Department of Science, Information Technology, Innovation and the Arts 🔳

Introduction to the Census of the Queensland Flora 2013

Queensland Herbarium

2013 version 1



Queensland Government

Great state. Great opportunity.

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Census of the Queensland flora

The census provides an authoritative published list of all the known native and naturalised species of plants, algae, fungi and lichens in Queensland, updated from the previous census (Bostock & Holland 2010). The macrofungi of Queensland are included here for the first time. In addition, a separate listing of the naturalised and doubtfully naturalised flora is presented for the use of weed officers. Species that are only present in cultivation are not included in any of the census lists.

The names of all native and naturalised species, subspecies, varieties, forms, hybrids and intergrades known to occur in Queensland are listed, generated from the Queensland Herbarium specimen label information database (HERBRECS) as of 28 March 2013. These records are primarily based on the Queensland Herbarium specimen collections representing 240 years of verified specimen data.

2013 presentation

The census is presented here in separate lists for vascular and non-vascular green plants (Plantae), red and green algae (Plantae), true algae (Chromista), bacteria (Cyanobacteria only), macrofungi and lichens (both Fungi). Microfungi are not included. Additional lists of non-native species include the current and former naturalised species and doubtfully naturalised plant species. A list of native species naturalised outside of the normal range is also included.

The Plantae (green plants) comprise vascular plants (flowering plants, conifers, cycads, ferns and fern allies), and non-vascular plants (mosses, liverworts, hornworts, green algae and red algae). True algae include brown algae and some related groups, together with diatoms (Chromista). Bacteria are restricted to the cyanobacteria, previously called blue-green algae. More information on the classification of these groups is given below.

The districts used are the Pastoral Districts of Queensland as outlined on maps issued by the former Survey Office of the Department of Natural Resources, Brisbane, based on State Map 4a. Specimen counts are given for each Queensland district, together with regional (non-Queensland) counts where applicable. Queensland collections not identifiable to a district are recorded as "QLD". Explanatory maps are provided for Australia, including pastoral districts, and for World regions. These maps are at the end of this document. Note that districts of Queensland, normally abbreviated as 2 letters e.g. MO for Moreton, have been prefaced by a capital Q in the spreadsheets, to distinguish them from other regions e.g. QWA for Warrego, Qld and WA for Western Australia.

Where taxa are recognised but not yet formally described, a temporary phrase name is provided e.g. *Tephrosia* sp. (Barkly Downs S.L.Everist 3384). Taxa that are known to occur in Queensland but which are represented only by specimen(s) held at another herbarium are given a value of "0" (zero). Finally, taxa are arranged alphabetically by family and genus.

Native species status

Native species are here defined as those that are considered to have evolved in Queensland unaided by humans, or have migrated to and persisted in Queensland without assistance from humans, from an area in which they are considered native. The conservation status (X=Extinct in the wild, E=Endangered, V=Vulnerable or N=Near Threatened) is as recorded in the Queensland <u>Nature Conservation Act 1992</u> for species listed in the <u>Nature Conservation Act 1992 (Wildlife</u> <u>Management) Regulation 2006 (</u>current as at 27 July 2012). The remaining native plant species

are known as least concern wildlife and these are not marked with a symbol in the status column. The conservation status of the non-vascular flora, algae, lichens and macrofungi is largely unknown as there is inadequate data for assessment.

Non-native species status

Naturalised species are here defined as those that are considered to have established populations outside of their native range, by reproducing without cultivation or other human intervention. Naturalised species are indicated by an asterisk (*) in the status column. Queensland native plants that have become naturalised in a pastoral district outside their native range are now recorded in a separate list.

To assist weed officers, there are additional separate census lists for naturalised (*), doubtfully naturalised (D) and formerly naturalised species (F). Species are recognised as naturalised when they have successfully established populations outside of their native range, by reproducing there without cultivation or other human intervention. Doubtfully naturalised species are those that occur outside of their native range and are not cultivated but do not meet the criteria for naturalisation. Formerly naturalised species are those that were previously considered naturalised, but have disappeared from the landscape (not collected for more than 50 years).

Many of these introduced species have become invasive in natural ecosystems and pose a threat to agriculture and the environment. More than 80 are listed as declared pests under the <u>Land</u> <u>Protection (Pest and Stock Route Management) Act 2002</u> and listed in the <u>Land Protection (Pest and Stock Route Management)</u> (current as at 1 August 2012).

