WET TROPICS
MANAGEMENT AUTHORITY

STATE OF THE WET TROPICS REPORT 2013–2014

State of Wet Tropics Management Authority 2013-2014

Ancient, threatened and endemic plants of the Wet Tropics World Heritage Area

Purpose of the report
Each year the Wet Tropics Management Authority prepares a report on the administration of the Act during the year, financial statements for the year, and a report on the state of Area. This State of Wet Tropics report satisfies the requirements of Queensland's *Wet Tropics World Heritage Protection and Management Act 1993* and the Commonwealth's *Wet Tropics of Queensland World Heritage Conservation Act 1994*.

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WET TROPICS
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Executive Summary

Plant biodiversity of the Wet Tropics is of global significance

The Wet Tropics of Queensland World Heritage Area supports an extraordinary assemblage of plants. Despite comprising only a very small proportion of the Australian continent, it supports a very high proportion of Australia's plant diversity. The Wet Tropics has recently been ranked as the second most irreplaceable natural terrestrial World Heritage Area. The distinctive and diverse assemblages of plants that exist in the Area occur because of finely balanced ecological and climatic conditions. Invasive species, climate change and habitat fragmentation threaten to disrupt these finely balanced conditions, and may result in rapid and catastrophic changes that increasingly threaten the region's flora and ecological systems.

The Wet Tropics World Heritage Area is a living museum containing one of the most complete and diverse living records of the major stages in the evolution of land plants in the world. It conserves a largely intact flora, with hundreds of locally endemic species restricted within its boundaries. It also provides the only habitat for more locally endemic, threatened and ancient plants than anywhere else in Australia. The Wet Tropics bioregion conserves 41% of all Queensland's vascular plant species in slightly over 1% of the State's land area.

In a recent assessment of the world's 172,000 protected areas, the Wet Tropics Heritage Area ranked amongst the top 10 most irreplaceable, a measure of its significance for the conservation of endemic and threatened species.

Rainforests dominate the vegetation of the Wet Tropics World Heritage Area. They contain the most habitat, community and species diversity; this diversity is the product of two major factors: inheritance - the survival of elements of the ancient Gondwanan rainforest flora; and immigration - the arrival of plant lineages from the north after the Australia-New Guinea land mass approached the Asian landmasses in geologically recent time. Subsequently, the interaction of geography and climate have maintained an archipelago of refugia, or areas of relative climate stability, that have helped to maintain this biodiversity through the climate fluctuations of the last 100,000 years.

The Outstanding Universal Value for which the Wet Tropics is recognised lies not just in the number of plant species and the high degree of endemicity or species unique to the region, but the evolutionary diversity these species represent. The World Heritage Area contains one of the world's most complete and diverse living records of the major stages in the evolution of land plants. Amongst the vascular plants, the World Heritage Area contains almost 60% of Australia's ferns and lycophytes, three of Australia's four cycad genera, and six out of 13 conifer genera.

The Wet Tropics also contains the highest concentrations of species of ancient lineages of flowering plants in the world, including one endemic family, the Austrobaileyaceae, which is found nowhere else on Earth.

The extraordinary richness and uniqueness of the Wet Tropics flora contributes not only to the natural values of the area, but also to the cultural and economic ones. A number of species are used by rainforest Traditional Owners in the World Heritage Area, which prior to European settlement was one of the most populated areas of Australia, and the only area where Aboriginal people of Australia lived permanently in the rainforest. Many species now also have iconic status for non-Indigenous peoples. In economic terms, the threatened, ancient and endemic flora give the World Heritage Area a unique identity that provides a basis for a thriving ecotourism industry, the major economic input to the regional economy. Future economic benefits may derive from horticultural or biodiscovery industries based on Wet Tropics biodiversity.

Refugia play an important role in explaining and conserving the World Heritage Area's ancient, threatened and endemic flora

The long term conservation of the ancient, threatened and endemic plants of the Wet Tropics and the Outstanding Universal Value of the World Heritage Area to which they contribute will require maintenance of the stability, condition and integrity of their habitat, in particular the refugia to which many of the species are restricted. Trends in these qualities are best assessed by long term monitoring programs designed to detect changes in distribution, abundance, health or age structure of individuals, populations, and the vegetation communities in which they occur. Such programs require ongoing support for a network of monitoring sites throughout the Wet Tropics and the human capability to utilise them effectively, a key recommendation of this report.

Management challenges

The distinctive and diverse assemblages of plants in the Wet Tropics are the result of finely balanced climatic conditions that, in turn, are due to the latitude and topography of the region and its proximity to easterly winds carrying moisture from the Pacific Ocean. Climate change threatens to disrupt these climatic conditions and may result in rapid and catastrophic changes to the regional environment that will limit the extent of rainforests and potentially lead to the extinction of many of the region's endemic plant species.

The Wet Tropics bioregion contains 348 species (8% of the total flora) listed as threatened under the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and/or the Queensland Nature Conservation *(Wildlife) Regulation 2006* (NCR). This represents 33% of Queensland's and 6% of Australia's total threatened flora. Recent studies have indicated that this is an underestimate, however, particularly for the unique flora of the mountain tops.

Climate change impacts on the flora are poorly understood, but are likely to be significant

Modelling studies of change in local climate conditions predicted potentially catastrophic effects on flora and fauna, and indeed whole communities such as the mountain top cloud forests, montane heaths and lowland swamp forests may disappear. These community level impacts are likely to be exacerbated by longer dry seasons, more frequent droughts and increased intensity of cyclones. Weed incursions, fire and pest animal impacts are also likely to increase, requiring careful planning to build environmental resilience through targeted restoration, environmental corridors and prioritised pest management.

Climate projections for the Wet Tropics indicate the magnitude of change that the region's ecosystems may encounter. Rainfall is predicted to become more seasonal with a wetter wet season and a longer, drier dry season. Cyclone intensity is predicted to be greater, creating risks of more frequent major ecosystem disruption as witnessed after Tropical Cyclones Larry and Yasi. The El Niño phenomenon is predicted to occur more frequently, causing more frequent droughts and increasing the risk of bushfire, with consequent damage to rainforests.

Climate changes will have severe and interacting effects on the values of the Wet Tropics World Heritage Area. We can anticipate changes in the abundance and distribution of flora. Interactions between organisms, such as insect pollination, are likely to be disrupted, creating consequent changes in ecosystem composition, structure and function.

Many of the highly valued endemic species of the Area are confined to the higher, cooler parts of the region. Climate modelling indicates a very significant diminishing of the area of suitable habitat for these thermally sensitive plant species. This will substantially increase the risk of extinction for several high elevation endemic plant species.

Threats to the Outstanding Universal Value of the World Heritage Area are cumulative and interactive

Disruption of ecosystems and changed climatic conditions will make the Wet Tropics Area more vulnerable to weed, pest animal and disease invasion. Weed species that may not be able to invade healthy native ecosystems at present may gain a competitive advantage under the warmer drier conditions that are expected. The risk of new invertebrate pests and plant diseases is also likely to increase. Changes to climate and the increase in frequency and duration of extreme events such as cyclones, droughts and heat waves will also have marked impacts on fire patterns, behaviour and intensity.

Whereas intact forest is relatively resilient, disturbance (natural, such as cyclones, or anthropogenic) can provide opportunities for the establishment and spread of weeds, which can fundamentally alter the structure and dynamics of natural communities. The most significant weeds have been identified and prioritised for action; ongoing funding is needed to ensure that management activities are maintained, and new threats are identified and dealt with rapidly.

Biosecurity risks to the Wet Tropics Area are increasing as the mobility of people, plants, animals and trade increases. Invasive species are an escalating threat to the Area:

- myrtle rust threatens many species within the very large Myrtaceae plant family
- *Phytophthora cinnamomi* threatens hundreds of the region's rainforest endemic plant species

- the incidences of tramp ants such as the yellow crazy ant present an major threat to both native fauna, flora and vital ecological processes
- the introduction and establishment of very invasive weed species has escalated over the last decade.

These new and emerging biosecurity threats are in addition to those Wet Tropics' pest species that are already well established, such as over 500 naturalised weed species. The full impacts of many of these invasive species that are already well established in the Wet Tropics are yet to be seen. It will take varying lengths of time for many to reach their full potential distributional range. Meanwhile, new invaders are continually arriving and taking hold.

New diseases such as myrtle rust are a potent threat to the Wet Tropics flora. Myrtle rust threatens most species in the family Myrtaceae, one of the most speciose of rainforest families, including many endemic and threatened species. Observations indicate the impacts of this disease are potentially great, but funding for systematic research and monitoring has yet to be identified.

Outlook conclusion and recommendations

While the outlook for the Wet Tropics World Heritage Area is a cause for great concern, much can be done at a regional level to adapt to the anticipated changes. Effective action can be taken now to build ecological resilience in the Wet Tropics landscape to the threats posed to the Area's Outstanding Universal Value by climate change, invasive weeds, pests, diseases and habitat fragmentation. The actions needed to combat these threats include:

1. programs of ecological monitoring and targeted research
2. on-ground works to improve forest health and manage environmental stress
3. increasing community awareness and mobilising behavioural change
4. improving and communicating our knowledge of the natural values for which the Wet Tropics was listed as a World Heritage property and the threats to those values.

Introduction

The Wet Tropics of Queensland World Heritage Area (WHA, or 'the Area') covers 894,420ha, extending 420km from Black Mountain National Park near Cooktown to Paluma Range National Park near Townsville. The WHA occupies 45% of the Wet Tropics bioregion, and includes large areas of rainforest, open forest and woodland.

The Wet Tropics is a region of spectacular scenery containing the richest diversity of terrestrial flora and fauna on the Australian continent.[1] In recognition of the Area's internationally significant natural values, the Area was inscribed on the list of World Heritage on 9 December 1988. In its decision, the World Heritage Committee found the Area satisfied all four criteria described for inclusion as a natural heritage site.[2] The criteria under which the Area is listed are now:[3]

- The property contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance (criterion vii)
- The property contains outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features (criterion viii)
- The property contains outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals (criterion ix)
- The property contains the most important and significant natural habitats for *in situ* conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation (criterion x).

In addition to satisfying the criteria, a property must also fulfil certain tests of integrity and must demonstrate that it has provision for its protection and management. The criteria, provisions for management and integrity are the 'three pillars' which underlie a property's recognition under the World Heritage Convention - its 'Outstanding Universal Value' (OUV) - the idea that a property has a significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. Although previously implicit in any World Heritage listing, a property's OUV is now explicitly stated. In 2012 the World Heritage Committee adopted the Retrospective Statement of Outstanding Universal Value for the Wet Tropics of Queensland, along with several other Australian properties listed for their natural values.[4]

The WHA is globally outstanding. It has been ranked eighth of more than 173,000 protected areas worldwide for irreplaceability based on its extraordinary total species diversity, and sixth on the basis of globally threatened species alone.[5] Of World Heritage properties listed for their natural values, the WHA is ranked the second most irreplaceable site globally.

This report is intended as an assessment of the current State of the Wet Tropics, with special focus on its ancient, endemic and threatened plants. The report is structured to:

- introduce, define and explore the concept of the Area's Outstanding Universal Value, and incorporate a synthesis of new information on the evolution of the region's flora that has been revealed through recent scientific research
- provide an assessment of the State of the Wet Tropics' ancient, endemic and threatened flora based on current knowledge, threats to that flora, and potential management responses to those threats, and
- suggest how the community, researchers and managers can act to preserve these values for generations to come.

Ancient, threatened and endemic flora of the Wet Tropics

Summary

- The flora of the Wet Tropics is internationally significant, representing a living record of the major stages in the Earth's evolutionary history.
- The Wet Tropics contains one of the most complete and diverse living records of the major stages in the evolution of vascular land plants, from the very first fern-like plants more than 200 million years ago to the evolution of seed-producing plants including the cone-bearing cycads and southern conifers, followed by the flowering plants.
- The Wet Tropics' flora preserves a large Gondwanan element, however there has been significant immigration of northern hemisphere plant lineages over the last 15 million years.
- The World Heritage Area contains almost 60% of Australia's ferns and lycophytes, including 43 endemic species.
- The Wet Tropics, and especially the World Heritage Area, contains one of the highest concentrations of ancient (and endemic) angiosperms in the world, and this is a key attribute of the Wet Tropics' Outstanding Universal Value.
- The World Heritage Area contains the most important habitat for threatened plant species of Outstanding Universal Value. The Wet Tropics World Heritage Area provides habitat for 348 threatened species - a third of the State's total threatened flora, and 6% of the national total.
- The World Heritage Area protects tracts of three nationally-listed endangered ecological communities.
- A large proportion of the bioregional flora is endemic.
- The World Heritage Area is one of the most irreplaceable conservation areas on Earth.

A living record of the major stages in the Earth's evolutionary history

Rainforests dominate the vegetation of the Wet Tropics World Heritage Area (**Figure 1**). They contain the most habitat diversity, the most diverse biological communities, and the most species of higher plants. The rainforests of the Wet Tropics comprise the largest continuous area of rainforests in Australia.[6]

Within the 1,989,107ha[7] Wet Tropics bioregion, the interaction of geography and climate produce an archipelago of refugia (islands of relative environmental stability) that have preserved Australia's greatest concentrations of terrestrial biodiversity. The WHA, covering 894,420ha conserves the most important and intact of these refugia; however, the vegetation of the bioregion as a whole helps buffer the WHA from external environmental stresses and thereby contributes to the maintenance of the Outstanding Universal Value of the Area.

Attributes contributing to Outstanding Universal Value associated with the ancient, threatened and endemic flora of the WHA are central to the Area's listing.[8] In the following section the aspects of the WHA flora which exemplify these values are discussed.

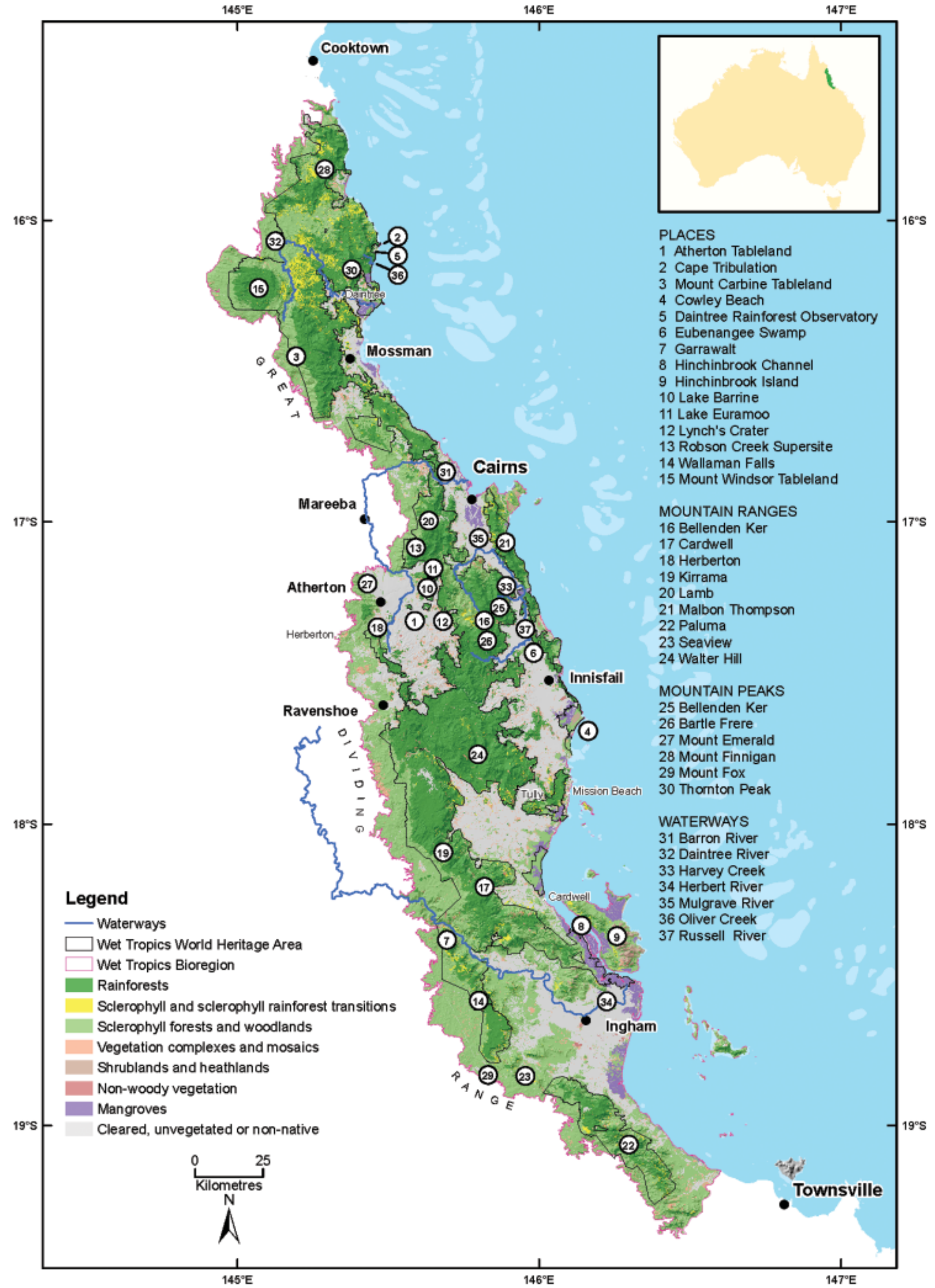


Figure 1: Position and extent of the World Heritage Area within the Wet Tropics bioregion, with selected localities and major vegetation types of the Wet Tropics.

Dillenia alata flower. Image © Campbell Clarke

Plant names

In this report, names for vascular plants (ferns, gymnosperms and angiosperms) follow the Australian Plant Census.[9] Higher level classifications for non-vascular plants follow Magallón and Hilu.[10]

Where species counts are presented (for example, **Table 1**) subspecies and varieties are ignored unless otherwise specified. Thus, the two subspecies of the tropical quandong (*Elaeocarpus largifloren*s subsp. *largiflorens* and *E. largiflorens* subsp. *retinervis*) are counted as one species. All species represented by collections with a spatial certainty of < 10km are included in these counts.

Origins of the land plants and the Wet Tropics flora

Living land plants are placed in four major groups:

1. liverworts (Marchantiophyta)
2. true mosses (Bryophyta)
3. hornworts (Anthocerophyta)
4. vascular plants (Tracheophyta).

The fossil record suggests that the first land plants evolved from aquatic ancestors approximately 470 million years ago (mya).[11,12] Most of these are long extinct and are known only from fossils. However, a few of these early lineages diversified and remain successful today - the non-vascular plants or bryophytes (hornworts, liverworts and mosses), lycophytes (club mosses, spikemosses and quillworts), ferns, and gymnosperms (cycads and conifers), all of which are represented in the Wet Tropics World Heritage Area.

While diverse and abundant at various stages of Earth's history, these groups are now dwarfed, in terms of both species numbers and ecosystem dominance, by the angiosperms, or flowering plants (**Table 1**).

Table 1: Estimated numbers of described species within the major groups of land plants.[13-14]

GROUP	WORLDWIDE	AUSTRALIA	WET TROPICS BIOREGION
Anthocerophyta (hornworts)	236	30	7
Marchantiophyta (liverworts)	5000	841	273
Bryophyta (mosses)	11,000	976	412
Tracheophyta (vascular plants)	12,000 ferns and lycophytes	498 ferns and lycophytes	276 ferns and lycophytes
	1021 gymnosperms	120 gymnosperms	22 gymnosperms
	268,600 angiosperms	18,706 angiosperms	3947 angiosperms
TOTAL	**281,621**	**19,324**	**4339**

The bryophytes - the first land plants

Non-vascular plants

The first three groups described above (collectively called the 'bryophytes') are small, herbaceous, moisture-loving plants (**Figure 2a and 2b**) which lack vascular tissue (xylem and phloem, which transport water and sugar rich fluids, respectively). As a result, bryophytes do not grow large, because they can only transport water a short distance, and are therefore limited to damp shady areas. The three groups diverged in the Precambrian, about 600 mya, although the oldest fossil evidence of land plants only dates back to the Ordovician, some 470 mya.[15]

Bryophytes play an important ecological role in maintaining an ecosystem's humidity level by their ability to absorb and retain water.[16] CSIRO researchers have found that leafy liverworts and mosses which form hanging clumps in tree branches of high altitude rainforests 'strip' considerable amounts of moisture from passing clouds. In fact, in some months of the year, they found that up to 40% more water is harvested out of the clouds in the Wet Tropics than is measured as rainfall in a rain gauge. They found that the bryophytes in the region's high altitude rainforests behave like giant sponges, capturing large volumes of water directly from clouds, which they then release slowly throughout the year. This process is now believed to be of great importance in maintaining stream flows throughout the dry season.

The process is considered significant to the overall water budget of the region, especially in terms of water recharge during the dry season. For the upland rainforest, cloud-stripping contributes up to 70% of the total water input into the forest system during the drier months. During the wet season, high rainfall masks the importance of cloud stripping which nonetheless still contributes 10-20% of the total water input into the region's upper catchments.[17]

Figure 2a: The hornwort *Dendroceros crispatus*. Image © Andi Cairns.

Figure 2b: The moss, *Achrophyllum dentatum*. Image © David Meagher.

Vascular plants

The vascular plants (which include lycophytes, ferns, gymnosperms and angiosperms) represent an evolutionary advance over the mosses in having internal networks of spirally thickened veins, reinforced with lignin, that can conduct water long distances from roots to their leaves. This, together with the evolution of a waxy coating (cuticle) on the leaves that reduces water loss, gives them a competitive edge over the bryophytes, allowing them to grow upwards into higher light environments, and reducing the need for a constantly moist environment.

The age of ferns (385 to 285 mya)

Lycophytes

The lycophytes include the club mosses and tassel ferns (12 species in the Wet Tropics), the spike mosses (six native species in the Wet Tropics), and the rarely seen quillworts (one species in the Wet Tropics).[18] Many of these species are widespread, not just in Australia, but across Asia. Today they are a relatively small group, but in the Devonian and Carboniferous periods, some 300-400 mya,[19] they were much more diverse, and physically much larger, growing as tree-sized plants that dominated the Australian landscape.

Although few in terms of numbers of species, club mosses, tassel ferns (**Figure 3**) and spikemosses are distributed widely and are often quite prominent in the ground stratum of some Wet Tropics' environments. The fernlike *Selaginella longipinna* can be a dominant ground cover in lowland rainforests, whilst *Lycopodiella cernua*, which looks like miniature pine trees, is common on roadside cuttings in moist environments.

Figure 3: Native tassel ferns (*Phlegmariurus* spp., left of image) are popular in cultivation, making them targets for theft in the wild. These specimens are cultivated under permit. Image © Ashley Field.

Most of Australia's eleven species of tassel ferns, *Phlegmariurus* (formerly called *Huperzia*), occur in the WHA, including six that are found nowhere else on the continent, and seven which are listed as threatened under the EPBC Act. Tassel ferns are epiphytes, with pendulous foliage that makes them popular in cultivation (**Figure 3**). The survival of one species, *Phlegmariurus dalhousieanus*, is threatened by illegal collecting from the wild.[20]

The ferns

The major lineages of ferns are ancient, estimated to have diverged in the early to mid-Carboniferous period (360-326 mya). Like bryophytes and lycophytes, they reproduce by spores (not seeds), and share unique anatomical features and DNA sequences that point to an ancient common ancestor.[21] Across much of the dry Australian continent, fern habitat is limited and fern diversity is low. However,

Figure 4a: *Psilotum nudum* (fork fern). Image © G.W Wilson.

Figure 4c: *Angiopteris evecta* (king fern) has the largest leaf of any fern. Image © S. J Worboys.

Figure 4b: *Cyathea rebeccae* (tree fern). Image © Dan Metcalfe.

