rubiaceae	<i>Randia</i>	22	med high	100	0	5

Asterids	Rubiaceae	<i>Rubia</i>	22	med high	60	5	11
Asterids	Rubiaceae	<i>Wendlandia</i>	22	med high	70	1	4
Asterids	Scrophulariaceae	<i>Alonsoa</i>	28	high	16	5	7
Asterids	Scrophulariaceae	<i>Antirrhinum</i>	16	medium low	26	13	26
Asterids	Scrophulariaceae	<i>Bartsia</i>	24	med high	49	6	21
Asterids	Scrophulariaceae	<i>Calceolaria</i>	18	medium low	388	45	89
Asterids	Scrophulariaceae	<i>Collinsia</i>	14	low	20	1	5
Asterids	Scrophulariaceae	<i>Cordylanthus</i>	24	med high	18	0	14
Asterids	Scrophulariaceae	<i>Cymbalaria</i>	14	low	9	3	6
Asterids	Scrophulariaceae	<i>Derwentia</i>	38	high	8	0	5
Asterids	Scrophulariaceae	<i>Diascia</i>	18	medium low	72	9	72
Asterids	Scrophulariaceae	<i>Digitalis</i>	28	high	19	15	19
Asterids	Scrophulariaceae	<i>Euphrasia</i>	22	med high	170	10	22
Asterids	Scrophulariaceae	<i>Gnaphalium</i>	16	medium low	20	3	5
Asterids	Scrophulariaceae	<i>Hebe</i>	40	high	90	2	8
Asterids	Scrophulariaceae	<i>Hemimeris</i>	14	low	4	0	4
Asterids	Scrophulariaceae	<i>Jamesbrittenia</i>	24	med high	83	0	7
Asterids	Scrophulariaceae	<i>Kickxia</i>	18	medium low	47	1	12
Asterids	Scrophulariaceae	<i>Lagotis</i>	22	med high	20	2	4
Asterids	Scrophulariaceae	<i>Limnophila</i>	34	high	37	2	6
Asterids	Scrophulariaceae	<i>Lindernia</i>	18	medium low	80	0	5
Asterids	Scrophulariaceae	<i>Lophospermum</i>	24	med high	8	0	4
Asterids	Scrophulariaceae	<i>Mabrya</i>	24	med high	5	0	4
Asterids	Scrophulariaceae	<i>Manulea</i>	16	medium low	74	0	6
Asterids	Scrophulariaceae	<i>Maurandya</i>	24	med high	4	0	4
Asterids	Scrophulariaceae	<i>Mazus</i>	20	med high	12	6	10
Asterids	Scrophulariaceae	<i>Melampyrum</i>	18	medium low	35	0	6
Asterids	Scrophulariaceae	<i>Mimulus</i>	16	medium low	150	19	35
Asterids	Scrophulariaceae	<i>Nemesia</i>	18	medium low	65	0	7
Asterids	Scrophulariaceae	<i>Odontites</i>	18	medium low	30	2	15



Asterids	Scrophulariaceae	<i>Pedicularis</i>	12	low	350	5	61
Asterids	Scrophulariaceae	<i>Penstemon</i>	14	low	250	1	29
Asterids	Scrophulariaceae	<i>Pseudolysimachion</i>	34	high	19	2	5
Asterids	Scrophulariaceae	<i>Scrophularia</i>	24	med high	200	36	60
Asterids	Scrophulariaceae	<i>Striga</i>	40	high	40	0	5
Asterids	Scrophulariaceae	<i>Verbascum</i>	26	high	360	6	35
Asterids	Scrophulariaceae	<i>Veronica</i>	14	low	180	34	83
Asterids	Scrophulariaceae	<i>Zaluzianskya</i>	12	low	55	0	7
Asterids	Solanaceae	<i>Brunfelsia</i>	22	med high	40	0	6
Asterids	Solanaceae	<i>Cestrum</i>	16	medium low	175	0	8
Asterids	Solanaceae	<i>Cyphomandra</i>	24	med high	32	0	11
Asterids	Solanaceae	<i>Datura</i>	24	med high	11	0	11
Asterids	Solanaceae	<i>Hyoscyamus</i>	28	high	15	2	14
Asterids	Solanaceae	<i>Lycium</i>	24	med high	100	5	24
Asterids	Solanaceae	<i>Lycopersicon</i>	24	med high	7	0	7
Asterids	Solanaceae	<i>Nicotiana</i>	18	medium low	72	31	72
Asterids	Solanaceae	<i>Petunia</i>	14	low	40	0	40
Asterids	Solanaceae	<i>Physalis</i>	20	med high	80	4	20
Asterids	Solanaceae	<i>Solanum</i>	12	low	1700	294	297
Asterids	Stylidiaceae	<i>Stylidium</i>	14	low	136	62	93
Asterids	Symplocaceae	<i>Symplocos</i>	22	med high	250	0	6
Asterids	Valerianaceae	<i>Patrinia</i>	22	med high	15	2	9
Asterids	Valerianaceae	<i>Valeriana</i>	14	low	200	76	111
Asterids	Valerianaceae	<i>Valerianella</i>	14	low	50	1	14
Asterids	Verbenaceae	<i>Clerodendrum</i>	46	high	400	0	7
Asterids	Verbenaceae	<i>Glandularia</i>	10	low		11	13
Asterids	Verbenaceae	<i>Junellia</i>	18	medium low	47	2	10
Asterids	Verbenaceae	<i>Lantana</i>	22	med high	150	2	6
Asterids	Verbenaceae	<i>Lippia</i>	30	high	200	0	4
Asterids	Verbenaceae	<i>Verbena</i>	10	low	200	1	12

Asterids	Verbenaceae	<i>Vitex</i>	24	med high	250	1	6
Basal Angiosperms	Annonaceae	<i>Annona</i>	14	low	137	0	4
Basal Angiosperms	Annonaceae	<i>Artabotrys</i>	16	medium low	100	0	7
Basal Angiosperms	Annonaceae	<i>Desmos</i>	16	medium low	30	0	4
Basal Angiosperms	Annonaceae	<i>Goniothalamus</i>	16	medium low	75	0	4
Basal Angiosperms	Annonaceae	<i>Polyalthia</i>	16	medium low	100	1	16
Basal Angiosperms	Aristolochiaceae	<i>Aristolochia</i>	8	low	120	22	34
Basal Angiosperms	Aristolochiaceae	<i>Asarum</i>	12	low	70	31	33
Basal Angiosperms	Aristolochiaceae	<i>Asiasarum</i>	26	high		0	5
Basal Angiosperms	Aristolochiaceae	<i>Heterotropa</i>	24	med high		0	9
Basal Angiosperms	Chloranthaceae	<i>Chloranthus</i>	30	high	18	2	10
Basal Angiosperms	Lauraceae	<i>Lindera</i>	24	med high	100	0	8
Basal Angiosperms	Lauraceae	<i>Litsea</i>	24	med high	400	1	6
Basal Angiosperms	Lauraceae	<i>Machilus</i>	24	med high		0	4
Basal Angiosperms	Magnoliaceae	<i>Illicium</i>	28	high	42	0	4
Basal Angiosperms	Magnoliaceae	<i>Magnolia</i>	38	high	100	12	21
Basal Angiosperms	Magnoliaceae	<i>Manglietia</i>	38	high	25	0	11
Basal Angiosperms	Magnoliaceae	<i>Michelia</i>	38	high	30	0	22
Basal Angiosperms	Magnoliaceae	<i>Schisandra</i>	14	low	25	6	7
Basal Angiosperms	Magnoliaceae	<i>Talauma</i>	38	high		0	7
Basal Angiosperms	Monimiaceae	<i>Tambourissa</i>	38	high	43	0	9
Basal Angiosperms	Nymphaeaceae	<i>Nuphar</i>	34	high	16	0	4
Basal Angiosperms	Nymphaeaceae	<i>Nymphaea</i>	18	medium low	50	14	27
Basal Angiosperms	Piperaceae	<i>Peperomia</i>	20	med high	1000	21	44
Basal Angiosperms	Piperaceae	<i>Piper</i>	26	high	2000	17	35
Basal Eudicots	Aizoaceae	<i>Brownanthus</i>	18	medium low	8	4	8
Basal Eudicots	Aizoaceae	<i>Cephalophyllum</i>	18	medium low	30	6	22
Basal Eudicots	Aizoaceae	<i>Cheiridopsis</i>	18	medium low	23	4	18
Basal Eudicots	Aizoaceae	<i>Conophytum</i>	18	medium low	85	6	45
Basal Eudicots	Aizoaceae	<i>Jordaaniella</i>	18	medium low	4	1	4

Basal Eudicots	Aizoaceae	<i>Mesembryanthemum</i>	18	medium low	25	1	6
Basal Eudicots	Aizoaceae	<i>Mollugo</i>	18	medium low	35	3	6
Basal Eudicots	Aizoaceae	<i>Prenia</i>	18	medium low		0	4
Basal Eudicots	Aizoaceae	<i>Psilocaulon</i>	36	high	12	3	8
Basal Eudicots	Aizoaceae	<i>Ruschia</i>	18	medium low	360	2	5
Basal Eudicots	Amaranthaceae	<i>Amaranthus</i>	28	high	60	0	29
Basal Eudicots	Berberidaceae	<i>Epimedium</i>	12	low	44	0	20
Basal Eudicots	Cactaceae	<i>Astrophytum</i>	22	med high	4	0	4
Basal Eudicots	Cactaceae	<i>Coryphantha</i>	22	med high	45	0	17
Basal Eudicots	Cactaceae	<i>Disocactus</i>	22	med high	11	0	11
Basal Eudicots	Cactaceae	<i>Echinocereus</i>	22	med high	47	6	28
Basal Eudicots	Cactaceae	<i>Ferocactus</i>	22	med high	23	0	15
Basal Eudicots	Cactaceae	<i>Gymnocalycium</i>	22	med high	65	14	65
Basal Eudicots	Cactaceae	<i>Melocactus</i>	22	med high	31	6	12
Basal Eudicots	Cactaceae	<i>Opuntia</i>	12	low	200	35	89
Basal Eudicots	Cactaceae	<i>Pereskia</i>	22	med high	16	0	12
Basal Eudicots	Cactaceae	<i>Rebutia</i>	22	med high	35	2	5
Basal Eudicots	Cactaceae	<i>Rhipsalis</i>	22	med high	50	1	26
Basal Eudicots	Caryophyllaceae	<i>Acanthophyllum</i>	30	high	56	1	5
Basal Eudicots	Caryophyllaceae	<i>Arenaria</i>	18	medium low	150	20	57
Basal Eudicots	Caryophyllaceae	<i>Bufonia</i>	16	medium low	20	5	9
Basal Eudicots	Caryophyllaceae	<i>Cerastium</i>	30	high	100	26	63
Basal Eudicots	Caryophyllaceae	<i>Dianthus</i>	30	high	300	15	74
Basal Eudicots	Caryophyllaceae	<i>Gastrolychnis</i>	24	med high		4	6
Basal Eudicots	Caryophyllaceae	<i>Herniaria</i>	18	medium low	48	6	12
Basal Eudicots	Caryophyllaceae	<i>Lychnis</i>	24	med high		2	13
Basal Eudicots	Caryophyllaceae	<i>Melandrium</i>	24	med high		4	11
Basal Eudicots	Caryophyllaceae	<i>Minuartia</i>	18	medium low	100	12	17
Basal Eudicots	Caryophyllaceae	<i>Moehringia</i>	24	med high	25	2	5
Basal Eudicots	Caryophyllaceae	<i>Petrorrhagia</i>	26	high	28	1	13

Basal Eudicots	Caryophyllaceae	<i>Polycarpon</i>	14	low	16	2	5
Basal Eudicots	Caryophyllaceae	<i>Sagina</i>	12	low	20	11	13
Basal Eudicots	Caryophyllaceae	<i>Saponaria</i>	28	high	40	1	6
Basal Eudicots	Caryophyllaceae	<i>Scleranthus</i>	22	med high	15	2	5
Basal Eudicots	Caryophyllaceae	<i>Spergula</i>	18	medium low	10	1	10
Basal Eudicots	Caryophyllaceae	<i>Spergularia</i>	18	medium low	25	7	14
Basal Eudicots	Caryophyllaceae	<i>Stellaria</i>	18	medium low	175	13	39
Basal Eudicots	Caryophyllaceae	<i>Vaccaria</i>	28	high	4	0	4
Basal Eudicots	Chenopodiaceae	<i>Arthrocnemum</i>	18	medium low		2	4
Basal Eudicots	Chenopodiaceae	<i>Atriplex</i>	16	medium low	300	19	73
Basal Eudicots	Chenopodiaceae	<i>Bassia</i>	18	medium low	21	0	5
Basal Eudicots	Chenopodiaceae	<i>Beta</i>	18	medium low	12	0	5
Basal Eudicots	Chenopodiaceae	<i>Ceratoides</i>	18	medium low		1	4
Basal Eudicots	Chenopodiaceae	<i>Chenopodium</i>	18	medium low	100	20	49
Basal Eudicots	Chenopodiaceae	<i>Climacoptera</i>	18	medium low		1	4
Basal Eudicots	Chenopodiaceae	<i>Corispermum</i>	18	medium low	60	0	6
Basal Eudicots	Chenopodiaceae	<i>Kochia</i>	16	medium low		0	6
Basal Eudicots	Chenopodiaceae	<i>Salicornia</i>	18	medium low	28	3	9
Basal Eudicots	Chenopodiaceae	<i>Salsola</i>	18	medium low	150	6	17
Basal Eudicots	Chenopodiaceae	<i>Suaeda</i>	18	medium low	100	4	13
Basal Eudicots	Crassulaceae	<i>Aeonium</i>	36	high	31	3	26
Basal Eudicots	Crassulaceae	<i>Dudleya</i>	34	high	40	2	7
Basal Eudicots	Crassulaceae	<i>Echeveria</i>	24	med high	150	67	85
Basal Eudicots	Crassulaceae	<i>Hylotelephium</i>	24	med high		1	4
Basal Eudicots	Crassulaceae	<i>Orostachys</i>	24	med high	10	0	4
Basal Eudicots	Crassulaceae	<i>Rosularia</i>	14	low	27	6	15
Basal Eudicots	Crassulaceae	<i>Sedum</i>	10	low	280	153	202
Basal Eudicots	Crassulaceae	<i>Sempervivum</i>	34	high	50	3	11
Basal Eudicots	Crassulaceae	<i>Villadia</i>	18	medium low	28	7	17
Basal Eudicots	Didiereaceae	<i>Alluaudia</i>	48	high	6	4	6

Basal Eudicots	Fumariaceae	<i>Corydalis</i>	8	low	400	67	72
Basal Eudicots	Fumariaceae	<i>Fumaria</i>	16	medium low	50	43	46
Basal Eudicots	Haloragaceae	<i>Myriophyllum</i>	14	low	60	3	5
Basal Eudicots	Hamamelidaceae	<i>Hamamelis</i>	24	med high	5	0	5
Basal Eudicots	Menispermaceae	<i>Stephania</i>	22	med high	35	0	8
Basal Eudicots	Nepenthaceae	<i>Nepenthes</i>	80	high	82	0	15
Basal Eudicots	Nyctaginaceae	<i>Boerhavia</i>	52	high	50	2	4
Basal Eudicots	Nyctaginaceae	<i>Commicarpus</i>	40	high		0	4
Basal Eudicots	Papaveraceae	<i>Argemone</i>	28	high	23	2	5
Basal Eudicots	Papaveraceae	<i>Chelidonium</i>	10	low	4	0	4
Basal Eudicots	Papaveraceae	<i>Dicentra</i>	16	medium low	12	3	7
Basal Eudicots	Papaveraceae	<i>Glaucium</i>	12	low	23	0	6
Basal Eudicots	Papaveraceae	<i>Hypocoum</i>	16	medium low	20	2	7
Basal Eudicots	Papaveraceae	<i>Papaver</i>	12	low	80	28	52
Basal Eudicots	Phytolaccaceae	<i>Phytolacca</i>	36	high	25	2	8
Basal Eudicots	Plumbaginaceae	<i>Acantholimon</i>	30	high	165	0	5
Basal Eudicots	Plumbaginaceae	<i>Armeria</i>	18	medium low	100	0	19
Basal Eudicots	Plumbaginaceae	<i>Limonium</i>	12	low	350	110	191
Basal Eudicots	Plumbaginaceae	<i>Plumbago</i>	12	low	24	0	4
Basal Eudicots	Polygonaceae	<i>Acetosella</i>	14	low		2	4
Basal Eudicots	Polygonaceae	<i>Aconogonum</i>	20	med high		1	7
Basal Eudicots	Polygonaceae	<i>Chorizanthe</i>	34	high	50	3	27
Basal Eudicots	Polygonaceae	<i>Fagopyrum</i>	16	medium low	10	2	10
Basal Eudicots	Polygonaceae	<i>Fallopia</i>	20	med high	11	3	11
Basal Eudicots	Polygonaceae	<i>Muehlenbeckia</i>	20	med high	23	0	8
Basal Eudicots	Polygonaceae	<i>Oxytheca</i>	40	high	7	0	6
Basal Eudicots	Polygonaceae	<i>Persicaria</i>	20	med high	150	11	19
Basal Eudicots	Polygonaceae	<i>Rheum</i>	22	med high	30	1	5
Basal Eudicots	Polygonaceae	<i>Rumex</i>	14	low	200	32	66
Basal Eudicots	Portulacaceae	<i>Anacampteros</i>	18	medium low	24	5	24