Botanical names

The botanical names used in these census lists comply with the rules of the <u>International Code of</u> <u>Nomenclature of Algae, Fungi and Plants</u> and the International Code of Nomenclature for Cultivated Plants (Brickell et al. 2009). Author abbreviations follow Brummitt and Powell (1992) and are also available from the <u>International Plant Names Index</u>. Names at the level of Kingdom and Phylum follow Cavalier-Smith (2004).

Data limitations

These census lists are a snapshot of the flora of Queensland as at 28 March 2013, reflecting the current knowledge of names and distribution of plants, algae, cyanobacteria, lichens and macrofungi in the State of Queensland based on the Queensland Herbarium collections. Other Australian herbarium collections holding Queensland plant data are not included (but see comment regarding species not represented by a <u>Queensland Herbarium specimen</u>), but may be accessed from <u>Australia's Virtual Herbarium</u>. Readers may submit specimen collections to fill obvious distribution gaps, but are requested to please <u>contact us</u> first, and find out <u>how to collect plant</u> <u>specimens</u>. Note that a <u>permit</u> is required for collecting activities on state lands or where listed threatened species are involved. Bryophytes, algae, lichens and fungi usually require additional processing, and it is recommended that you first contact a specialist before collecting these organisms.

Queensland flora statistics 2013

The Queensland native flora is currently represented by 14,098 native species across all groups, nearly double the number listed by Bailey in 1913 (7,781 species), and a further 243 species

(excluding macrofungi) since the last census (Bostock and Holland 2010). Of these, 1,052 species (1,066 taxa, if subspecies, varieties and formas are included) are currently listed as threatened (endangered (E) or vulnerable (V)), near threatened (NT) or extinct in the wild (X).

There are currently 1,279 non-native vascular species that are known to have become naturalised (*) in Queensland since European contact. The naturalised flora of Queensland has been increasing at the rate of approximately 10 species per year for more than 100 years according to Queensland Herbarium records, and now represents about 13% of the total vascular flora. In some urbanised coastal areas, more than 30% of the flora consists of naturalised non-native species.

A further 350 species are considered to have potential to become naturalised, here called doubtfully naturalised (D). In addition, 21 native Queensland species are recorded here as naturalised outside of their native range.

Plantae: vascular plants

Vascular plants are those that have distinct vascular tissue (xylem and phloem), as opposed to the non-vascular plants (see below). They are thought to have evolved from a single freshwater green algal ancestor, and now include around 250,000 species worldwide. The flowering plants (angiosperms) are the largest group, but Queensland also has many native conifers and cycads (gymnosperms) and ferns (pteridophytes). The classification presented here generally follows that of the <u>Australian Plant Census</u> and the <u>Angiosperm Phylogeny Group III</u>, with some exceptions.

Queensland's 8,545 native vascular plant species represent about half of the known Australian vascular flora. More than one third of these species are endemic, that is they are only found in Queensland. New plant species are still being discovered and described in Queensland at the rate of over 50 species a year. Queensland has a wide diversity of <u>regional ecosystems</u>, over 1,380 and includes some unique habitats such as lowland tropical rainforests and desert dune systems. Queensland is also the Australian centre of diversity for iconic plant groups such as cycads and ferns.

Table 1. Statistics—number of species

Kingdom & Group	this publication	Bostock & Holland 2010	Bostock & Holland 2007	Henderson 2002	Henderson 1997	Henderson 1994	Bailey 1913			
Plantae										
Angiosperms (flowering plants)										
Native	8,100	8,005	7,901	7,677	7,512	7,252	4,626			
Naturalised	1,262	1,241	1,175	1,066	1,001	910	297			
Subtotal	9,362	9,246	9,076	8,743	8,513	8,162	4,923			
Gymnosperm	s (conifers,	cycads and	allies)							
Native	64	62	62	59	60	54	29			
Naturalised	6	6	6	3	3	3	0			
Subtotal	70	68	68	62	63	57	29			
Pteridophytes	s (ferns and	allies)								
Native	381	381	381	377	374	375	233			
Naturalised	11	11	10	10	7	5	0			
Subtotal	392	392	391	387	381	380	233			
Non-vascular	plants									
Bryophytes (mosses)	561	555	556	574	595	not listed	360			
Liverworts and hornworts	437	421	411	315	not listed	not listed	113			
Algae (Plantae, Chror	nista and C	yanobacteri	a)							
Algae	1,555	1,505	1,433	1,011	1,004	not listed	718			
Fungi										
Lichens	1,962	1,888	1,742	1,558	1,370	not listed	828			
Macrofungi	1,038	not listed	not listed	not listed	not listed	not listed	874			
Total native	14,098	12,817	12,486	11,571	10,915	7,681	7,781			
Total naturalised (all are vascular plants)	1,279	1,258	1,191	1,079	1,011	918	297			
Overall total, excluding macrofungi	14,339	14,075	14,032	12,815	12,058	8,696	7,204			
Overall total, including macrofungi	15,377	_	_	_	_	_	8,078			