Figure 4d: *Chingia australis* is listed as 'Endangered' under the *Commonwealth Environment Protection and Biodiversity Conservation Act* and the Queensland Nature Conservation Act. Image © Dan Metcalfe.

the year-round moisture availability in much of the Wet Tropics has resulted in ferns and lycophytes reaching their greatest diversity in Australia, with 276 species. This represents 6.5% of the total vascular plant flora of the Wet Tropics, a proportion comparable to other tropical continental floras.[22] Despite the high diversity, regional fern endemicity is low, due to the dust-like spores being readily dispersed by the wind, and therefore they tend to have wide geographical distributions. Only two genera, *Coveniella* and *Pteridoblechnum*, are restricted to the continent, the latter to the Wet Tropics. Representatives of most of the major fern lineages are also found in the Wet Tropics (**Figure 4**). Only one subclass of ferns, the horsetails (Equisetidae), does not occur naturally in Australia.

Within the WHA there are a number of fern species that are listed as threatened, or presumed extinct (**Figure 4d**). Of the 29 Australian ferns listed as extinct or threatened under the EPBC Act, 15 are endemic to the Wet Tropics, or have their most significant populations within the Area. Another nine species are restricted to the offshore territories of Norfolk Island and Christmas Island. If these external territories are excluded, the WHA is home to 75% of Australia's threatened ferns, and is critically important for their conservation.

The age of conifers (208 to 144 mya)

Gymnosperms are seed plants, and include the conifers (kauris, pines and podocarps) and the cycads. The conifers and cycads are estimated to have diverged around 366 mya, with the oldest fossil conifers dating from 310 mya[23], although they did not become dominant until the Jurassic (208-144 mya).

At the genus and family level, the WHA contains the greatest diversity of gymnosperms in Australia. Three of Australia's four cycad genera are present: *Cycas* (Cycadaceae), common in drier landscapes; *Bowenia* (Zamiaceae), a small rainforest specialist with a massive underground stem (**Figure 5**); and *Lepidozamia* (Zamiaceae), one of the world's tallest cycads, which reaches heights in excess of 12 metres. Six genera of conifers across three families are also present. Two of the conifer families, Podocarpaceae (**Figure 6**) and Araucariaceae have Gondwanan distributions. They are widespread in New Zealand, South America, New Caledonia and southern Africa. The other, Cupressaceae, is widespread in both the northern and southern hemisphere.[24]

Conifers are prominent, even ecologically dominant, in some communities. In some areas of seasonally drier rainforest, such as the Seaview Range and the western fall of the Carbine Tableland, *Araucaria cunninghamii* (hoop pine), may dominate. Two small populations of *Araucaria bidwillii* (bunya pine) occur in the WHA. These populations are unusual in that they are disjunct by more than a thousand kilometres from the larger, next nearest populations in southern Queensland.

Agathis spp. (kauri pine) are very conspicuous in some rainforest communities, especially on the western edge of the WHA on the Windsor Tableland and the Kirrama Range. The genus is ancient, with fossil evidence suggesting it dominated some Jurassic ecosystems.

Figure 5: Cones and leaf bases of *Bowenia spectabilis*, a cycad of the rainforest floor.
Image © G.W. Wilson

Figure 6: *Prumnopitys ladei*. Image © Dan Metcalfe.

The age of angiosperms (144 mya to the present day)

Flowering plants (angiosperms), with an estimated 268,600 species described worldwide, are by far the most diverse group of land plants. Not only do they display great morphological diversity, but they also are the major determinants of ecological function and biotic composition in modern terrestrial ecosystems.[25] Rainforests in particular are reservoirs of floristic richness, acting as refuges for evolutionary lineages that have gone extinct in drier or more seasonal environments.

The origins and early evolution of the angiosperms remain obscure. But beyond dispute is the far-reaching effects on Earth that the angiosperms have shaped since their evolutionary origin in the early Cretaceous (about 140 mya).[26] In broad terms, angiosperms look the way they do today because of interactions with herbivores, dispersal agents and pollinators. Similarly, the evolution of animal form and behaviour has been profoundly influenced by the plants on which they feed.

Although not species rich on a world scale[27], the flora of the WHA contains a great phylogenetic diversity, including one of the largest representations of ancient angiosperm lineages (**Appendix I**). Indeed, a principal attribute for nomination of Queensland's Wet Tropics for World Heritage listing was the occurrence in the Area of the richest variety of "primitive" or ancient angiosperms in the world.[28]

The extraordinary diversity observed in the WHA flora is not restricted to ancient angiosperms. For example:

- The WHA conserves the greatest diversity of palms in Australia. All five subfamilies of palms occur within the WHA,[29] with some localities particularly diverse, e.g. Mission Beach, with eight genera of palms and Cape Tribulation with seven genera.
- Of the 17 recognised tribes within the family Myrtaceae worldwide[30], 14 are conserved within the WHA. One of these tribes (Lindsayomyrteae) contains just one species, the blue-leaved Daintree Penda (*Lindsayomyrtus racemoides*).
- Of the 80 genera in the family Proteaceae worldwide[31], 27 are conserved in the WHA and 15 of these are endemic to the Wet Tropics (**Appendix II**). Most importantly, the majority of these genera belong to lineages that diverged early in the evolution of the family and so represent a significant proportion of the phylogenetic diversity of the family.

In the following sections, the significance of the WHA flora is discussed, emphasising the role of the breakup of Gondwana and changing climates in creating the endemicity and diversity we see today. The complex and ancient history of continental movement and biotic exchange have influenced the extant distributions of flora and fauna.

The breakup of Gondwana and northward migration of the Australian Plate

The breakup of Gondwana commenced in the early Jurassic (180 mya). For much of its subsequent history, what is now continental Australia's vegetation was dominated by cool-adapted rainforest.[32,33] Forests went through warmer (more tropical) and cooler (more temperate) phases but persisted until Australia's final separation from Antarctica, around 38 mya, brought about the formation of the Antarctic circumpolar current. Australia's subsequent northward drift coincided with a gradual cooling in the southern hemisphere and expansion of the Antarctic ice sheet. This resulted in a cooling and drying of the continent, leading to the contraction of rainforest to small refugia along the eastern coast and ranges. This continental-scale change in vegetation patterns was exacerbated by several periodic expansions and contractions of refugial rainforests during the glacial fluctuations of the last 2.5 million years.[34] Despite these conditions, Australia's remaining rainforest fragments have remained stable enough to allow the survival of many ancient lineages of plants and animals. These changes can be summarised[35]:

- 65 mya (beginning of the Cenozoic): widespread rainforest across Australia
- 55-34 mya (Eocene): appearance of open sclerophyll vegetation beside rainforest in central Australia; temperate to tropical and wet environment in north-eastern Queensland with extensive rainforest
- 34 to 23.8 mya (Oligocene): considerable regional variation in vegetation with rainforest reduced to pockets in central Australia
- 6 mya (late Miocene): general reduction in rainforest in southern Australia where it was replaced by wet sclerophyll. In northeastern Australia, rainforest persisted
- 5.3 mya to 2.6 mya (early Pliocene): development of grasslands in the central northern interior of Australia but not in southern Australia until the late Pliocene
- 2.6 mya to 11,700 years ago (Pleistocene): fluctuating climate with major expansions of grasslands across Australia; rainforest mosaics retained in north eastern Australia.

Affinities of the extant flora

The Wet Tropics contains the highest concentration of ancient angiosperm lineages in the world. Within these ancient lineages the Wet Tropics conserves one monotypic family and 48 monotypic genera, 37 of which are endemic to the Wet Tropics (**Appendix II**). Further to this exceptional evolutionary legacy, accumulating evidence[36-38] now suggests that the Gondwanan elements of the rainforest flora have been enriched by an influx of angiosperm lineages from southeast Asia following the collision of the Australian (Sahul) and Sunda shelves (**Figure 7**) in the Miocene (from about 25 mya). These more recent species arrivals originated in the low altitude tropical forests of the Sunda shelf, and were already well adapted to warm, moist conditions. This exchange of two continental biotas is ongoing.

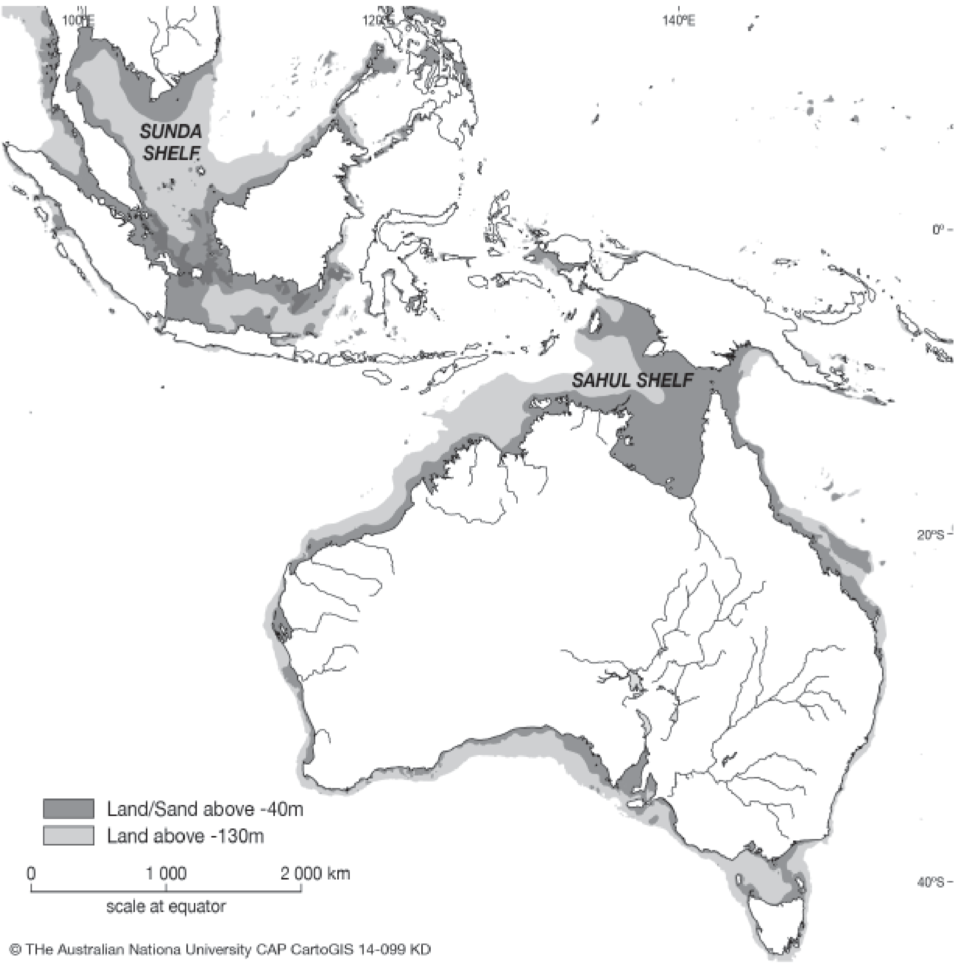


Figure 7: Current configuration of land masses in the Australasian region, showing the land above the -40 m and -130 m contour on the continental shelf. The northward drift of the Australian continent (Sahul Shelf) brought it into contact with the South East Asian region (Sunda Shelf) some 25 million years ago, creating much of the Indonesian archipelago and leading to increased exchange in biota between the two regions. © Australian National University, College of Asia and the Pacific, CartoGIS. Reproduced with permission.

The timing of historical vegetation changes at a local scale can be determined through analyses of fossil pollen. Cores taken from the deep peat deposits of Lynch's Crater on the Atherton Tablelands reveal a 230,000 year pollen record, which clearly documents the contraction and expansion cycles of rainforest vegetation over time.[39] Analysis of these pollen cores show that the rainforest species which dominated the forests surrounding the crater decreased substantially during the ice ages 190,000 to 135,000 years ago, and again 120,000 to 95,000 years ago. During the most recent ice age, ending 10,000 years ago, the pollen of fire-tolerant eucalypts formed a high proportion of the samples, indicating a contraction in rainforest coverage. The timing of rainforest contractions is replicated in the marine pollen record obtained offshore from the Wet Tropics.[40] In the milder periods between glaciations, climatic conditions improved and refugial rainforest populations expanded into newly suitable habitat.

The north Queensland fossil record shows prevalence of *Nothofagus* (Antarctic beech - now extinct in tropical Australia) and Podocarpaceae in the largest of these refugia, which points to a cooler, more temperate climate than today for much of the Miocene.[41,42] The extant lowland flora is closely comparable to fossil sites in south eastern Australia.[43,44] The flora we see today in the Wet Tropics bears some similarity to fossil floras of different eras during Australia's history. Both upland sites with similarities to cooler temperate floras, and lowland sites have been inferred as long-term refugia.[45,46]

Australian plant groups of Gondwanan origins (**Table 2**) often predominate in cool temperate rainforests similar to those that may have existed on Gondwana. As the Australian continent drifted into tropical regions over a period of 50 million years, it became subject to invasion by plants adapted to the tropical lowlands of the Sunda shelf. The significance of these immigrant lineages in the assembly of the Wet Tropics flora has been contentious. Fossil and phylogenetic evidence suggests some lineages arrived by long distance dispersal from southeast Asia during Oligocene (23-34 mya)[47], a time when the continent was far more widely separated from the Asian landmass than it is today. Invading Sundanian lineages may have been at a competitive disadvantage against an already established rainforest flora.[47]

However, periodic glacial cycles in the Pleistocene (2.6 mya to 11,700 years ago) have forced rainforest to repeatedly contract and re-expand from small refugial areas. The re-expansion periods may have provided opportunities for Sundanian lineages to obtain a foothold. Support for this hypothesis is the higher proportion of Sundanian species found in lowland rainforest areas, whose boundaries advanced and retreated with the changing climates of the Pleistocene.[48]

Lowland habitats predominated on the Sunda Shelf and Southeast Asia up until about the Pliocene, when the island of New Guinea underwent a large-scale deformation and uplift event creating the high east-west mountain spine. For most of the Miocene (23 to five mya), cooler temperatures in the uplands in northeast Queensland are likely to have limited the establishment of most Sundanian lineages, due to the tendency for lineages to remain bound to a narrow range of habitats throughout their evolutionary history. These Sundanian lineages preferentially colonised lowland areas with climates similar to those in which they first evolved.[49] Generally, the proportion of species of Sundanian origin decreases with elevation, although Gondwanan groups may be abundant in specific lowland localities, such as the northern Daintree area.

Table 2: Hypothesised origin of prominent plant groups within the Wet Tropics.[50,51]

GROUPS WITH A GONDWANAN ORIGIN	
Araucariaceae	*Agathis, Araucaria*
Arecaceae	*Nypa*
Casuarinaceae	*Gymnostoma*
Cornaceae	*Alangium*
Cunoniaceae	*Gillbeea*
Elaeocarpaceae	*Elaeocarpus*
Myrtaceae	*Eucalyptus, Backhousia*
Podocarpaceae	*Podocarpus*
Proteaceae	*Banksia, Gevuina/Hicksbeachia, Grevillea/Hakea, Helicia, Xylomelum*
Sapindaceae	*Dodonaea,* subfamily *Cupaniaceae*
GROUPS WITH A SOUTH EAST ASIAN ORIGIN	
Actinidiaceae	*Saurauia*
Annonaceae	*Cananga, Pseuduvaria*
Apocynaceae	*Alstonia, Cerbera, Dischidia, Tabernaemontana*
Arecaceae	*Livistona*
Euphorbiaceae	*Mallotus, Macaranga*
Meliaceae	*Aglaia, Dysoxylum*
Myrtaceae	*Eugenia*
Sapindaceae	*Atalaya, Harpullia*
Sapotaceae	*Pouteria, Manilkara, Mimusops, Palaquium*
Taccaceae	*Tacca*
Urticaceae	*Dendrocnide*

Refugia - how elevation and glacial cycles affected the distribution of Gondwanan and Southeast Asian elements

Measures of species diversity and endemism have long been used to distinguish the upland areas of the Wet Tropics bioregion as historical rainforest refugia.[52] During the climatic cycles of the last 100,000 years, where dry cool periods of extreme polar glaciation were interspersed by warmer wetter periods, persistent mountain-cloud wetter areas provided stable refuges protected from drought and fire - critical environmental factors influencing rainforest distribution. As environmental conditions became more suitable for rainforest in the interglacial periods, habitat was colonised mostly from local gene pools, resulting in populations of some upland rainforest trees displaying low genetic diversity within populations, but high genetic differences between populations.

Analyses have identified areas that largely avoided the effects of the Quaternary (that is, the last 2.6 million years) glaciation/ warming cycles. These areas of long term rainforest stability[53], are referred to as refugial areas. Comparisons of plant diversity among these refugial areas have revealed some striking contrasts. For example, two lowland areas, the Daintree and the Cairns-Cardwell lowlands, are renowned for their high species richness. However, when phylogenetic diversity (incorporating evolutionary relatedness of the species) is considered, the two areas show marked differences. In the Daintree, the lineages are relatively closely related to one another reflecting their shared Gondwanan ancestry, whereas the higher phylogenetic diversity of the Cairns-Cardwell lowlands reflects the influence of Sundanian (northern hemisphere) lineages that established among the Gondwanan flora during periods of climatic instability.

Habitat for threatened species of Outstanding Universal Value

Endemism

The previous section reviewed the plants which illustrate the record of life on Earth as part of the Outstanding Universal Value of the WHA. This section discusses the importance of the WHA for conservation of habitat for these species in the face of environmental change. Further, this section discusses the concept of irreplaceability, a metric which greatly reinforces the OUV of the WHA as habitat for threatened and endemic species.

Endemic means "restricted to a particular area".[54] A species is endemic to the Wet Tropics bioregion if the species' known distribution is almost wholly within the bioregion.

Although endemic species are found throughout the Wet Tropics, there are significant trends in their distribution and abundance. Within rainforest habitats, there is a tendency for higher numbers of endemics with increasing elevation, so much so that endemicity approaches 90% above 1400m.[55] In contrast, at lower altitudes, endemicity tends to be much lower (0-50%), although the actual proportions are dependent upon the type and location of the rainforest itself, with less seasonal habitats having more endemics and more seasonal habitats having fewer. Some statistics for Wet Tropics' endemic vascular plants are presented below:

- There is a total of 708 (**Appendix II**) endemic vascular plant species across all habitat types, of which 669 species occur in rainforest
- 17% of the total bioregional flora is endemic
- 31% of the bioregional rainforest flora is endemic
- Families containing the most endemic species are:
  - Myrtaceae (61 species)
  - Orchidaceae (49 species)
  - Proteaceae (46 species)
  - Lauraceae (41 species)
  - Sapindaceae (41 species)
  - Rubiaceae (38 species)
- Genera containing the most endemic species are:
  - *Syzygium* (23 species, Myrtaceae)
  - *Endiandra* (16 species, Lauraceae)
  - *Elaeocarpus* (14 species, Elaeocarpaceae)
  - *Bulbophyllum* (14 species, Orchidaceae)
  - *Cryptocarya* (13 species, Lauraceae)
  - *Symplocos* (11 species, Symplocaceae)
- 48 genera are endemic, which represents 4% of the total 1154 genera in the bioregion
- Families containing the most endemic genera are:
  - Proteaceae (15 genera)
  - Myrtaceae (4 genera)
  - Arecaceae (3 genera)
  - Celastraceae (3 genera)
  - Hamamelidaceae (3 genera)

- Of the 48 endemic genera, 37 contain only one species and are dominated by:
  - Proteaceae (9 genera)
  - Myrtaceae (3 genera)
  - Arecaceae (3 genera)
  - Hamamelidaceae (3 genera)
  - Monimiaceae (2 genera)
- One family is endemic to the Wet Tropics, Austrobaileyaceae (*Austrobaileya scandens*).

Why is the Wet Tropics irreplaceable?[56-59]

The Wet Tropics World Heritage Area (WHA) is widely cited or implicated in relation to high biodiversity and/or irreplaceability in several recent reviews. Points of particular note include:

- The WHA is one of 19 World Heritage sites in Australia
- The WHA is included in the Biodiversity Hotspot "Forests of East Australia", which is ranked third out of the 35 Global Biodiversity Hotspots[56]
- The WHA is recognised as a Centre of Plant Diversity[57], one of 234 centres in the world. It is both a centre of plant diversity and a biodiversity World Heritage site (i.e. a World Heritage site nominated primarily in recognition of its biodiversity values, rather than cultural, historical or geological values), making it one of 73 such sites in the world
- The WHA is one of only six biodiversity World Heritage sites with more than three "Alliance for Zero Extinction" sites. The Alliance for Zero Extinction (AZE) is a group of 88 non-government biodiversity conservation organisations working to pinpoint and conserve epicentres of imminent extinction[58]. Sites identified by the AZE hold "≥95% of the global population of Critically Endangered or Endangered animal or plant species"
- The WHA is ranked as the second most irreplaceable World Heritage site[59], based upon the conservation of bird, mammal and amphibian species. It is ranked the sixth and eighth most irreplaceable protected area of the worlds' 172,461 protected areas for all species and threatened species respectively (**Table 3**).

Idiospermum australiense (idiot fruit) seeds and seedlings. This species is restricted to two localities in the Wet Tropics localities.
Image © Mike Trennery.

Table 3: Ranked irreplaceability of Australian and selected other biodiversity World Heritage sites among 172,461 protected areas globally. The Wet Tropics World Heritage Area (shaded) is the second highest ranked of World Heritage sites, and among the top ten of all protected areas globally.[61,62]

STATE PARTY	BIODIVERSITY WORLD HERITAGE SITE	WORLD HERITAGE CRITERIA
Venezuala	Canaima National Park	(vii) (viii) (ix) (x)
Australia	**Wet Tropics of Queensland**	**(vii) (viii) (ix) (x)**
Panama; Costa Rica	Talamanca Range-La Amistad Reserves/ La Amistad National Park	(vii) (viii) (ix) (x)
Indonesia	Lorentz National Park	(viii) (ix) (x)
Ecuador	Galapagos Islands	(vii) (viii) (ix) (x)
India	Western Ghats	(ix) (x)
Madagascar	Rainforests of the Atsinanana	(ix) (x)
Australia	Kakadu National Park	(i) (vi) (vii) (ix) (x)
Australia	Shark Bay	(vii) (viii) (ix) (x)
Australia	Tasmanian Wilderness	(iii) (iv) (vi) (vii) (viii) (ix) (x)
Australia	Gondwana Rainforests of Australia	(viii) (ix) (x)
Australia	The Greater Blue Mountains Area	(ix) (x)
Australia	Great Barrier Reef	(vii) (viii) (ix) (x)

Threatened plants

There are 348 Wet Tropics plant species (from 86 families and 236 genera) listed as endangered, vulnerable, or near threatened (EVNT) under either the EPBC Act and/or the NCA (**Appendix III**). This represents 33% of Queensland's and 6% of Australia's total EVNT flora. Angiosperms dominate the list (83.5%), followed by ferns and fern allies (15.5%), and gymnosperms (0.5%). Significantly, 36 of the 236 genera of threatened species are either endemic to the Wet Tropics, or in Australia are only found in the Wet Tropics.

Eight percent of the flora of the Wet Tropics is considered EVNT, of which 81% are rainforest species, the remaining 19% occur in sclerophyll communities.

Considering habitat alone, 13% of the total Wet Tropics rainforest flora is threatened, whereas 3% of the non-rainforest flora is EVNT.

The families with the most EVNT species are:

- Orchidaceae (42 species)
- Myrtaceae (21 species)
- Proteaceae (17 species)
- Fabaceae (14 species)
- Lauraceae (13 species)
- Sapindaceae (13 species)

The genera with the greatest number of EVNT species are:

- *Endiandra* (10 species)
- *Phlegmariurus* (8 species)

AREA (km^2)	IRREPLACEABILITY SCORE		IRREPLACEABILITY RANK AMONGST ALL PROTECTED AREAS	
	All species	Threatened species	All species	Threatened species
29,019	41.16	8.33	3	16
8,987.9	**32.49**	**10.51**	**6**	**8**
4,073.0	29.21	8.93	7	14
23,707.6	24.56	3.56	13	68
146,678.6	24.39	11.02	15	5
8,165.4	24.03	14.58	17	2
4,810.9	20.18	10.58	20	7
19,230.7	6.76	2.92	63	100
22,100.2	5.08	3.97	92	59
14,095.7	3.60	0.14	163	726
3,697.4	1.11	0.81	559	425
10,364.9	1.00	0.33	656	568
350,426.1	0.20	0.03	1,229	1,161

Dendrobium (6 species)
Hymenophyllum (6 species)
Acacia (5 species)
Pseuduvaria (5 species)
Symplocos (5 species)

Most species listed as EVNT are either endemic to the Wet Tropics or to Queensland or to Australia. A number of species occur elsewhere in the tropics (for example, New Guinea and Southeast Asia) but their Australian distribution is confined to small and scarcely viable populations in the Wet Tropics. These extra-Australian species are mostly ferns and lycophytes, and predominantly occur on the wet coastal lowlands and foothills in rainforest communities.