Basal Eudicots	Portulacaceae	<i>Calandrinia</i>	20	med high	60	0	5
Basal Eudicots	Portulacaceae	<i>Claytonia</i>	10	low	24	3	13
Basal Eudicots	Portulacaceae	<i>Portulaca</i>	8	low	40	14	17
Basal Eudicots	Portulacaceae	<i>Talinum</i>	24	med high	40	1	8
Basal Eudicots	Ranunculaceae	<i>Actaea</i>	16	medium low	8	0	5
Basal Eudicots	Ranunculaceae	<i>Adonis</i>	16	medium low	26	2	12
Basal Eudicots	Ranunculaceae	<i>Anemone</i>	14	low	144	12	49
Basal Eudicots	Ranunculaceae	<i>Anemonoides</i>	16	medium low		6	10
Basal Eudicots	Ranunculaceae	<i>Aquilegia</i>	14	low	80	0	24
Basal Eudicots	Ranunculaceae	<i>Batrachium</i>	16	medium low		4	7
Basal Eudicots	Ranunculaceae	<i>Callianthemum</i>	16	medium low	14	1	7
Basal Eudicots	Ranunculaceae	<i>Caltha</i>	16	medium low	14	12	14
Basal Eudicots	Ranunculaceae	<i>Cimicifuga</i>	16	medium low	18	0	10
Basal Eudicots	Ranunculaceae	<i>Clematis</i>	16	medium low	295	8	67
Basal Eudicots	Ranunculaceae	<i>Consolida</i>	14	low	43	0	20
Basal Eudicots	Ranunculaceae	<i>Coptis</i>	16	medium low	15	0	7
Basal Eudicots	Ranunculaceae	<i>Delphinium</i>	16	medium low	320	11	85
Basal Eudicots	Ranunculaceae	<i>Ficaria</i>	16	medium low		2	6
Basal Eudicots	Ranunculaceae	<i>Hepatica</i>	14	low	7	0	5
Basal Eudicots	Ranunculaceae	<i>Knowltonia</i>	48	high	8	0	4
Basal Eudicots	Ranunculaceae	<i>Nigella</i>	12	low	20	0	10
Basal Eudicots	Ranunculaceae	<i>Paeonia</i>	10	low	33	8	33
Basal Eudicots	Ranunculaceae	<i>Pulsatilla</i>	16	medium low	38	2	22
Basal Eudicots	Ranunculaceae	<i>Thalictrum</i>	14	low	330	9	26
Basal Eudicots	Ranunculaceae	<i>Trollius</i>	16	medium low	31	0	16
Basal Eudicots	Saxifragaceae	<i>Boykinia</i>	14	low	9	3	8
Basal Eudicots	Saxifragaceae	<i>Chrysosplenium</i>	12	low	60	27	32
Basal Eudicots	Saxifragaceae	<i>Heuchera</i>	14	low	55	0	15
Basal Eudicots	Saxifragaceae	<i>Itea</i>	22	med high	15	0	7
Basal Eudicots	Saxifragaceae	<i>Lithophragma</i>	14	low	9	0	4

Basal Eudicots	Saxifragaceae	<i>Parnassia</i>	18	medium low	15	7	15
Basal Eudicots	Saxifragaceae	<i>Ribes</i>	16	medium low	150	1	34
Basal Eudicots	Saxifragaceae	<i>Saxifraga</i>	16	medium low	440	67	128
Basal Eudicots	Saxifragaceae	<i>Sullivantia</i>	14	low	6	0	6
Basal Eudicots	Tamaricaceae	<i>Tamarix</i>	24	med high	54	0	15
Basal Eudicots	Vitaceae	<i>Cayratia</i>	40	high	50	1	4
Basal Eudicots	Vitaceae	<i>Cissus</i>	20	med high	200	4	13
Basal Eudicots	Vitaceae	<i>Cyphostemma</i>	22	med high	250	3	6
Basal Eudicots	Vitaceae	<i>Leea</i>	24	med high	34	4	15
Basal Eudicots	Vitaceae	<i>Vitis</i>	38	high	65	0	7
Basal Monocots	Alismataceae	<i>Alisma</i>	14	low	9	3	6
Basal Monocots	Alismataceae	<i>Echinodorus</i>	22	med high	48	0	4
Basal Monocots	Amaryllidaceae	<i>Alstroemeria</i>	16	medium low	50	0	20
Basal Monocots	Amaryllidaceae	<i>Amaryllis</i>	22	med high		1	17
Basal Monocots	Amaryllidaceae	<i>Crinum</i>	20	med high	120	1	29
Basal Monocots	Amaryllidaceae	<i>Galanthus</i>	24	med high	12	1	12
Basal Monocots	Amaryllidaceae	<i>Habranthus</i>	12	low	10	2	5
Basal Monocots	Amaryllidaceae	<i>Haemanthus</i>	16	medium low	25	0	25
Basal Monocots	Amaryllidaceae	<i>Hessea</i>	22	med high	14	0	5
Basal Monocots	Amaryllidaceae	<i>Hippeastrum</i>	20	med high	76	0	15
Basal Monocots	Amaryllidaceae	<i>Hymenocallis</i>	38	high	35	1	10
Basal Monocots	Amaryllidaceae	<i>Hypoxis</i>	14	low	150	4	6
Basal Monocots	Amaryllidaceae	<i>Leucojum</i>	14	low	10	0	7
Basal Monocots	Amaryllidaceae	<i>Lycoris</i>	12	low	20	11	20
Basal Monocots	Amaryllidaceae	<i>Narcissus</i>	14	low	58	13	58
Basal Monocots	Amaryllidaceae	<i>Pancreatium</i>	22	med high	16	0	7
Basal Monocots	Amaryllidaceae	<i>Scadoxus</i>	18	medium low	9	0	5
Basal Monocots	Amaryllidaceae	<i>Sternbergia</i>	20	med high	7	0	7
Basal Monocots	Amaryllidaceae	<i>Strumaria</i>	20	med high	9	0	9
Basal Monocots	Amaryllidaceae	<i>Ungernia</i>	22	med high	8	0	5

Basal Monocots	Amaryllidaceae	<i>Zephyranthes</i>	12	low	40	12	15
Basal Monocots	Aponogetonaceae	<i>Aponogeton</i>	24	med high	43	7	16
Basal Monocots	Araceae	<i>Amorphophallus</i>	26	high	90	0	30
Basal Monocots	Araceae	<i>Anubias</i>	48	high	8	0	8
Basal Monocots	Araceae	<i>Aridarum</i>	24	med high	7	0	4
Basal Monocots	Araceae	<i>Arum</i>	28	high	26	3	18
Basal Monocots	Araceae	<i>Bucephalandra</i>	26	high	4	0	4
Basal Monocots	Araceae	<i>Colocasia</i>	26	high	8	0	4
Basal Monocots	Araceae	<i>Cryptocoryne</i>	20	med high	50	2	5
Basal Monocots	Araceae	<i>Dieffenbachia</i>	34	high	20	1	7
Basal Monocots	Araceae	<i>Dracontium</i>	26	high	23	0	4
Basal Monocots	Araceae	<i>Homalomena</i>	38	high	140	1	10
Basal Monocots	Araceae	<i>Hottarum</i>	26	high	5	0	4
Basal Monocots	Araceae	<i>Lagenandra</i>	36	high	12	0	4
Basal Monocots	Araceae	<i>Philodendron</i>	30	high	375	1	5
Basal Monocots	Araceae	<i>Pinellia</i>	26	high	6	2	4
Basal Monocots	Araceae	<i>Piptospatha</i>	26	high	10	0	6
Basal Monocots	Araceae	<i>Schismatoglottis</i>	26	high	100	1	12
Basal Monocots	Araceae	<i>Syngonium</i>	22	med high	33	0	7
Basal Monocots	Araceae	<i>Theriophonum</i>	14	low	5	1	4
Basal Monocots	Araceae	<i>Typhonium</i>	16	medium low	30	1	4
Basal Monocots	Araceae	<i>Zantedeschia</i>	32	high	6	0	5
Basal Monocots	Dioscoreaceae	<i>Dioscorea</i>	20	med high	850	34	51
Basal Monocots	Hydrocharitaceae	<i>Blyxa</i>	16	medium low	9	2	4
Basal Monocots	Iridaceae	<i>Aristea</i>	32	high	50	1	8
Basal Monocots	Iridaceae	<i>Calydorea</i>	14	low	10	3	4
Basal Monocots	Iridaceae	<i>Crocus</i>	6	low	80	35	50
Basal Monocots	Iridaceae	<i>Cypella</i>	14	low	20	0	4
Basal Monocots	Iridaceae	<i>Dierama</i>	20	med high	44	0	6
Basal Monocots	Iridaceae	<i>Dietes</i>	20	med high	6	1	5

Basal Monocots	Iridaceae	<i>Ferraria</i>	20	med high	10	2	10
Basal Monocots	Iridaceae	<i>Galaxia</i>	14	low	15	1	12
Basal Monocots	Iridaceae	<i>Geissorhiza</i>	26	high	84	1	34
Basal Monocots	Iridaceae	<i>Gladiolus</i>	22	med high	195	17	59
Basal Monocots	Iridaceae	<i>Gynandriris</i>	6	low	9	3	8
Basal Monocots	Iridaceae	<i>Hesperantha</i>	24	med high	67	1	4
Basal Monocots	Iridaceae	<i>Homeria</i>	8	low	33	3	33
Basal Monocots	Iridaceae	<i>Iris</i>	14	low	210	43	130
Basal Monocots	Iridaceae	<i>Ixia</i>	20	med high	50	0	5
Basal Monocots	Iridaceae	<i>Juno</i>	18	medium low		1	5
Basal Monocots	Iridaceae	<i>Lapeirousia</i>	6	low	36	24	32
Basal Monocots	Iridaceae	<i>Moraea</i>	10	low	120	6	20
Basal Monocots	Iridaceae	<i>Romulea</i>	18	medium low	90	5	65
Basal Monocots	Iridaceae	<i>Sisyrinchium</i>	16	medium low	80	31	44
Basal Monocots	Iridaceae	<i>Tritonia</i>	20	med high	28	0	4
Basal Monocots	Iridaceae	<i>Watsonia</i>	18	medium low	52	0	31
Basal Monocots	Juncaginaceae	<i>Triglochin</i>	16	medium low	17	6	8
Basal Monocots	Lemnaceae	<i>Lemna</i>	20	med high	13	10	13
Basal Monocots	Lemnaceae	<i>Wolffia</i>	20	med high	7	2	5
Basal Monocots	Lemnaceae	<i>Wolffiella</i>	20	med high	7	5	7
Basal Monocots	Liliaceae	<i>Albuca</i>	14	low	50	0	17
Basal Monocots	Liliaceae	<i>Allium</i>	14	low	690	392	440
Basal Monocots	Liliaceae	<i>Aloe</i>	14	low	365	9	70
Basal Monocots	Liliaceae	<i>Androcymbium</i>	18	medium low	12	0	7
Basal Monocots	Liliaceae	<i>Anthericum</i>	16	medium low	50	7	9
Basal Monocots	Liliaceae	<i>Arthropodium</i>	22	med high	11	2	5
Basal Monocots	Liliaceae	<i>Asparagus</i>	16	medium low	135	10	36
Basal Monocots	Liliaceae	<i>Asphodeline</i>	28	high	14	0	4
Basal Monocots	Liliaceae	<i>Aspidistra</i>	36	high	27	0	27
Basal Monocots	Liliaceae	<i>Bellevalia</i>	8	low	45	9	37

Basal Monocots	Liliaceae	<i>Chlorophytum</i>	14	low	215	14	35
Basal Monocots	Liliaceae	<i>Clintonia</i>	14	low	7	6	7
Basal Monocots	Liliaceae	<i>Cordyline</i>	38	high	15	0	4
Basal Monocots	Liliaceae	<i>Dipcadi</i>	8	low	30	3	10
Basal Monocots	Liliaceae	<i>Disporum</i>	12	low	22	1	22
Basal Monocots	Liliaceae	<i>Dracaena</i>	34	high	60	0	13
Basal Monocots	Liliaceae	<i>Drimia</i>	18	medium low	120	1	5
Basal Monocots	Liliaceae	<i>Echeandia</i>	16	medium low	80	4	18
Basal Monocots	Liliaceae	<i>Eremurus</i>	14	low	45	0	14
Basal Monocots	Liliaceae	<i>Eriospermum</i>	10	low	100	19	88
Basal Monocots	Liliaceae	<i>Erythronium</i>	20	med high	20	2	9
Basal Monocots	Liliaceae	<i>Eucomis</i>	30	high	10	4	9
Basal Monocots	Liliaceae	<i>Fritillaria</i>	14	low	100	1	93
Basal Monocots	Liliaceae	<i>Gasteria</i>	14	low	25	0	25
Basal Monocots	Liliaceae	<i>Haworthia</i>	14	low	87	0	32
Basal Monocots	Liliaceae	<i>Hemerocallis</i>	22	med high	17	0	17
Basal Monocots	Liliaceae	<i>Heteropolygonatum</i>	32	high		1	4
Basal Monocots	Liliaceae	<i>Hosta</i>	60	high	25	1	12
Basal Monocots	Liliaceae	<i>Hyacinthella</i>	16	medium low	19	1	19
Basal Monocots	Liliaceae	<i>Hyacinthoides</i>	16	medium low	5	0	5
Basal Monocots	Liliaceae	<i>Iphigenia</i>	22	med high	14	0	5
Basal Monocots	Liliaceae	<i>Leopoldia</i>	18	medium low		0	4
Basal Monocots	Liliaceae	<i>Lomandra</i>	16	medium low	50	2	9
Basal Monocots	Liliaceae	<i>Maianthemum</i>	36	high	27	1	4
Basal Monocots	Liliaceae	<i>Merendera</i>	18	medium low		1	5
Basal Monocots	Liliaceae	<i>Muscari</i>	18	medium low	31	3	31
Basal Monocots	Liliaceae	<i>Nomocharis</i>	24	med high	8	0	8
Basal Monocots	Liliaceae	<i>Nothoscordum</i>	8	low	20	6	12
Basal Monocots	Liliaceae	<i>Ophiopogon</i>	36	high	22	2	22
Basal Monocots	Liliaceae	<i>Paris</i>	10	low	24	2	24

Basal Monocots	Liliaceae	<i>Polygonatum</i>	14	low	55	10	51
Basal Monocots	Liliaceae	<i>Prospero</i>	12	low		2	6
Basal Monocots	Liliaceae	<i>Sansevieria</i>	20	med high	100	10	19
Basal Monocots	Liliaceae	<i>Smilacina</i>	36	high		0	13
Basal Monocots	Liliaceae	<i>Streptopus</i>	16	medium low	8	3	5
Basal Monocots	Liliaceae	<i>Tofieldia</i>	28	high		0	6
Basal Monocots	Liliaceae	<i>Tricyrtis</i>	24	med high	20	0	4
Basal Monocots	Liliaceae	<i>Trillium</i>	10	low	42	4	14
Basal Monocots	Liliaceae	<i>Tulbaghia</i>	12	low	22	0	21
Basal Monocots	Liliaceae	<i>Tulipa</i>	24	med high	100	5	52
Basal Monocots	Liliaceae	<i>Tupistra</i>	38	high	35	0	16
Basal Monocots	Liliaceae	<i>Urginea</i>	20	med high		1	10
Basal Monocots	Liliaceae	<i>Veratrum</i>	16	medium low	18	7	13
Basal Monocots	Liliaceae	<i>Wurmbaea</i>	22	med high	40	1	4
Basal Monocots	Najadaceae	<i>Najas</i>	12	low	32	4	14
Basal Monocots	Orchidaceae	<i>Acampe</i>	36	high	16	0	4
Basal Monocots	Orchidaceae	<i>Aerides</i>	36	high	20	0	8
Basal Monocots	Orchidaceae	<i>Bulbophyllum</i>	38	high	1000	0	30
Basal Monocots	Orchidaceae	<i>Calanthe</i>	38	high	150	0	52
Basal Monocots	Orchidaceae	<i>Cephalanthera</i>	32	high	14	0	10
Basal Monocots	Orchidaceae	<i>Cleisostoma</i>	38	high	80	0	6
Basal Monocots	Orchidaceae	<i>Coelogyne</i>	38	high	100	0	16
Basal Monocots	Orchidaceae	<i>Cymbidium</i>	38	high	44	0	35
Basal Monocots	Orchidaceae	<i>Cypripedium</i>	20	med high	40	0	20
Basal Monocots	Orchidaceae	<i>Dactylorhiza</i>	40	high	35	15	33
Basal Monocots	Orchidaceae	<i>Dendrobium</i>	36	high	900	1	144
Basal Monocots	Orchidaceae	<i>Disa</i>	36	high	99	0	7
Basal Monocots	Orchidaceae	<i>Epipactis</i>	38	high	22	0	20
Basal Monocots	Orchidaceae	<i>Eria</i>	18	medium low	500	29	33
Basal Monocots	Orchidaceae	<i>Gymnadenia</i>	40	high	10	1	6