Plantae: non-vascular plants—bryophytes

"Bryophyte" is a collective term for three distinct lineages of non-vascular land plants within the Kingdom Plantae: mosses (Bryophyta), liverworts (Marchantiophyta) and hornworts (Anthocerotophyta). The three lineages are grouped together because of shared traits, primarily small stature, lack of vascular tissue, and a life cycle including a sporophyte (diploid spore producing phase), and a gametophyte (haploid sexual phase) which is the most easily seen form). From an evolutionary viewpoint, the bryophytes mark the transition from aquatic to terrestrial environments and are considered the closest modern relatives of terrestrial plants but the classification and relationships of the three lineages is still debated. There are an estimated 23,000 species worldwide.

In Queensland, bryophytes occupy a diverse range of habitats from arid environments through to tropical rainforests. They are often among the first species to colonise exposed surfaces such as road cuttings, and along with cyanobacteria, lichens and algae, they are a critical component of the crusts which bind the soil surface in semi-arid to arid areas.

The mosses are the most abundant group, and have leaves spirally arranged around the stem and usually have a mid-rib (costa). Mosses are generally erect in form and are attached to the substrate via root-like structures (rhizoids).

Liverworts may be flat (thallose) or leafy and superficially resemble mosses but leaves lack a midrib. Many species grow on other plants, especially in high-rainfall forests and are important as habitats for invertebrates and in regulating forest hydrology.

Hornworts have distinctive elongated sporophytes that split longitudinally to release the spores, while the gametophytes are flat. Most species are terrestrial, growing on moist earthen banks or in gaps between ground covers. One genus (*Dendroceros*) is epiphytic, growing on rough barked trees in rainforests. (Contributors: Andrew Franks, Ross Patterson)

Algae

Algae and Cyanobacteria (blue-green algae) have traditionally been grouped together based on their ability to undertake photosynthesis in aquatic environments. Unlike land plants which evolved from a common ancestor, different lineages of algae have separately evolved in aquatic environments over the last three billion years. These different evolutionary histories are reflected in the current classification scheme which assigns 'algal' species to four of the six Kingdoms of Life on Earth: cyanobacteria (Bacteria), red and green algae (Plantae), euglenoids and dinoflagellates (Protozoa, not covered in this census) and the brown algae, diatoms and several other phyla (Chromista, algae in the narrow sense). The classification of the 'algae' has changed markedly over the last fifty years and is expected to undergo further revisions as new species are discovered and more intensive studies generate new data. The arrangement of the kingdoms and their constituent cyanobacterial and algal species in this census follows Cavalier-Smith (2004).

Globally, there are approximately 34,000 described species of cyanobacteria and algae, but this is probably only a tenth of the species still waiting to be discovered. These organisms play an important role in aquatic ecosystems underpinning food webs including those supporting commercial fisheries, contributing to global carbon, nitrogen and sulphur cycles, stabilizing sediments to improve water quality and providing habitat for many other species. (Contributors: Julie Phillips, Glenn McGregor)

Fungi: macrofungi

Fungi are an important part of ecosystem processes. The roles of different fungi include decomposers that recycle nutrients, mycorrhizal fungi that are associated with plant roots and assist water and nutrient absorption, and the disease fungi such as <u>myrtle rust</u> which attack their hosts. Many fungi are important food sources for native animals.