Because so little is known of the environmental requirements of many of these species, their responses to current and future threats are difficult to predict. However recent predictions for the future of the mountaintop (above 1000m elevation) habitats of the WHA indicates that more than 30 plant species that are restricted to these habitats are gravely threatened by climate-driven habitat loss.

Irreplaceability in the Wet Tropics World Heritage Area

Irreplaceability (or uniqueness, or rarity) is arguably the most important concept for assessing the potential of a site to be considered of Outstanding Universal Value. One of the most common measures for ranking the irreplaceability of sites

Crater of Mt Quinkan. Image © Andrew Ford.

(and ecosystems more broadly) is species endemism.[63] The ranking is based on the number of threatened species within an area, and how dependent on the area they are - a threatened species whose entire habitat is located within an area gives more weighting than a threatened species that is more widespread.

Using plant community survey data, an analysis has been undertaken which illustrates the relative irreplaceability ranking of areas within the Wet Tropics.[64] From the analyses, irreplaceable areas were modelled (**Figure 8a** and **Figure 8b**) with the Daintree-Cape Tribulation area (including Thornton Range) and the eastern Atherton Tableland south-west of Mt Bartle Frere being identified as the most irreplaceable.

Underlining the extraordinary botanical and evolutionary significance of the Wet Tropics, these analyses indicated that all areas of rainforest contain some combination of ancient, bioregionally endemic or threatened species. Drier, fire-prone sclerophyll-dominated vegetation communities occupy only a small proportion of the WHA. They nevertheless protect a flora with significant numbers of threatened and endemic species.

Eucryphia wilkiei is listed as 'Vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act* and the Queensland *Nature Conservation Act*. Image © Andrew Ford.

Key areas and important locations in the Wet Tropics for significant rainforest species and communities

Low altitude areas

Modelling of the minimum predicted extent of lowland rainforest using past climate scenarios (**Figure 9**) shows that the Cape Tribulation-Mossman and Cairns-Cardwell areas are the most significant, having retained stable lowland rainforests during historical climate fluctuations.[65] The Cairns-Cardwell area has been subject to extensive clearing for grazing, sugar cane, and urban development. The Cape Tribulation to the Daintree River area appears to have a disproportionate representation of ancient and endemic species. According to the models, lowland rainforest south of the Cardwell Range disappeared during climatically unfavourable periods and this is reflected in the low number of bioregional endemics found there today. In other words, the rainforest we see today south of the Cardwell Range on the coastal plain and foothills is likely a result of colonisation by species which expanded their range from northern refugia during more favourable climates.

High altitude and Tableland areas

For upland refugia, the modelling of VanDerWal (2009)[66] and Hilbert *etal.* (2007)[67], although very similar, show important differences (**Figure 10a** and **10b**). Both models predict (from north to south) Mt Finnigan, Thornton Range, Mount Carbine Tableland, Malbon Thompson Range and the Bellenden Ker Range to be noteworthy upland refugia. These areas harbour a disproportionately high number of ancient, endemic and threatened flora. The models differ primarily in the refugial potential of the Mount Windsor Tableland, Walter Hill Range (north-west of Tully), Hinchinbrook Island and the Paluma Range. Their relative value can only be ascertained by undertaking targeted surveys and analysing the floristics, community composition and structure of the vegetation.

Overall

Modelling of Hilbert *et al.* (2007) indicates historically stable rainforest areas (refugia) across the Cape Tribulation-Mossman lowlands, Mount Carbine Tablelands, Bellenden Ker Range, Atherton Tablelands, and the northern end of the Paluma Range (**Figure 11**). As noted above, much of the lowland rainforest in the Cairns-Cardwell area, which persisted through the last glacial maximum, has now been cleared. Within the WHA, uncleared, historically stable, lowland rainforests occur only in the foothills of the near-coastal ranges and in the Cape Tribulation-Mossman area. The most significant upland refugia are all located within the boundaries of the WHA.

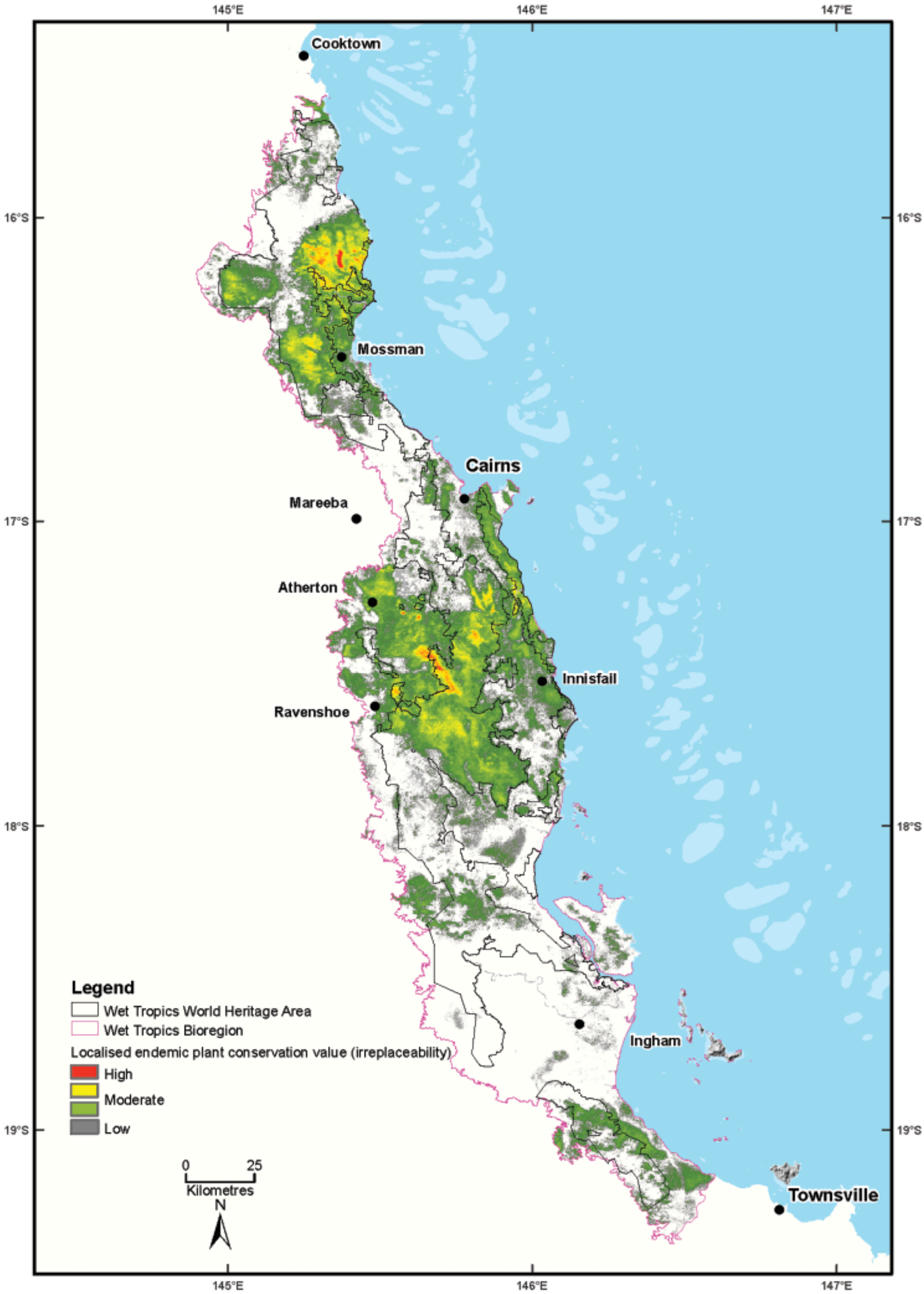


Figure 8a: Maps of irreplaceability for Wet Tropics, based upon plant species from vegetation site surveys. The colour red represents areas which are of greatest irreplaceability.[68]

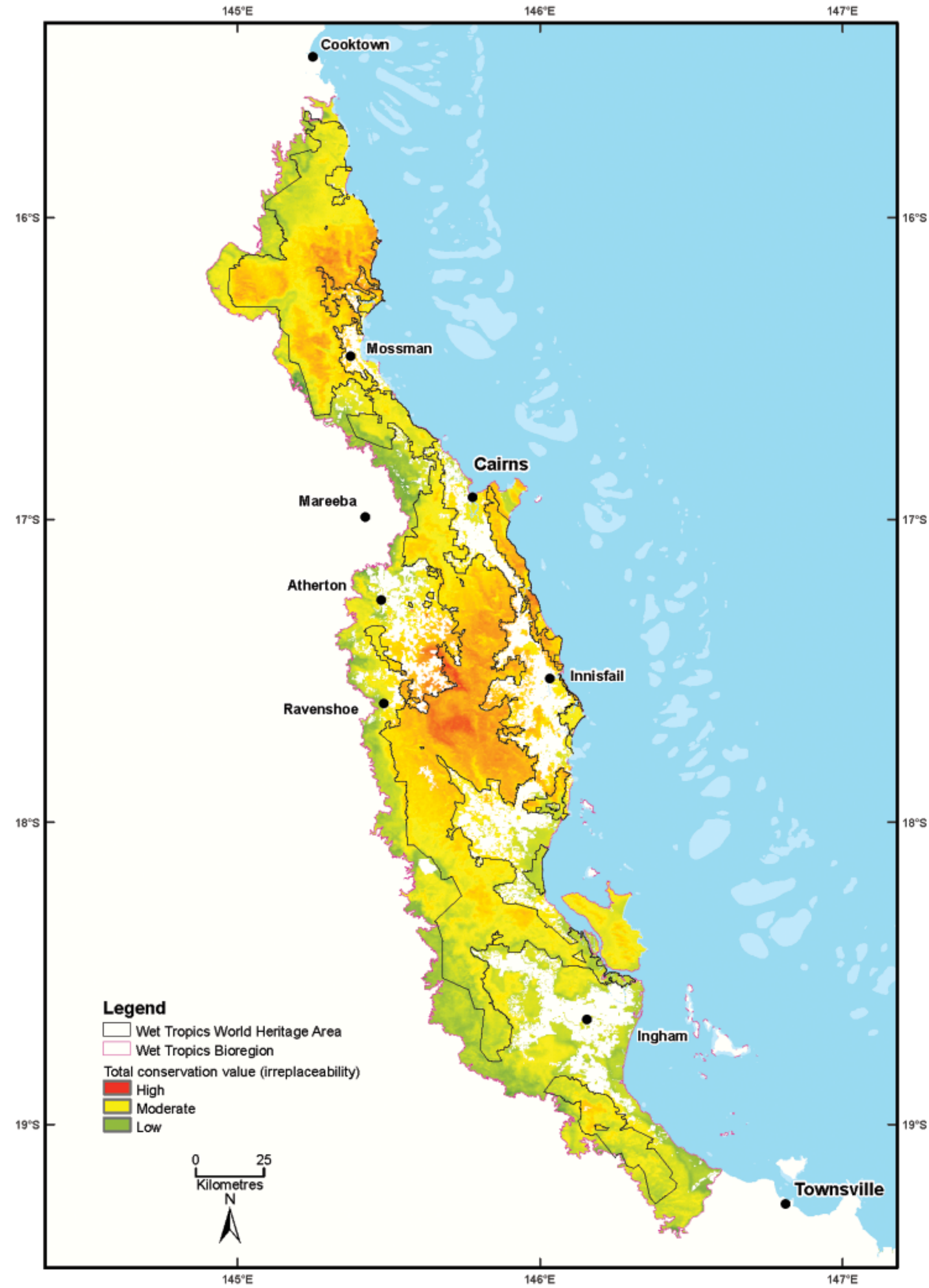


Figure 8b: Map of irreplaceability for the Wet Tropics illustrating the total conservation value when all components of diversity are considered. That is, the number of species, median area of occurrence, number of endemic species and number of ancient angiosperm families. The colour red represents areas which are greatest irreplaceability.

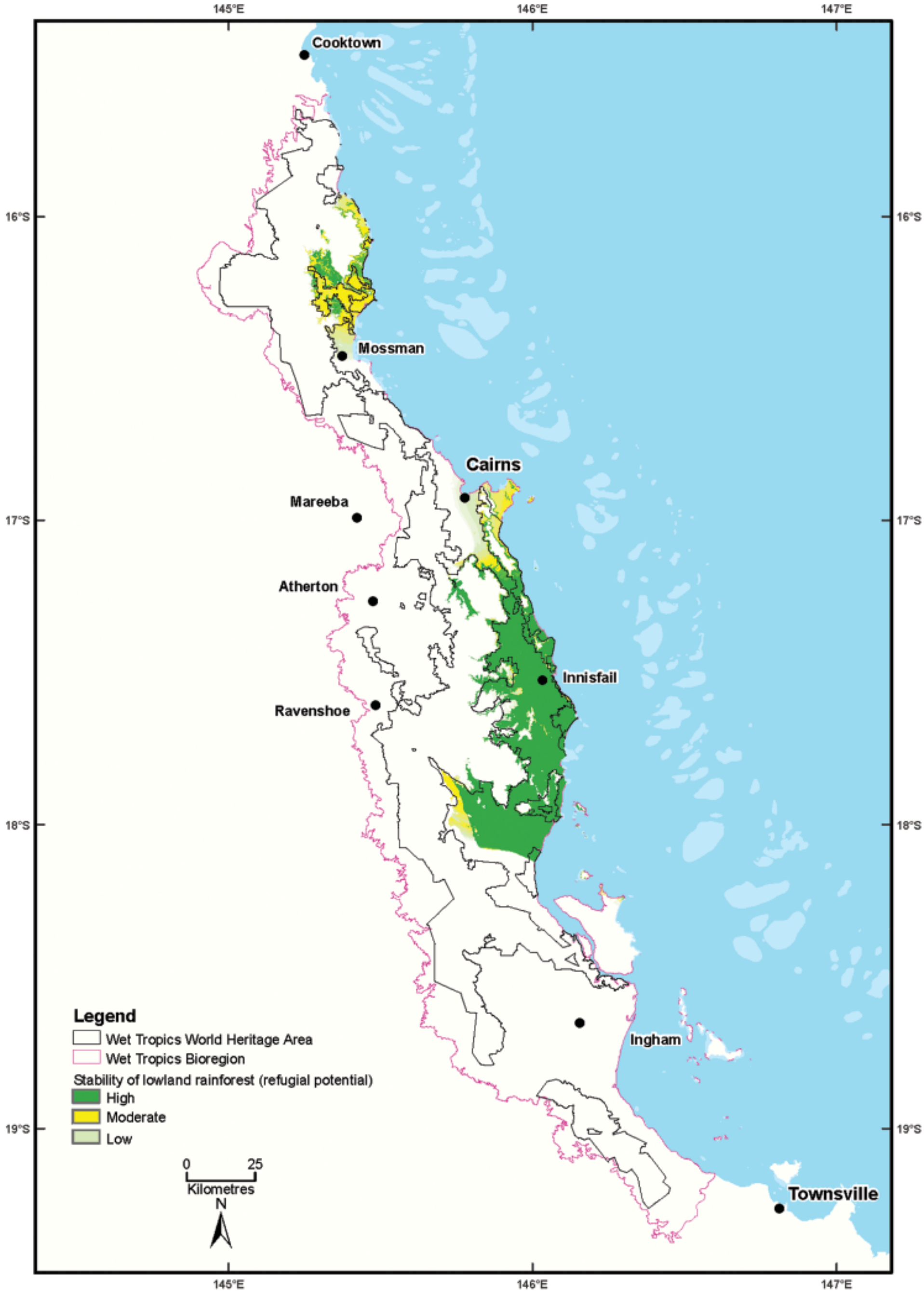


Figure 9: Map showing relative stability of lowland rainforest in the Wet Tropics.[69] The darkest colours represent areas of rainforest that were predicted to be the most stable in all past and current climate scenarios: Pleistocene/Holocene transition (11,700 years ago), Holocene climatic optimum (5000 years ago) and last glacial maximum (18,000 years ago).

Research undertaken in the Wet Tropics improves our capacity to understand manage and conserve Australia's tropical rainforest biodiversity and ecosystems. Image © Dan Metcalfe.

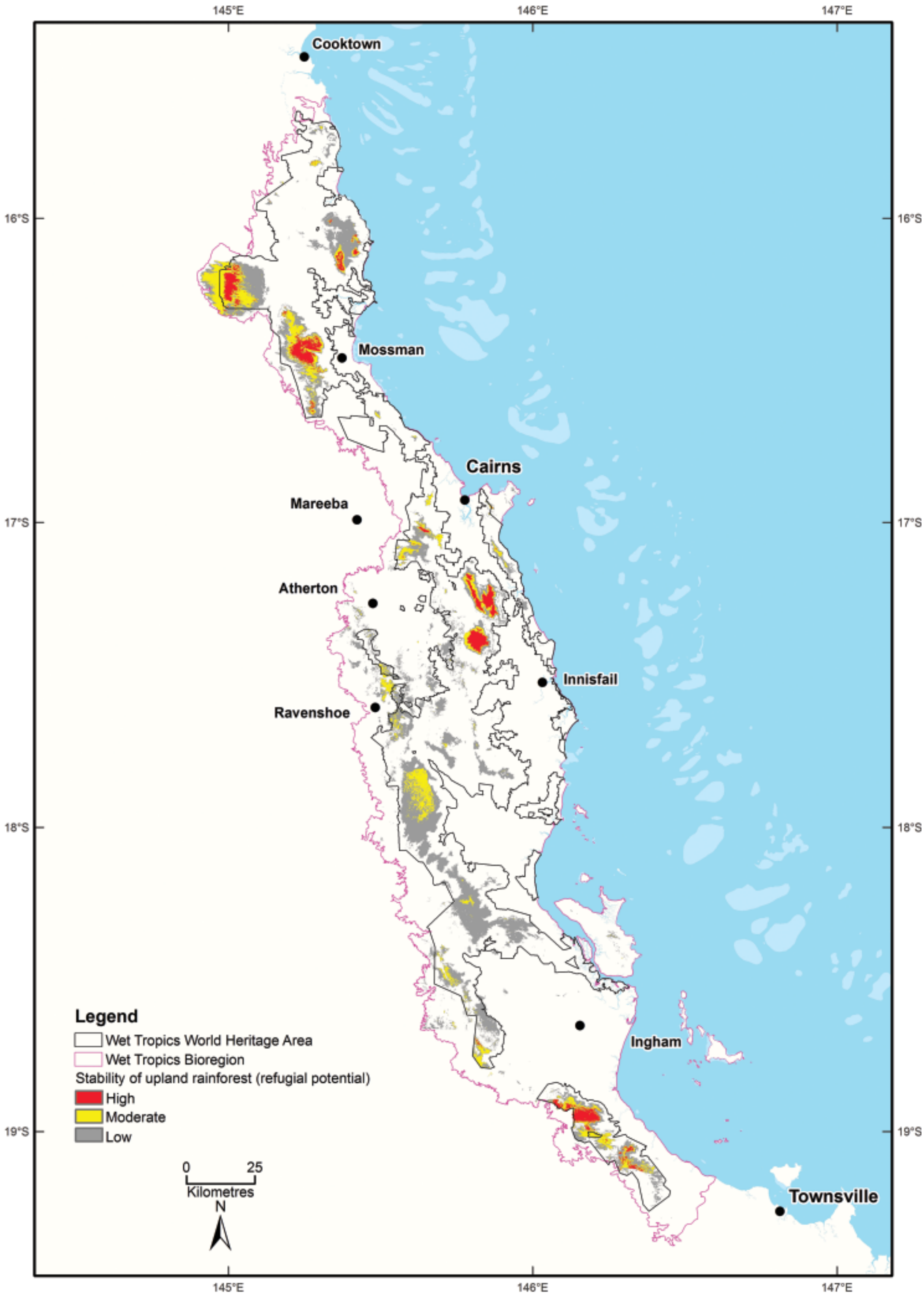
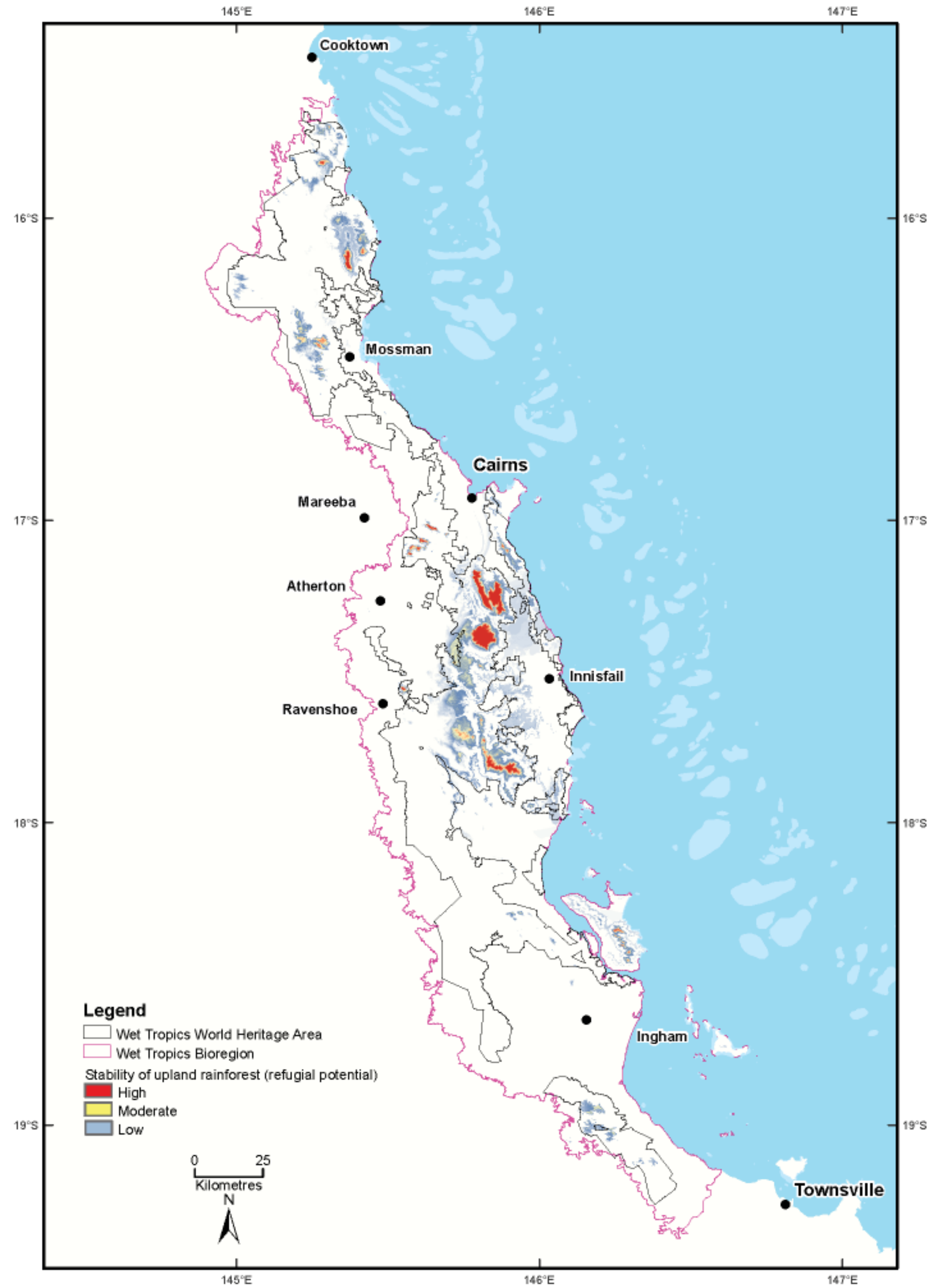