Basal Monocots	Orchidaceae	<i>Herminium</i>	36	high	30	1	8
Basal Monocots	Orchidaceae	<i>Hetaeria</i>	24	med high	27	2	4
Basal Monocots	Orchidaceae	<i>Liparis</i>	20	med high	350	12	23
Basal Monocots	Orchidaceae	<i>Listera</i>	34	high	20	0	9
Basal Monocots	Orchidaceae	<i>Luisia</i>	38	high	40	0	5
Basal Monocots	Orchidaceae	<i>Malaxis</i>	30	high	300	1	4
Basal Monocots	Orchidaceae	<i>Microcoelia</i>	48	high	23	0	12
Basal Monocots	Orchidaceae	<i>Microstylis</i>	30	high		0	4
Basal Monocots	Orchidaceae	<i>Neottia</i>	36	high	9	0	4
Basal Monocots	Orchidaceae	<i>Nigritella</i>	40	high	8	3	8
Basal Monocots	Orchidaceae	<i>Oberonia</i>	30	high	300	0	14
Basal Monocots	Orchidaceae	<i>Odontoglossum</i>	56	high	140	2	18
Basal Monocots	Orchidaceae	<i>Oncidium</i>	36	high	680	0	5
Basal Monocots	Orchidaceae	<i>Orchis</i>	18	medium low	33	28	30
Basal Monocots	Orchidaceae	<i>Peristylus</i>	42	high	70	2	11
Basal Monocots	Orchidaceae	<i>Pholidota</i>	38	high	29	0	4
Basal Monocots	Orchidaceae	<i>Phragmipedium</i>	18	medium low	15	0	13
Basal Monocots	Orchidaceae	<i>Pleione</i>	38	high	16	0	13
Basal Monocots	Orchidaceae	<i>Pogonia</i>	18	medium low	4	2	4
Basal Monocots	Orchidaceae	<i>Polystachya</i>	40	high	150	0	6
Basal Monocots	Orchidaceae	<i>Ponerorchis</i>	42	high		0	4
Basal Monocots	Orchidaceae	<i>Sarcoglottis</i>	46	high	40	0	4
Basal Monocots	Orchidaceae	<i>Serapias</i>	36	high	13	1	9
Basal Monocots	Orchidaceae	<i>Spiranthes</i>	30	high	30	3	13
Basal Monocots	Orchidaceae	<i>Tolumnia</i>	40	high	35	8	20
Basal Monocots	Orchidaceae	<i>Tridactyle</i>	44	high	38	0	8
Basal Monocots	Orchidaceae	<i>Vanda</i>	38	high	45	2	13
Basal Monocots	Orchidaceae	<i>Zeuxine</i>	20	med high	26	2	5
Basal Monocots	Potamogetonaceae	<i>Posidonia</i>	20	med high	9	0	9
Basal Monocots	Potamogetonaceae	<i>Potamogeton</i>	26	high	90	11	21

Basal Monocots	Potamogetonaceae	<i>Zannichellia</i>	12	low	4	2	4
Basal Monocots	Smilacaceae	<i>Smilax</i>	26	high	300	5	38
Basal Monocots	Velloziaceae	<i>Pleurostima</i>	34	high	25	0	6
Basal Monocots	Velloziaceae	<i>Vellozia</i>	14	low	124	1	20
Basal Monocots	Velloziaceae	<i>Xerophyta</i>	14	low	28	4	8
Gymnosperms	Araucariaceae	<i>Araucaria</i>	26		18	0	5
Gymnosperms	Cephalotaxaceae	<i>Cephalotaxus</i>	22		8	0	8
Gymnosperms	Cupressaceae	<i>Callitris</i>	22		14	0	5
Gymnosperms	Cupressaceae	<i>Chamaecyparis</i>	22		8	0	6
Gymnosperms	Cupressaceae	<i>Cupressus</i>	22		23	1	23
Gymnosperms	Cupressaceae	<i>Juniperus</i>	22		50	3	15
Gymnosperms	Cupressaceae	<i>Thuja</i>	22		5	0	4
Gymnosperms	Cycadaceae	<i>Ceratozamia</i>	16		10	0	4
Gymnosperms	Cycadaceae	<i>Cycas</i>	20		17	0	8
Gymnosperms	Cycadaceae	<i>Macrozamia</i>	18		15	0	8
Gymnosperms	Cycadaceae	<i>Zamia</i>	16		40	0	32
Gymnosperms	Ephedraceae	<i>Ephedra</i>	14		40	7	18
Gymnosperms	Pinaceae	<i>Abies</i>	22		49	0	23
Gymnosperms	Pinaceae	<i>Picea</i>	22		40	0	29
Gymnosperms	Pinaceae	<i>Pinus</i>	18		93	0	63
Gymnosperms	Pinaceae	<i>Pseudotsuga</i>	24		4	0	4
Gymnosperms	Pinaceae	<i>Tsuga</i>	24		14	0	8
Gymnosperms	Podocarpaceae	<i>Podocarpus</i>	26		94	0	9
Higher Monocots	Areaceae	<i>Arenga</i>	32	high	20	0	5
Higher Monocots	Areaceae	<i>Calamus</i>	26	high	400	0	10
Higher Monocots	Areaceae	<i>Chamaedorea</i>	26	high	100	0	6
Higher Monocots	Areaceae	<i>Dypsis</i>	32	high	20	0	8
Higher Monocots	Areaceae	<i>Raphia</i>	28	high	28	0	6
Higher Monocots	Areaceae	<i>Ravenea</i>	30	high	9	0	4
Higher Monocots	Areaceae	<i>Sabal</i>	36	high	16	0	5



Higher Monocots	Bromeliaceae	<i>Ananas</i>	48	high	8	0	4
Higher Monocots	Bromeliaceae	<i>Dyckia</i>	50	high	107	0	5
Higher Monocots	Bromeliaceae	<i>Pitcairnia</i>	50	high	320	0	14
Higher Monocots	Bromeliaceae	<i>Puya</i>	50	high	168	0	4
Higher Monocots	Bromeliaceae	<i>Tillandsia</i>	36	high	380	2	49
Higher Monocots	Bromeliaceae	<i>Vriesea</i>	50	high	280	0	9
Higher Monocots	Commelinaceae	<i>Aneilema</i>	26	high	62	2	6
Higher Monocots	Commelinaceae	<i>Callisia</i>	12	low	20	1	4
Higher Monocots	Commelinaceae	<i>Commelina</i>	16	medium low	170	17	33
Higher Monocots	Commelinaceae	<i>Gibasis</i>	10	low	11	1	11
Higher Monocots	Commelinaceae	<i>Palisota</i>	40	high	18	0	4
Higher Monocots	Commelinaceae	<i>Tradescantia</i>	12	low	70	9	23
Higher Monocots	Eriocaulaceae	<i>Eriocaulon</i>	20	med high	400	1	10
Higher Monocots	Eriocaulaceae	<i>Paepalanthus</i>	50	high	485	1	7
Higher Monocots	Heliconiaceae	<i>Heliconia</i>	24	med high	150	0	28
Higher Monocots	Marantaceae	<i>Calathea</i>	24	med high	300	0	7
Higher Monocots	Poaceae	<i>Aegilops</i>	12	low	27	13	27
Higher Monocots	Poaceae	<i>Agropyron</i>	14	low	50	36	50
Higher Monocots	Poaceae	<i>Agrostis</i>	14	low	220	50	67
Higher Monocots	Poaceae	<i>Aira</i>	14	low	12	3	12
Higher Monocots	Poaceae	<i>Alopecurus</i>	14	low	36	7	21
Higher Monocots	Poaceae	<i>Andropogon</i>	20	med high	100	14	26
Higher Monocots	Poaceae	<i>Anisantha</i>	14	low		3	5
Higher Monocots	Poaceae	<i>Anthoxanthum</i>	10	low	18	3	10
Higher Monocots	Poaceae	<i>Arctopoa</i>	42	high		0	4
Higher Monocots	Poaceae	<i>Aristida</i>	22	med high	330	3	21
Higher Monocots	Poaceae	<i>Arrhenatherum</i>	14	low	6	0	5
Higher Monocots	Poaceae	<i>Arthraxon</i>	18	medium low	20	2	7
Higher Monocots	Poaceae	<i>Arundinella</i>	16	medium low	47	1	10
Higher Monocots	Poaceae	<i>Avena</i>	14	low	27	13	27

Higher Monocots	Poaceae	<i>Avenula</i>	14	low		6	14
Higher Monocots	Poaceae	<i>Axonopus</i>	20	med high	35	4	12
Higher Monocots	Poaceae	<i>Bambusa</i>	46	high	120	1	17
Higher Monocots	Poaceae	<i>Bouteloua</i>	20	med high	24	8	13
Higher Monocots	Poaceae	<i>Brachiaria</i>	12	low	100	20	33
Higher Monocots	Poaceae	<i>Brachypodium</i>	14	low	17	3	12
Higher Monocots	Poaceae	<i>Briza</i>	10	low	21	15	21
Higher Monocots	Poaceae	<i>Bromopsis</i>	14	low		7	12
Higher Monocots	Poaceae	<i>Bromus</i>	14	low	100	34	65
Higher Monocots	Poaceae	<i>Calamagrostis</i>	26	high	230	10	42
Higher Monocots	Poaceae	<i>Catapodium</i>	14	low	5	1	5
Higher Monocots	Poaceae	<i>Chionochloa</i>	42	high	21	0	11
Higher Monocots	Poaceae	<i>Chloris</i>	20	med high	40	7	11
Higher Monocots	Poaceae	<i>Chrysopogon</i>	20	med high	26	0	11
Higher Monocots	Poaceae	<i>Coelorhachis</i>	18	medium low	21	1	4
Higher Monocots	Poaceae	<i>Coix</i>	10	low	5	1	4
Higher Monocots	Poaceae	<i>Colpodium</i>	4	low	19	4	5
Higher Monocots	Poaceae	<i>Corynephorus</i>	14	low	5	0	4
Higher Monocots	Poaceae	<i>Critesion</i>	14	low		5	11
Higher Monocots	Poaceae	<i>Crypsis</i>	16	medium low	8	2	4
Higher Monocots	Poaceae	<i>Cynosurus</i>	14	low	5	0	4
Higher Monocots	Poaceae	<i>Dactylis</i>	14	low	5	2	5
Higher Monocots	Poaceae	<i>Dactyloctenium</i>	18	medium low	10	0	4
Higher Monocots	Poaceae	<i>Deschampsia</i>	14	low	40	21	24
Higher Monocots	Poaceae	<i>Dichanthium</i>	20	med high	20	4	6
Higher Monocots	Poaceae	<i>Digitaria</i>	18	medium low	220	25	44
Higher Monocots	Poaceae	<i>Echinochloa</i>	18	medium low	35	18	22
Higher Monocots	Poaceae	<i>Ehrharta</i>	24	med high	35	1	15
Higher Monocots	Poaceae	<i>Eleusine</i>	16	medium low	12	3	12
Higher Monocots	Poaceae	<i>Elymus</i>	14	low	150	136	145

Higher Monocots	Poaceae	<i>Elytrigia</i>	14	low	15	13	15
Higher Monocots	Poaceae	<i>Eragrostis</i>	16	medium low	300	29	48
Higher Monocots	Poaceae	<i>Eremopyrum</i>	14	low	4	1	4
Higher Monocots	Poaceae	<i>Erianthus</i>	18	medium low		2	4
Higher Monocots	Poaceae	<i>Eriochloa</i>	18	medium low	30	11	14
Higher Monocots	Poaceae	<i>Festuca</i>	14	low	450	120	194
Higher Monocots	Poaceae	<i>Garnotia</i>	20	med high	29	1	4
Higher Monocots	Poaceae	<i>Glyceria</i>	20	med high	40	4	18
Higher Monocots	Poaceae	<i>Helictotrichon</i>	14	low	100	21	41
Higher Monocots	Poaceae	<i>Hilaria</i>	36	high	10	2	4
Higher Monocots	Poaceae	<i>Holcus</i>	8	low	8	5	6
Higher Monocots	Poaceae	<i>Hyparrhenia</i>	20	med high	55	7	11
Higher Monocots	Poaceae	<i>Hystrix</i>	28	high	9	0	4
Higher Monocots	Poaceae	<i>Ichnanthus</i>	20	med high	39	1	6
Higher Monocots	Poaceae	<i>Indocalamus</i>	48	high	10	0	5
Higher Monocots	Poaceae	<i>Indosasa</i>	48	high	12	0	5
Higher Monocots	Poaceae	<i>Isachne</i>	20	med high	50	5	8
Higher Monocots	Poaceae	<i>Ischaemum</i>	18	medium low	65	3	10
Higher Monocots	Poaceae	<i>Kengyilia</i>	42	high		0	11
Higher Monocots	Poaceae	<i>Koeleria</i>	14	low	35	11	31
Higher Monocots	Poaceae	<i>Lasiacis</i>	36	high	20	0	13
Higher Monocots	Poaceae	<i>Leersia</i>	24	med high	17	5	7
Higher Monocots	Poaceae	<i>Leptochloa</i>	20	med high	27	3	5
Higher Monocots	Poaceae	<i>Lolium</i>	14	low	8	0	8
Higher Monocots	Poaceae	<i>Lophochloa</i>	12	low		1	5
Higher Monocots	Poaceae	<i>Melica</i>	18	medium low	80	1	23
Higher Monocots	Poaceae	<i>Melinis</i>	36	high	22	0	4
Higher Monocots	Poaceae	<i>Milium</i>	8	low	5	2	5
Higher Monocots	Poaceae	<i>Molinia</i>	18	medium low	9	7	9
Higher Monocots	Poaceae	<i>Muhlenbergia</i>	16	medium low	160	19	47

Higher Monocots	Poaceae	<i>Oryza</i>	12	low	18	4	13
Higher Monocots	Poaceae	<i>Oryzopsis</i>	24	med high	20	2	6
Higher Monocots	Poaceae	<i>Panicum</i>	14	low	500	54	105
Higher Monocots	Poaceae	<i>Parapholis</i>	14	low	6	1	4
Higher Monocots	Poaceae	<i>Paspalidium</i>	18	medium low		4	5
Higher Monocots	Poaceae	<i>Pentaschistis</i>	14	low	65	11	26
Higher Monocots	Poaceae	<i>Phalaris</i>	12	low	20	3	12
Higher Monocots	Poaceae	<i>Phleum</i>	14	low	17	3	17
Higher Monocots	Poaceae	<i>Piptatherum</i>	24	med high		0	6
Higher Monocots	Poaceae	<i>Pleioblastus</i>	48	high		0	10
Higher Monocots	Poaceae	<i>Poa</i>	14	low	200	73	108
Higher Monocots	Poaceae	<i>Polypogon</i>	14	low	10	3	5
Higher Monocots	Poaceae	<i>Psathyrostachys</i>	14	low	10	2	10
Higher Monocots	Poaceae	<i>Pseudanthistiria</i>	20	med high	4	0	4
Higher Monocots	Poaceae	<i>Pseudoroegneria</i>	14	low		6	10
Higher Monocots	Poaceae	<i>Pseudosasa</i>	48	high	5	0	5
Higher Monocots	Poaceae	<i>Puccinellia</i>	14	low	25	14	23
Higher Monocots	Poaceae	<i>Roegneria</i>	14	low		48	50
Higher Monocots	Poaceae	<i>Saccharum</i>	20	med high	37	7	11
Higher Monocots	Poaceae	<i>Sasa</i>	48	high	60	0	10
Higher Monocots	Poaceae	<i>Schizachyrium</i>	20	med high	60	3	7
Higher Monocots	Poaceae	<i>Sesleria</i>	14	low	27	12	13
Higher Monocots	Poaceae	<i>Sinobambusa</i>	48	high	17	0	9
Higher Monocots	Poaceae	<i>Sorghastrum</i>	20	med high	17	2	9
Higher Monocots	Poaceae	<i>Sorghum</i>	10	low	24	8	24
Higher Monocots	Poaceae	<i>Spartina</i>	40	high	17	1	9
Higher Monocots	Poaceae	<i>Sporobolus</i>	12	low	160	23	25
Higher Monocots	Poaceae	<i>Stipa</i>	20	med high	300	33	39
Higher Monocots	Poaceae	<i>Themeda</i>	18	medium low	18	4	12
Higher Monocots	Poaceae	<i>Thinopyrum</i>	14	low	20	8	10

Higher Monocots	Poaceae	<i>Tragus</i>	20	med high	6	0	4
Higher Monocots	Poaceae	<i>Tribolium</i>	12	low	11	4	9
Higher Monocots	Poaceae	<i>Trisetaria</i>	12	low	15	0	5
Higher Monocots	Poaceae	<i>Trisetum</i>	12	low	70	11	20
Higher Monocots	Poaceae	<i>Triticum</i>	14	low	31	13	31
Higher Monocots	Poaceae	<i>Urochloa</i>	26	high	110	0	6
Higher Monocots	Poaceae	<i>Vulpia</i>	14	low	22	4	14
Higher Monocots	Poaceae	<i>Zea</i>	20	med high	4	1	4
Higher Monocots	Pontederiaceae	<i>Monochoria</i>	24	med high	6	1	5
Higher Monocots	Proteaceae	<i>Leucospermum</i>	24	med high	46	0	16
Higher Monocots	Proteaceae	<i>Protea</i>	24	med high	100	0	10
Higher Monocots	Sparganiaceae	<i>Sparganium</i>	30	high	14	0	8
Higher Monocots	Typhaceae	<i>Typha</i>	30	high	11	1	5
Higher Monocots	Zingiberaceae	<i>Boesenbergia</i>	20	med high	30	3	8
Higher Monocots	Zingiberaceae	<i>Costus</i>	18	medium low	42	0	12
Higher Monocots	Zingiberaceae	<i>Curcuma</i>	42	high	40	1	6
Higher Monocots	Zingiberaceae	<i>Globba</i>	24	med high	35	4	8
Higher Monocots	Zingiberaceae	<i>Kaempferia</i>	22	med high	50	2	5
Higher Monocots	Zingiberaceae	<i>Roscoea</i>	24	med high	17	0	5
Higher Monocots	Zingiberaceae	<i>Scaphochlamys</i>	26	high	30	0	4
Higher Monocots	Zingiberaceae	<i>Zingiber</i>	22	med high	60	0	14
Pteridophytes	Aspleniaceae	<i>Asplenium</i>	72	medium low	720	153	226
Pteridophytes	Aspleniaceae	<i>Hymenasplenium</i>	76	med high		1	9
Pteridophytes	Aspleniaceae	<i>Phyllitis</i>	72	medium low		2	5
Pteridophytes	Azollaceae	<i>Azolla</i>	40	low	7	0	7
Pteridophytes	Blechnaceae	<i>Blechnum</i>	56	low	175	13	47
Pteridophytes	Blechnaceae	<i>Doodia</i>	64	medium low	12	3	6
Pteridophytes	Blechnaceae	<i>Woodwardia</i>	68	medium low	13	0	10
Pteridophytes	Cyatheaceae	<i>Alsophila</i>	138	high		0	17
Pteridophytes	Cyatheaceae	<i>Cyathea</i>	138	high	620	2	37