Fungi appear in the fossil record at around the same time as plants and animals. The macrofungi recorded here include those with larger, more visible fruiting bodies, and are mainly decomposers or mycorrhiza. Two groups are included in this census, reflecting the majority of fungal collections: the sac fungi (Ascomycetes), and the club fungi (Basidiomycetes). The sac fungi are recognized by the typical ascus (plural asci), a cup or sac usually containing eight sexually-produced spores. These include the cup fungi, morels, truffles and most lichens. Club fungi are recognised by their distinctive basidium (plural basidia), or club shaped cells, which usually bear sexually-produced spores in groups of four. They include the mushrooms, puffballs, coral fungi, bracket fungi and many other forms.

The fungal biodiversity of Queensland is still largely unknown and the classification of fungi is undergoing rapid changes due to the results of molecular studies. Recent surveys in south-eastern Queensland have shown that more than 70% of fungi species in this area are new to science. The Queensland Herbarium and the <u>Queensland Mycological Society</u> are actively involved in discovering and documenting the fungi flora. (Contributors: Nigel Fechner, Megan Prance)

Fungi: lichens

The lichens are an artificial group of organisms characterised by a symbiotic relationship between a fungus and a photobiont (photosynthetic organism). The photobiont is usually a green alga or a cyanobacterium (blue-green alga). The fungus is almost always a sac fungus (Ascomycete) but may also be a club fungus (Basidiomycete). About 40% of sac fungi are lichenized. Lichens are considered to be ancient in origin, appearing in the earliest known land floras.

A lichen name is strictly applicable to the fungal component only, the photobiont being classified separately. Most of the green-algal photobionts are not known to occur outside of lichens and many show genetic adaptation to the lichen life-style. Lichenization has occurred at least five times within the Ascomycota and several times in the Basidiomycota.

About half of the known Australian lichens occur in Queensland, with many more yet to be discovered, especially in central and northern Queensland. The Queensland Herbarium and the Queensland Mycological Society are actively involved in discovering and documenting the lichen flora. (Contributor: Rod Rogers)

Useful references

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Contributors

[*= Queensland Herbarium honorary research associate or external contributor (non-staff)]