Figure 10a: Figures 10a and 10b. Comparison maps of putative upland refugia (simple notophyll and microphyll rainforest) in the Wet Tropics. The red represents areas of upland rainforest that were predicted to be stable in all past and current climate scenarios (Pleistocene/Holocene transition (11,700 years ago), Holocene climatic optimum (5000 years ago) and Last glacial maximum (18,000 years ago). Figure 10a is based on the analyses of Nilbert.[70] Figure 10b is based on the analyses of Van der Wal.[71]



145°E
146°E
147°E
16°S
17°S
18°S
19°S
Cooktown
Mossman
Cairns
Mareeba
Atherton
Innisfail
Ravenshoe
Ingham
Townsville
Legend
Wet Tropics World Heritage Area
Wet Tropics Bioregion
Stability of upland rainforest (refugial potential)
High
Moderate
Low
0
25
Kilometres
N

Figure 10b

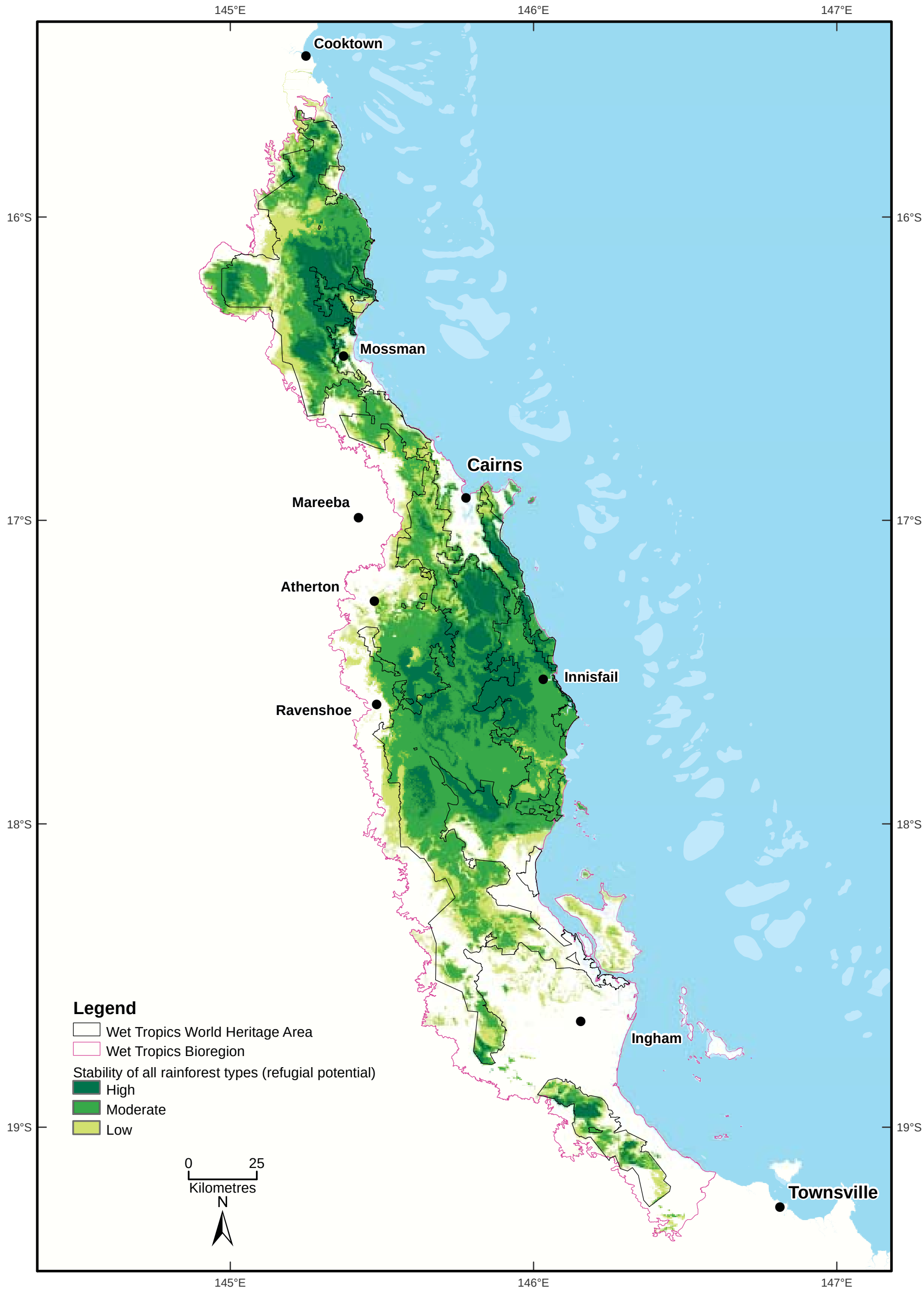


Figure 11: Map showing the relative stability of all types of rainforest in the Wet Tropics. Dark colours represent areas of rainforest that were predicted to be the most stable in all past and current climate scenarios (Pleistocene/Holocene transition (11,700 years ago), Holocene climatic optimum (5, 000 years ago) and last glacial maximum (18,000 years ago).[71]

Understanding the Outstanding Universal Value of the Wet Tropics' flora

Summary

- The bioregion contains three of Queensland's four highest mountains. Proximity to the coast, marked elevational change and tropical latitude generates abundant and reliable rainfall, creating warm humid refuges that allowed the survival of flora and fauna that may have otherwise gone extinct.
- Geological diversity within the WHA has led to the development of diverse habitats. Habitat diversity allows for high species diversity.
- The flora of the WHA exhibits high species richness, but it is the extremely high phylogenetic diversity which contributes most to the Outstanding Universal Value of the area.
- The Wet Tropics World Heritage Area has the greatest diversity of ancient flowering plants in the world.
- Both lowland and upland refugia are important for long term conservation of ancient, endemic and threatened rainforest flora.
- Centres of endemism do not just occur in rainforest - several Wet Tropics bioregion endemic species and disjunct species occurrences occur in mountain woodlands and heathlands on the western edge of the bioregion.

Geology and geomorphology

The World Heritage Area boundaries encompass a wide range of geologies[72], most prominent being metamorphosed sediments of Devonian age (400 mya)- the Hodgkinson Formation. Within the Hodgkinson Formation are much younger intrusions of granite. Prominent amongst these are three of Queensland's four highest mountains: Bartle Frere, Bellenden Ker and Thornton Peak. These peaks provide the only habitat for a variety of highly restricted endemic species, including *Eucryphia wilkiei, Cinnamomum propinquum* and *Dracophyllum sayeri*.

Rhyolites of late Carboniferous to early Permian age (about 330-250 mya) are prominent between Ravenshoe and the Paluma Range.[73] Soils developing on these rocks are of low fertility. Over the last four million years, the region has experienced significant volcanic activity with lava flows covering large areas of the Atherton Tablelands, where they have weathered to produce fertile soils.[74]

At the base of hills and ranges, soils have developed from colluvial deposits, unconsolidated sediments that have been deposited by rain-wash or slow downslope creep. The high rainfall and temperatures of the Wet Tropics accelerate these erosional processes. Along the coastline are recent alluvial deposits and sand accumulations which have largely been cleared of natural vegetation for agriculture and urban development.

The Great Escarpment is the dominant topographic feature of the Wet Tropics. This 80 million year old cliff, probably the continent's most significant geological structure, runs east of the Great Divide, almost the length of the continent.[75] The escarpment and its associated high mountains create steep altitudinal gradients that generate abundant and reliable orographic rainfall. The development of the Great Escarpment commenced at roughly the same time as the breakup of Gondwana. The reliable rainfall associated with the escarpment's mountains created humid refuges that allowed the survival of flora and fauna that may otherwise have gone extinct. The majority of Australia's remnant rainforests are associated with the Great Escarpment.

To the west, the ridgelines of the Great Dividing Range separate east flowing and west flowing streams. In most locations, the Great Divide is located to the west of the Wet Tropics bioregional boundary, although just to the north of Cairns the two coincide for a short distance before again separating.

Climate

The Wet Tropics is the wettest region in Australia. It has a moderately seasonal tropical climate, with roughly 60% of mean annual rainfall occurring in the December to March wet season.[76] The weather station on the peak of Bellenden Ker is Australia's wettest place, recording a mean annual rainfall of 8.17 metres, peaking in 2000 at 12.46 metres.[77]

Cyclones are significant and irregular disturbance events during the wet season, causing damage to forests as well as causing major floods. During the remainder of the year, the north-south trending high coastal ranges play a significant role in intercepting and capturing the moisture-laden south east trade winds. On higher mountains, this rainfall is supplemented by "cloud stripping".[78]

Vegetation

Although rainforests dominate the vegetation of the Wet Tropics WHA, it also supports a variety of other vegetation types including mangroves, wetlands and fire-prone forests, woodlands and heathlands.[79]

Diversity of the Wet Tropics' flora-species and lineages

The values for which the Wet Tropics were recognised lie not just in the number of species, but the evolutionary diversity these species represent. The Wet Tropics of Queensland world heritage nomination document[80] states the WHA "contains one of the most complete and diverse living records of the major stages in the evolution of the land plants from the very first plants on land to the higher plants, the gymnosperms and the angiosperms".

The diversity of a flora is best thought of as the range of different lineages of plants to which the species in the flora belong. A lineage is the ancestry or pedigree of a species or group of related species. The breadth of diversity of a flora is a concept which takes into account the evolutionary relatedness of the species in the flora, not just how many species there are. More commonly referred to as phylogenetic diversity, its determination requires knowledge of the evolutionary heritage and relationships among organisms - the phylogeny.

Phylogenies are usually depicted as evolutionary or phylogenetic trees which show the relationships between extant species or groups (**Figure 12**). A flora which contains species from many diverse lineages is more phylogenetically diverse than a flora of the same number of species but which belong to fewer, more closely

Samadera sp. Barong (B.Gray 742). An undescribed species endemic to the Wet Tropics.
Image © Andrew Ford.

related lineages. For example, a rainforest tree flora comprising a laurel (family Lauraceae), a mahogany (Meliaceae), a palm (Arecaceae) and a silky oak (Proteaceae) contains vastly more phylogenetic diversity than a woodland flora containing ten species of *Eucalyptus* (Myrtaceae) and ten species of grass (Poaceae). Assessments of phylogenetic diversity can be used as a measure of conservation significance, which is superior to simple measures of species diversity (numbers of species): the higher the phylogenetic diversity within a nominated area, the more evolutionary heritage it contains.[81,82]

Once the phylogeny of a lineage is known, it can be used to infer aspects of its evolutionary history, such as its age or how the geographical distribution of its members has changed through time. This window on the past allows a much deeper understanding of how past evolutionary forces (for example, environmental change, ecological opportunity) have shaped modern ecosystems, and helps us to predict their responses to current and future stresses.

The new understanding of phylogenetic diversity has revolutionised our understanding of the Outstanding Universal Value of the WHA flora. It has confirmed the property as home to the greatest diversity of ancient flowering plants in the world, and greatly enhances knowledge of the mixing of two continental floras.

All of the major living land plant lineages are found within the WHA: liverworts, true mosses, hornworts, lycophytes, ferns, gymnosperms (cycads and conifers) and angiosperms (flowering plants). But it is the flowering plants for which the WHA is best known - it has rightly been called a living floral museum. The major lineages that characterise the flora of the WHA, and its Outstanding Universal Value, are discussed in the following sections.

Phylogenetic analysis in the molecular genetic age

The science of phylogenetics has been transformed by the advent of molecular genetic techniques. DNA sequences generally provide much more decisive data than traditional anatomical and chemical characteristics and are now used routinely as a source of information for phylogenetic analysis. These analyses have revolutionised our understanding of the evolutionary tree of life, in some cases revealing unsuspected relationships and upending long standing classifications – for instance, the macadamia/banksia family, Proteaceae (Figure 12) is now understood to be most closely related to the lotus family (Nelumbonaceae) and the family of the widely planted temperate tree, the London plane (Platanaceae).[83] Platanaceae branched from this lineage 135 million years ago, and is considered a "basal lineage" in the Proteales phylogeny.

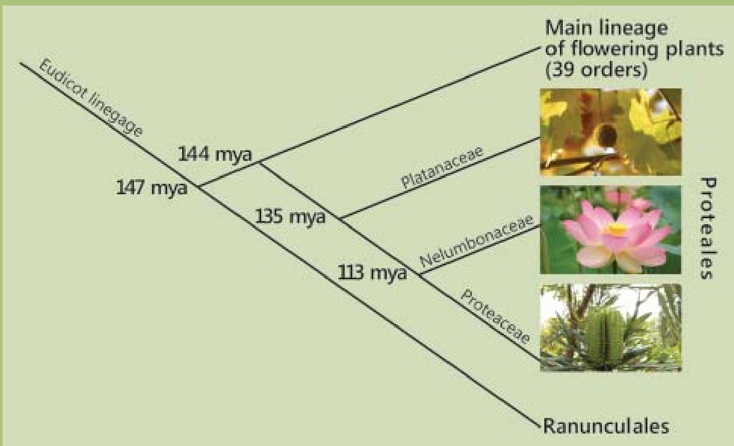


Figure 12: Proteales. *Platanus hispanica* 'Acerifolia', Platanaceae (London plane), *Nelumbo nucifera*, Nelumbonaceae (lotus lily) and *Banksia aquilonia*, Proteaceae (Northern banksia) belong to separate but closely related lineages, which diverged from their common ancestor about 144 million years ago.[84]

A re-evaluation of Queensland's Wet Tropics "primitive" plants

What is a "primitive plant"?

In the past much has been written about the "primitive" angiosperms of the Wet Tropics. Unfortunately the term "primitive" is often taken to mean two things: inferior, and ancestral. Neither of these meanings accurately describes the "primitive" angiosperms of the Wet Tropics for the following three reasons.

1. Far from being inferior, these plants are members of lineages that have been evolutionarily successful over tens of millions of years.
2. It may be more accurate to describe these plants as having some features (morphological, biochemical, genetic) which are primitive (in the sense of having first evolved very early in the evolutionary history of angiosperms) but also other features which are highly advanced.
3. A species cannot under normal circumstances be ancestral to another co-existing species. Rather, co-existing species share common ancestors which because of inheritance, they may resemble in many ways.

For these reasons, it is preferable to use the term "ancient" rather than "primitive" to refer to the evolutionarily distinct lineages for which the Wet Tropics is renowned. The term "ancient" has been adopted in this report, except where discussing the results of some previous studies.

Redefining the ancient angiosperms in the light of new science

The Rainforest Conservation Society of Queensland's (RSCQ) report considered the orders Magnoliales and Laurales to contain the most primitive families, and arrived at its total of 13 out of 19 families being present in the Wet Tropics.[85] Enormous advances in phylogenetics since 1986 have led to a need for a reappraisal of the primitive flora of the Wet Tropics rainforests in the context of other Australian rainforest areas, and selected tropical rainforest floras worldwide.[86]

A complete list of families regarded as "primitive" by previous and current authors is given in **Table 4.** Modern phylogenetic interpretation makes a case for the Wet Tropics as being even more evolutionary valuable than previously thought with 15 ancient angiosperm families represented.

Table 4: Orders and families of primitive angiosperms, showing the 19 families considered by the Rainforest Conservation Society of Queensland (RCSQ) and the missing families revealed by modern phylogenetic classification.[87] Families with representation in the rainforests (including species of non-rainforest communities) of the Wet Tropics Bioregion are in bold text, with the number of genera/species present in parentheses.

ORDER	1986 ANALYSIS RCSQ	CURRENT ANALYSIS
Amborellales	Amborellaceae	Amborellaceae
Nymphaeales		**Cabombaceae (1/1)**
		Nymphaeaceae (1/5)
Austrobaileyales	**Austrobaileyaceae**	**Austrobaileyaceae (1/1)**
		Schisandraceae
		Trimeniaceae
Chloranthales		Chloranthaceae
Magnoliales	**Myristicaceae**	**Myristicaceae (1/2)**
	Magnoliaceae	Magnoliaceae
	Degeneriaceae	Degeneriaceae
	Himantandraceae	**Himantandraceae (1/1)**
	Eupomatiaceae	**Eupomatiaceae (1/2)**
	Annonaceae	**Annonaceae (12/30)**
Laurales	**Atherospermataceae**	**Atherospermataceae (3/3)**
	Calycanthaceae + **Idiospermaceae**	**Calycanthaceae (1/1)**
	Gomortegaceae	Gomortegaceae
	Hernandiaceae + Gyrocarpaceae	**Hernandiaceae (1/2)**
	Lauraceae	**Lauraceae (8/86)**
	Monimiaceae	**Monimiaceae (8/23)**
		Siparunaceae
	Trimeniaceae	
Canellales	Canellaceae	Canellaceae
	Winteraceae	**Winteraceae (2/7)**
Piperales		**Aristolochiaceae (2/6)**
		Hydnoraceae
		Lactoridaceae
		Piperaceae (2/14)
		Saururaceae

In terms of representation of ancient lineages at genus and species levels, the Wet Tropics outranks all other rainforest areas in Australia. Except for the family Trimeniaceae, all groups present in any Australian rainforest are also found in the Wet Tropics.

In terms of representation of ancient lineages, the Wet Tropics compares favourably with New Caledonia and Costa Rica. Both these areas are regarded as having exceptional botanical richness, and have equivalent diversity of ancient lineages compared with the Wet Tropics, but both have lower species richness of these ancient lineages per unit area.

The role of refugia in the conservation of the Wet Tropics flora

The existence of climate refugia and their role in promoting the survival of ancient angiosperm lineages through historical climatic fluctuations has long been postulated.[88] Recent modelling work has provided much clearer definition of the location, extent and history of these postulated refugia or "areas of stability".

Upland rainforest refugia include Mt Finnigan, Thornton Peak and associated ranges, Mount Windsor Tableland, Mount Carbine Tableland (including Mt Lewis-Mt Spurgeon-Main Coast Range), Lamb Range, Herberton Range, Bellenden Ker Range (including Bellenden Ker-Bartle Frere), Cardwell Range, Kirrama Range and Paluma Range (**Figure 10a** and **Figure 10b**). Upland refugia are rich in ancient, bioregionally endemic and threatened flora with Lauraceae, Monimiaceae, Myrtaceae and Proteaceae being very prominent families.

Lowland refugia, defined as coastal areas within areas receiving over 2500mm rainfall per year, include Mossman-Cape Tribulation in the north and Deeral-Tully in the south. Both of these areas contain significant assemblages of ancient, threatened and bioregionally endemic species. Some lowland refugia may have functioned as such for very long periods of time. It has been argued that the richness of ancient rainforest angiosperm lineages in the Wet Tropics suggests that "the refugia now centred in the region are of great antiquity...when many primitive angiosperms originated".[89] However, there is no fossil evidence for the antiquity of the Wet Tropics rainforests *in situ* – instead we point to the existence of durable refugia to account for the survival of ancient angiosperm lineages.

Between lowland and upland refugia, are a series of rainforest communities described as "notophyll vine forests". The vast majority of these notophyll vine forests occur at mid-elevations and on the Atherton Tablelands. The area comprising the headwaters of the Russell, Johnstone and Mulgrave Rivers, harbours endemism levels similar to or greater than those of upland refugia. This area appears as a region of high irreplaceability, rich in ancient, endemic and threatened species (**Figure 8a** and **Figure 8b**). Notable localised endemics include: *Cryptocarya cercophylla* (Lauraceae), *Hexaspora pubescens* (Celastraceae), *Mammaea touriga* (Clusiaceae), *Stockwellia quadrifida* (Myrtaceae) and *Symplocos hylandii* (Symplocaceae). Of special significance is the endemic *Austrobaileya scandens*, also present on the Mt Carbine Tableland. This species of vine (**Figure 13**) is the sole living member of its family (Austrobaileyaceae), one of the most ancient lineages of flowering plants.

Figure 13: *Austrobaileya scandens*, the sole living member of an ancient family endemic to the Wet Tropics World Heritage Area. Image © Gary Wilson.

Other centres of endemism

There are also a number of non-rainforest areas which harbour an unusual array of endemic species and disjunct species. One such area is on the Herberton Range on the western margin of the bioregion where "altitude, climate and geology interact to produce considerably different localised vegetation types which in turn can foster evolutionary activity leading to speciation...". Here, locally endemic specices are usually associated with sheltered gullies or rock outcrops protected from frequent fires.[90]

There are several other higher altitude areas on the western edge of the bioregion and also similar areas on and near Hinchinbrook Island that are centres of endemism. On the mainland, these areas are extremely limited in extent but remain largely unprotected, and are subject to ongoing grazing, regular burning and development proposals.

State of the Wet Tropics flora

Summary

- The threatened, ancient and endemic flora of the Wet Tropics World Heritage Area is protected under Commonwealth and State law, but is still subject to a number of global stresses and pressures.
- Climate change is a significant threat to many species, especially cool-adapted mountaintop endemics that may be displaced by warming. Modelling predicts significant or complete loss of habitat for many of these species. Climate change may also result in increased frequency and duration of droughts and forest fires, affecting swamp-forest communities and the forests abutting fire-prone woodlands.
- Plant theft is a concern for populations of some charismatic protected flora species. Despite laws to protect these plants, prosecutions are few.
- The impacts of plant diseases are poorly known. Myrtle rust is an emerging threat to one of the most species rich and ecologically important families in the bioregion, with little or nothing known about its impacts on most species. *Phytophthora cinnamomi* is associated with patch death in upland rainforests, and may become more significant as environmental change places further stress on plants.
- Weeds continue to have substantial impacts on the natural values of the WHA. Weeds, such as miconia and harungana, are particularly concerning as they rapidly colonise cyclone-disturbed forest, and displace native species. Long term control programs are in place, but funding is not secure. Invasive tramp ants, if allowed to establish, are likely to fundamentally change the ecology of infested areas. Other feral animals, especially pigs, pose a significant threat to wetland habitats and to particular species, such as wild native bananas.
- Assessment of genetic diversity in populations of ancient, threatened and endemic species underpins effective conservation and recovery actions.
- Ongoing monitoring at established sites tracks long term responses to environmental pressures in natural systems, and informs management decisions.
- At a broad scale, the Queensland Government's Regional Ecosystem mapping, complemented by the Authority's vegetation and geology mapping of the bioregion is the basis for a wide variety of planning and research applications.
- The importance to society of the ancient, threatened and endemic species of the WHA include a wide range of ecological goods and services of cultural and economic importance. Plants remain a source of food and fibre for rainforest Aboriginal people. Significant economic value is derived from the horticultural industry and nursery trade, biodiscovery of novel compounds, or as features of interest for the tourism industry. However, the greatest values of the WHA's flora are intangible - the awe inspired in those fortunate enough to experience and appreciate one of the greatest natural wonders on Earth.

Pressures affecting the flora of the Wet Tropics

The flora of the Wet Tropics World Heritage Area is protected under Commonwealth and Queensland law. These laws offer both specific protection (as in the case of listed threatened species and ecological communities) and broad protection, such as that offered to all flora and fauna within the boundaries of the WHA. In many cases, isolation and inaccessibility offers further protection.

Despite these legislated protections, a number of threats to ancient, endemic, or threatened plants still exist. Some of these threats, such as plant poaching may be manageable through appropriate policy and enforcement measures, others like myrtle rust and climate change are more difficult. In the following section, some of the more significant pressures affecting the ancient, endemic and threatened flora of the Wet Tropics World Heritage Area are discussed.