Pteridophytes	Cyatheaceae	<i>Nephelea</i>	138	high		0	5
Pteridophytes	Cyatheaceae	<i>Sphaeropteris</i>	138	high		0	8
Pteridophytes	Davalliaceae	<i>Araiostegia</i>	80	med high		0	5
Pteridophytes	Davalliaceae	<i>Davallia</i>	80	med high	34	0	10
Pteridophytes	Dennstaedtiaceae	<i>Dennstaedtia</i>	58	low	45	9	24
Pteridophytes	Dennstaedtiaceae	<i>Hypolepis</i>	52	low	40	15	18
Pteridophytes	Dennstaedtiaceae	<i>Microlepia</i>	84	high	45	9	15
Pteridophytes	Dennstaedtiaceae	<i>Sphenomeris</i>	76	med high	22	2	5
Pteridophytes	Dicksoniaceae	<i>Dicksonia</i>	130	high	23	0	8
Pteridophytes	Dryopteridaceae	<i>Arachniodes</i>	82	high	60	9	34
Pteridophytes	Dryopteridaceae	<i>Athyrium</i>	78	med high	180	28	89
Pteridophytes	Dryopteridaceae	<i>Cornopteris</i>	80	med high	9	0	6
Pteridophytes	Dryopteridaceae	<i>Ctenitis</i>	82	high	150	9	44
Pteridophytes	Dryopteridaceae	<i>Cyrtomium</i>	82	high		6	12
Pteridophytes	Dryopteridaceae	<i>Cystopteris</i>	84	high	18	12	18
Pteridophytes	Dryopteridaceae	<i>Diplazium</i>	80	med high	400	41	88
Pteridophytes	Dryopteridaceae	<i>Dryoathyrium</i>	80	med high	34	1	5
Pteridophytes	Dryopteridaceae	<i>Dryopteris</i>	82	high	225	84	199
Pteridophytes	Dryopteridaceae	<i>Gymnocarpium</i>	80	med high	7	2	6
Pteridophytes	Dryopteridaceae	<i>Lastreopsis</i>	82	high	40	2	22
Pteridophytes	Dryopteridaceae	<i>Lunathyrium</i>	80	med high		2	9
Pteridophytes	Dryopteridaceae	<i>Phanerophlebia</i>	82	high		3	9
Pteridophytes	Dryopteridaceae	<i>Pleocnemia</i>	82	high	19	0	6
Pteridophytes	Dryopteridaceae	<i>Polystichum</i>	78	med high	200	48	116
Pteridophytes	Dryopteridaceae	<i>Rumohra</i>	82	high	7	2	7
Pteridophytes	Dryopteridaceae	<i>Tectaria</i>	78	med high	150	13	55
Pteridophytes	Dryopteridaceae	<i>Woodsia</i>	76	med high	25	10	20
Pteridophytes	Equisetaceae	<i>Equisetum</i>	216	high	17	1	17
Pteridophytes	Gleicheniaceae	<i>Dicranopteris</i>	78	med high	12	1	6
Pteridophytes	Gleicheniaceae	<i>Gleichenia</i>	40	low	23	6	23

Pteridophytes	Gleicheniaceae	<i>Sticherus</i>	68	medium low	80	2	10
Pteridophytes	Grammitidaceae	<i>Ctenopteris</i>	74	med high		3	13
Pteridophytes	Grammitidaceae	<i>Grammitis</i>	72	medium low	400	3	18
Pteridophytes	Grammitidaceae	<i>Xiphopteris</i>	64	medium low		1	6
Pteridophytes	Hymenophyllaceae	<i>Cephalomanes</i>	64	medium low	60	1	5
Pteridophytes	Hymenophyllaceae	<i>Crepidomanes</i>	72	medium low	120	0	14
Pteridophytes	Hymenophyllaceae	<i>Gonocormus</i>	36	low		5	6
Pteridophytes	Hymenophyllaceae	<i>Macroglena</i>	66	medium low		1	6
Pteridophytes	Hymenophyllaceae	<i>Meringium</i>	42	low		0	10
Pteridophytes	Hymenophyllaceae	<i>Microgonium</i>	68	medium low		5	9
Pteridophytes	Hymenophyllaceae	<i>Sphaerocionium</i>	72	medium low	80	1	11
Pteridophytes	Hymenophyllaceae	<i>Trichomanes</i>	56	low	80	14	28
Pteridophytes	Isoetaceae	<i>Isoetes</i>	20	low	150	40	72
Pteridophytes	Lomariopsidaceae	<i>Bolbitis</i>	82	high	44	3	21
Pteridophytes	Lomariopsidaceae	<i>Egenolfia</i>	82	high		0	4
Pteridophytes	Lomariopsidaceae	<i>Elaphoglossum</i>	82	high	400	14	44
Pteridophytes	Lomariopsidaceae	<i>Lomariopsis</i>	32	low	45	1	7
Pteridophytes	Lycopodiaceae	<i>Diphasiastrum</i>	46	low		1	8
Pteridophytes	Lycopodiaceae	<i>Huperzia</i>	134	high	300	7	9
Pteridophytes	Lycopodiaceae	<i>Lycopodiella</i>	68	medium low	40	5	7
Pteridophytes	Lycopodiaceae	<i>Lycopodium</i>	44	low	40	19	38
Pteridophytes	Lycopodiaceae	<i>Phlegmariurus</i>	272	high		0	8
Pteridophytes	Marattiaceae	<i>Angiopteris</i>	80	med high	22	0	22
Pteridophytes	Marattiaceae	<i>Marattia</i>	78	med high	60	1	5
Pteridophytes	Marsileaceae	<i>Marsilea</i>	40	low	60	4	15
Pteridophytes	Marsileaceae	<i>Pilularia</i>	18	low	6	0	5
Pteridophytes	Nephrolepidaceae	<i>Nephrolepis</i>	82	high	30	0	20
Pteridophytes	Oleandraceae	<i>Arthropteris</i>	82	high	14	0	5
Pteridophytes	Oleandraceae	<i>Oleandra</i>	80	med high	40	1	5
Pteridophytes	Ophioglossaceae	<i>Botrychium</i>	90	high	50	4	11

Pteridophytes	Ophioglossaceae	<i>Botrypus</i>	90	high		2	4
Pteridophytes	Ophioglossaceae	<i>Ophioglossum</i>	200	high	27	9	21
Pteridophytes	Ophioglossaceae	<i>Sceptridium</i>	90	high		7	20
Pteridophytes	Osmundaceae	<i>Osmunda</i>	44	low	14	0	14
Pteridophytes	Plagiogyriaceae	<i>Plagiogyria</i>	130	high	30	2	7
Pteridophytes	Polypodiaceae	<i>Arthromeris</i>	72	medium low	9	0	5
Pteridophytes	Polypodiaceae	<i>Campyloneurum</i>	74	med high	20	1	8
Pteridophytes	Polypodiaceae	<i>Colysis</i>	72	medium low	30	1	8
Pteridophytes	Polypodiaceae	<i>Crypsinus</i>	66	medium low	50	1	11
Pteridophytes	Polypodiaceae	<i>Drynaria</i>	72	medium low	15	0	6
Pteridophytes	Polypodiaceae	<i>Goniophlebium</i>	70	medium low	8	1	5
Pteridophytes	Polypodiaceae	<i>Lepisorus</i>	50	low	40	6	27
Pteridophytes	Polypodiaceae	<i>Loxogramme</i>	70	medium low	33	2	10
Pteridophytes	Polypodiaceae	<i>Marginaria</i>	74	med high		1	11
Pteridophytes	Polypodiaceae	<i>Microgramma</i>	72	medium low	15	1	4
Pteridophytes	Polypodiaceae	<i>Microsorium</i>	72	medium low	60	1	20
Pteridophytes	Polypodiaceae	<i>Phymatodes</i>	72	medium low		1	4
Pteridophytes	Polypodiaceae	<i>Phymatopteris</i>	72	medium low		1	14
Pteridophytes	Polypodiaceae	<i>Phymatosorus</i>	72	medium low	13	0	13
Pteridophytes	Polypodiaceae	<i>Platycterium</i>	74	med high	17	0	5
Pteridophytes	Polypodiaceae	<i>Polypodium</i>	70	medium low	150	12	77
Pteridophytes	Polypodiaceae	<i>Pyrrosia</i>	70	medium low	100	4	25
Pteridophytes	Psilotaceae	<i>Psilotum</i>	104	high	4	1	4
Pteridophytes	Psilotaceae	<i>Tmesipteris</i>	200	high	14	5	14
Pteridophytes	Pteridaceae	<i>Acrostichum</i>	60	low	4	2	4
Pteridophytes	Pteridaceae	<i>Adiantum</i>	60	low	150	33	71
Pteridophytes	Pteridaceae	<i>Aleuritopteris</i>	58	low		1	10
Pteridophytes	Pteridaceae	<i>Anogramma</i>	52	low	7	3	7
Pteridophytes	Pteridaceae	<i>Argyrochosma</i>	54	low		1	7
Pteridophytes	Pteridaceae	<i>Aspidotis</i>	60	low		1	5



Pteridophytes	Pteridaceae	<i>Bommeria</i>	60	low	6	0	5
Pteridophytes	Pteridaceae	<i>Ceratopteris</i>	78	med high	4	1	4
Pteridophytes	Pteridaceae	<i>Coniogramme</i>	60	low	20	7	15
Pteridophytes	Pteridaceae	<i>Cryptogramma</i>	56	low	6	1	6
Pteridophytes	Pteridaceae	<i>Doryopteris</i>	58	low	25	2	5
Pteridophytes	Pteridaceae	<i>Eriosorus</i>	174	high	25	2	7
Pteridophytes	Pteridaceae	<i>Hemionitis</i>	60	low	7	2	6
Pteridophytes	Pteridaceae	<i>Onychium</i>	58	low	11	4	10
Pteridophytes	Pteridaceae	<i>Pellaea</i>	58	low	35	4	22
Pteridophytes	Pteridaceae	<i>Pityrogramma</i>	60	low	16	4	8
Pteridophytes	Pteridaceae	<i>Pteris</i>	58	low	250	33	92
Pteridophytes	Salviniaceae	<i>Salvinia</i>	18	low	10	5	6
Pteridophytes	Schizaeaceae	<i>Anemia</i>	76	med high	100	12	17
Pteridophytes	Schizaeaceae	<i>Lygodium</i>	58	low	40	4	15
Pteridophytes	Schizaeaceae	<i>Mohria</i>	76	med high	7	3	6
Pteridophytes	Schizaeaceae	<i>Schizaea</i>	144	high	30	2	10
Pteridophytes	Selaginellaceae	<i>Selaginella</i>	14	low	700	9	99
Pteridophytes	Thelypteridaceae	<i>Abacopteris</i>	72	medium low		2	8
Pteridophytes	Thelypteridaceae	<i>Amauropelta</i>	58	low		4	22
Pteridophytes	Thelypteridaceae	<i>Christella</i>	72	medium low		9	26
Pteridophytes	Thelypteridaceae	<i>Cyclosorus</i>	72	medium low	600	3	22
Pteridophytes	Thelypteridaceae	<i>Goniopteris</i>	72	medium low		8	21
Pteridophytes	Thelypteridaceae	<i>Leptogramma</i>	72	medium low		2	8
Pteridophytes	Thelypteridaceae	<i>Macrothelypteris</i>	62	medium low	14	8	14
Pteridophytes	Thelypteridaceae	<i>Parathelypteris</i>	54	low		2	6
Pteridophytes	Thelypteridaceae	<i>Phegopteris</i>	60	low	6	0	6
Pteridophytes	Thelypteridaceae	<i>Pneumatopteris</i>	72	medium low		2	6
Pteridophytes	Thelypteridaceae	<i>Pronephrium</i>	72	medium low		4	13
Pteridophytes	Thelypteridaceae	<i>Pseudocyclosorus</i>	70	medium low		0	6
Pteridophytes	Thelypteridaceae	<i>Pseudophegopteris</i>	62	medium low	20	2	7

Pteridophytes	Thelypteridaceae	<i>Sphaerostephanos</i>	72	medium low		1	8
Pteridophytes	Thelypteridaceae	<i>Thelypteris</i>	54	low	280	18	73
Pteridophytes	Thelypteridaceae	<i>Wagneriopteris</i>	62	medium low		3	6
Pteridophytes	Vittariaceae	<i>Anthrophyum</i>	120	high		1	5
Pteridophytes	Vittariaceae	<i>Didymoglossum</i>	68	medium low		2	7
Pteridophytes	Vittariaceae	<i>Polytaenium</i>	120	high		1	4
Pteridophytes	Vittariaceae	<i>Vittaria</i>	120	high	65	5	12
Rosids	Aceraceae	<i>Acer</i>	26	high	111	2	34
Rosids	Anacardiaceae	<i>Rhus</i>	28	high	200	0	19
Rosids	Begoniaceae	<i>Begonia</i>	20	med high	900	12	26
Rosids	Betulaceae	<i>Alnus</i>	28	high	25	4	14
Rosids	Betulaceae	<i>Betula</i>	28	high	35	13	25
Rosids	Betulaceae	<i>Carpinus</i>	16	medium low	26	4	6
Rosids	Betulaceae	<i>Corylus</i>	22	med high	15	0	4
Rosids	Bombacaceae	<i>Adansonia</i>	88	high	8	1	8
Rosids	Bombacaceae	<i>Ceiba</i>	86	high	11	0	6
Rosids	Brassicaceae	<i>Aethionema</i>	14	low	70	4	6
Rosids	Brassicaceae	<i>Alyssum</i>	14	low	190	19	64
Rosids	Brassicaceae	<i>Arabidopsis</i>	10	low	17	3	15
Rosids	Brassicaceae	<i>Barbarea</i>	16	medium low	20	0	7
Rosids	Brassicaceae	<i>Brassica</i>	14	low	37	4	37
Rosids	Brassicaceae	<i>Camelina</i>	12	low	6	0	4
Rosids	Brassicaceae	<i>Cardamine</i>	12	low	200	25	50
Rosids	Brassicaceae	<i>Cardaminopsis</i>	16	medium low		0	5
Rosids	Brassicaceae	<i>Clypeola</i>	14	low	9	1	5
Rosids	Brassicaceae	<i>Cochlearia</i>	12	low	25	9	18
Rosids	Brassicaceae	<i>Coincya</i>	24	med high	6	1	5
Rosids	Brassicaceae	<i>Conringia</i>	14	low	6	0	4
Rosids	Brassicaceae	<i>Coronopus</i>	32	high	10	0	4
Rosids	Brassicaceae	<i>Crambe</i>	30	high	20	3	13

Rosids	Brassicaceae	<i>Descurainia</i>	14	low	40	1	5
Rosids	Brassicaceae	<i>Diplotaxis</i>	14	low	27	6	14
Rosids	Brassicaceae	<i>Draba</i>	16	medium low	300	43	65
Rosids	Brassicaceae	<i>Erucastrum</i>	14	low	20	4	8
Rosids	Brassicaceae	<i>Erysimum</i>	12	low	200	35	77
Rosids	Brassicaceae	<i>Farsetia</i>	24	med high	25	0	6
Rosids	Brassicaceae	<i>Halimolobos</i>	16	medium low	19	1	4
Rosids	Brassicaceae	<i>Hesperis</i>	12	low	25	3	10
Rosids	Brassicaceae	<i>Hilliella</i>	42	high		0	6
Rosids	Brassicaceae	<i>Iberis</i>	14	low	40	0	13
Rosids	Brassicaceae	<i>Isatis</i>	14	low	30	11	22
Rosids	Brassicaceae	<i>Leavenworthia</i>	22	med high	8	0	4
Rosids	Brassicaceae	<i>Lepidium</i>	14	low	140	20	36
Rosids	Brassicaceae	<i>Lesquerella</i>	10	low	40	2	9
Rosids	Brassicaceae	<i>Lobularia</i>	22	med high	9	1	9
Rosids	Brassicaceae	<i>Malcolmia</i>	14	low	30	1	7
Rosids	Brassicaceae	<i>Matthiola</i>	10	low	55	0	25
Rosids	Brassicaceae	<i>Moricandia</i>	22	med high	7	0	6
Rosids	Brassicaceae	<i>Nerisyrenia</i>	16	medium low	11	1	9
Rosids	Brassicaceae	<i>Rorippa</i>	16	medium low	80	12	18
Rosids	Brassicaceae	<i>Sinapidendron</i>	20	med high	5	0	4
Rosids	Brassicaceae	<i>Sisymbrium</i>	14	low	90	3	19
Rosids	Brassicaceae	<i>Smelowskia</i>	12	low	6	1	6
Rosids	Brassicaceae	<i>Streptanthus</i>	28	high	35	0	5
Rosids	Brassicaceae	<i>Thlaspi</i>	14	low	60	3	20
Rosids	Brassicaceae	<i>Vella</i>	34	high	4	2	4
Rosids	Brassicaceae	<i>Yinshania</i>	12	low	8	0	4
Rosids	Cannabaceae	<i>Humulus</i>	14	low	4	0	4
Rosids	Casuarinaceae	<i>Casuarina</i>	18	medium low	17	0	5
Rosids	Celastraceae	<i>Euonymus</i>	32	high	177	3	7