Flowering Plants (Angiosperms). Bean A.R.: Acanthaceae, Amaranthaceae, Apiaceae, Balsaminaceae, Callitrichaceae, Caprifoliaceae, Chrysobalanaceae, Cleomaceae, Heliconiaceae, Hydatellaceae, Hydroleaceae, Lythraceae, Melastomataceae, Musaceae, Myodocarpaceae, Myrtaceae (Leptospermoideae), Plantaginaceae, Ranunculaceae, Rhamnaceae, Rosaceae, Sambucaceae, Solanaceae, Sphenocleaceae, Strelitziaceae, Stylidiaceae, Thymelaeaceae. Bean A.R. & Jessup L.W.: Araliaceae. Bean A.R. & Forster P.I.: Lamiaceae. Booth R.: Centrolepidaceae, Cyperaceae, Restionaceae. Bostock P.D.: Bromeliaceae, Corsiaceae, Cymodoceaceae, Lentibulariaceae, Ruppiaceae, Triuridaceae, Zosteraceae. Bostock P.D., Mathieson M. & Field, A.R. (northern): Orchidaceae. Clarkson J.R.*: Erythroxylaceae. Crayn D.*: Ericaceae. Edginton M.: Brassicaceae, Chenopodiaceae, Cucurbitaceae, Myoporaceae, Passifloraceae, Santalaceae, Viscaceae. Fechner N.: Scrophulariaceae, Stackhousiaceae. Fensham R.J.: Burmanniaceae, Eriocaulaceae, Pandanaceae. Forster P.I.: Agavaceae, Amaryllidaceae, Apocynaceae, Arecaceae, Argophyllaceae, Asphodelaceae, Blandfordiaceae, Buddlejaceae, Cactaceae, Campanulaceae, Carpodetaceae, Commelinaceae, Costaceae, Crassulaceae, Dioscoreaceae, Doryanthaceae, Dracaenaceae, Escalloniaceae, Flagellariaceae, Haemodoraceae, Hyacinthaceae, Iridaceae, Loganiaceae, Melianthaceae, Phyllanthaceae, Piperaceae, Ptaeroxylaceae, Putranjivaceae, Quintiniaceae, Ripogonaceae, Rutaceae, Smilacaceae, Stemonaceae, Taccaceae, Violaceae, Vitaceae, Xanthorrhoeaceae, Xyridaceae, Zingiberaceae. Forster P.I. & Halford D.A.*: Euphorbiaceae, Picrodendraceae, Rubiaceae. Forster P.I. & Guymer G.P.: Sapindaceae. Forster P.I. & Laidlaw, M.J.: Araceae. Forster P.I. & Edginton, M. (Grevillea, Hakea): Proteaceae. Guymer G.P.: Aceraceae, Alseuosmiaceae, Balanopaceae, Bignoniaceae, Bombacaceae, Byttneriaceae, Capparaceae, Corynocarpaceae, Elaeagnaceae, Elaeocarpaceae, Gesneriaceae, Helicteraceae, Icacinaceae, Leptaulaceae, Loranthaceae, Malvaceae, Nothofagaceae, Pennantiaceae, Pentapetaceae, Simaroubaceae, Stemonuraceae, Surianaceae, Tamaricaceae, Winteraceae. Guymer G.P. & Jessup L.W.: Myrtaceae (Myrtoideae). Guymer G.P. & McDonald W.J.*: Sterculiaceae. Halford D.A.*: Brownlowiaceae, Convolvulaceae, Muntingiaceae, Sparrmanniaceae. Harris W.K.*: Asparagaceae, Cannaceae, Gentianaceae, Marantaceae, Martyniaceae, Oleaceae, Pedaliaceae. Hodgon J.*: Juncaceae. Holland A.E.: Bataceae, Begoniaceae, Cannabaceae, Casuarinaceae, Goodeniaceae, Gyrostemonaceae, Hydrangeaceae, Lecythidaceae, Moringaceae, Nitrariaceae, Olacaceae, Oxalidaceae, Papaveraceae, Petiveriaceae, Phytolaccaceae, Plumbaginaceae, Resedaceae, Tropaeolaceae, Zygophyllaceae. Holland A.E. & Bean, A.R.: Asteraceae. Holland A.E. & Pedley L.*: Fabaceae. Hosking J.* & Bean A.R.: naturalised species. Jessup L.W.: Actinidiaceae, Akaniaceae, Anacardiaceae, Annonaceae, Aphanopetalaceae, Aquifoliaceae, Aristolochiaceae, Atherospermataceae, Austrobaileyaceae, Basellaceae, Berberidaceae, Berberidopsidaceae, Bixaceae, Burseraceae, Cardiopteridaceae, Caricaceae, Celastraceae, Clusiaceae, Cochlospermaceae, Connaraceae, Cornaceae, Datiscaceae, Dichapetalaceae, Dilleniaceae, Ebenaceae, Elatinaceae, Eupomatiaceae, Flacourtiaceae, Hamamelidaceae, Hanguanaceae, Hernandiaceae, Himantandraceae, Idiospermaceae, Lauraceae, Malpighiaceae, Meliaceae, Memecylaceae, Menispermaceae, Monimiaceae, Moraceae, Myristicaceae, Myrsinaceae, Ochnaceae, Opiliaceae, Pentaphylacaceae, Pittosporaceae, Rhizophoraceae, Samolaceae, Sapotaceae, Sphenostemonaceae, Symplocaceae, Theaceae, Trimeniaceae, Turneraceae, Ulmaceae, Urticaceae. Jessup L.W. & Laidlaw M.J.: Cunoniaceae. Mathieson, M.: Byblidaceae, Droseraceae, Frankeniaceae. McDonald W.J.*: Combretaceae. Pedley L.*: Avicenniaceae, Caesalpiniaceae, Verbenaceae. Pedley L.*, Booth R. & Turpin G. (northern Acacia): Mimosaceae. Pennay C.: Alismataceae, Aponogetonaceae, Cabombaceae, Ceratophyllaceae, Haloragaceae, Hydrocharitaceae, Juncaginaceae, Limnocharitaceae,

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Conifers, cycads and allies (gymnosperms): Forster P.I. & Edginton M. (Pinaceae).

Ferns and fern allies (pteridophytes): Bostock P.D. & Field A.R.

Mosses, liverworts, hornworts (bryophytes): Franks A.*, Patterson R.*, Lovatt R.* & Bolin A.

Algae: McGregor G.* (freshwater), Phillips J.A.* (marine) & Bolin A.

Lichens: Rogers R.*, Bolin A. & Guymer G.P.

Fungi: Fechner N., Prance, M. (Trametes), Leonard P.*, McMullan-Fisher S.*, Guard F.* & Evans G.*

Figure 1. Regions of the world





Figure 2. States of Australia and pastoral districts of Queensland