Climate change

Loss of habitat due to climate change caused by anthropogenic emissions of greenhouse gases is a Key Threatening Process under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The potential impacts within the Wet Tropics World Heritage Area are significant, and were considered at length in the 2008 State of the Wet Tropics Report.[91]

Impacts are likely to be felt across the WHA, but species restricted to upland ecosystems are expected to be the most vulnerable.[92] By 2070 under a high emissions scenario (that is, >4°C change) the climates that currently characterise some upland environments may disappear entirely, leading to substantial loss of biodiversity. Recent modelling of habitat suitability for 19 Wet Tropics endemic plants entirely restricted to mountaintops, have made predictions of a decline in suitable habitat for each of the 19 species by a minimum of 63% and up to 100% by 2040.[93] Of these 19 species, eight species are listed as threatened under Queensland legislation, and three represent ancient lineages. The potential resilience of these species to climate change cannot be determined due to the lack of detailed knowledge of their distributions, life history characteristics, physiology, ecological tolerances and relative competitive abilities. Lowland species could potentially migrate with the projected southward shift in tropical and subtropical environments, but their capacity to respond in this way will be severely constrained by the lack of migration corridors as a result of fragmentation of habitat due to land clearing.[94]

Climate change also has the potential to interact with, and exacerbate, other causes of environmental degradation, for instance:

- **Cyclones**. Modelling predicts an increase in the intensity, if not the frequency, of tropical cyclones and their attendant wind damage, storm surges and flooding. Wet Tropics communities have evolved with cyclones, but more frequent devastating storms, combined with weed pressure, patterns of land clearance, fire and pests and diseases may lead to dramatic shifts in vegetation structure and species composition.[95]
- **Fire**. Evidence suggests that climate change is causing, and will continue to cause, increases in the severity and duration of fire-weather.[96]
- **Declining water inputs on uplands**. The predicted increase in cloud height[97] may reduce water inputs to ecosystems from cloud stripping, impacting on moisture dependent upland vegetation communities and reducing dry-season stream flows.

- **Plants become more toxic and less nutritious**. Many plants respond to increased atmospheric carbon dioxide levels with a decrease in their concentration of overall plant nitrogen, and an increase in poisonous protective chemicals. If widespread, this may affect plant-animal interactions and have consequences for species competition.[98]

For some cool-adapted, moisture-dependent upland endemic species, *in situ* conservation may be impossible. *Ex situ* conservation, potentially involving long distance translocations to more southerly locations is an expensive and controversial alternative, requiring consideration not just of the translocated species, but the impacts on species and the ecology in the receiving environments. Careful prioritisation of actions, collection of baseline data, community engagement and ongoing monitoring programs are vital to avoid wasting resources, or failing to act in cases where active management is necessary.

Human pressures

Plant theft is a significant concern for populations of some plants in the Wet Tropics. There are three groups that appear to be especially targeted by plant thieves - orchids, ferns and tassel ferns.

Unfortunately, data on the impacts of plant theft on threatened species are lacking. The endangered *Phalaenopsis amabilis* (moth orchid), vulnerable *Dendrobium bigibbum s.l.* (Cooktown orchid), and endangered *Dendrobium nindii* (blue orchid) are all identified by expert opinion as threatened by illegal collecting[99-101], as is the endangered *Phlegmariurus dalhousieanus* (blue tassel fern).

Despite the existence of laws to protect threatened flora, prosecutions under the Queensland *Nature Conservation Act 1992* (NCA) and its subsidiary regulations have been few, and none have been recorded for offences within the Wet Tropics region.

Disease threats

A major loss of biodiversity may occur when a new disease is introduced, resulting in catastrophic depopulation. Where virulent outbreaks occur, the anticipated consequences include:

- major disruptions to ecological community structure
- local extinctions of populations of some plant species
- a massive reduction in primary productivity
- less productive, more open, less diverse habitat for wildlife

Myrtle rust

Myrtle rust was identified as a threat to the Wet Tropics diverse and ecologically important Myrtaceae at a very early stage in its spread in Australia. However, awareness of myrtle rust as a threat to Australia's ecosystems predates its April 2010 appearance on the continent by more than 30 years.[102] The disease attacks the new growth, flowers and fruits of members of the myrtle family (**Figure 14**). The Myrtaceae is an important and diverse group within the WHA:

- the fleshy fruited species are an important food resource for many animals
- they are prominent, in some cases ecologically dominant, in many Wet Tropics ecosystems
- the region is home to numerous endemic species, several of which are classed as threatened or near threatened under Commonwealth and State legislation.

The myrtle rust fungus, *Puccinia psidii* s.l.[103] is unusual amongst the rusts in having an extraordinarily wide host range.[104,105] Repeated damage to flushes of new growth over several growing periods may kill seedlings, saplings and trees, or greatly reduce seed yield. The potential consequences of this disease for the flora of the Wet Tropics are substantial. It is likely to have significant impacts on a very large number of species, including many threatened and geographically restricted species.[106] Within the WHA, myrtle rust has spread rapidly and widely since first detected in May 2012.[107] About 73 Wet Tropics' Myrtaceae species have been reported with myrtle rust infections, including endemics such as *Ristantia pachysperma, Syzygium boonjee and Stockwellia quadrifida*. Twenty four threatened Myrtaceae species occur in the Wet Tropics, many of them endemic. The susceptibility of these species to myrtle rust is little known, making the impacts of the disease in the Wet Tropics difficult to predict.

The spores of the fungus can be spread by movement of infected plant material, wind, water, animals and people. It seems that little can be done to halt the spread of the fungus - it has been observed in remote, rarely visited areas throughout the WHA.[107]

Although limiting disease spread and management of infections are likely to be impractical across the WHA, other management options include:

Figure 14: Myrtle rust affecting new growth on *Eugenia reinwardtiana*, a Wet Tropics endemic. Image © Dan Metcalfe.

- identifying accessible high conservation priority populations that can be treated with fungicide. This is a high cost option, and most of the chemical treatments available have side effects, particularly if used in the long term.
- monitoring the impacts on populations and/or Myrtaceae-dominated ecosystems across a broader geographic range.

A future nomination and listing of myrtle rust infection as a Key Threatening Process under the EPBC Act seems appropriate.

Phytophthora

Forest dieback caused by *Phytophthora cinnamomi* has had a devastating effect on forests, heathlands and woodlands across the wetter areas of Australia.[108] This disease-causing fungus-like organism is believed to have been introduced during European settlement and now affects hundreds of thousands of hectares of native vegetation, impacting significantly on biodiversity values and threatening the survival of some species.

Widespread, small patches of rainforest dieback associated with outbreaks of *Phytophthora cinnamomi* were first recorded in the Wet Tropics during the 1970s.[109] More recent outbreaks were found in the late 1990s and continue to the present day. The trigger of these outbreaks is presently unknown. Soil surveys undertaken between 1975 and 1981 identified several species of *Phytophthora*, however

Figure 15: Patch death such as that seen here near Mt Bartle Frere's western peak typically affects upland forests on low fertility soils derived from granite or rhyolite. Image © S.J. Worboys.

most isolates were of *P. cinnamomi*.[110] It was also found that *P. cinnamomi* while widespread was not ubiquitous in the Wet Tropics.[111] *P. cinnamomi* was more frequently isolated from dieback-affected forests, logged forests and areas disturbed by pigs. Despite the clear and severe impacts of patch death on upland rainforests (**Figure 15**), there is evidence that affected forest patches can recover[112] although the impacts on forest health and species composition at a landscape scale are still unknown.[113]

In recognition of the threat it poses to biodiversity at a national level, *P. cinnamomi* has been identified as a Key Threatening Process under the EPBC Act. A national Threat Abatement Plan[114] has been developed to prioritise actions for its control. The Threat Abatement Plan identifies three key objectives:

Objective 1- Identify and prioritise for protection biodiversity assets that are, or may be, impacted by *Phytophthora cinnamomi*

Objective 2 - Protect priority biodiversity assets through reducing the spread and mitigating the impacts of *Phytophthora cinnamomi*

Objective 3 - Communication and training.

Within the WHA, the first of these objectives has been addressed. State and Commonwealth-listed threatened species and communities likely to be impacted by *P. cinnamomi* have been prioritised, and easy-to-implement hygiene measures have been recommended for works in remote areas of the WHA. As with any consistently enforced hygiene actions, they will have the added benefit of limiting weed spread. Although some communication and training has been carried out, the effectiveness of these hygiene protocols has not been assessed.

Invasive species

Weeds

An environmentally invasive weed species is one that has been introduced, by deliberate or accidental human action, into an area in which it did not previously occur and is capable of establishing self-sustaining populations by invading native communities or ecosystems, and is capable of causing modifications to native species richness, abundance or ecosystem function. Consistent with this definition, environmentally invasive pest species can be distinguished by the following five criteria, they are:

- alien (non-native or exotic) species
- introduced intentionally or accidentally by humans to areas where they never previously occurred
- naturalised in this new area, whereby they are capable of creating self-sustaining populations
- expanding their distribution and/or increasing their abundance
- occurring in natural and semi-natural habitats, rather than disturbed landscapes.[115]

Invasion by weeds constitutes a serious threat to the integrity of rainforests.[116] Few weed species have shown themselves to be capable of invading and transforming intact rainforest, but a large number of species are capable of responding to disturbance events, either natural or artificial.[117]

Invasive plant species threaten the Outstanding Universal Value of the World Heritage Area[118]

Nearly 9% of the species in the Wet Tropics rainforests are weeds, but most of those are species which are transient – they thrive in recent disturbances such as road cuttings or tree-fall gaps, and then disappear again. However, a small but potentially very significant minority – just a dozen or so species – have the ability to drastically change the landscape if they get established. Some, like miconia, the "purple plague" get established after natural disturbances like cyclones, but persist as the canopy closes again, slowly growing and producing seeds.

At the next major cyclone disturbance they are ready to germinate in far greater numbers, dominating areas and excluding all native species, as they have done in areas of Hawai'i. Others, such as *Chromolaena odorata* (Siam weed) have extremely fast growth rates and the capacity to scramble over existing vegetation, displacing native vegetation and increasing the fire hazard. Most of these potential "ecosystem engineers" are closely managed, but we need to maintain vigilance against new outbreaks and new species, and maintain funding to ensure that eradication or containment is achieved early while still practically and economically feasible.

The threats posed by weeds to the endemic, threatened and ancient plants of the WHA are varied. For instance, invasive plants can create novel habitats or alter ecosystem processes (for example, exotic grasses can change fire regimes, or a reduction in natural food availability may cause losses of pollinators and seed dispersers). In cyclone-impacted forests around Innisfail (already noted for their importance as lowland refugia), forest disturbance has allowed the rainforest invasion and spread of several aggressive weeds, including *Miconia calvescens* (miconia), *Mikania micrantha* (mile-a-minute vine), *Cecropia* spp. (Mexican bean tree) and *Harungana madagascariensis* (harungana).

The work of the Australian Weeds Committee (www.weeds.org.au) provides an inter-governmental mechanism for identification and resolution of weed issues at a national level. Priorities identified at a national level then inform state level management responses. In Queensland, the *Land Protection (Pest and Stock Route Management) Act 2002* prioritises weeds for management action, and requires local governments to draw up Pest Management Plans (PMP) for their Local Government Area. PMPs exist for all local government areas covered by the WHA; in addition the Wet Tropics Management Plan contains a list of undesirable plants which must not be cultivated within the WHA. Finally, an extensive literature exists on the prioritisation and management of invasive plants that affect Wet Tropics environments.[119-124]

On-ground implementation of weed control is funded by national, state and local authorities. Much weed control is undertaken by local councils and land managers such as Queensland Parks and Wildlife Service, Powerlink, private landholders and Queensland Rail.

Within the Wet Tropics, some of the toughest work of weed control is undertaken by staff of the National Four Tropical Weed Eradication Program. The program involves collaboration between Biosecurity Queensland, seven local governments, National Parks, Queensland Department of Natural Resources and Mines, CSIRO and landholders. Eighteen full-time equivalent staff are currently engaged, focussing on eradication of species deemed to be a threat at a national level: three miconia species, *Clidemia hirta* (Koster's curse), the aquatic weed *Limnocharis flava* (limnocharis) and *Mikania micrantha* (mile-a-minute vine).[125]

Invasive ants

Ants are among the worst invasive species in the world - and the worst invasive ants are tramp ants. The yellow crazy ant (*Anoplolepis gracilipes*) is a tramp ant and is regarded as one of the world's 100 worst invasive species. The pest ant has spread extensively since it was first discovered in Cairns in 2001.[126] Despite Biosecurity Queensland's ongoing treatment and surveillance activities, the known infested areas have increased to over 600ha since 2007.[127]

Yellow crazy ants can form densely populated super-colonies with more than one queen. These super-colonies can have a huge impact on both native plants and animals. On Christmas Island, where large super-colonies have become established, the ants have radically changed ecosystems, severely impacting the land crabs that are the island's primary herbivores, and encouraging the proliferation of sap-sucking insects. Although the impacts of Christmas Island infestations are relatively well researched, the applicability of this research to the large complex forests of the Wet Tropics is limited, with direct and unanticipated impacts likely. The impacts of yellow crazy ants on the threatened and ancient plants which are an integral part of these ecosystems are also unknown and further monitoring and research is needed.

There are currently two infestations of yellow crazy ants - one inside the WHA, the other immediately adjacent. Control is currently achieved through a five year, $1,950,000 Commonwealth grant managed through the Wet Tropics Management Authority, with James Cook University, Conservation Volunteers and Biosecurity Queensland as partners. The majority of this funding goes to helicopter baiting of forested areas and manual baiting within the adjoining affected urban areas.

Synergies and interactions

In the preceding sections, pressures which impact on populations of threatened, endemic and ancient species within the WHA have been identified and discussed as isolated threats. Interactions between multiple pressures, however, are of special concern in ecology due to their potential for unpredictable synergistic effects and long lasting legacies on landscape structure and function.[128-130]

Changes in climate, patterns of clearing and associated land uses and encroachment into natural habitats by community infrastructure such as roads, electricity distribution networks and communications facilities and their interactions are altering the local profile of biodiversity risks and threats in the Wet Tropics.

Recent monitoring and research projects in the Wet Tropics have highlighted the fact that climate changes will have severe and interacting effects on the Outstanding Universal Value of the WHA. Changed interactions will not only occur between organisms, such as insect pollination and animal seed dispersal but also parasite and disease relationships are likely to be disrupted creating consequent major changes in ecosystem composition, structure and function. Disruption of ecosystems and changed climatic conditions will make the WHA more vulnerable to weed and pest invasion. Weed species that are not able to invade native ecosystems at present may gain a competitive advantage under the warmer drier conditions that are expected. The risk of new vertebrate and insect pests and plant and animal diseases is also likely to increase. For example, climate change may affect invasive pests through:

- increased disturbance due to extreme weather events (cyclones, droughts)
- potential range shifts (movement towards higher elevations)
- higher temperatures
- changes in rainfall timing, frequency and levels (including humidity and evapotranspiration)
- reduced stream and river flows (exposing well-watered riparian areas)
- changes in coastal and estuarine habitat due to rising sea levels
- increased carbon dioxide fertilisation (and resultant increases in weed growth)
- changes to species interactions (between plants and pollinators, weed vectors, etc).

Potential exists for the action of multiple threats to amplify extinction risk for susceptible organisms. Many of the Wet Tropics endemic and ancient species have extremely restricted distributions. Such species may be particularly susceptible to threats acting in synergy. Climate change alone may be a major threat[131], with extinction risks increased through the action of other threats acting singly or in combination.[132]

Monitoring the integrity of ancient plants as an attribute of Outstanding Universal Value

Monitoring and reporting of the condition of World Heritage should reflect an Area's outstanding universal value. Case study examples demonstrating how they can be used to monitor the integrity of ancient plants as part of the Area's Outstanding Universal Value are outlined below.
The case of *Idiospermum australiense* illustrates the value of a population level focus in conservation assessments; the plot-based forest dynamics data collected by CSIRO and collaborators over several decades enables researchers to monitor changes to rainforest community composition and structure, and the Queensland Government's Regional Ecosystem mapping program enables landscape scale monitoring of habitat changes through time.

Idiospermum - effective conservation requires protecting genetically distinct populations

Genetic diversity is recognised as one of the three main levels of biodiversity. Genetic diversity refers to the variety of genes within a species. Each species is made up of individuals that have their own particular genetic composition. Within a species there may also be discrete populations with distinctive genes. To conserve the genetic diversity within a species, different populations must be conserved. This protects the genetic diversity that allows for adaptability to environmental changes and is therefore vital to species survival. Because genetic diversity provides the basis for adaptive evolution and promotes resilience to disease and environmental change, it is critical to conservation and species recovery actions to know which populations harbour unique genetic diversity.

Idiospermum australiense is a Wet Tropics endemic tree species, restricted to very wet lowland rainforests[133] and is emblematic of the Outstanding Universal Value of the WHA. It belongs to an ancient lineage, and is restricted to tiny patches of rainforest more than 5000km from its nearest relatives in southern China. The species is known from a small number of populations which in total cover about 23km^2. These populations are found on the southern slopes of Mt Bartle Frere, on the eastern slopes of Mt Bellenden Ker (southern populations), and in the lower catchments of Hutchinson Creek, Cooper Creek and Noah/Oliver Creek near Cape Tribulation (northern populations). The enormous, toxic, starchy seeds of this species rely solely on gravity for dispersal, a feature which may have restricted its ability to expand from its existing refugial distribution[134], compounded by the poor flight capabilities of its pollinators. There is significant variation between all studied populations, suggesting long periods of isolation and limited dispersal or inter-population cross breeding.[135]

Therefore, conservation of all populations of *Idiospermum australiense* not only conserves an ancient species, but preserves an as yet poorly understood record of population isolation and genetic divergence.

Our understanding of the Wet Tropics flora is improving

To study, understand and manage the Wet Tropics flora, precise knowledge of species and their names is essential.[136-139] In the Wet Tropics scientists have identified a number of new species that have not yet been scientifically described and many others surely await discovery. When the first version of CSIRO's computer-based rainforest key was published in 1993, roughly 8% of the rainforest tree species of northern Australia listed were not formally named. In the 2010 edition, the proportion of unnamed tree species is 4.7%, reflecting ongoing studies in the taxonomy of the rainforest flora.[140]

The identification and description of a new species entails detailed study of its physical characteristics, ecology and in some cases genetics. This requires expert knowledge and access to comprehensive and well curated herbaria - research collections of preserved plant specimens.

To the west and south of the Bellenden Ker Range lies a hotspot of poorly known, undescribed species. This hotspot, mapped as highly irreplaceable (**Figure 8a and 8b**) is home to several threatened, ancient and endemic species, including *Argyrodendron* sp. Boonjie (B.Hyland 2139RFK) – a tall rainforest tree, *Callerya* sp. Beatrice River (L.S.Smith 10487) – a vigorous vine and *Erythroxylum* sp. Brewer Logging Area (B.Hyland 13373) – a small tree related to coca. Research on the taxonomy of these and other species is ongoing.

CSIRO research plots - long term monitoring of ancient plants in situ

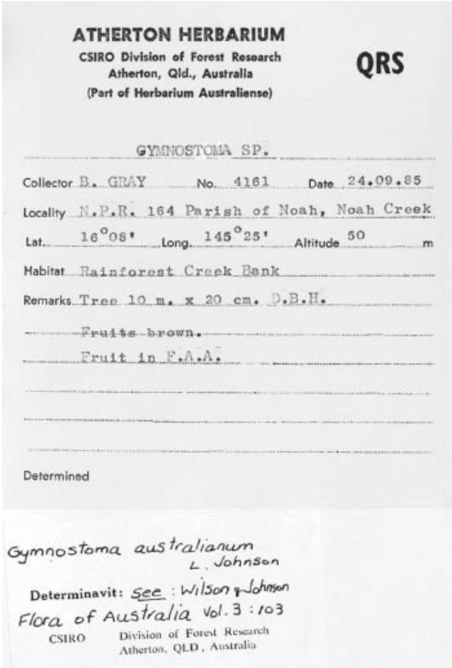
Dotted across the Wet Tropics is a network of CSIRO Permanent Plots. These long term forest monitoring sites were established between 1971 and 1980 to record and analyse patterns of tree growth and stand dynamics in a broad range of permanently reserved plots in rainforest and associated forest types of north Queensland.[141] Despite recent theoretical and technological advances in biology, the use of such permanent plots remains the most practicable way of observing and predicting the directions and rates of changes in natural systems, whether derived from gradual or catastrophic changes. The value of these plots (**Figure 16**) is widely recognised, with another recently established at the Daintree Rainforest Observatory, and the Robson Creek 25ha "supersite".[142,143]

The research work at these plots includes:

- detailed flora species lists
- growth increments for all trees greater than 10cm diameter
- climate data
- detailed geological and soil descriptions
- soil carbon content (including ancient *Eucalyptus* charcoal)[144]
- gas exchange between forest and the atmosphere.

The floristic data from these plots, collected over time, provides a detailed picture of species ecology, recruitment, growth rates and mortality rates for a variety of forest types across the Wet Tropics. The lessons apply equally to all species, but will be of particular relevance for threatened, endemic and ancient tree species. The role of changing climate in these processes will be of increasing interest in years to come.

Figure 16: Agapetes Scientific Area – numbering and re-measuring a kauri in an experimental plot on the Windsor Tablelands. The painted band around the trunk marks the point at which the tree diameter is measured. Image © Dan Metcalfe.



ATHERTON HERBARIUM
CSIRO Division of Forest Research
Atherton, Qld., Australia
(Part of Herbarium Australiense)

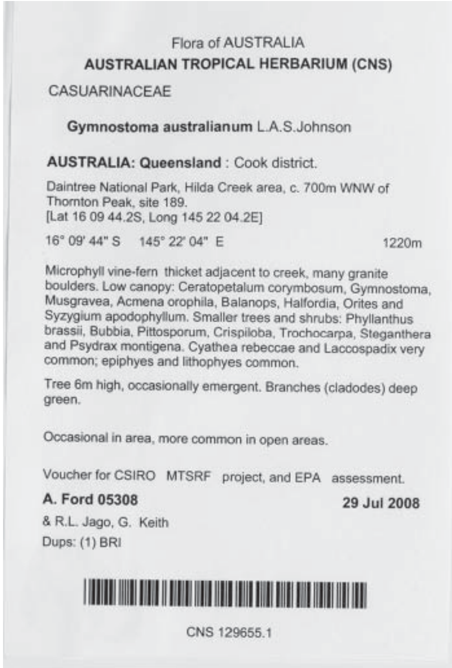
QRS

GYMNOSTOMA SP.

Collector B. GRAY No. 4161 Date 24.09.85
Locality N.P.R. 164 Parish of Noah, Noah Creek
Lat. 16°08' Long. 145°25' Altitude 50 m
Habitat Rainforest Creek Bank
Remarks Tree 10 m. x 20 cm. D.B.H.
~~Fruits brown.~~
Fruit in F.A.A.

Determined

Gymnostoma australianum L. Johnson
Determinavit: See: Wilson & Johnson Flora of Australia Vol. 3 : 103
CSIRO Division of Forest Research Atherton, QLD, Australia



Flora of AUSTRALIA
AUSTRALIAN TROPICAL HERBARIUM (CNS)
CASUARINACEAE

Gymnostoma australianum L.A.S.Johnson

AUSTRALIA: Queensland : Cook district.
Daintree National Park, Hilda Creek area, c. 700m WNW of Thornton Peak, site 189.
[Lat 16 09 44.2S, Long 145 22 04.2E]
16° 09' 44" S 145° 22' 04" E 1220m

Microphyll vine-fern thicket adjacent to creek, many granite boulders. Low canopy: Ceratopetalum corymbosum, Gymnostoma, Musgravea, Acmena orophila, Balanops, Halfordia, Orites and Syzygium apodophyllum. Smaller trees and shrubs: Phyllanthus brassii, Bubbia, Pittosporum, Crispiloba, Trochocarpa, Steganthera and Psydrax montigena. Cyathea rebeccae and Laccospadix very common; epiphyes and lithophyes common.

Tree 6m high, occasionally emergent. Branches (cladodes) deep green.

Occasional in area, more common in open areas.