Rosids	Celastraceae	<i>Maytenus</i>	20	med high	200	3	6
Rosids	Cistaceae	<i>Cistus</i>	18	medium low	18	0	14
Rosids	Cistaceae	<i>Halimium</i>	18	medium low	9	0	4
Rosids	Cistaceae	<i>Helianthemum</i>	10	low	110	41	42
Rosids	Clusiaceae	<i>Clusia</i>	56	high	145	0	5
Rosids	Clusiaceae	<i>Garcinia</i>	48	high	200	1	6
Rosids	Combretaceae	<i>Terminalia</i>	24	med high	150	2	8
Rosids	Coriariaceae	<i>Coriaria</i>	40	high	13	3	13
Rosids	Corynocarpaceae	<i>Corynocarpus</i>	44	high	6	0	4
Rosids	Cucurbitaceae	<i>Bryonia</i>	20	med high	12	2	6
Rosids	Cucurbitaceae	<i>Cucumis</i>	14	low	32	23	25
Rosids	Cucurbitaceae	<i>Cucurbita</i>	40	high	13	0	5
Rosids	Cucurbitaceae	<i>Gynostemma</i>	22	med high	8	2	8
Rosids	Cucurbitaceae	<i>Luffa</i>	26	high	7	0	4
Rosids	Cucurbitaceae	<i>Sechium</i>	24	med high	6	0	5
Rosids	Cucurbitaceae	<i>Thladiantha</i>	18	medium low	23	0	7
Rosids	Dichapetalaceae	<i>Dichapetalum</i>	24	med high	124	1	7
Rosids	Dipterocarpaceae	<i>Shorea</i>	14	low	357	0	15
Rosids	Elaeagnaceae	<i>Elaeagnus</i>	28	high	40	0	6
Rosids	Erythroxylaceae	<i>Erythroxylum</i>	24	med high	230	0	5
Rosids	Euphorbiaceae	<i>Acalypha</i>	20	med high	430	5	9
Rosids	Euphorbiaceae	<i>Breynia</i>	52	high	25	0	5
Rosids	Euphorbiaceae	<i>Bridelia</i>	26	high	60	0	4
Rosids	Euphorbiaceae	<i>Chamaesyce</i>	12	low		3	6
Rosids	Euphorbiaceae	<i>Chrozophora</i>	22	med high	9	2	5
Rosids	Euphorbiaceae	<i>Croton</i>	20	med high	750	1	12
Rosids	Euphorbiaceae	<i>Dalechampia</i>	36	high	115	2	8
Rosids	Euphorbiaceae	<i>Euphorbia</i>	10	low	2000	135	186
Rosids	Euphorbiaceae	<i>Glochidion</i>	52	high	300	0	4
Rosids	Euphorbiaceae	<i>Jatropha</i>	20	med high	175	2	36

Rosids	Euphorbiaceae	<i>Mallotus</i>	22	med high	140	2	7
Rosids	Euphorbiaceae	<i>Manihot</i>	36	high	98	0	6
Rosids	Euphorbiaceae	<i>Mercurialis</i>	16	medium low	8	4	8
Rosids	Euphorbiaceae	<i>Phyllanthus</i>	12	low	600	30	34
Rosids	Fabaceae	<i>Adesmia</i>	20	med high	230	1	13
Rosids	Fabaceae	<i>Aeschynomene</i>	20	med high	150	2	9
Rosids	Fabaceae	<i>Albizia</i>	26	high	118	1	18
Rosids	Fabaceae	<i>Alhagi</i>	16	medium low	6	0	6
Rosids	Fabaceae	<i>Alysicarpus</i>	14	low	25	0	14
Rosids	Fabaceae	<i>Anthyllis</i>	12	low	23	0	23
Rosids	Fabaceae	<i>Arachis</i>	10	low	50	47	50
Rosids	Fabaceae	<i>Argyrolobium</i>	26	high	70	1	6
Rosids	Fabaceae	<i>Astragalus</i>	12	low	1750	177	453
Rosids	Fabaceae	<i>Atylosia</i>	22	med high		0	11
Rosids	Fabaceae	<i>Bauhinia</i>	24	med high	300	0	17
Rosids	Fabaceae	<i>Butea</i>	18	medium low	4	0	4
Rosids	Fabaceae	<i>Caesalpinia</i>	22	med high	150	1	14
Rosids	Fabaceae	<i>Calliandra</i>	16	medium low	200	1	11
Rosids	Fabaceae	<i>Campylotropis</i>	22	med high	65	0	11
Rosids	Fabaceae	<i>Canavalia</i>	22	med high	51	0	7
Rosids	Fabaceae	<i>Caragana</i>	16	medium low	80	5	23
Rosids	Fabaceae	<i>Carmichaelia</i>	32	high	40	3	15
Rosids	Fabaceae	<i>Cassia</i>	14	low	61	40	61
Rosids	Fabaceae	<i>Centrosema</i>	14	low	35	0	13
Rosids	Fabaceae	<i>Chamaecrista</i>	16	medium low	265	0	4
Rosids	Fabaceae	<i>Chamaecytisus</i>	46	high	30	1	5
Rosids	Fabaceae	<i>Cicer</i>	16	medium low	40	0	12
Rosids	Fabaceae	<i>Colutea</i>	16	medium low	28	0	4
Rosids	Fabaceae	<i>Coronilla</i>	12	low	19	5	19
Rosids	Fabaceae	<i>Coursetia</i>	16	medium low	38	1	17

Rosids	Fabaceae	<i>Crotalaria</i>	8	low	600	99	110
Rosids	Fabaceae	<i>Cytisus</i>	46	high	33	0	10
Rosids	Fabaceae	<i>Dalbergia</i>	20	med high	100	0	10
Rosids	Fabaceae	<i>Dalea</i>	14	low	160	1	19
Rosids	Fabaceae	<i>Derris</i>	22	med high	40	0	4
Rosids	Fabaceae	<i>Desmodium</i>	20	med high	450	1	69
Rosids	Fabaceae	<i>Dichilus</i>	28	high	5	0	5
Rosids	Fabaceae	<i>Dolichos</i>	20	med high	60	0	4
Rosids	Fabaceae	<i>Dorycnium</i>	12	low		0	7
Rosids	Fabaceae	<i>Ebenus</i>	14	low	18	0	12
Rosids	Fabaceae	<i>Eriosema</i>	20	med high	130	0	4
Rosids	Fabaceae	<i>Flemingia</i>	22	med high	30	0	6
Rosids	Fabaceae	<i>Galactia</i>	20	med high	140	0	7
Rosids	Fabaceae	<i>Genista</i>	12	low	87	47	49
Rosids	Fabaceae	<i>Gleditsia</i>	28	high	14	0	4
Rosids	Fabaceae	<i>Glycyrrhiza</i>	16	medium low	19	0	19
Rosids	Fabaceae	<i>Hedysarum</i>	14	low	100	2	37
Rosids	Fabaceae	<i>Hippocrepis</i>	14	low	30	0	10
Rosids	Fabaceae	<i>Indigofera</i>	12	low	700	6	58
Rosids	Fabaceae	<i>Inga</i>	26	high	350	2	17
Rosids	Fabaceae	<i>Lens</i>	14	low	7	0	7
Rosids	Fabaceae	<i>Lespedeza</i>	18	medium low	40	3	16
Rosids	Fabaceae	<i>Leucaena</i>	52	high	22	3	20
Rosids	Fabaceae	<i>Lonchocarpus</i>	22	med high	130	0	51
Rosids	Fabaceae	<i>Lotononis</i>	18	medium low	120	4	38
Rosids	Fabaceae	<i>Lotus</i>	12	low	100	12	68
Rosids	Fabaceae	<i>Macroptilium</i>	22	med high	8	0	7
Rosids	Fabaceae	<i>Medicago</i>	14	low	85	9	53
Rosids	Fabaceae	<i>Melilotus</i>	16	medium low	20	0	15
Rosids	Fabaceae	<i>Melolobium</i>	18	medium low	20	1	5

Rosids	Fabaceae	<i>Millettia</i>	16	medium low	90	2	24
Rosids	Fabaceae	<i>Mimosa</i>	26	high	480	5	32
Rosids	Fabaceae	<i>Onobrychis</i>	14	low	130	14	37
Rosids	Fabaceae	<i>Ormosia</i>	16	medium low	100	0	6
Rosids	Fabaceae	<i>Ornithopus</i>	14	low	6	0	4
Rosids	Fabaceae	<i>Orobus</i>	14	low		0	5
Rosids	Fabaceae	<i>Oxytropis</i>	16	medium low	300	32	89
Rosids	Fabaceae	<i>Phaseolus</i>	14	low	36	0	14
Rosids	Fabaceae	<i>Pisum</i>	14	low	5	0	5
Rosids	Fabaceae	<i>Pithecellobium</i>	26	high	37	0	4
Rosids	Fabaceae	<i>Prosopis</i>	28	high	44	1	16
Rosids	Fabaceae	<i>Psophocarpus</i>	18	medium low	10	0	6
Rosids	Fabaceae	<i>Psoralea</i>	20	med high	20	0	5
Rosids	Fabaceae	<i>Pterocarpus</i>	22	med high	21	3	5
Rosids	Fabaceae	<i>Pueraria</i>	22	med high	17	1	6
Rosids	Fabaceae	<i>Rhynchosia</i>	22	med high	300	0	14
Rosids	Fabaceae	<i>Senna</i>	26	high	350	1	7
Rosids	Fabaceae	<i>Sesbania</i>	12	low	50	4	26
Rosids	Fabaceae	<i>Sophora</i>	18	medium low	45	3	16
Rosids	Fabaceae	<i>Stylosanthes</i>	20	med high	25	5	21
Rosids	Fabaceae	<i>Styphnolobium</i>	28	high		0	5
Rosids	Fabaceae	<i>Tephrosia</i>	22	med high	400	1	35
Rosids	Fabaceae	<i>Tetragonolobus</i>	14	low		0	5
Rosids	Fabaceae	<i>Trifolium</i>	10	low	238	12	107
Rosids	Fabaceae	<i>Trigonella</i>	8	low	50	17	20
Rosids	Fabaceae	<i>Ulex</i>	32	high	20	5	13
Rosids	Fabaceae	<i>Uraria</i>	22	med high	20	0	5
Rosids	Fabaceae	<i>Vicia</i>	10	low	150	6	150
Rosids	Fabaceae	<i>Vigna</i>	18	medium low	150	1	34
Rosids	Fabaceae	<i>Wisteria</i>	16	medium low	6	1	4

Rosids	Fabaceae	<i>Zapoteca</i>	26	high	17	0	7
Rosids	Fabaceae	<i>Zornia</i>	20	med high	86	0	8
Rosids	Fagaceae	<i>Castanea</i>	24	med high	10	0	5
Rosids	Flacourtiaceae	<i>Flacourtia</i>	22	med high	15	0	5
Rosids	Hippocastanaceae	<i>Aesculus</i>	40	high	228	0	4
Rosids	Juglandaceae	<i>Juglans</i>	32	high	21	0	13
Rosids	Linaceae	<i>Linum</i>	14	low	180	22	46
Rosids	Loranthaceae	<i>Loranthus</i>	18	medium low	5	0	5
Rosids	Loranthaceae	<i>Macrosolen</i>	24	med high	25	0	4
Rosids	Lythraceae	<i>Cuphea</i>	12	low	260	33	41
Rosids	Lythraceae	<i>Diplusodon</i>	30	high	74	0	4
Rosids	Lythraceae	<i>Lythrum</i>	10	low	36	2	10
Rosids	Malpighiaceae	<i>Banisteriopsis</i>	20	med high	92	1	14
Rosids	Malpighiaceae	<i>Byrsonima</i>	24	med high	130	0	9
Rosids	Malpighiaceae	<i>Camarea</i>	34	high	7	0	4
Rosids	Malpighiaceae	<i>Gaudichaudia</i>	80	high	10	0	9
Rosids	Malpighiaceae	<i>Heteropterys</i>	20	med high	120	0	5
Rosids	Malpighiaceae	<i>Janusia</i>	20	med high	18	9	11
Rosids	Malpighiaceae	<i>Stigmaphyllon</i>	20	med high	100	0	4
Rosids	Malvaceae	<i>Abutilon</i>	14	low	100	19	29
Rosids	Malvaceae	<i>Alcea</i>	42	high	50	0	5
Rosids	Malvaceae	<i>Anoda</i>	26	high	23	1	11
Rosids	Malvaceae	<i>Callirhoe</i>	28	high	9	2	8
Rosids	Malvaceae	<i>Gossypium</i>	26	high	41	3	41
Rosids	Malvaceae	<i>Lavatera</i>	14	low	25	10	11
Rosids	Malvaceae	<i>Pavonia</i>	26	high	150	3	5
Rosids	Malvaceae	<i>Sida</i>	14	low	200	12	27
Rosids	Malvaceae	<i>Sphaeralcea</i>	10	low	60	9	14
Rosids	Melastomataceae	<i>Brachyotum</i>	20	med high	50	0	7
Rosids	Melastomataceae	<i>Centradenia</i>	36	high	6	0	4



Rosids	Melastomataceae	<i>Clidemia</i>	30	high	117	1	28
Rosids	Melastomataceae	<i>Conostegia</i>	34	high	43	0	7
Rosids	Melastomataceae	<i>Heterocentron</i>	36	high	10	0	10
Rosids	Melastomataceae	<i>Leandra</i>	28	high	175	0	12
Rosids	Melastomataceae	<i>Macairea</i>	22	med high	22	0	4
Rosids	Melastomataceae	<i>Medinilla</i>	36	high	400	0	9
Rosids	Melastomataceae	<i>Miconia</i>	32	high	1000	9	72
Rosids	Melastomataceae	<i>Monochaetum</i>	36	high	45	0	21
Rosids	Melastomataceae	<i>Osbeckia</i>	20	med high	50	1	10
Rosids	Melastomataceae	<i>Sonerila</i>	18	medium low	175	1	8
Rosids	Moraceae	<i>Ficus</i>	26	high	750	0	16
Rosids	Moraceae	<i>Morus</i>	28	high	14	1	14
Rosids	Myricaceae	<i>Myrica</i>	16	medium low	55	1	5
Rosids	Myrtaceae	<i>Baeckea</i>	22	med high	75	3	8
Rosids	Myrtaceae	<i>Beaufortia</i>	16	medium low	17	0	6
Rosids	Myrtaceae	<i>Calytrix</i>	22	med high	76	3	13
Rosids	Myrtaceae	<i>Chamelaucium</i>	22	med high	23	0	9
Rosids	Myrtaceae	<i>Darwinia</i>	10	low	45	4	20
Rosids	Myrtaceae	<i>Eucalyptus</i>	22	med high	600	0	19
Rosids	Myrtaceae	<i>Eugenia</i>	22	med high	550	0	4
Rosids	Myrtaceae	<i>Leptospermum</i>	10	low	79	15	17
Rosids	Myrtaceae	<i>Melaleuca</i>	22	med high	220	0	6
Rosids	Myrtaceae	<i>Metrosideros</i>	22	med high	50	0	12
Rosids	Myrtaceae	<i>Micromyrtus</i>	22	med high	22	1	4
Rosids	Myrtaceae	<i>Scholtzia</i>	22	med high	15	1	4
Rosids	Myrtaceae	<i>Syzygium</i>	22	med high	1000	1	7
Rosids	Myrtaceae	<i>Thryptomene</i>	18	medium low	32	2	10
Rosids	Myrtaceae	<i>Verticordia</i>	12	low	97	28	58
Rosids	Onagraceae	<i>Circaea</i>	22	med high	7	0	4
Rosids	Onagraceae	<i>Clarkia</i>	10	low	33	1	7

Rosids	Onagraceae	<i>Fuchsia</i>	22	med high	105	14	32
Rosids	Onagraceae	<i>Gaura</i>	14	low	21	2	18
Rosids	Onagraceae	<i>Ludwigia</i>	16	medium low	82	47	74
Rosids	Onagraceae	<i>Oenothera</i>	14	low	124	2	75
Rosids	Oxalidaceae	<i>Biophytum</i>	14	low	50	1	5
Rosids	Passifloraceae	<i>Passiflora</i>	12	low	430	4	30
Rosids	Polygalaceae	<i>Polygala</i>	16	medium low	500	13	14
Rosids	Resedaceae	<i>Reseda</i>	12	low	60	14	16
Rosids	Resedaceae	<i>Sesamoides</i>	20	med high	6	2	6
Rosids	Rhamnaceae	<i>Rhamnus</i>	24	med high	125	0	14
Rosids	Rhamnaceae	<i>Ziziphus</i>	22	med high	86	3	13
Rosids	Rhizophoraceae	<i>Bruguiera</i>	34	high	6	0	4
Rosids	Rhizophoraceae	<i>Crossostylis</i>	28	high	10	0	8
Rosids	Rhizophoraceae	<i>Rhizophora</i>	36	high	8	0	4
Rosids	Rosaceae	<i>Acaena</i>	42	high	100	2	8
Rosids	Rosaceae	<i>Agrimonia</i>	28	high	15	3	7
Rosids	Rosaceae	<i>Amelanchier</i>	30	high	33	4	12
Rosids	Rosaceae	<i>Amygdalus</i>	16	medium low		2	12
Rosids	Rosaceae	<i>Aphanes</i>	16	medium low	20	1	4
Rosids	Rosaceae	<i>Armeniaca</i>	16	medium low		0	4
Rosids	Rosaceae	<i>Aruncus</i>	14	low		0	5
Rosids	Rosaceae	<i>Cerasus</i>	16	medium low		0	8
Rosids	Rosaceae	<i>Cotoneaster</i>	34	high	261	32	47
Rosids	Rosaceae	<i>Cowania</i>	18	medium low	5	0	5
Rosids	Rosaceae	<i>Dryas</i>	18	medium low	9	0	9
Rosids	Rosaceae	<i>Filipendula</i>	14	low	10	4	8
Rosids	Rosaceae	<i>Fragaria</i>	14	low	17	6	17
Rosids	Rosaceae	<i>Potentilla</i>	10	low	500	87	139
Rosids	Rosaceae	<i>Prunus</i>	16	medium low	200	10	41
Rosids	Rosaceae	<i>Pyrus</i>	34	high	30	0	30