Voucher for CSIRO MTSRF project, and EPA assessment.
A. Ford 05308 **29 Jul 2008**
& R.L. Jago, G. Keith
Dups: (1) BRI

CNS 129655.1

Figure 17: Label information presented with two different herbarium specimens of a Wet Tropics endemic, *Gymnostoma australianum*. The precision and detail of information in the more recent specimen (right) allows for detailed assessments of habitat preferences and conservation planning.

Regional ecosystem mapping - informing the conservation of habitat

Within the WHA, landscape scale monitoring of threatened species habitat is achieved through the Queensland Government's Regional Ecosystem mapping program, which is complemented in the Wet Tropics by the Authority's more detailed vegetation mapping of the Wet Tropics bioregion.[145] The extent of remnant vegetation within the Wet Tropics, and across Queensland is monitored by a comparison of the estimated extent of vegetation before clearing associated with European settlement and actual current vegetation extent.[146] This process is generally undertaken every two years.[147]

Vegetation communities, or regional ecosystems (RE), are described and mapped in terms of their underlying geology (land zone), landform and dominant species composition. The methodology for describing rainforest vegetation is different to that applied to grasslands and woodlands, with rainforest structural features generally more significant in describing an RE than species composition. But the result is the same – a detailed RE map that can be used in a wide variety of planning and research applications.

The application of Regional Ecosystem mapping information to habitat conservation for ancient and threatened species depends on an additional layer of knowledge – specimen information that is supplied with herbarium collections. Often on older specimens, this information is sparse or lacking, but specimens collected in the last 25 years usually provide detailed habitat description information and precise geographic locations (**Figure 17**). This information, in conjunction with high quality vegetation/ecosystem mapping can be used to piece together a picture of the preferred habitats for a species, allowing detailed planning for their conservation and management.[148,149]

What price the intangible? Value of the Wet Tropics flora

Traditional cultural value

Before European settlement, the Wet Tropics rainforests were one of the most populated areas of Australia, and the only area where Australian Aboriginal people lived permanently in rainforest. The Area's rainforests provided Rainforest Aboriginal people with spirituality, identity, social order, shelter, food and medicine. Aboriginal people also utilised an economic system that involved the bartering of rainforest resources amongst different tribal groups.[150]

Rainforest plants provide food, fibre, medicine and shelter, and there are abundant records of the use (both historical and current) of the region's rare, ancient and endemic plants including:

- processed seeds of *Beilschmiedia bancroftii* (yellow walnut) and *Endiandra palmerstonii* (black walnut) were staple food items[151,152]
- seeds of *Cycas media*, (cycads) and *Sundacarpus amarus* (black pine) were used as food after processing[153]
- the soft timber of *Cryptocarya murrayi* (Murray's walnut) and *Wilkiea (Tetrasynandra) pubescens* was used as a base for fire making.[154]

Research and knowledge recording of traditional uses of plants is being undertaken by the Tropical Indigenous Ethnobotany Centre (www.ath.org.au/JCU_077417.html). The TIEC is Indigenous led, and supports Traditional Owners' aspirations for keeping cultural plant use and knowledge alive through information sharing, practice and collaboration.

Economic and Social Value

Determining the economic and social value of ancient, endemic and threatened plants is difficult. Direct monetary contributions would appear to be few, and might include:

- **Nursery trade**. Some species, propagated from material collected under permit from within the WHA; have become popular in the nursery trade. Rare, endemic species such as *Gymnostoma australian* (Daintree pine), *Xanthostemon verticillatus* (Bloomfield penda) and *Toechima pterocarpum* (orange tamarind) have all become popular in cultivation in recent years.
- **Genetic resources**.Tropical rainforests are a valuable resource for the known and potential value of their component species, and represent a genetic reservoir of great diversity. This includes seed provision for forestry outside of the WHA, and as sources of novel pharmaceutical products and other products.

Perhaps the greatest contribution of the Wet Tropics flora to the economic and social life of the region comes indirectly. The rare, ancient and endemic flora that contribute to the outstanding universal values of the WHA give it a unique identity that provides a basis for a thriving ecotourism industry, the major economic input to the regional economy. Examples are:

- Kauris (*Agathis robusta*) that can be seen from the Skyrail cableway
- The twin bull kauris (*Agathis microstachys*) at Lake Barrine
- Idiot fruit (*Idiospermum australiense*), an iconic ancient angiosperm that can be seen from the Marrdja Boardwalk in the Daintree
- Curtain Fig (*Ficus virens*) on the Atherton Tablelands
- Fan palm forest (*Licnala ramsay*).

Discovering, understanding, communicating and protecting the full magnitude of the outstanding universal value of the region requires input from scientists, planners and skilled on-ground workers. The majority of these workers live within the Wet Tropics bioregion, contributing directly to the economy through their day-to-day exchanges, and indirectly through knowledge sharing with the wider community.

The value of the WHA flora must be seen in more than a simple utilitarian, economic sense. Its greatest contribution lies not in the short-term monetary value that can be extracted from it, but in its very existence.[155] The Outstanding Universal Value of the Wet Tropics World Heritage Area cannot be bought or sold -it however needs to be managed to ensure the value is passed on to future generations. Within the Wet Tropics flora we see orchids of great beauty, grand old bull kauris of awe-inspiring age and stature, and fascinating oddities like the rarely seen myco – heterotroph *Corsia dispar*. The World Heritage protects a greater diversity of ancient angiosperm lineages and a greater representation of the diversity of the Myrtaceae and Proteaceae families than can be found in any comparably sized region in the world. The forests, considered not only as an assemblage of plant species but as an ecosystem, have a value and a right to existence independent of humans, which we have a duty to respect.

Outlook

Trends

A large proportion of the plant species identified in the listing of the Wet Tropics World Heritage Area as contributing to its Outstanding Universal Value have one or more of a range of characteristics. They are:

- restricted to environmentally stable refugial areas and/or high-altitude environments
- have small and/or isolated or bounded distributions
- have small restricted ranges
- have poor dispersal capabilities
- are considered to possess habitat specialisation
- show close, co-evolved, or synchronous relationships with other species
- are at the limits of their latitudinal or altitudinal range.

The condition and integrity of the ancient, endemic and threatened flora can be assessed by long term monitoring programs designed to detect changes in distribution, abundance, health or age structure of individuals, populations, and the communities in which they occur. These parameters are best quantified by maintaining a network of monitoring sites throughout the Wet Tropics, a key recommendation of this report.

Cyclones have the ability to shape and transform vegetation structure and function. On average a weak tropical cyclone will cross the coast between Cooktown and Ingham every five years, and a powerful cyclone every fifty or more years.[156] There have recently been two such powerful cyclones (Tropical Cyclone Larry in 2006 and Tropical Cyclone Yasi in 2011), each making landfall in the Innisfail-Tully area and causing substantial structural damage to forests. These episodes can offer considerable advantages to woody weed species. The threat is so much so that, "some [weed] species may have longer-term effects on the successional trajectory of the rainforest and future forest composition and structure".[157] Therefore, some woody weed species such as *Chromolaena odorata* (Siam weed), *Harungana madagascariensis, Lantana camara* (lantana), *Miconia spp.* and *Rubus alceifolius* (giant bramble) represent a serious threat to the integrity and condition of lowland rainforest communities and their various ancient, endemic and threatened species.

Threats are not equal in all places. For example, fire is much more important for sclerophyllous species in the Atherton-Herberton-Ravenshoe area than the Wallaman Falls-Mt Fox area, even though habitats and conditions are similar. Woody weeds invading cyclone impacted rainforest is a concern in the Cairns-Cardwell area but less so in more seasonally dry coastal areas north of Cape Tribulation and south of Ingham. These seasonally drier areas harbour fewer endemics, ancients and threatened species than the well-known coastal high rainfall areas.

Perhaps the greatest threat to habitat stability in the Wet Tropics is climate change – the outlook for some species is dire. How we manage the changes wrought by global climate change will affect the survival of many of the ancient, endemic and threatened flora species of the Wet Tropics World Heritage Area.

Managing for ecological resilience

Ecological resilience can be defined as the capacity of an ecosystem to tolerate or recover from disturbance without collapsing. A resilient ecosystem can withstand shocks and rebuild itself when necessary. For ecosystems to persist in the long-term, successful recovery after disturbance is fundamental. Natural systems are characterised by environmental thresholds that, if crossed, may lead to large-scale and relatively abrupt shifts in state, including changes in ecosystem processes and structure. Once a threshold is crossed and a shift in state or a key process occurs, it may be difficult, or even impossible, to reverse the shift. A major benefit of managing natural systems for overall resilience is that it provides the best general insurance against current and emerging threats. It is inevitable that currently unrecognised threats will emerge within the region, so the best long-term management strategy is to aim for a system with the resilience to recover from as wide a range of anticipated challenges as possible. Factors contributing to ecological resilience include:

- **Biological diversity**. Ecological systems with high biological diversity (or phylogenetic diversity) will generally have greater inherent resilience, largely because they will have more diverse responses and capacities available to them, which can provide the basis for adaptation. Diversity of habitats also increases the likelihood of some habitats being more resilient to impacts from particular stresses or disturbances.
- **Connectivity**. Connectivity refers to the extent of the connections between populations. The capacity of natural systems to recover after a disturbance, or to reorganise in the face of new or intensified pressures, depends to a large extent on the ability of plant and animal populations, genes and ecological processes to disperse or move across the landscape.
- **Refugia**. Refugia are stable areas within the landscape where ecosystems are buffered from pressures or disturbances that would otherwise result in reduced resilience elsewhere. Refugia serve as secure source areas which are important for the replenishment of disturbed populations and serve as stepping stones for maintaining population connectivity across larger scales. Important features of refugia include adequate extent to provide sufficient source populations and inclusion of a diverse and comprehensive sample of many different habitat types.

Conserving or creating greater landscape connectivity between areas rich in biodiversity, in conjunction with refugia, provides greater opportunities for species and ecological processes to recover, re-establish and relocate or to adapt and evolve. The following sections outline a range of practical steps that the region can take to help achieve a more resilient natural environment.

Management actions

Effective action can be taken now to build resilience in the Wet Tropics landscape to the threat posed to the Area's OUV by climate change, invasive weeds, pests, diseases and habitat fragmentation. The actions needed to combat these threats include:

1. programs of ecological monitoring and targeted research
2. on-ground works to improve forest health
3. increasing community awareness and mobilising behavioural change
4. improving and communicating our knowledge of the natural values for which the Wet Tropics was listed as a World Heritage site and the threats to those values
5. improving regional planning and coordination.

Programs of ecological monitoring and targeted research

Monitoring is critical, given environmental changes and their impacts on the region's flora entail so many uncertainties. Monitoring is necessary to detect population changes and species declines or increases. Monitoring should focus on species at special risk, but be flexible enough to detect other changes.

The extensive network of climate change/ forest dynamics monitoring plots which have been established in the Wet Tropics by James Cook University and CSIRO researchers, with recent funding from the Terrestrial Ecosystem Research Network (TERN), the National Environmental Research Program (NERP) and other sources, provides Australia with the opportunity to join a worldwide network of rainforest monitoring plots. The Wet Tropics plot network has the potential to provide the most comprehensive study of biological communities ever undertaken in Australia. They not only provide the baseline for long-term monitoring for a very large proportion of all the plant species and bioclimates in the Wet Tropics, but also a large proportion of Queensland's and Australia's total biodiversity.

The Wet Tropics has the potential to become a central hub of a global network of biodiversity/environmental change monitoring sites. From a topographical and climatic basis, Queensland's Wet Tropics has affinities with upland tropical forest localities in the upper reaches of the Amazon and Congo basins and in the uplands of the east coast of Madagascar, Brazil and New Guinea. Together, these forests contain a very large proportion of the world's total biodiversity. However, what sets the Wet Tropics apart is that it contains tropical rainforests at their latitudinal and climatic limits. This potentially makes the Area an early warning site for alerting other vulnerable tropical forest hotspots to the emerging effects of global environmental change threats.

The benefits of long term monitoring

Much of the change referred to in this report has taken place over millions or thousands of years – continental drift, climate refugia, and speciation – but we are now seeing an unprecedented rate of change as a result of human intervention in the landscape, and through our impacts on global climate patterns. Modelling responses to change at the population, species and community level help us plan for anticipated events, but monitoring is also crucial, both to identify how and where that anticipated change takes place, but also to identify unexpected change. The World Heritage Area is well supported by research infrastructure with long-term research plots, rainforest canopy access, world-class research laboratories and collections, but all of these need to be maintained and staffed into the future. Charting the decline of the endemic mountain-top flora, understanding how to measure success in restoration planting for environmental corridors, and recognising new threats or challenges, such as myrtle rust or declines in pollinator populations, will not be possible without it.

On-ground works to improve forest health

The principal means of achieving ecosystem resilience is to build and maintain ecosystem health. Measures such as wildlife corridors, limiting further clearing, restoration of previously cleared areas, protecting important stable refugia and managing the threat of environmental pests and changing fire regimes will all assist in strengthening the ability of Wet Tropics ecosystems to adapt to environmental change.

Improving and communicating our knowledge of the natural values for which the Wet Tropics was listed as a World Heritage property and the threats to those values

Regional research institutions such as CSIRO and James Cook University (JCU) with support from the Terrestrial Ecosystem Research Network (TERN) and the National Environmental Research Program (NERP) have made good progress in understanding the natural environment and ecology of the region, and on the impact of environmental change. More work is needed to improve, refine and communicate current knowledge. There are opportunities to capitalise on regional research capability that would deliver information to managers and policy makers to improve management responses.

Increasing community awareness and mobilising behavioural change

Private land managers can make a major contribution to projects aimed at improving the resilience of the Wet Tropics landscape and helping to preserve the region's threatened, endemic and ancient plants into the future. Environment agencies need to provide long term leadership by increasing community awareness of the international importance and irreplaceability of the Wet Tropics and the risks to the Area from climate change, invasive weeds, pests, diseases and habitat fragmentation. Improved land management practices should be supported through technical advice, incentives and appropriate land and resource management policies. Communities must be appropriately engaged in decision-making affecting their own land or public lands such as those in the Wet Tropics World Heritage Area.

Regional planning, coordination and leadership

This work aims to coordinate and align the efforts of regional land and environment agencies and private land managers to ensure resources are well targeted, and effort is appropriately aligned with agreed priorities. Regional institutions and communities already have the underlying capability to take action against climate change, invasive weeds, pests, diseases and habitat fragmentation if supported with adequate resources.

Appendix I – Wet Tropics Plants of Ancient Lineage

List of seed plant species found in the Wet Tropics Bioregion which are members of an ancient lineage.

= undescribed species

FAMILY	TAXON	WET TROPICS ENDEMIC	HABITAT
Annonaceae	*Cananga odorata* (Lam.) Hook.f. & Thomson		Rainforest
Annonaceae	*Desmos goezeanus* (F.Muell.) Jessup	Endemic	Rainforest
Annonaceae	*Desmos polycarpus* Jessup		Rainforest
Annonaceae	*Fitzalania heteropetala* (F.Muell.) F.Muell.		Rainforest
Annonaceae	*Goniothalamus australis* Jessup	Endemic	Rainforest
Annonaceae	*Haplostichanthus johnsonii* F.Muell.	Endemic	Rainforest
Annonaceae	*Haplostichanthus rufescens* Jessup	Endemic	Rainforest
Annonaceae	*Haplostichanthus submontanus* Jessup subsp. *submontanus*	Endemic	Rainforest
Annonaceae	*Haplostichanthus submontanus* subsp. *sessiliflorus* Jessup	Endemic	Rainforest
Annonaceae	*Meiogyne cylindrocarpa* (Burck) Heusden subsp. *trichocarpa* Jessup		Rainforest
Annonaceae	*Meiogyne hirsuta* Jessup	Endemic	Rainforest
Annonaceae	*Meiogyne verrucosa* Jessup	Endemic	Rainforest
Annonaceae	*Melodorum crassipetalum* Jessup		Rainforest
Annonaceae	*Melodorum leichhardtii* F.Muell.		Rainforest
Annonaceae	*Melodorum topazensis* Jessup	Endemic	Rainforest
Annonaceae	*Melodorum uhrii* F.Muell.		Rainforest
Annonaceae	*Miliusa brahei* (F.Muell.) Jessup		Rainforest
Annonaceae	*Miliusa horsfieldii* (Benn.) Baill. ex Pierre		Rainforest
Annonaceae	*Polyalthia australis* (Benth.) Jessup		Rainforest
Annonaceae	*Polyalthia michaelii* C.T.White	Endemic	Rainforest
Annonaceae	*Polyalthia nitidissima* (Dunal) Benth.		Rainforest
Annonaceae	*Polyalthia patinata* Jessup	Endemic	Rainforest
Annonaceae	*Polyalthia xanthocarpa* B.Xue & R.M.K.Saunders	Endemic	Rainforest
Annonaceae	*Pseuduvaria froggattii* (F.Muell.) Jessup	Endemic	Rainforest
Annonaceae	*Pseuduvaria hylandii* Jessup	Endemic	Rainforest
Annonaceae	*Pseuduvaria mulgraveana* Jessup var. *mulgraveana*	Endemic	Rainforest
Annonaceae	*Pseuduvaria mulgraveana* var. *glabrescens* Jessup	Endemic	Rainforest
Annonaceae	*Pseuduvaria villosa* Jessup	Endemic	Rainforest
Annonaceae	*Uvaria concava* Teijsm. & Binn.		Rainforest
Annonaceae	*Xylopia maccreae* (F.Muell.) L.S.Sm.		Rainforest
Aristolochiaceae	*Aristolochia acuminata* Lam.		Rainforest
Aristolochiaceae	*Aristolochia pubera* R.Br. var. *pubera*		Rainforest
Aristolochiaceae	*Pararistolochia australopithecurus* Michael J.Parsons	Endemic	Rainforest

FAMILY	TAXON	WET TROPICS ENDEMIC	HABITAT
Aristolochiaceae	*Pararistolochia deltantha* (F.Muell.) Michael J.Parsons		Rainforest
Aristolochiaceae	*Pararistolochia praevenosa* (F.Muell.) Michael J.Parsons		Rainforest
Aristolochiaceae	*Pararistolochia sparusifolia* Michael J.Parsons	Endemic	Rainforest
Atherospermataceae	*Daphnandra repandula* (F.Muell.) F.Muell.	Endemic	Rainforest
Atherospermataceae	*Doryphora aromatica* (F.M.Bailey) L.S.Sm.	Endemic	Rainforest
Atherospermataceae	*Dryadodaphne trachyphloia* Schodde	Endemic	Rainforest
Austrobaileyaceae	*Austrobaileya scandens* C.T.White	Endemic	Rainforest
Cabombaceae	*Brasenia schreberi* J.F.Gmel		Aquatic
Calycanthaceae	*Idiospermum australiense* (Diels) S.T.Blake	Endemic	Rainforest
Eupomatiaceae	*Eupomatia barbata* Jessup	Endemic	Rainforest
Eupomatiaceae	*Eupomatia laurina* R.Br.		Rainforest
Hernandiaceae	*Hernandia albiflora* (C.T.White) Kubitzki	Endemic	Rainforest
Hernandiaceae	*Hernandia nymphaeifolia* (C.Presl) Kubitzki		Rainforest
Himantandraceae	*Galbulimima baccata* F.M.Bailey		Rainforest
Lauraceae	*Beilschmiedia bancroftii* (F.M.Bailey) C.T.White	Endemic	Rainforest
Lauraceae	*Beilschmiedia brunnea* B.Hyland	Endemic	Rainforest
Lauraceae	*Beilschmiedia castrisinensis* B.Hyland	Endemic	Rainforest
Lauraceae	*Beilschmiedia collina* B.Hyland		Rainforest
Lauraceae	*Beilschmiedia obtusifolia* (F.Muell. ex Meisn.) F.Muell.		Rainforest
Lauraceae	*Beilschmiedia oligandra* L.S.Sm.	Endemic	Rainforest
Lauraceae	*Beilschmiedia recurva* B.Hyland	Endemic	Rainforest
Lauraceae	*Beilschmiedia tooram* (F.M.Bailey) B.Hyland	Endemic	Rainforest
Lauraceae	*Beilschmiedia volckii* B.Hyland	Endemic	Rainforest
Lauraceae	*Cassytha capillaris* Meisn.		Sclerophyll
Lauraceae	*Cassytha filiformis* L.		Rainforest
Lauraceae	*Cassytha rufa* J.Z.Weber		Sclerophyll
Lauraceae	*Cinnamomum baileyanum* (F.Muell. ex F.M.Bailey) W.D.Francis		Rainforest
Lauraceae	*Cinnamomum laubatii* F.Muell.		Rainforest
Lauraceae	*Cinnamomum oliveri* F.M.Bailey		Rainforest
Lauraceae	*Cinnamomum propinquum* F.M.Bailey	Endemic	Rainforest
Lauraceae	*Cryptocarya angulata* C.T.White		Rainforest
Lauraceae	*Cryptocarya bellendenkerana* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya bidwillii* Meisn.		Rainforest
Lauraceae	*Cryptocarya cercophylla* W.E. Cooper	Endemic	Rainforest
Lauraceae	*Cryptocarya clarksoniana* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya cocosoides* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya corrugata* C.T.White & W.D.Francis		Rainforest
Lauraceae	*Cryptocarya cunninghamii* Meisn.		Rainforest
Lauraceae	*Cryptocarya densiflora* Blume		Rainforest
Lauraceae	*Cryptocarya exfoliata* C.K.Allen		Rainforest
Lauraceae	*Cryptocarya grandis* B.Hyland		Rainforest

FAMILY	TAXON	WET TROPICS ENDEMIC	HABITAT
Lauraceae	*Cryptocarya hypospodia* F.Muell.		Rainforest
Lauraceae	*Cryptocarya laevigata* Blume		Rainforest
Lauraceae	*Cryptocarya leucophylla* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya lividula* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya mackinnoniana* F.Muell.		Rainforest
Lauraceae	*Cryptocarya melanocarpa* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya murrayi* F.Muell.		Rainforest
Lauraceae	*Cryptocarya oblata* F.M.Bailey	Endemic	Rainforest
Lauraceae	*Cryptocarya onoprienkoana* B.Hyland		Rainforest
Lauraceae	*Cryptocarya pleurosperma* C.T.White & W.D.Francis	Endemic	Rainforest
Lauraceae	*Cryptocarya putida* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya rhodosperma* B.Hyland		Rainforest
Lauraceae	*Cryptocarya saccharata* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya smaragdina* B.Hyland	Endemic	Rainforest
Lauraceae	*Cryptocarya triplinervis* var. *puben* B.Hyland		Rainforest
Lauraceae	*Cryptocarya triplinervis* var. riparia B.Hyland		Rainforest
Lauraceae	*Cryptocarya vulgaris* B.Hyland		Rainforest
Lauraceae	*Cryptocarya whiffiniana* Le Cussan & Hyland	Endemic	Rainforest
Lauraceae	*Endiandra acuminata* C.T.White & W.D.Francis		Rainforest
Lauraceae	*Endiandra anthropophagorum* Domin	Endemic	Rainforest
Lauraceae	*Endiandra bellendenkerana* B.Hyland	Endemic	Rainforest
Lauraceae	*Endiandra bessaphila* B.Hyland	Endemic	Rainforest
Lauraceae	*Endiandra compressa* C.T.White		Rainforest
Lauraceae	*Endiandra cooperana* B.Hyland	Endemic	Rainforest
Lauraceae	*Endiandra cowleyana* F.M.Bailey		Rainforest
Lauraceae	*Endiandra dichrophylla* F.Muell.	Endemic	Rainforest
Lauraceae	*Endiandra dielsiana* Teschner		Rainforest
Lauraceae	*Endiandra discolor* Benth.		Rainforest
Lauraceae	*Endiandra glauca* R.Br.		Rainforest
Lauraceae	*Endiandra globosa* Maiden & Betche		Rainforest
Lauraceae	*Endiandra grayi* B.Hyland	Endemic	Rainforest
Lauraceae	*Endiandra hypotephra* F.Muell.		Rainforest
Lauraceae	*Endiandra impressicosta* C.K.Allen		Rainforest
Lauraceae	*Endiandra insignis* (F.M.Bailey) F.M.Bailey	Endemic	Rainforest
Lauraceae	*Endiandra jonesii* B.Hyland	Endemic	Rainforest
Lauraceae	*Endiandra leptodendron* B.Hyland	Endemic	Rainforest
Lauraceae	*Endiandra longipedicellata* C.T.White & W.D.Francis		Rainforest
Lauraceae	*Endiandra microneura* C.T.White	Endemic	
Lauraceae	*Endiandra monothyra* B.Hyland subsp. *monothyra*	Endemic	
Lauraceae	*Endiandra monothyra* subsp. *trichophylla* B.Hyland	Endemic	