Rosids	Rosaceae	<i>Rosa</i>	14	low	125	36	58
Rosids	Rosaceae	<i>Rubus</i>	14	low	250	137	197
Rosids	Rosaceae	<i>Sanguisorba</i>	28	high	11	3	11
Rosids	Rosaceae	<i>Sorbaria</i>	36	high	4	0	4
Rosids	Rosaceae	<i>Spiraea</i>	16	medium low	90	8	26
Rosids	Rutaceae	<i>Boronia</i>	18	medium low	104	2	6
Rosids	Rutaceae	<i>Citrus</i>	18	medium low	53	0	53
Rosids	Rutaceae	<i>Clausena</i>	18	medium low	23	3	6
Rosids	Rutaceae	<i>Eriostemon</i>	28	high	35	0	5
Rosids	Rutaceae	<i>Fortunella</i>	18	medium low	5	0	5
Rosids	Rutaceae	<i>Haplophyllum</i>	18	medium low	66	1	5
Rosids	Rutaceae	<i>Phebalium</i>	32	high	49	0	5
Rosids	Rutaceae	<i>Ptelea</i>	42	high	11	0	6
Rosids	Rutaceae	<i>Zieria</i>	36	high	44	3	14
Rosids	Salicaceae	<i>Salix</i>	18	medium low	400	91	93
Rosids	Sapindaceae	<i>Cardiospermum</i>	14	low	14	0	4
Rosids	Sapindaceae	<i>Dodonaea</i>	28	high	68	0	16
Rosids	Sapindaceae	<i>Koelreuteria</i>	30	high	4	0	4
Rosids	Sapindaceae	<i>Paullinia</i>	24	med high	194	0	5
Rosids	Sapindaceae	<i>Sapindus</i>	28	high	13	0	4
Rosids	Sapindaceae	<i>Serjania</i>	24	med high	215	0	22
Rosids	Sonneratiaceae	<i>Sonneratia</i>	22	med high	6	0	6
Rosids	Sterculiaceae	<i>Brachychiton</i>	40	high	31	0	16
Rosids	Sterculiaceae	<i>Dombeya</i>	54	high	225	0	8
Rosids	Sterculiaceae	<i>Pterospermum</i>	38	high	25	0	5
Rosids	Thymelaeaceae	<i>Daphne</i>	18	medium low	50	1	13
Rosids	Thymelaeaceae	<i>Thymelaea</i>	18	medium low	30	1	4
Rosids	Tiliaceae	<i>Corchorus</i>	14	low	100	1	8
Rosids	Tiliaceae	<i>Grewia</i>	18	medium low	150	2	12
Rosids	Trapaceae	<i>Trapa</i>	44	high	15	0	4

Rosids	Turneraceae	<i>Piriqueta</i>	14	low	21	2	9
Rosids	Turneraceae	<i>Turnera</i>	10	low	50	12	32
Rosids	Ulmaceae	<i>Celtis</i>	20	med high	100	3	8
Rosids	Ulmaceae	<i>Ulmus</i>	28	high	28	1	23
Rosids	Ulmaceae	<i>Zelkova</i>	28	high	4	0	4
Rosids	Urticaceae	<i>Boehmeria</i>	28	high	80	1	14
Rosids	Urticaceae	<i>Parietaria</i>	12	low	10	1	5
Rosids	Urticaceae	<i>Pilea</i>	24	med high	200	6	16
Rosids	Urticaceae	<i>Pouzolzia</i>	20	med high	70	1	8
Rosids	Urticaceae	<i>Urtica</i>	20	med high	80	2	20
Rosids	Violaceae	<i>Hybanthus</i>	16	medium low	150	1	4
Rosids	Viscaceae	<i>Viscum</i>	20	med high	65	2	24
Rosids	Zygophyllaceae	<i>Fagonia</i>	18	medium low	30	0	7

**Table S2.** Data used to obtain the phylogenetic estimate of the frequency of polyploid speciation in angiosperms. SS = Number of species sampled; SI = Number of species recognized in the ingroup; SD = Number of species with chromosome count data; PS = Number of polyploid species; IRR = Number of ploidy shifts inferred with an irreversible model; PAR = Number of ploidy shifts inferred with parsimony.

Group	Family	Focal Genus	SS	SI	SD	PS	IRR	PAR	Reference
Asterids	Apiaceae	<i>Perideridia</i>	13	14	13	12	4	1	Downie et al., Syst. Bot. 29:737 (2004)
Asterids	Apiaceae	<i>Sium/Berula/Afrocarum</i>	14	14	6	3	1	1	Spalik and Downie, Am. J. Bot. 93:747 (2006)
Asterids	Aquifoliaceae	<i>Ilex</i>	7	7	3	0	0	0	Gottlieb et al., Am. J. Bot. 92: 352 (2005)
Asterids	Asteraceae	<i>Achillea</i>	58	130	55	11	3	3	Guo et al., Taxon 53:657 (2004)
Asterids	Asteraceae	<i>Asteriscus</i>	12	15	3	0	0	0	Goertzen et al., Syst. Bot. 28:815 (2002)
Asterids	Asteraceae	<i>Brachyglottis/Bedfordia/Dolichoglottis/Haastia/Traversia</i>	22	38	3	0	0	0	Wagstaff and Breitwieser, Syst. Bot. 29:1003 (2004)
Asterids	Asteraceae	<i>Chrysothamnus</i>	18	18	12	0	0	0	Roberts and Urbatsch, Syst. Bot. 29:199 (2004)
Asterids	Asteraceae	<i>Coreopsis</i>	25	27	16	1	1	1	Crawford and Mort, Am. J. Bot. 92:330 (2005)
Asterids	Asteraceae	<i>Cynara</i>	8	10	3	0	0	0	Robba et al., Plant Syst. Evol. 253:53 (2005)
Asterids	Asteraceae	<i>Ericameria</i>	33	33	8	0	0	0	Roberts and Urbatsch, Taxon 52:209 (2003)
Asterids	Asteraceae	<i>Hypochaeris</i>	32	45	20	1	1	1	Tremetsberger et al., Syst. Bot. 31:610 (2006)
Asterids	Asteraceae	<i>Lasthenia</i>	16	17	16	2	2	2	Desrochers and Dodge, Syst. Bot. 28:208 (2003)
Asterids	Asteraceae	<i>Leontodon/Helminthotheca/Picris</i>	45	90	36	5	4	4	Samuel et al., Am. J. Bot. 93:1193 (2006)
Asterids	Asteraceae	<i>Lessingia</i>	12	12	5	0	0	0	Markos and Baldwin, Syst. Bot. 26:168 (2001)
Asterids	Asteraceae	<i>Machaeranthera</i>	22	30	14	10	5	4	Morgan, Syst. Bot. 28:179 (2003)
Asterids	Asteraceae	<i>Microseris</i>	16	16	16	6	4	3	Lohwasser et al., Syst. Bot. 29:774 (2004)
Asterids	Asteraceae	<i>Senecio</i>	26	26	20	19	10	2	Pelser et al., Syst. Bot. 29:790 (2004)
Asterids	Asteraceae	<i>Stephanomeria</i>	11	16	9	1	1	1	Ford et al., Am. J. Bot. 93:480 (2006)
Asterids	Asteraceae	<i>Tolpis</i>	10	10	7	0	0	0	Archibald et al., Am. J. Bot. 93:1154 (2006)

Asterids	Campanulaceae	<i>Campanula sect. Isophylla</i>	45	150	35	32	10	5	Park et al., Syst. Bot. 31:862 (2006)
Asterids	Campanulaceae	<i>Downingia</i>	13	13	10	0	0	0	Schultheis, Syst. Bot. 26:603 (2001)
Asterids	Boraginaceae	<i>Tiquilia</i>	13	30	11	3	2	2	Moore et al., Am. J. Bot. 93:1163 (2006)
Asterids	Hydrophyllaceae	<i>Phacelia</i>	55	185	48	4	2	2	Gilbert et al., Syst. Bot. 30:627 (2005)
Asterids	Caprifoliaceae	<i>Viburnum</i>	42	175	31	3	3	3	Donoghue et al., Syst. Bot. 29:188 (2004)
Asterids	Actinidiaceae	<i>Actinidia</i>	31	62	31	7	5	5	Chat et al., Am. J. Bot. 91:736 (2004)
Asterids	Ericaceae	<i>Gaylussacia</i>	41	49	3	1	1	1	Floyd, Syst. Bot. 27:99 (2002)
Asterids	Ericaceae	<i>Vaccinium</i>	16	18	11	3	2	2	Powell and Kron, Syst. Bot. 27:766 (2002)
Asterids	Polemoniaceae	<i>Collomia</i>	10	15	7	2	2	2	Johnson and Johnson, Syst. Bot. 31:349 (2006)
Asterids	Primulaceae	<i>Dodecatheon</i>	14	15	11	2	1	1	Mast et al., Am. J. Bot. 91:926 (2004)
Asterids	Styracaceae	<i>Styrax</i>	26	77	2	0	0	0	Fritsch, Syst. Bot. 28:421 (2003)
Asterids	Symplocaceae	<i>Symplocos</i>	110	300	4	0	0	0	Wang et al., Am. J. Bot. 91:1901 (2004)
Asterids	Geraniaceae	<i>Erodium</i>	66	74	58	8	7	7	Fiz et al., Syst. Bot. 31:739 (2006)
Asterids	Geraniaceae	<i>Geranium sect. Dissectum</i>	4	4	2	0	0	0	Aedo et al., Syst. Bot. 30:533 (2005)
Asterids	Geraniaceae	<i>Pelargonium</i>	143	280	91	21	12	12	Bakker et al., Taxon 53:17 (2004)
Asterids	Rubiaceae	<i>Ernodea</i>	4	4	4	0	0	0	Negron-Ortiz and Watson, Syst. Bot. 28:442 (2003)
Asterids	Rubiaceae	<i>Exostema</i>	14	27	2	0	0	0	McDowell et al., Syst. Bot. 28:431 (2003)
Asterids	Rubiaceae	<i>Houstonia</i>	16	16	16	3	2	2	Church and Taylor, Am. J. Bot. 92:1372 (2005)
Asterids	Bignoniaceae	<i>Bignoniaceae (many genera)</i>	119	360	15	1	1	1	Lohmann, Am. J. Bot. 93:304 (2006)
Asterids	Bignoniaceae	<i>Incarvillea</i>	14	14	5	0	0	0	Chen et al., Am. J. Bot. 92:625 (2005)
Asterids	Gesneriaceae	<i>Achimenes</i>	21	23	16	3	3	3	Roalson et al., Syst. Bot. 28:593 (2003)
Asterids	Gesneriaceae	<i>Columnea</i>	19	75	2	0	0	0	Clark and Zimmer, Syst. Bot. 28:365 (2003)
Asterids	Lamiaceae	<i>Mentha</i>	15	16	14	10	6	6	Bunsawat et al., Syst. Bot. 29:959 (2004)
Asterids	Orobanchaceae	<i>Euphrasia</i>	3	3	3	0	0	0	Wu and Huang, Taxon 53:911 (2004)
Asterids	Orobanchaceae	<i>Orobanche</i>	34	100	33	5	2	2	Weiss-Schneeweiss et al., Am. J. Bot. 93:148 (2006)
Asterids	Plantaginaceae	<i>Penstemon</i>	163	271	92	12	10	10	Wolfe et al., Am. J. Bot. 93:1699 (2006)
Asterids	Scrophulariaceae	<i>Antirrhinum</i>	20	36	20	16	1	1	Oyama and Baum, Am. J. Bot. 91:918 (2004)

Asterids	Scrophulariaceae	<i>Digitalis/Isoplexis</i>	22	23	20	19	4	1	Brauchler et al., Plant Syst. Evol. 248:111 (2004)
Asterids	Scrophulariaceae	<i>Mimulus</i>	94	94	74	37	5	5	Beardsley et al., Am. J. Bot. 91:474 (2004)
Asterids	Scrophulariaceae	<i>Veronica</i>	8	8	8	3	3	3	Martinez-Ortega et al., Syst. Bot. 29:965 (2004)
Asterids	Veronicaceae	<i>Synthyris/Besseyia</i>	19	19	9	1	1	1	Hufford and McMahon, Syst. Bot. 29:716 (2004)
Asterids	Convolvulaceae	<i>Convolvulus</i>	21	21	11	2	1	1	Carine et al., Am. J. Bot. 91:1070 (2004)
Asterids	Convolvulaceae	<i>Ipomoea</i>	34	100	13	0	0	0	Miller et al., Am. J. Bot. 91:1208 (2004)
Asterids	Solanaceae	<i>Iochroma/Acnistus/Dunalia/Eriolarynx/Saracha/Vassobia</i>	36	37	5	0	0	0	Smith and Baum, Am. J. Bot. 93:1140 (2006)
Asterids	Solanaceae	<i>Lycium</i>	21	63	11	0	0	0	Miller, Syst. Bot. 27:416 (2002)
Asterids	Solanaceae	<i>Physalis</i>	35	75	19	1	1	1	Whitson and Manos, Syst. Bot. 30:216 (2005)
Asterids	Solanaceae	<i>Solanum sect. Leptostemonum</i>	134	350	48	3	2	2	Levin et al., Am. J. Bot. 93:157 (2006)
Basal Angiosperms	Aristolochiaceae	<i>Aristolochia</i>	75	400	62	22	1	1	Ohi-Toma et al., Syst. Bot. 31:481 (2006)
Basal Eudicots	Cactaceae	<i>Mammillaria</i>	113	145	23	1	1	1	Butterworth and Wallace, Am. J. Bot. 91:1086 (2004)
Basal Eudicots	Cactaceae	<i>Pachycereus</i>	24	24	2	0	0	0	Arias et al., Syst. Bot. 28:547 (2003)
Basal Eudicots	Cactaceae	<i>Pereskia</i>	17	17	10	0	0	0	Edwards et al., Am. J. Bot. 92:1177 (2005)
Basal Eudicots	Caryophyllaceae	<i>Cerastium</i>	43	100	30	29	9	6	Scheen et al., Am. J. Bot. 91:943 (2004)
Basal Eudicots	Caryophyllaceae	<i>Silene</i>	12	12	11	5	4	3	Popp et al., Syst. Bot. 30:302 (2005)
Basal Eudicots	Portulacaceae	<i>Claytonia/Montia/Neopoxia</i>	34	47	23	8	7	7	O'Quinn and Hufford, Syst. Bot. 30:314 (2005)
Basal Eudicots	Gunneraceae	<i>Gunnera</i>	22	35	8	1	1	1	Wanntorp et al., Syst. Bot. 27:512 (2002)
Basal Eudicots	Platanaceae	<i>Platanus</i>	6	7	3	0	0	0	Feng et al., Syst. Bot. 30:786 (2005)
Basal Eudicots	Ranunculaceae	<i>Caltha</i>	10	10	3	2	2	2	Schuettelpelz and Hoot, Am. J. Bot. 91:247 (2004)
Basal Eudicots	Ranunculaceae	<i>Delphinium sect. Diedropetala</i>	62	67	45	0	0	0	Koontz et al., Syst. Bot. 29:345 (2004)





Higher Monocots	Poaceae	<i>Oryza</i>	7	24	7	3	1	1	Bao and Ge, Plant Syst. Evol. 249:55 (2004)
Higher Monocots	Poaceae	<i>Psathyrostachys</i>	8	8	7	1	1	1	Petersen et al., Plant Syst. Evol. 249:99 (2004)
Higher Monocots	Poaceae	<i>Sorghum</i>	24	24	24	9	7	7	Dillon et al., Plant Syst. Evol. 249:233 (2004)
Higher Monocots	Costaceae	<i>Costus/Dimerocostus/Monocostus/Tapeinoc hilos</i>	65	120	10	2	2	2	Specht, Syst. Bot. 31:89 (2006)
Higher Monocots	Zingiberaceae	<i>Alpinia</i>	72	230	13	12	1	1	Kress et al., Am. J. Bot. 92:167 (2005)
Rosids	Brassicaceae	<i>Capsella</i>	3	3	3	1	1	1	Slotte et al., Am. J. Bot. 93:1714 (2006)
Rosids	Brassicaceae	<i>Cardamine</i>	17	17	13	7	3	3	Lihova et al., Am. J. Bot. 93:1206 (2006)
Rosids	Brassicaceae	<i>Cardamine</i>	18	18	10	3	3	3	Lihova et al., Am. J. Bot. 91:1231 (2004)
Rosids	Brassicaceae	<i>Leavenworthia</i>	11	11	11	1	1	1	Beck et al., Syst. Bot. 31:151 (2006)
Rosids	Brassicaceae	<i>Lepidium</i>	54	150	21	15	8	5	Mummenhoff et al., Am. J. Bot. 91:254 (2004)
Rosids	Begoniaceae	<i>Begonia</i>	81	158	14	6	5	4	Plana, Syst. Bot. 28:693 (2003)
Rosids	Cucurbitaceae	<i>Cucumis</i>	17	22	14	2	2	2	Garcia-Mas et al., Plant Syst. Evol. 248:191 (2004)
Rosids	Fabaceae	<i>Cercis</i>	6	10	4	0	0	0	Davis et al., Syst. Bot. 27:289 (2002)
Rosids	Fabaceae	<i>Hoffmanseggia</i>	21	21	3	0	0	0	Simpson et al., Syst. Bot. 29:933 (2004)
Rosids	Fabaceae	<i>Lathyrus</i>	54	160	38	1	1	1	Kenicer et al., Am. J. Bot. 92:1199 (2005)
Rosids	Fabaceae	<i>Phaseolus</i>	52	76	15	0	0	0	Delgado-Salinas et al., Syst. Bot. 31: 779 (2006)
Rosids	Fabaceae	<i>Strophostyles</i>	3	3	2	0	0	0	Riley-Hulting et al., Syst. Bot. 29:627 (2004)
Rosids	Betulaceae	<i>Betula</i>	14	35	14	4	3	3	Jarvinen et al., Am. J. Bot. 91:1834 (2004)
Rosids	Betulaceae	<i>Corylus</i>	14	15	4	0	0	0	Whitcher and Wen, Syst. Bot. 26:283 (2001)
Rosids	Fagaceae	<i>Fagus</i>	10	10	2	1	1	1	Denk et al., Am. J. Bot. 92:1006 (2005)
Rosids	Krameriaceae	<i>Krameria</i>	17	18	3	0	0	0	Simpson et al., Syst. Bot. 29:97 (2004)
Rosids	Salicaceae	<i>Populus</i>	17	29	16	0	0	0	Hamzeh and Dayanandan, Am. J. Bot. 91:1398 (2004)



Table S3. Data used to obtain the phylogenetic estimate of the frequency of polyploid speciation in pteridophytes. SS = Number of species sampled; SI = Number of species recognized in the ingroup; SD = Number of species with chromosome count data; PS = Number of polyploid species; IRR = Number of ploidy shifts inferred with an irreversible model; PAR = Number of ploidy shifts inferred with parsimony.

Group	Family	Focal Genus	SS	SI	SD	PS	IRR	PAR	Reference
Eusporangiate	Equisetaceae	<i>Equisetum</i>	15	15	15	0	0	0	Des Marais et al., Int. J. Plant Sci. 164:737 (2003)
Eusporangiate	Ophioglossaceae	<i>Botrychium sensu stricto</i>	19	23	18	13	6	4	Haufler and Hauk., Am. J. Bot. 86:614 (1999)
Leptosporangiate	Aspleniaceae	<i>Asplenium subg. Ceterach</i>	10	10	10	6	6	6	Van den Heede et al., Am. J. Bot. 90:481 (2003)
Leptosporangiate	Aspleniaceae	<i>Asplenium - Appalachian Asplenium Complex</i>	6	6	6	3	3	3	Werth et al., Syst. Bot. 10:184 (1985)
Leptosporangiate	Aspleniaceae	<i>Asplenium - New Zealand Australe Group</i>	14	14	14	6	5	5	Perrie and Brownsey, Amer. Fern J. 95:1 (2005)
Leptosporangiate	Dryopteridaceae	<i>Matteucia/Onoclea/Onocleopsis</i>	5	5	5	0	0	0	Gastony and Ungerer, Am. J. Bot. 84:840(1997)
Leptosporangiate	Dryopteridaceae	<i>Dryopteris</i>	55	225	43	15	13	12	Geiger and Ranker, Mol. Phyl. Evol. 34:392 (2005)
Leptosporangiate	Dryopteridaceae	<i>Cystopteris - North America C. fragilis complex</i>	8	8	8	5	5	5	Haufler and Windham, Amer. Fern J. 81:7 (1991)
Leptosporangiate	Dryopteridaceae	<i>Gymnocarpium - North American</i>	5	5	5	1	1	1	Pryer and Haufler, Syst. Bot. 18:150 (1993); Pryer, Amer. Fern J. 82:34 (1992)
Leptosporangiate	Dryopteridaceae	<i>Polystichum - Australasian Group</i>	12	12	7	0	0	0	Perrie et al., J. Biogeography 30:1729 (2003)
Leptosporangiate	Dryopteridaceae	<i>Phanerophlebia</i>	8	8	8	3	3	3	Yatskievych, Ann. Mo. Bot. Gard. 83:168 (1996)
Leptosporangiate	Hymenophyllaceae	<i>Vandenboschia - V. radicans complex</i>	5	5	5	3	3	3	Ebihara et al., Am. J. Bot. 92:1535 (2005)
Leptosporangiate	Marsiliaceae	<i>Azolla</i>	7	7	7	0	0	0	Reid et al., Int. J. Plant Sci. 167: 529 (2006)



**Table S4.** Model-based estimates of the number of ploidy shifts for a subset of angiosperm groups with aneuploid variation. Irreversible parsimony results used to estimate the frequency of polyploid speciation are included for comparison. See Supporting Methods for details of the likelihood models used to estimate ploidy shifts and Table S2 for references and further details of each included study.

<b>Focal Genus</b>	<b>No. ploidy shifts irreversible parsimony</b>	<b>No. ploidy shifts likelihood model</b>	<b>Best supported model</b>	<b>Inferred haploid number at root</b>
<i>Perideridia</i>	4	8	M1	8
<i>Campanula sect. Isophylla</i>	10	7	M1	9
<i>Downingia</i>	0	0	M0	12
<i>Phacelia</i>	2	2	M1	12
<i>Viburnum</i>	3	3	M1	9
<i>Mentha</i>	6	9	M5	9
<i>Aristolochia</i>	1	1	M1	8
<i>Claytonia/Montia/Neopoxia</i>	7	8	M2	9
<i>Aponogeton</i>	8	7	M4	18
<i>Leavenworthia</i>	1	1	M2	10

<i>Begonia</i>	5	2	M4	19
<i>Cuphea</i>	8	14	M2	8

**Table S5.** Models of chromosome number evolution evaluated.

Model	Parameters	Possible events and model assumptions
M0	$\lambda, \delta$	Gains and losses, no polyploidy
M1	$\lambda, \delta, \rho$	Gains, losses, and polyploidy
M2	$\lambda, \delta, \rho$	Gains, losses, demi-polyploidy, polyploidy. Rates of polyploidy and demi-polyploidy are equal
M3	$\lambda, \delta, \mu, \rho$	Gains, losses, demi-polyploidy, polyploidy
M4	$\lambda, \delta, \lambda_i, \delta_i, \rho$	Gains, losses, and polyploidy. Rates of gain and loss depend linearly on the current chromosome number
M5	$\lambda, \delta, \lambda_i, \delta_i$	Gains and losses. Rates depend linearly on the current chromosome number

**Table S6.** Data used to obtain the phylogenetic estimate of the frequency of polyploid generation in angiosperms. GS = Number of genera sampled; GI = Number of genera recognized in the ingroup; GD = Number of genera with chromosome count data; PG = Number of polyploid genera; IRR = Number of ploidy shifts inferred with an irreversible model.

<b>Group</b>	<b>Family</b>	<b>GS</b>	<b>GI</b>	<b>GD</b>	<b>PG</b>	<b>IRR</b>	<b>Reference</b>
Asterids	Asteraceae	5	5	3	0	0	McKenzie et al., Amer. J. Bot. 93:1222 (2006)
Asterids	Ebenaceae	6	6	2	0	0	Duangjai et al., Amer. J. Bot. 93:1808 (2006)
Asterids	Primulaceae	10	22	9	3	3	Mast et al., Amer. J. Bot. 91:926 (2004)
Asterids	Apocynaceae	8	9	2	0	0	Simoes et al., Amer. J. Bot. 91:1409 (2004)
Asterids	Apocynaceae	16	165	3	0	0	Lahaye et al., Amer. J. Bot. 92:1381 (2005)
Asterids	Rubiaceae	24	28	4	0	0	Motley et al., Amer. J. Bot. 92:316 (2005)
Asterids	Rubiaceae	6	7	3	0	0	Alejandro et al., Amer. J. Bot. 92:544 (2005)
Asterids	Bignoniaceae	43	47	21	0	0	Lohmann, Amer. J. Bot. 93:304 (2006)
Asterids	Lamiaceae	11	73	10	3	2	Walker et al., Amer. J. Bot. 91:1115 (2004)
Asterids	Orobanchaceae	22	89	11	8	4	Bennett and Mathews, Amer. J. Bot. 93:1039 (2006)



Asterids	Solanaceae	3	3	3	0	0	Levin and Miller, Amer. J. Bot. 92:2044 (2005)
Asterids	Solanaceae	7	7	5	0	0	Smith and Baum, Amer. J. Bot. 93:1140 (2006)
Basal Angiosperms	Annonaceae	30	112	10	0	0	Mols et al., Amer. J. Bot. 91:590 (2005)
Basal Eudicots	Chenopodiaceae	7	7	2	0	0	Shepherd et al., Amer. J. Bot. 91:1387 (2004)
Basal Eudicots	Plumbaginaceae	15	23	5	2	2	Lledo et al., Amer. J. Bot. 92:1189 (2005)
Basal Eudicots	Vitaceae	12	14	7	5	3	Soejima and Wen, Amer. J. Bot. 93:278 (2006)
Basal Monocots	Araceae	12	12	11	5	4	Tam et al., Amer. J. Bot. 91:490 (2004)
Basal Monocots	Orchidaceae	33		7	1	1	van den Berg et al., Amer. J. Bot. 92:613 (2005)
Basal Monocots	Orchidaceae	3	3	3	0	0	Cameron, Amer. J. Bot. 92:1025 (2005)
Basal Monocots	Orchidaceae	34	158	22	0	0	Carlsward et al., Amer. J. Bot. 93:770 (2006)
Basal Monocots	Burmanniaceae	14	14	6	3	2	Merckx, Amer. J. Bot. 93:1684 (2006)
Higher Monocots	Arecaceae	65	65	32	0	0	Norup et al., Amer. J. Bot. 93:1065 (2006)
Higher Monocots	Bromeliaceae	10	10	5	0	0	Barfuss et al., Amer. J. Bot. 92:337 (2005)
Higher Monocots	Poaceae	10	12	8	0	0	Guo and Ge, Amer. J. Bot. 92:1548 (2005)

Rosids	Brassicaceae	101	350	61	8	5	Beilstein et al., Amer. J. Bot. 93:607 (2006)
Rosids	Fabaceae	8	8	6	1	1	McMahon and Hufford, Amer. J. Bot. 91:1219 (2004)
Rosids	Fabaceae	16	16	7	0	0	Haston et al., Amer. J. Bot. 92:1359 (2005)
Rosids	Euphorbiaceae	9		2	0	0	Berry et al., Amer. J. Bot. 92:1520 (2005)
Rosids	Phyllanthaceae	47	56	18	14	8	Wurdack et al., Amer. J. Bot. 91:1882 (2004)
Rosids	Dipterocarpaceae	4	4	2	0	0	Kamiya et al., Amer. J. Bot. 92:775 (2005)
Rosids	Malvaceae	67	70	63	32	14	Tate et al., Amer. J. Bot. 92:584 (2005)
Rosids	Melastomataceae	35	150	19	11	7	Renner, Amer. J. Bot. 91:1427 (2004)
Rosids	Moraceae	33	37	14	0	0	Datwyler and Weiblen, Amer. J. Bot. 91:767 (2004)
Rosids	Rosaceae	83	83	83	22	12	Vamosi and Dickinson, Intl. J. Pl. Sci. 167:349 (2006)

**Table S7.** Data used to test for an effect of ploidy shift on net diversification rate in angiosperms. For studies that provided multiple contrasts, systematic information and references are reported only once.

Sample	Group	Family	Focal Genus	Species Sampled	Species Ingroup	Species Higher Ploid Clade	Species Lower Ploid Clade	Polyploid Lineage More Species?	Reference
SR	Basal Eudicots	Crassulaceae	<i>Aeonium/Greenovia/Monanthes</i>	46	53	1	2	N	Mort et al., Syst. Bot. 27:271 (2002)
SR	Asterids	Ericaceae	<i>Vaccinium</i>	13	15	2	5	N	Powell and Kron, Syst. Bot. 27:766 (2002)
SR	Basal Eudicots	Crassulaceae	<i>Aichryson</i>	11	11	1	1		Fairfield et al., Plant Syst. Evol. 248:71 (2004)
SR	Rosids	Brassicaceae	<i>Cardamine</i>	17	17	7	1	Y	Lihova et al., Amer. J. Bot. 93:1206 (2006)
SR	Asterids	Gesneriaceae	<i>Achimenes</i>	21	23	1	1		Roalson et al., Syst. Bot. 28:593 (2003)
SR	Asterids	Primulaceae	<i>Dodecatheon</i>	14	15	2	2	T	Mast et al., Amer. J. Bot. 91:926 (2004)
SR	Basal Monocots	Liliaceae	<i>Gagea</i>	7	7	1	1		Peterson et al., Plant Syst. Evol. 245:145 (2004)
SR	Asterids	Scrophulariaceae	<i>Digitalis/Isoplexis</i>	22	23	1	1		Brauchler et al., Plant Syst. Evol. 248:111 (2004)
SR	Asterids	Lamiaceae	<i>Mentha</i>	15	16	1	1		Bunsawat et al., Syst. Bot. 29:959 (2004)
SR						1	1		
SR						2	2	T	
SR						1	1		

SR	Higher Monocots	Poaceae	<i>Psathyrostachys</i>	8	8	1	6	N	Petersen et al., Plant Syst. Evol. 249:99 (2004)
SR	Basal Eudicots	Caryophyllaceae	<i>Silene</i>	12	12	1	1		Popp et al., Syst. Bot. 30:302 (2005)
SR						2	2	T	
SR	Asterids	Apiaceae	<i>Perideridia</i>	13	14	1	1		Downie et al., Syst. Bot. 29:737-751(2004)
SR	Asterids	Asteraceae	<i>Lasthenia</i>	16	17	1	1		Desrochers and Dodge, Syst. Bot. 28:208 (2003)
SR						1	1		
SR	Basal Monocots	Orchidaceae	<i>Calopogon</i>	5	5	1	1		Goldman et al., Amer. J. Bot. 91:707 (2004)
SR	Asterids	Asteraceae	<i>Microseris</i>	16	16	2	6	N	Lohwasser et al., Syst. Bot. 29:774 (2004)
SR						1	1		
SR						1	1		
SR	Rosids	Brassicaceae	<i>Capsella</i>	3	3	1	2	N	Slotte et al., Amer. J. Bot. 93:1714 (2006)
SR	Rosids	Brassicaceae	<i>Leavenworthia</i>	11	11	1	1		Beck et al., Syst. Bot. 31:151 (2006)
SR	Asterids	Rubiaceae	<i>Houstonia</i>	16	16	1	1		Church and Taylor, Amer. J. Bot. 92:1372 (2005)
SR						1	1		
SR	Asterids	Scrophulariaceae	<i>Mimulus</i>	94	94	1	5	N	Beardsley et al., Amer. J. Bot. 91:474 (2004)
SR						1	2	N	
SR	Asterids	Scrophulariaceae	<i>Veronica</i>	8	8	1	1		Martinez-Ortega et al., Syst. Bot. 29:965 (2004)
SR	Rosids	Onagraceae	<i>Gaura (Stenosiphon)</i>	22	22	1	1		Hoggard et al., Amer. J. Bot. 91:139 (2004)

SR	Higher Monocots	Poaceae	<i>Sorghum</i>	24	24	1	1		Dillon et al., Plant Syst. Evol. 249:233 (2004)
SR	Asterids	Asteraceae	<i>Achillea</i>	58	130	1	1		Guo et al., Taxon 53:657 (2004)
SR						1	1		
SR	Asterids	Asteraceae	<i>Coreopsis</i>	25	27	1	1		Crawford and Mort, Amer. J. Bot. 92:330 (2005)
SR	Asterids	Asteraceae	<i>Hypochaeris</i>	32	45	1	1		Tremetsberger et al., Syst. Bot. 31:610 (2006)
SR	Asterids	Asteraceae	<i>Leontodon/Hemethot heca/Picris</i>	45	90	1	1		Samuel et al., Amer. J. Bot. 93:1193 (2006)
SR						1	1		
SR	Asterids	Asteraceae	<i>Machaeranthera</i>	22	30	1	1		Morgan, Syst. Bot. 28:179 (2003)
SR						1	1		
SR	Asterids	Campanulaceae	<i>Campanula sect. Isophylla</i>	47	150	1	1		Park et al., Syst. Bot. 31:862 (2006)
SR						2	1	Y	
SR						1	1		
SR	Asterids	Boraginaceae	<i>Tiquilia</i>	13	30	2	1	Y	Moore et al., Amer. J. Bot. 93:1163 (2006)
SR						1	1		
SR	Asterids	Hydrophyllaceae	<i>Phacelia</i>	55	185	1	1		Gilbert et al., Syst. Bot. 30:627 (2005)
SR	Asterids	Caprifoliaceae	<i>Viburnum</i>	42	175	1	2	N	Donoghue et al., Syst. Bot. 29:188 (2004)
SR	Asterids	Actinidiaceae	<i>Actinidia</i>	31	62	1	1		Chat et al., Amer. J. Bot. 91:736 (2004)
SR	Asterids	Polemoniaceae	<i>Collomia</i>	10	15	1	1		Johnson and Johnson, Syst. Bot. 31:349 (2006)
SR						1	1		

SR	Asterids	Geraniaceae	<i>Pelargonium</i>	143	280	1	1		Bakker et al., Taxon 53:17 (2004)
SR						1	1		
SR						3	3	T	
SR						2	1	Y	
SR						1	3	N	
SR						1	3	N	
SR	Asterids	Orobanchaceae	<i>Orobanche</i>	34	100	1	2	N	Weiss-Schneeweiss et al., Amer. J. Bot. 93:148 (2006)
SR						4	1	Y	
SR	Asterids	Plantaginaceae	<i>Penstemon</i>	163	271	1	1		Wolfe et al., Amer. J. Bot. 93:1699 (2006)
SR						1	1		
SR						1	1		
SR	Asterids	Scrophulariaceae	<i>Antirrhinum</i>	20	36	16	1	Y	Oyama and Baum, Amer. J. Bot. 91:918 (2004)
SR	Asterids	Solanaceae	<i>Physalis</i>	35	75	1	6	N	Whitson and Manos, Syst. Bot. 30:216 (2005)
SR	Basal Angio.	Aristolochiaceae	<i>Aristolochia</i>	75	400	22	38	N	Ohi-Toma et al., Syst. Bot. 31:481 (2006)
SR	Basal Eudicots	Portulacaceae	<i>Claytonia/Montia/Neopaxia</i>	36	47	1	1		O'Quinn and Hufford, Syst. Bot. 30:314 (2005)
SR						1	1		
SR	Basal Eudicots	Gunneraceae	<i>Gunnera</i>	22	35	1	2	N	Wanntorp et al., Syst. Bot. 27:512 (2002)
SR	Basal Eudicots	Saxifragaceae	<i>Saxifraga</i>	3	5	1	1		Jorgensen et al., Syst. Bot. 31:702 (2006)
SR	Basal Monocots	Aponogetonaceae	<i>Aponogeton</i>	19	42	1	1		Les et al., Syst. Bot. 30:503 (2005)
SR						1	1		