FAMILY	TAXON	WET TROPICS ENDEMIC	HABITAT
Lauraceae	*Endiandra montana* C.T.White		
Lauraceae	*Endiandra palmerstonii* (F.M.Bailey) C.T.White & W.D.Francis	Endemic	
Lauraceae	*Endiandra phaeocarpa* B.Hyland	Endemic	
Lauraceae	*Endiandra sankeyana* F.M.Bailey	Endemic	
Lauraceae	*Endiandra sideroxylon* B.Hyland	Endemic	
Lauraceae	*Endiandra wolfei* B.Hyland		
Lauraceae	*Endiandra xanthocarpa* B.Hyland	Endemic	
Lauraceae	*Lindera queenslandica* B.Hyland		
Lauraceae	*Litsea bennettii* B.Hyland	Endemic	
Lauraceae	*Litsea bindoniana* (F.Muell.) F.Muell.		
Lauraceae	*Litsea breviumbellata* C.K.Allen		
Lauraceae	*Litsea connorsii* B.Hyland	Endemic	
Lauraceae	*Litsea fawcettiana* (F.Muell.) B.Hyland		
Lauraceae	*Litsea glutinosa* (Lour.) C.B.Rob.		
Lauraceae	*Litsea granitica* B.Hyland	Endemic	
Lauraceae	*Litsea leefeana* (F.Muell.) Merr.		
Lauraceae	*Neolitsea brassii* C.K.Allen		
Lauraceae	*Neolitsea dealbata* (R.Br.) Merr.		
Monimiaceae	*Austromatthaea elegans* L.S.Sm.	Endemic	
Monimiaceae	*Hedycarya loxocarya* (Benth.) W.D.Francis	Endemic	
Monimiaceae	*Hemmantia webbii* Whiffin	Endemic	
Monimiaceae	*Levieria acuminata* (F.Muell.) J.R.Perkins		
Monimiaceae	*Palmeria coriacea* C.T.White	Endemic	
Monimiaceae	*Palmeria hypotephra* (F.Muell.) Domin		
Monimiaceae	*Palmeria scandens* F.Muell.		
Monimiaceae	*Steganthera australiana* C.T.White	Endemic	
Monimiaceae	*Steganthera cooperorum* Whiffin	Endemic	
Monimiaceae	*Steganthera laxiflora* (Benth.) Whiffin & Foreman subsp. *laxiflora*		
Monimiaceae	*Steganthera laxiflora* subsp. *lewisensis* Whiffin	Endemic	
Monimiaceae	*Steganthera macooraia* (F.M.Bailey) P.K.Endress	Endemic	
Monimiaceae	*Wilkiea angustifolia* (F.M.Bailey) J.R.Perkins	Endemic	
Monimiaceae	*Wilkiea cordata* Whiffin	Endemic	
Monimiaceae	*Wilkiea kaarruana* Zich & A.J.Ford	Endemic	
Monimiaceae	*Wilkiea longipes* (Benth.) Whiffin & Foreman		
Monimiaceae	*Wilkiea macrophylla* (A.Cunn.) A.DC.		
Monimiaceae	*Wilkiea pubescens* (Benth.) Whiffin & Foreman		Rainforest
Monimiaceae	*Wilkiea rigidifolia* (A.C.Sm.) Whiffin & Foreman		Rainforest
Monimiaceae	*Wilkiea smithii* Whiffin	Endemic	Rainforest
Monimiaceae	*Wilkiea* sp. (McDowall Range J.G.Tracey 14552)#	Endemic	Rainforest
Monimiaceae	*Wilkiea wardellii* (F.Muell.) J.R.Perkins	Endemic	Rainforest
Myristicaceae	*Myristica globosa* subsp. *muelleri* (Warb.) W.J.de Wilde		Rainforest

FAMILY	TAXON	WET TROPICS ENDEMIC	HABITAT
Myristicaceae	*Myristica insipida* R.Br.		Rainforest
Nymphaeaceae	*Nymphaea gigantea* Hook.		Aquatic
Nymphaeaceae	*Nymphaea immutabilis* S.W.L.Jacobs		Aquatic
Nymphaeaceae	*Nymphaea nouchali* Burm.f.		Aquatic
Nymphaeaceae	*Nymphaea pubescens* Willd.		Aquatic
Nymphaeaceae	*Nymphaea violacea* Lehm.		Aquatic
Piperaceae	*Peperomia bellendenkerensis* Domin	Endemic	Rainforest
Piperaceae	*Peperomia blanda* var. *floribunda* (Miq.) H.Huber		Rainforest
Piperaceae	*Peperomia enervis* F.Muell. & C.DC.		Rainforest
Piperaceae	*Peperomia hunteriana* P.I.Forst.	Endemic	Rainforest
Piperaceae	*Peperomia tetraphylla* (G.Forst.) Hook. & Arn.		Rainforest
Piperaceae	*Piper caninum* Blume		Rainforest
Piperaceae	*Piper fungiforme* Spokes		Rainforest
Piperaceae	*Piper hederaceum* (Miq.) C.DC. var. *hederaceum*		Rainforest
Piperaceae	*Piper hederaceum* var. *longiorispicum* Spokes	Endemic	Rainforest
Piperaceae	*Piper interruptum* Opiz		Rainforest
Piperaceae	*Piper macropiper* Pennant		Rainforest
Piperaceae	*Piper mestonii* F.M.Bailey		Rainforest
Piperaceae	*Piper umbellatum* L.		Rainforest
Winteraceae	*Bubbia queenslandiana* subsp. *australis* Vink	Endemic	Rainforest
Winteraceae	*Bubbia queenslandiana* Vink subsp. *queenslandiana*	Endemic	Rainforest
Winteraceae	*Bubbia semecarpoides* (F.Muell.) B.L.Burtt		Rainforest
Winteraceae	*Bubbia whiteana* A.C.Sm.	Endemic	Rainforest
Winteraceae	*Tasmannia insipida* R.Br. ex DC.		Rainforest
Winteraceae	*Tasmannia membranea* (F.Muell.) A.C.Sm.	Endemic	Rainforest
Winteraceae	*Tasmannia* sp. (Mt Bellenden Ker J.R.Clarkson 6571) #	Endemic	Rainforest

APPENDIX II – Endemic plants of the Wet Tropics

List of vascular plant genera which are endemic to the Wet Tropics Bioregion. Monotypic genera (i.e. genera comprising just one species) are indicated.

FAMILY	GENUS	MONOTYPIC
Ferns		
Blechnaceae	*Pteridoblechnum*	
Flowering Plants		
Achariaceae	*Baileyoxylon*	Yes
Alseuosmiaceae	*Crispiloba*	Yes
Araliaceae	*Motherwellia*	Yes
Arecaceae	*Laccospadix*	Yes
Arecaceae	*Normanbya*	Yes
Arecaceae	*Oraniopsis*	Yes
Austrobaileyaceae	*Austrobaileya*	Yes
Calycanthaceae	*Idiospermum*	Yes
Celastraceae	*Dinghoua*	Yes
Celastraceae	*Hexaspora*	Yes
Celastraceae	*Hypsophila*	
Colchicaceae	*Kuntheria*	Yes
Elaeocarpaceae	*Peripentadenia*	
Euphorbiaceae	*Hylandia*	Yes
Gesneriaceae	*Lenbrassia*	Yes
Hamamelidaceae	*Neostrearia*	Yes
Hamamelidaceae	*Noahdendron*	Yes
Hamamelidaceae	*Ostrearia*	Yes
Malvaceae	*Franciscodendron*	Yes
Monimiaceae	*Austromatthaea*	Yes
Monimiaceae	*Hemmantia*	Yes
Myrtaceae	*Barongia*	Yes
Myrtaceae	*Mitrantia*	Yes
Myrtaceae	*Sphaerantia*	
Myrtaceae	*Stockwellia*	Yes
Orchidaceae	*Drymoanthus*	
Orchidaceae	*Mobilabium*	Yes
Picrodendraceae	*Sankowskya*	Yes
Picrodendraceae	*Whyanbeelia*	Yes
Proteaceae	*Athertonia*	Yes
Proteaceae	*Austromuellera*	
Proteaceae	*Buckinghamia*	
Proteaceae	*Cardwellia*	Yes
Proteaceae	*Carnarvonia*	
Proteaceae	*Catalepidia*	Yes
Proteaceae	*Darlingia*	

FAMILY	GENUS	MONOTYPIC
Proteaceae	*Hollandaea*	
Proteaceae	*Megahertzia*	Yes
Proteaceae	*Musgravea*	
Proteaceae	*Neorites*	Yes
Proteaceae	*Nothorites*	Yes
Proteaceae	*Opisthiolepis*	Yes
Proteaceae	*Placospermum*	Yes
Proteaceae	*Sphalmium*	Yes
Rhamnaceae	*Schistocarpaea*	Yes
Rutaceae	*Brombya*	
Stemonuraceae	*Irvingbaileya*	Yes

List of vascular plant taxa that are endemic to the Wet Tropics Bioregion. Includes subspecies and varieties which are restricted to the Wet Tropics – other subspecies or varieties of the species may occur outside the bioregion.

Key to symbols

= undescribed species

FAMILY	TAXON
Ferns and Lycophytes	
Aspleniaceae	*Asplenium athertonense* S.B.Andrews
Aspleniaceae	*Asplenium baileyanum* (Domin) Watts
Aspleniaceae	*Asplenium bicentenniale* D.L.Jones
Aspleniaceae	*Asplenium wildii* F.M.Bailey
Athyriaceae	*Diplazium bostockii* D.L.Jones
Blechnaceae	*Blechnum articulatum* (F.Muell.) S.B.Andrews
Blechnaceae	*Blechnum wurunuran* Parris
Blechnaceae	*Pteridoblechnum acuminatum* (C.T.White & Goy) Hennipman
Blechnaceae	*Pteridoblechnum neglectum* (F.M.Bailey) Hennipman
Cyatheaceae	*Cyathea baileyana* (Domin) Domin
Cyatheaceae	*Cyathea woollsiana* (F.Muell.) Domin
Dennstaedtiaceae	*Oenotrichia dissecta* (C.T.White & Goy) S.B.Andrews
Dennstaedtiaceae	*Oenotrichia tripinnata* (F.Muell. ex Benth.) Copel.
Dryopteridaceae	*Dryopteris wattsii* M.McKeown, Sundue & Barrington
Dryopteridaceae	*Lastreopsis grayi* D.L.Jones
Dryopteridaceae	*Lastreopsis tinarooensis* Tindale
Dryopteridaceae	*Lastreopsis walleri* Tindale
Dryopteridaceae	*Lastreopsis windsorensis* D.L.Jones & B.Gray
Dryopteridaceae	*Lastreopsis wurunuran* (Domin) Tindale
Grammitidaceae	*Calymmodon luerssenianus* (Domin) Copel.
Grammitidaceae	*Ctenopteris walleri* (Maiden & Betche) S.B.Andrews
Grammitidaceae	*Grammitis albosetosa* F.M.Bailey
Grammitidaceae	*Grammitis leonardii* Parris

FAMILY	TAXON
Grammitidaceae	*Grammitis queenslandica* Parris
Grammitidaceae	*Prosaptia fuscopilosa* (F.Muell. & Baker) Parris
Grammitidaceae	*Scleroglossum wooroonooran* (F.M.Bailey) C.Chr.
Hymenophyllaceae	*Crepidomanes majoriae* (Watts) N.A.Wakef.
Hymenophyllaceae	*Hymenophyllum gracilescens* Domin
Hymenophyllaceae	*Hymenophyllum kerianum* Watts
Hymenophyllaceae	*Hymenophyllum whitei* Goy
Lindsaeaceae	*Lindsaea terrae-reginae* K.U.Kramer
Lycopodiaceae	*Phlegmariurus lockyeri* (D.L.Jones & B.Gray) A.R.Field & Bostock
Lycopodiaceae	*Phlegmariurus marsupiiformis* (D.L.Jones & B.Gray) A.R.Field & Bostock
Nephrolepidaceae	*Arthropteris* sp. (Mt Carbine L.W.Jessup+ GJM1135) #
Polypodiaceae	*Crypsinus simplicissimus* (F.Muell.) S.B.Andrews
Polypodiaceae	*Microsorum australiense* (F.M.Bailey) Bostock
Polypodiaceae	*Pyrrosia confluens* var. *dielsii* (C.Chr.) Hovenkamp
Selaginellaceae	*Selaginella australiensis* Baker
Selaginellaceae	*Selaginella longipinna* Warb.
Thelypteridaceae	*Amphineuron queenslandicum* Holttum
Thelypteridaceae	*Chingia australis* Holttum
Vittariaceae	*Antrophyum jagoanum* D.L.Jones & Bostock
Conifers and Cycads	
Araucariaceae	*Agathis atropurpurea* B.Hyland
Araucariaceae	*Agathis microstachya* J.F.Bailey & C.T.White
Cycadaceae	*Cycas candida* K.D.Hill
Zamiaceae	*Lepidozamia hopei* (W.Hill) Regel
Podocarpaceae	*Podocarpus dispermus* C.T.White
Podocarpaceae	*Podocarpus smithii* de Laub.
Podocarpaceae	*Prumnopitys ladei* (F.M.Bailey) de Laub.
Flowering Plants	
Achariaceae	*Baileyoxylon lanceolatum* C.T.White
Achariaceae	*Ryparosa kurrangii* B.L.Webber
Actinidiaceae	*Saurauia andreana (F.Muell.) Oliv.*
Alseuosmiaceae	*Crispiloba disperma* (S.Moore) Steenis
Anacardiaceae	*Buchanania mangoides* F.Muell.
Annonaceae	*Desmos goezeanus* (F.Muell.) Jessup
Annonaceae	*Goniothalamus australis* Jessup
Annonaceae	*Haplostichanthus johnsonii* F.Muell.
Annonaceae	*Haplostichanthus rufescens* Jessup
Annonaceae	*Haplostichanthus submontanus* Jessup subsp. *submontanus*
Annonaceae	*Haplostichanthus submontanus* subsp. *sessiliflorus* Jessup
Annonaceae	*Meiogyne hirsuta* Jessup
Annonaceae	*Meiogyne verrucosa* Jessup
Annonaceae	*Melodorum topazensis* Jessup
Annonaceae	*Polyalthia michaelii* C.T.White
Annonaceae	*Polyalthia patinata* Jessup

FAMILY	TAXON
Annonaceae	*Polyalthia xanthocarpa* B.Xue & R.M.K.Saunders
Annonaceae	*Pseuduvaria froggattii* (F.Muell.) Jessup
Annonaceae	*Pseuduvaria hylandii* Jessup
Annonaceae	*Pseuduvaria mulgraveana* Jessup
Annonaceae	*Pseuduvaria villosa* Jessup
Apiaceae	*Hydrocotyle miranda* A.R.Bean & Henwood
Apocynaceae	*Alyxia grandis* P.I.Forst.
Apocynaceae	*Alyxia ilicifolia* F.Muell.
Apocynaceae	*Alyxia orophila* Domin
Apocynaceae	*Marsdenia araujacea* F.Muell.
Apocynaceae	*Marsdenia jensenii* P.I.Forst.
Apocynaceae	*Marsdenia longipedicellata* P.I.Forst.
Apocynaceae	*Marsdenia rara* P.I.Forst.
Apocynaceae	*Marsdenia straminea* P.I.Forst.
Apocynaceae	*Melodinus bacellianus* (F.Muell.) S.T.Blake
Apocynaceae	*Parsonsia bartlensis* J.B.Williams
Apocynaceae	*Parsonsia densivestita* C.T.White
Apocynaceae	*Parsonsia grayana* J.B.Williams
Apocynaceae	*Parsonsia langiana* F.Muell.
Apocynaceae	*Parsonsia wongabelensis* J.B.Williams
Apocynaceae	*Tylophora colorata* C.T.White
Apocynaceae	*Tylophora* sp. (Wongabel)#
Aponogetonaceae	*Aponogeton bullosus* H.Bruggen
Aponogetonaceae	*Aponogeton lancesmithii* Hellq. & S.W.L.Jacobs
Aponogetonaceae	*Aponogeton proliferus* Hellq. & S.W.L.Jacobs
Aquifoliaceae	*Ilex* sp. (Gadgarra B.P.Hyland RFK2011)#
Araceae	*Pothos brassii* B.L.Burtt
Araceae	*Rhaphidophora hayi* P.C. Boyce & Bogner
Araceae	*Rhaphidophora petrieana* A.Hay
Araliaceae	*Motherwellia haplosciadea* F.Muell.
Araliaceae	*Polyscias bellendenkerensis* (F.M.Bailey) Philipson
Araliaceae	*Polyscias mollis* (Benth.) Harms
Araliaceae	*Polyscias willmottii* (F.Muell.) Philipson
Araliaceae	*Trachymene geraniifolia* F.M.Bailey
Arecaceae	*Archontophoenix maxima* Dowe
Arecaceae	*Archontophoenix myolensis* Dowe
Arecaceae	*Archontophoenix purpurea* Hodel & Dowe
Arecaceae	*Laccospadix australasica* H.Wendl. & Drude
Arecaceae	*Linospadix apetiolata* Dowe & A.K.Irvine
Arecaceae	*Linospadix microcarya* (Domin) Burret
Arecaceae	*Linospadix palmeriana* (F.M.Bailey) Burret
Arecaceae	*Normanbya normanbyi* (W.Hill) L.H.Bailey
Arecaceae	*Oraniopsis appendiculata* (F.M.Bailey) J.Dransf., A.K.Irvine & N.W.Uhl
Argophyllaceae	*Argophyllum cryptophlebum* Zemann

FAMILY	TAXON
Argophyllaceae	*Argophyllum* sp. (Babinda L.S.Smith 10213)#
Argophyllaceae	*Argophyllum* sp. (Koolmoon Creek B.Gray 1040)#
Aristolochiaceae	*Pararistolochia australopithecurus* Michael J.Parsons
Aristolochiaceae	*Pararistolochia sparusifolia* Michael J.Parsons
Asteraceae	*Tetramolopium* sp. (Mt Bowen D.G.Fell+ DGF1224)#
Atherospermataceae	*Daphnandra repandula* (F.Muell.) F.Muell.
Atherospermataceae	*Doryphora aromatica* (F.M.Bailey) L.S.Sm.
Atherospermataceae	*Dryadodaphne trachyphloia* Schodde
Austrobaileyaceae	*Austrobaileya scandens* C.T.White
Bignoniaceae	*Tecomanthe* sp. (Roaring Meg L.J.Brass 20326)#
Burmanniaceae	*Thismia* sp.#
Calycanthaceae	*Idiospermum australiense* (Diels) S.T.Blake
Casuarinaceae	*Gymnostoma australianum* L.A.S.Johnson
Celastraceae	*Brassiantha hedraiantheroides* A.J.Ford
Celastraceae	*Denhamia viridissima* F.M.Bailey & F.Muell. ex F.M.Bailey
Celastraceae	*Dinghoua globularis* (Ding Hou) R.H. Archer
Celastraceae	*Elaeodendron australe* var. (Windsor Tableland B.P.Hyland 5574) #
Celastraceae	*Hexaspora pubescens* C.T.White
Celastraceae	*Hypsophila dielsiana* Loes.
Celastraceae	*Hypsophila halleyana* F.Muell.
Celastraceae	*Siphonodon membranaceus* F.M.Bailey
Clusiaceae	*Calophyllum costatum* F.M.Bailey
Clusiaceae	*Garcinia brassii* C.T.White
Clusiaceae	*Garcinia gibbsiae* S.Moore
Clusiaceae	*Garcinia mestonii* F.M.Bailey
Clusiaceae	*Garcinia zichii* W.E.Cooper
Clusiaceae	*Mammea touriga* (C.T.White & W.D.Francis) L.S.Sm.
Clusiaceae	*Mesua larnachiana* (F.Muell.) Kosterm.
Clusiaceae	*Mesua* sp. (Boonjie A.K.Irvine 1218)#
Colchicaceae	*Kuntheria pedunculata* (F.Muell.) Conran & Clifford
Convolvulaceae	*Argyreia soutteri* (F.M.Bailey) Domin
Corsiaceae	*Corsia dispar* D.L.Jones et B.Gray
Cucurbitaceae	*Trichosanthes odontosperma* W.E.Cooper & A.J.Ford
Cunoniaceae	*Caldcluvia* sp. (Bellenden Ker W.Sayer 45)#
Cunoniaceae	*Ceratopetalum corymbosum* C.T.White
Cunoniaceae	*Ceratopetalum hylandii* Rozefelds & R.W.Barnes
Cunoniaceae	*Ceratopetalum iugumensis* Rozefelds & R.W.Barnes
Cunoniaceae	*Ceratopetalum macrophyllum* Hoogland
Cunoniaceae	*Ceratopetalum succirubrum* C.T.White
Cunoniaceae	*Ceratopetalum virchowii* F.Muell.
Cunoniaceae	*Davidsonia pruriens* F.Muell.
Cunoniaceae	*Eucryphia wilkiei* B.Hyland
Cunoniaceae	*Gillbeea adenopetala* F.Muell.
Cunoniaceae	*Gillbeea whypallana* Rozefelds & Pellow

FAMILY	TAXON
Cunoniaceae	*Karrabina biagiana* (F.Muell.) Rozefelds & H.C.Hopkins
Cunoniaceae	*Pseudoweinmannia apetala* (F.M.Bailey) Engl.
Cunoniaceae	*Pullea stutzeri* (F.Muell.) Gibbs
Cunoniaceae	*Schizomeria whitei* Mattf.
Cunoniaceae	*Spiraeanthemum davidsonii* F.Muell.
Cyperaceae	*Fimbristylis adjuncta* S.T.Blake
Dilleniaceae	*Hibbertia concinna* F.M.Bailey
Dilleniaceae	*Hibbertia melhanioides* var. *baileyana* Domin
Dilleniaceae	*Hibbertia pholidota* S.T.Reynolds
Dipentodontaceae	*Perrottetia arborescens* (F.Muell.) Loes.
Droseraceae	*Drosera adelae* F.Muell.
Droseraceae	*Drosera prolifera* C.T.White
Droseraceae	*Drosera schizandra* Diels
Ebenaceae	*Diospyros* sp. (Baird LA B.P.Hyland 9374)#
Ebenaceae	*Diospyros* sp. (Millaa Millaa L.W.Jessup 515)#
Ebenaceae	*Diospyros* sp. (Mt Lewis L.S.Smith 10107)#
Ebenaceae	*Diospyros* sp. (Mt Spurgeon C.T.White 10677)#
Ebenaceae	*Diospyros* sp. (Swipers LA BH 1984RFK)#
Elaeocarpaceae	*Aceratium concinnum* (S.Moore) C.T.White
Elaeocarpaceae	*Aceratium doggrellii* C.T.White
Elaeocarpaceae	*Aceratium ferrugineum* C.T.White
Elaeocarpaceae	*Aceratium megalospermum* (F.Muell.) Balgooy
Elaeocarpaceae	*Aceratium sericoleopsis* Balgooy
Elaeocarpaceae	*Elaeocarpus bancroftii* F.Muell. & F.M.Bailey
Elaeocarpaceae	*Elaeocarpus carolinae* B.Hyland & Coode
Elaeocarpaceae	*Elaeocarpus coorangooloo* J.F.Bailey & C.T.White
Elaeocarpaceae	*Elaeocarpus elliffii* B.Hyland & Coode
Elaeocarpaceae	*Elaeocarpus ferruginiflorus* C.T.White
Elaeocarpaceae	*Elaeocarpus grahamii* F.Muell.
Elaeocarpaceae	*Elaeocarpus hylobroma* Y. Baba & Crayn
Elaeocarpaceae	*Elaeocarpus johnsonii* F.Muell.
Elaeocarpaceae	*Elaeocarpus largiflorens* subsp. *retinervis* B.Hyland & Coode
Elaeocarpaceae	*Elaeocarpus linsmithii* Guymer
Elaeocarpaceae	*Elaeocarpus* sp. (Mt Bellenden Ker L.J.Brass 18336)#
Elaeocarpaceae	*Elaeocarpus* sp. (Mt Lewis B.P.Hyland 2907)#
Elaeocarpaceae	*Elaeocarpus stellaris* L.S.Sm.
Elaeocarpaceae	*Elaeocarpus thelmae* B.Hyland & Coode
Elaeocarpaceae	*Peripentadenia mearsii* (C.T.White) L.S.Sm.
Elaeocarpaceae	*Peripentadenia phelpsii* B.Hyland & Coode
Elaeocarpaceae	*Sloanea australis* subsp. *parviflora* Coode
Ericaceae	*Acrotriche baileyana* (Domin) J.M.Powell
Ericaceae	*Dracophyllum sayeri* F.Muell.
Ericaceae	*Paphia meiniana* (F.Muell.) Schltr.
Ericaceae	*Rhododendron lochiae* F.Muell.