SR	Basal Monocots	Araceae	<i>Arisaema</i>	43	150	1	1		Renner et al., Amer. J. Bot. 91:881 (2004)
SR						1	1		
SR	Basal Monocots	Lemnaceae	<i>Lemna/Wolffia/Wolffiella</i>	35	35	1	1		Les et al., Syst. Bot. 27:221 (2002)
SR						1	1		
SR						2	1	Y	
SR	Basal Monocots	Burmanniaceae	<i>Burmannia/Gymnosiphon/Apteria/Cymbocarpa/Hexapterella/Dictyostega</i>	41	85	1	1		Merckx et al., Amer. J. Bot. 93:1684 (2006)
SR	Basal Monocots	Trilliaceae	<i>Trillium/Paris/Daiswa/Paris/Kinugasa</i>	69	69	1	2	N	Farmer and Schilling, Syst. Bot. 27:674 (2002)
SR	Higher Monocots	Poaceae	<i>Oryza</i>	7	24	3	3	T	Bao and Ge, Plant Syst. Evol. 249:55 (2004)
SR	Rosids	Brassicaceae	<i>Lepidium</i>	54	150	1	1		Mummenhoff et al., Amer. J. Bot. 91:254 (2004)
SR	Rosids	Cucurbitaceae	<i>Cucumis</i>	17	22	1	1		Garcia-Mas et al., Plant Syst. Evol. 248:191 (2004)
SR						1	1		
SR	Rosids	Fabaceae	<i>Lathyrus</i>	54	160	1	1		Kenicer et al., Amer. J. Bot. 92:1199 (2005)
SR	Rosids	Betulaceae	<i>Betula</i>	14	35	1	1		Jarvinen et al., Amer. J. Bot. 91:1834 (2004)
SR						2	1	Y	
SR						1	3	N	
SR	Rosids	Malvaceae	<i>Tarasa</i>	27	27	1	1		Tate and Simpson, Syst. Bot. 28:723 (2003)
SR	Rosids	Lythraceae	<i>Cuphea</i>	53	260	1	1		Graham et al., syst. Bot. 31:764 (2006)

SR	Rosids	Onagraceae	<i>Fuschia</i>	33	110	1	2	N	Berry et al., Amer. J. Bot. 91:601 (2004)
SR						1	2	N	
SR						1	3	N	
SR	Rosids	Rosaceae	<i>Geum/allies</i>	23	40	1	2	N	Smedmark and Eriksson, Syst. Bot. 27:303 (2002)
SR						1	1		
SR						1	1		
SR						1	1		
NR	Rosids	Betulaceae	<i>Alnus</i>	34	35	1	1		Chen and Li, Int. J. Plant Sci. 165:325 (2004)
NR						2	1	Y	
NR	Asterids	Apiaceae	<i>Angelica</i>	15	110	2	1	Y	Spalik et al., Plant Syst. Evol. 243:189 (2004)
NR						1	1		
NR	Asterids	Asteraceae	<i>Antennaria</i>	29	33	1	1		Bayer et al., Amer. J. Bot. 83:516 (1996)
NR	Asterids	Apiaceae	<i>Bupleurum</i>	32	180	16	4	Y	Neves and Watson, Ann. Bot. 93:379 (2004)
NR	Asterids	Asteraceae	<i>Aster</i>	21	21	2	1	Y	Ito et al., J. Plant Res. 111:217 (1998)
NR	Asterids	Asteraceae	<i>Doronicum</i>	30	40	1	1		Fernandez et al., Mol. Phylog. Evol. 20:41 (2001)
NR	Asterids	Ericaceae	<i>Kalmia</i>	7	7	1	1		Kron and King, Syst. Bot. 21:17 (1996)
NR	Asterids	Apiaceae	<i>Sanicula</i>	23	39	1	1		Vargas et al., Proc. Natl. Acad. Sci. 95:235 (1998)
NR	Asterids	Araliaceae	<i>Panax</i>	13	13	1	1		Wen and Zimmer, Mol. Phylog. Evol. 6:167 (1996)
NR	Basal Monocots	Amaryllidaceae	<i>Galanthus</i>	14	14	1	1		Lledo et al., Plant Syst. Evol. 246:223 (2004)



NR	Basal Monocots	Amaryllidaceae	<i>Zephyranthes</i>	14	40	1	1		Meerow et al., Syst. Bot. 25:708 (2000)
NR	Asterids	Araliaceae	<i>Hedera</i>	12	12	5	6	N	Vargas et al., Plant Syst. Evol. 219:165 (1999)
NR	Asterids	Apocynaceae	<i>Ceropegia/Brachystelma</i>	43	260	1	3	N	Meve and Liede-Schumann, AMBG 94:392 (2007)
NR						1	8	N	
NR						1	12	N	
NR	Asterids	Asteraceae	<i>Artemisia</i>	32	350	1	1		Torrell et al. Taxon 48:721 (1999)
NR						1	1		
NR						2	1	Y	
NR						2	1	Y	
NR						2	1	Y	
NR	Asterids	Boraginaceae	<i>Amsinckia</i>	9	15	1	1		Schoen et al. Evolution 51:1090 (1997)
NR						1	1		
NR	Asterids	Callitrichaceae	<i>Callitriche</i>	19	19	2	1	Y	Philbrick and Les, Aquatic Bot. 68:123 (2000)
NR						2	1	Y	
NR						1	2	N	
NR	Asterids	Campanulaceae	<i>Lobelia</i>	4	4	1	1		Knox et al., NZJB 46:77 (2008)
NR	Basal Eudicots	Caryophyllaceae	<i>Moehringia</i>	26	26	1	1		Fior and Karis, Cladistics 23:362 (2007)
NR	Basal Eudicots	Chenopodiaceae	<i>Beta</i>	12	12	2	1	Y	Shen et al., Heredity 80:624 (1998)
NR	Asterids	Ericaceae	<i>Rhododendron</i>	88	850	1	1		Goetsch et al., Syst. Bot. 30:616 (2005)
NR						1	2	N	
NR	Rosids	Fabaceae	<i>Stylosanthes</i>	32	32	8	1	Y	Vander Stappen et al., Plant Syst. Evol 234:27 (2002)

NR	Asterids	Gentianaceae	<i>Centaurium</i>	27	27	1	1		Mansion et al., Taxon 54:931 (2005)
NR	Basal Eudicots	Hamamelidaceae	<i>Corylopsis</i>	3	7	1	1		Li et al., Amer. J. Bot. 86:1027 (1999)
NR	Basal Monocots	Iridaceae	<i>Iris</i>	47	210	1	1		Wilson, Mol. Phylog. Evol. 33:402 (2004)
NR						1	1		
NR						1	2	N	
NR	Asterids	Lamiaceae	<i>Monarda</i>	16	16	10	5	Y	Prather et al., Syst. Bot. 27:127 (2002)
NR	Basal Monocots	Asparagaceae	<i>Asparagus</i>	21	130	1	1		Fukuda et al., Plant Sp. Biol. 20:121 (2005)
NR	Rosids	Rosaceae	<i>Sanguisorba</i>	10	23	1	1		Mishima et al., Chromosoma 110:550 (2002)
NR						1	1		
NR						1	1		
NR	Rosids	Brassicaceae	<i>Vella</i>	6	6	1	1		Crespo et al., Ann. Bot. 86:53 (2000)
NR						1	1		
NR	Rosids	Euphorbiaceae	<i>Mercurialis</i>	7	7	1	1		Obbard et al., Evolution 60:1801 (2006)
NR						1	1		
NR	Higher Monocots	Poaceae	<i>Avena</i>	54	54	1	2	N	Nikoloudakis et al., Mol. Phylog. Evol. 46:102 (2008)
NR	Rosids	Coriariaceae	<i>Coriaria</i>	12	13	1	2	N	Yokoyama et al., Mol. Phylog. Evol. 14:11 (2000)
NR						2	1	Y	
NR	Higher Monocots	Poaceae	<i>Briza</i>	23	23	1	1		Essi et al., Mol. Phylog. Evol. 47:1018 (2008)
NR	Basal Monocots	Liliaceae	<i>Clintonia</i>	5	5	4	1	Y	Hayashi et al., Plant Species Biol. 16:119 (2001)

NR	Asterids	Solanaceae	<i>Nicotiana</i>	39	70	1	2	N	Aoki and Ito, Plant Biol. 2:316 (2000)
NR						1	1		
NR	Asterids	Asteraceae	<i>Raoulia</i>	21	21	2	2	T	Ward, New Zeal. J. Bot. 31:31 (1993)
NR	Basal Eudicots	Didiereaceae	<i>Alluaudia</i>	6	6	1	1		Applequist and Wallace, Plant Syst. Evol. 221:157 (2000)
NR	Asterids	Asteraceae	<i>Carthamus</i>	10	15	2	1	Y	Vilatersana et al., Bot. J. Linn. Soc. 147:375 (2005)
NR						1	1		

# Supporting Information

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## SI Methods: A Likelihood-Based Model for Chromosome Evolution

Here, we describe the likelihood model used to infer the number of ploidy shifts across phylogenies of a subset of the angiosperm groups with aneuploid variation. Full details of this model are available in ref. 8. Chromosome number evolution is modeled as a continuous time Markov process defined by the rate matrix  $Q$ , which describes the instantaneous rate of change from a genome with  $i$  haploid chromosomes to a genome with  $j$  haploid chromosomes. For  $i \neq j$ , we define:

$$Q_{ij} = \begin{cases} \lambda + (i - 1) \times \lambda_l & j = i + 1 \\ \delta + (i - 1) \times \delta_l & j = i - 1 \\ \rho & j = 2i \\ \mu & j = 1.5i \\ 0 & \text{otherwise} \end{cases}$$

The diagonal elements are determined by the constraint that each row in  $Q$  sums to zero. The  $Q$  matrix above represents the most general model considered and contains 6 parameters:  $\rho$  is the polyploidization parameter.  $\lambda$  and  $\delta$  refer to single chromosome increase (chromosome gain) and decrease (chromosome loss) respectively. Because the loss of  $>1$  chromosome in a single transition is not allowed, this model is irreversible with respect to ploidy state change. Two parameters,  $\lambda_l$  and  $\delta_l$ , were added to allow for the possibility that the instantaneous rates of gains and losses, respectively, depend on the current number of chromosomes. Finally,  $\mu$  is the “demi”-polyploidization parameter. This parameter captures ploidy increases (addition of complete chromosome sets) that are not doubling events, for example, by the union of  $2x$  and  $4x$  gametes.

Various parameter combinations define different models, each representing a different hypothesis regarding the mode of chromosome number evolution. The 6 models considered here are summarized in Table S1. The Akaike information criterion (AIC) was used to determine the best-fit model for a particular dataset (1).

Theoretically, haploid chromosome number can be any positive integer value. However, to achieve efficient likelihood calculations we allow a total of  $C$  states, corresponding to  $\{1, 2, \dots, C - 1 \geq C\}$  chromosomes. The last state represents all chromosome counts equal to or greater than  $C$ . We set  $C$  to be large enough that the probability of it being reached is extremely small, thus the error due to truncation is negligible.

Given the  $Q$  matrix, transition probabilities from state  $i$  to state  $j$  along a branch of length  $t$  were computed by matrix exponentiation. It is emphasized that in our model time-reversibility is not assumed, and hence the results are conditional on the location of the root. Furthermore, the model results are specific to a given phylogenetic tree and its associated branch lengths. Here, we constrained the topology to match that used to infer the number of ploidy shifts in the parsimony analysis, pruning taxa that lack chromosome counts. We obtained branch lengths estimated by maximum likelihood by reanalyzing the original data matrix used for the study in ref. 2 using PhyML version 3.0.

Note, that in our model the rate matrix is not normalized (i.e., the average rate of change does not equal 1). Thus, branch lengths may be in any unit proportional to time, with the units of  $Q$  being inversely proportional to this time unit. In this way, branch lengths from nucleotide substitution units can be transformed to chromosome-number transition units by a factor that determines the ratio between these 2 units. This factor is assumed to be uniform across the topology. Likelihood calculations also require the assignment of root frequencies. Here, we weighted each root state according to its probability of giving rise to the extant data,  $D$ , given the model parameters (3). Given a rooted phylogenetic tree and the chromosome counts for sampled species, the likelihood of the data were calculated using Felsenstein’s (4) pruning algorithm. The model parameters were estimated by maximum likelihood using Brent’s optimization scheme (5). To avoid being trapped at local maxima, 10 random starting points were used during the optimization process.

Given the best supported model and its optimized parameters, we then computed the expected number of polyploid events along each branch of the phylogeny. Briefly, the expected number of transitions from state  $u$  to state  $v$  along a certain branch can be calculated using the following formula:

$$E(N_{uv}(AB)|D, \theta) = \sum_{y=1}^C \sum_{z=1}^C P(A = y, B = z|D, \theta) \cdot E(N_{uv}(AB)|A = y, B = z, \theta) \quad [\text{S1}]$$

where  $AB$  is a branch that starts at node  $A$  and ends at node  $B$  and the double summation is taken over all possible state combinations at both branch terminals. The left term of the summation (the joint probability of observing states at the tips of a branch given the data) was calculated using an elaboration of the ancestral state reconstruction algorithm of Koshi and Goldstein (6) for nonreversible models. The right term of the summation, the expected number of ploidy transitions given the states at the tips of branches, was calculated using simulations (see ref. 7 for details).

To calculate the number of polyploid events we sum over all relevant transitions. For example, to calculate the expected number of polyploid events along branch  $AB$  we sum over all  $u$ ,  $v$ , such that  $v = 2u$ :

$$E(N_{uv}(AB)|D, \theta) = \sum_{u \in \{1, \dots, C\}, v=2u} E(N_{uv}(AB)|D, \theta) \quad [\text{S2}]$$

The computation is similar for the expected number of demi-polyploidizations ( $v = 1.5u$ ), which is included in our inference of the number of ploidy shifts (Table S4).

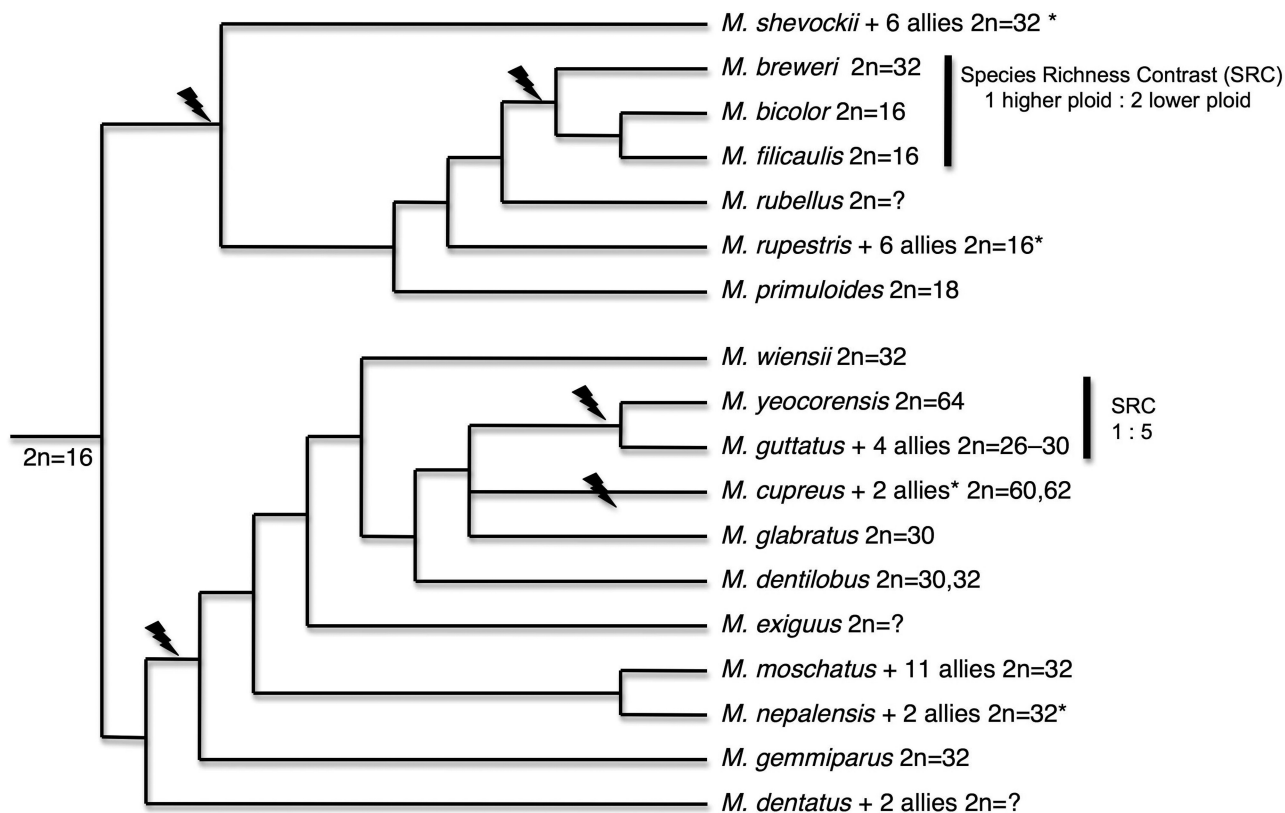
The total number of transitions of a certain type throughout the phylogeny is summed over all branches:

$$E(N_{uv}(\text{tree})|D, \theta) = \sum_{\text{branch} \in \text{tree}} (E(N_{uv}(\text{branch})|D, \theta)) \quad [\text{S3}]$$

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**Fig. S1.** Depiction of a polyploid speciation frequency estimate and 2 sister group contrasts of lineages separated by a ploidy shift. Phylogenetic hypothesis of the flowering plant genus *Mimulus* [simplified from Beardsley et al. (2003) *Am J Bot* 91:474–489]. Lightning bolts designate inferred ploidy shifts. Across the entire topology, 5 of 93 speciation events (5.4%) are accompanied by ploidy increase. Including infraspecific polyploids, 13 of 101 biological speciation events (12.9%) involve a ploidy increase. Asterisks after chromosome counts indicate count data not available for all species within the alliance. Note that *M. guttatus* and allies are inferred to be tetraploid with aneuploid variation in chromosome number.

## Other Supporting Information Files

- [Table S1](#)
- [Table S2](#)
- [Table S3](#)
- [Table S4](#)
- [Table S5](#)
- [Table S6](#)
- [Table S7](#)