FAMILY	TAXON
Ericaceae	*Trochocarpa bellendenkerensis* Domin
Erythroxylaceae	*Erythroxylum* sp. (Brewer LA B.Hyland 13373)#
Euphorbiaceae	*Acalypha lyonsii* P.I.Forst.
Euphorbiaceae	*Baloghia parviflora* C.T.White
Euphorbiaceae	*Bertya polystigma* Gruening
Euphorbiaceae	*Claoxylon tenerifolium* (Baill.) F.Muell. subsp. *boreale* P.I.Forst.
Euphorbiaceae	*Croton densivestitus* C.T.White & W.D.Francis
Euphorbiaceae	*Fontainea picrosperma* C.T.White
Euphorbiaceae	*Hylandia dockrillii* Airy Shaw
Euphorbiaceae	*Macaranga dallachyana* (Baill.) Airy Shaw
Euphorbiaceae	*Macaranga inamoena* F.Muell. ex Benth.
Euphorbiaceae	*Omphalea queenslandiae* F.M.Bailey
Euphorbiaceae	*Rockinghamia brevipes* Airy Shaw
Euphorbiaceae	*Shonia tristigma* (F.Muell.) Halford & R.J.F.Hend. subsp. *tristigma*
Euphorbiaceae	*Wetria australiensis* P.I.Forst.
Eupomatiaceae	*Eupomatia barbata* Jessup
Fabaceae	*Acacia hylonoma* Pedley
Fabaceae	*Acacia lumholtzii* Pedley
Fabaceae	*Albizia* sp. (Windsor Tableland BG 2181)#
Fabaceae	*Archidendron kanisii* R.S.Cowan
Fabaceae	*Archidendron ramiflorum* (F.Muell.) Kosterm.
Fabaceae	*Archidendron vaillantii* (F.Muell.) F.Muell.
Fabaceae	*Archidendron whitei* I.C.Nielsen
Fabaceae	*Archidendropsis xanthoxylon* (C.T.White & W.D.Francis) I.C.Nielsen
Fabaceae	*Austrosteenisia stipularis* (C.T.White) Jessup
Fabaceae	*Caesalpinia robusta* (C.T.White) Pedley
Fabaceae	*Callerya pilipes* (F.M.Bailey) Schot
Fabaceae	*Callerya* sp. (Barratt Creek GS 428)#
Fabaceae	*Callerya* sp. (Beatrice River L.S.Smith 10487)#
Fabaceae	*Cassia queenslandica* C.T.White
Fabaceae	*Storckiella australiensis* J.H.Ross & B.Hyland
Gentianaceae	*Fagraea fagraeacea* (F.Muell.) Druce
Gesneriaceae	*Boea kinnearii* (F.Muell.) B.L.Burtt
Gesneriaceae	*Cyrtandra baileyi* F.Muell.
Gesneriaceae	*Lenbrassia australiana* (C.T.White) G.W.Gillett
Haloragaceae	*Gonocarpus* sp. (Thornton Peak L.J.Brass+ 249)#
Hamamelidaceae	*Neostrearia fleckeri* L.S.Sm.
Hamamelidaceae	*Noahdendron nicholasii* P.K.Endress, B.Hyland & Tracey
Hamamelidaceae	*Ostrearia australiana* Baill.
Hemerocallidaceae	*Dianella longifolia* var. *fragrans* R.J.F.Hend.
Hernandiaceae	*Hernandia albiflora* (C.T.White) Kubitzki
Icacinaceae	*Apodytes brachystylis* F.Muell.
Lamiaceae	*Clerodendrum grayi* Munir
Lamiaceae	*Gmelina fasciculiflora* Benth.

FAMILY	TAXON
Lamiaceae	*Plectranthus amicorum* S.T.Blake
Lamiaceae	*Plectranthus amoenus* P.I.Forst.
Lamiaceae	*Plectranthus apreptus* S.T.Blake
Lamiaceae	*Plectranthus foetidus* Benth.
Lamiaceae	*Plectranthus gratus* S.T.Blake
Lamiaceae	*Plectranthus spectabilis* S.T.Blake
Lamiaceae	*Plectranthus thalassoscopicus* P.I.Forst.
Lamiaceae	*Prostanthera albohirta* C.T.White
Lamiaceae	*Prostanthera* sp. (Kalpahlim Rock)#
Lauraceae	*Beilschmiedia bancroftii* (F.M.Bailey) C.T.White
Lauraceae	*Beilschmiedia brunnea* B.Hyland
Lauraceae	*Beilschmiedia castrisinensis* B.Hyland
Lauraceae	*Beilschmiedia oligandra* L.S.Sm.
Lauraceae	*Beilschmiedia recurva* B.Hyland
Lauraceae	*Beilschmiedia tooram* (F.M.Bailey) B.Hyland
Lauraceae	*Beilschmiedia volckii* B.Hyland
Lauraceae	*Cinnamomum propinquum* F.M.Bailey
Lauraceae	*Cryptocarya bellendenkerana* B.Hyland
Lauraceae	*Cryptocarya clarksoniana* B.Hyland
Lauraceae	*Cryptocarya cocosoides* B.Hyland
Lauraceae	*Cryptocarya leucophylla* B.Hyland
Lauraceae	*Cryptocarya lividula* B.Hyland
Lauraceae	*Cryptocarya melanocarpa* B.Hyland
Lauraceae	*Cryptocarya oblata* F.M.Bailey
Lauraceae	*Cryptocarya pleurosperma* C.T.White & W.D.Francis
Lauraceae	*Cryptocarya putida* B.Hyland
Lauraceae	*Cryptocarya saccharata* B.Hyland
Lauraceae	*Cryptocarya smaragdina* B.Hyland
Lauraceae	*Cryptocarya cercophylla* W.E.Cooper
Lauraceae	*Cryptocarya whiffiniana* Le Cussan & Hyland
Lauraceae	*Endiandra anthropophagorum* Domin
Lauraceae	*Endiandra bellendenkerana* B.Hyland
Lauraceae	*Endiandra bessaphila* B.Hyland
Lauraceae	*Endiandra cooperana* B.Hyland
Lauraceae	*Endiandra dichrophylla* F.Muell.
Lauraceae	*Endiandra grayi* B.Hyland
Lauraceae	*Endiandra insignis* (F.M.Bailey) F.M.Bailey
Lauraceae	*Endiandra jonesii* B.Hyland
Lauraceae	*Endiandra leptodendron* B.Hyland
Lauraceae	*Endiandra microneura* C.T.White
Lauraceae	*Endiandra monothyra* B.Hyland
Lauraceae	*Endiandra palmerstonii* (F.M.Bailey) C.T.White & W.D.Francis
Lauraceae	*Endiandra phaeocarpa* B.Hyland
Lauraceae	*Endiandra sankeyana* F.M.Bailey

FAMILY	TAXON
Lauraceae	*Endiandra sideroxylon* B.Hyland
Lauraceae	*Endiandra xanthocarpa* B.Hyland
Lauraceae	*Litsea bennettii* B.Hyland
Lauraceae	*Litsea connorsii* B.Hyland
Lauraceae	*Litsea granitica* B.Hyland
Laxmanniaceae	*Romnalda grallata* R.J.F.Hend.
Laxmanniaceae	*Romnalda ophiopogonoides* Conran, P.I.Forst. & Donnon
Loranthaceae	*Amyema glabrum* (Domin) Danser
Loranthaceae	*Amyema quaternifolium* Barlow
Loranthaceae	*Amyema whitei* (Blakely) Danser
Loranthaceae	*Decaisnina congesta* Barlow
Maesaceae	*Maesa dependens* F.Muell. var. *dependens*
Malvaceae	*Argyrodendron peralatum* (F.M.Bailey) Edlin ex Boas
Malvaceae	*Argyrodendron* sp. (Boonjie B.P.Hyland RFK2139)#
Malvaceae	*Argyrodendron* sp. (Karnak P.I.Forster+ PIF10711)#
Malvaceae	*Argyrodendron* sp. (Mt Haig L.S.Smith+ 14307)#
Malvaceae	*Argyrodendron* sp. (Whyanbeel B.P.Hyland RFK1106)#
Malvaceae	*Franciscodendron laurifolium* (F.Muell.) B.Hyland & Steenis
Meliaceae	*Aglaia australiensis* Pannell
Meliaceae	*Aglaia brassii* Merr. & L.M.Perry
Meliaceae	*Aglaia ferruginea* C.T.White & W.D.Francis
Meliaceae	*Aglaia meridionalis* Pannell
Meliaceae	*Dysoxylum pumilum* Mabb.
Menispermaceae	*Carronia pedicellata* Forman
Menispermaceae	*Hypserpa smilacifolia* Diels
Menispermaceae	*Parapachygone longifolia* (F.M.Bailey) Forman
Monimiaceae	*Austromatthaea elegans* L.S.Sm.
Monimiaceae	*Endressia wardellii* (F.Muell.) Whiffin
Monimiaceae	*Hedycarya loxocarya* (Benth.) W.D.Francis
Monimiaceae	*Hemmantia webbii* Whiffin
Monimiaceae	*Palmeria coriacea* C.T.White
Monimiaceae	*Steganthera australiana* C.T.White
Monimiaceae	*Steganthera cooperorum* Whiffin
Monimiaceae	*Steganthera laxiflora* subsp. *lewisensis* Whiffin
Monimiaceae	*Steganthera macooraia* (F.M.Bailey) P.K.Endress
Monimiaceae	*Wilkiea angustifolia* (F.M.Bailey) J.R.Perkins
Monimiaceae	*Wilkiea cordata* Whiffin
Monimiaceae	*Wilkiea kaarruana* Zich & A.J.Ford
Monimiaceae	*Wilkiea smithii* Whiffin
Monimiaceae	*Wilkiea* sp. (McDowall Range J.G.Tracey 14552)#
Monimiaceae	*Wilkiea* sp. (Mt Lewis L.J.Webb+ 10501)#
Moraceae	*Ficus crassipes* F.M.Bailey
Moraceae	*Ficus pleurocarpa* F.Muell.
Moraceae	*Ficus triradiata* Corner

FAMILY	TAXON
Moraceae	*Streblus glaber* var. *australianus* (C.T.White) Corner
Musaceae	*Musa fitzalanii* F.Muell.
Musaceae	*Musa jackeyi* W.Hill
Myodocarpaceae	*Delarbrea michieana* (F.Muell.) F.Muell.
Myrsinaceae	*Ardisia brevipedata* F.Muell.
Myrsinaceae	*Ardisia fasciculata* C.T.White
Myrsinaceae	*Ardisia hylandii* Jackes
Myrsinaceae	*Ardisia pachyrrhachis* (F.Muell.) F.M.Bailey
Myrsinaceae	*Embelia grayi* S.T.Reynolds
Myrsinaceae	*Myrsine achradifolia* F.Muell.
Myrsinaceae	*Myrsine elata* Jackes
Myrsinaceae	*Myrsine maculata* Jackes
Myrsinaceae	*Myrsine oreophila* Jackes
Myrsinaceae	*Myrsine rubiginosa* Jackes
Myrsinaceae	*Myrsine smithii* Jackes
Myrsinaceae	*Tapeinosperma pallidum* Jackes
Myrsinaceae	*Tetrardisia bifaria* (C.T.White & W.D.Francis) C.T.White
Myrtaceae	*Backhousia bancroftii* F.M.Bailey & F.Muell. ex F.M.Bailey
Myrtaceae	*Backhousia enata* A.J.Ford, Craven & J.Holmes
Myrtaceae	*Backhousia hughesii* C.T.White
Myrtaceae	*Barongia lophandra* Peter G.Wilson & B.Hyland
Myrtaceae	*Corymbia leptoloma* (Brooker & A.R.Bean) K.D.Hill & L.A.S.Johnson
Myrtaceae	*Corymbia torelliana* (F.Muell.) K.D.Hill & L.A.S.Johnson
Myrtaceae	*Gossia lewisensis* N.Snow & Guymer
Myrtaceae	*Gossia shepherdii* (F.Muell.) N.Snow & Guymer
Myrtaceae	*Kunzea graniticola* Byrnes
Myrtaceae	*Kunzea* sp. (Herbert River R.J.Cumming 11309)#
Myrtaceae	*Leptospermum wooroonooran* F.M.Bailey
Myrtaceae	*Melaleuca lophocoracorum* A.J.Ford, Craven & Brophy
Myrtaceae	*Melaleuca pyramidalis* Craven
Myrtaceae	*Melaleuca uxorum* Craven
Myrtaceae	*Mitrantia bilocularis* Peter G.Wilson & B.Hyland
Myrtaceae	*Pilidiostigma sessile* N.Snow
Myrtaceae	*Pilidiostigma tetramerum* L.S.Sm.
Myrtaceae	*Pilidiostigma tropicum* L.S.Sm.
Myrtaceae	*Rhodamnia blairiana* F.Muell.
Myrtaceae	*Rhodamnia longisepala* N.Snow & A.J.Ford
Myrtaceae	*Rhodamnia sessiliflora* Benth.
Myrtaceae	*Rhodomyrtus canescens* C.T.White & W.D.Francis
Myrtaceae	*Rhodomyrtus effusa* Guymer
Myrtaceae	*Rhodomyrtus pervagata* Guymer
Myrtaceae	*Rhodomyrtus sericea* Burret
Myrtaceae	*Ristantia gouldii* Peter G.Wilson & B.Hyland
Myrtaceae	*Ristantia pachysperma* (F.Muell. & F.M.Bailey) Peter G.Wilson & J.T.Waterh.

FAMILY	TAXON
Myrtaceae	*Sphaerantia chartacea* Peter G.Wilson & B.Hyland
Myrtaceae	*Sphaerantia discolor* Peter G.Wilson & B.Hyland
Myrtaceae	*Stockwellia quadrifida* D.J.Carr, S.G.M.Carr & B.Hyland
Myrtaceae	*Syzygium alatoramulum* B.Hyland
Myrtaceae	*Syzygium alliiligneum* B.Hyland
Myrtaceae	*Syzygium boonjee* B.Hyland
Myrtaceae	*Syzygium canicortex* B.Hyland
Myrtaceae	*Syzygium dansiei* B.Hyland
Myrtaceae	*Syzygium divaricatum* (Merr. & L.M.Perry) Craven & Biffin
Myrtaceae	*Syzygium erythrocalyx* (C.T.White) B.Hyland
Myrtaceae	*Syzygium fratris* Craven
Myrtaceae	*Syzygium glenum* Craven
Myrtaceae	*Syzygium graveolens* (F.M.Bailey) Craven & Biffin
Myrtaceae	*Syzygium gustavioides* (F.M.Bailey) B.Hyland
Myrtaceae	*Syzygium hedraiophyllum* (F.Muell.) Craven & Biffin
Myrtaceae	*Syzygium kuranda* (F.M.Bailey) B.Hyland
Myrtaceae	*Syzygium maraca* Craven & Biffin
Myrtaceae	*Syzygium monimioides* Craven
Myrtaceae	*Syzygium monospermum* Craven
Myrtaceae	*Syzygium mulgraveanum* (B.Hyland) Craven & Biffin
Myrtaceae	*Syzygium sayeri* (F.Muell.) B.Hyland
Myrtaceae	*Syzygium sharoniae* B.Hyland
Myrtaceae	*Syzygium trachyphloium* (C.T.White) B.Hyland
Myrtaceae	*Syzygium unipunctatum* (B.Hyland) Craven & Biffin
Myrtaceae	*Syzygium wilsonii* (F.Muell.) B.Hyland subsp. wilsonii
Myrtaceae	*Syzygium wilsonii* subsp. *epigaeum* Craven & Biffin
Myrtaceae	*Syzygium xerampelinum* B.Hyland
Myrtaceae	*Thaleropia queenslandica* (L.S.Sm.) Peter G.Wilson
Myrtaceae	*Uromyrtus metrosideros* (F.M.Bailey) A.J.Scott
Myrtaceae	*Uromyrtus tenellus* N.Snow & Guymer
Myrtaceae	*Xanthostemon formosus* Peter G.Wilson
Myrtaceae	*Xanthostemon graniticus* Peter G.Wilson
Myrtaceae	*Xanthostemon verticillatus* (C.T.White & W.D.Francis) L.S.Sm.
Myrtaceae	*Xanthostemon whitei* Gugerli
Ochnaceae	*Brackenridgea australiana* F.Muell.
Oleaceae	*Jasminum kajewskii* C.T.White
Orchidaceae	*Acianthus borealis* D.L.Jones
Orchidaceae	*Anoectochilus yatesiae* F.M.Bailey
Orchidaceae	*Bulbophyllum boonjee* B.Gray & D.L.Jones
Orchidaceae	*Bulbophyllum evasum* T.E.Hunt & Rupp
Orchidaceae	*Bulbophyllum gadgarrense* Rupp
Orchidaceae	*Bulbophyllum grandimesense* B.Gray & D.L.Jones
Orchidaceae	*Bulbophyllum johnsonii* T.E.Hunt
Orchidaceae	*Bulbophyllum lageniforme* F.M.Bailey

FAMILY	TAXON
Orchidaceae	*Bulbophyllum lewisense* B.Gray & D.L.Jones
Orchidaceae	*Bulbophyllum lilianae* Rendle
Orchidaceae	*Bulbophyllum nematopodum* F.Muell.
Orchidaceae	*Bulbophyllum sladeanum* A.D.Hawkes
Orchidaceae	*Bulbophyllum wadsworthii* Dockrill
Orchidaceae	*Bulbophyllum wilkianum* T.E.Hunt
Orchidaceae	*Bulbophyllum windsorense* B.Gray & D.L.Jones
Orchidaceae	*Bulbophyllum wolfei* B.Gray & D.L.Jones
Orchidaceae	*Cadetia uniflos* (F.M.Bailey) M.T.Mathieson
Orchidaceae	*Calochilus psednus* D.L.Jones & Lavarack
Orchidaceae	*Chiloglottis longiclavata* D.L.Jones
Orchidaceae	*Cooktownia robertsii* D.L.Jones
Orchidaceae	*Crepidium flavovirens* D.L.Jones & M.A.Clem.
Orchidaceae	*Crepidium lawleri* (Lavarack & B.Gray) Szlach.
Orchidaceae	*Dendrobium adae* F.M.Bailey
Orchidaceae	*Dendrobium agrostophyllum* F.Muell.
Orchidaceae	*Dendrobium callitrophilum* B.Gray & D.L.Jones
Orchidaceae	*Dendrobium carrii* Rupp & C.T.White
Orchidaceae	*Dendrobium finniganense* D.L.Jones
Orchidaceae	*Dendrobium fleckeri* Rupp & C.T.White
Orchidaceae	*Dendrobium toressae* (F.M.Bailey) Dockrill
Orchidaceae	*Dockrillia brevicauda* (D.L.Jones & M.A.Clem.) M.A.Clem. & D.L.Jones
Orchidaceae	*Dockrillia racemosa* (Nicholls) Rauschert
Orchidaceae	*Drymoanthus minutus* Nicholls
Orchidaceae	*Gastrodia queenslandica* Dockrill
Orchidaceae	*Gastrodia urceolata* D.L.Jones
Orchidaceae	*Genoplesium tectum* D.L.Jones
Orchidaceae	*Habenaria divaricata* R.S.Rogers & C.T.White
Orchidaceae	*Liparis angustilabris* (F.Muell.) Blaxell
Orchidaceae	*Liparis bracteata* T.E.Hunt
Orchidaceae	*Mobilabium hamatum* Rupp
Orchidaceae	*Oberonia attenuata* Dockrill
Orchidaceae	*Octarrhena pusilla* (F.M.Bailey) M.A.Clem. & D.L.Jones
Orchidaceae	*Pterostylis anatona* D.L.Jones
Orchidaceae	*Pterostylis caligna* M.T. Mathieson
Orchidaceae	*Pterostylis depauperata* F.M.Bailey
Orchidaceae	*Saccolabiopsis rectifolia* (Dockrill) Garay
Orchidaceae	*Sarcochilus borealis* (Nicholls) M.A.Clem. & D.L.Jones
Orchidaceae	*Sarcochilus serrulatus* D.L.Jones
Orchidaceae	*Taeniophyllum confertum* B.Gray & D.L.Jones
Orchidaceae	*Vrydagzynea grayi* D.L.Jones & M.A.Clem.
Passifloraceae	*Passiflora kuranda* Krosnick & A.J.Ford
Philydraceae	*Helmholtzia acorifolia* F.Muell.
Phyllanthaceae	*Actephila flavescens* P.I.Forst.

FAMILY	TAXON
Phyllanthaceae	*Actephila foetida* Domin
Phyllanthaceae	*Actephila petiolaris* Benth.
Phyllanthaceae	*Actephila vernicosa* P.I.Forst.
Phyllanthaceae	*Cleistanthus discolor* Summerh.
Phyllanthaceae	*Cleistanthus myrianthus* (Hassk.) Kurz
Phyllanthaceae	*Glochidion barronense* Airy Shaw
Phyllanthaceae	*Glochidion harveyanum* var. *pubescens* Airy Shaw
Phyllanthaceae	*Glochidion hylandii* Airy Shaw
Phyllanthaceae	*Glochidion pruinosum* Airy Shaw
Phyllanthaceae	*Glochidion pungens* Airy Shaw
Phyllanthaceae	*Glochidion sessiliflorum* var. *stylosum* Airy Shaw
Phyllanthaceae	*Phyllanthus hypospodius* F.Muell.
Picrodendraceae	*Austrobuxus megacarpus* P.I.Forst.
Picrodendraceae	*Choriceras majus* Airy Shaw
Picrodendraceae	*Dissiliaria tuckeri* P.I.Forst.
Picrodendraceae	*Sankowskya stipularis* P.I.Forst.
Picrodendraceae	*Whyanbeelia terrae-reginae* Airy Shaw & B.Hyland
Piperaceae	*Peperomia bellendenkerensis* Domin
Piperaceae	*Peperomia hunteriana* P.I.Forst.
Piperaceae	*Piper hederaceum* var. *longiorispicum* Spokes
Pittosporaceae	*Auranticarpa papyracea* L.Cayzer, Crisp & I.Telford
Pittosporaceae	*Pittosporum trilobum* L.Cayzer, Crisp & I.Telford
Poaceae	*Isachne sharpii* B.K.Simon
Poaceae	*Mullerochloa moreheadiana* (F.M.Bailey) K.M.Wong
Polygalaceae	*Comesperma praecelsum* F.Muell.
Polygalaceae	*Comesperma* sp. (Mt Emerald)#
Polygalaceae	*Xanthophyllum fragrans* C.T.White
Polyosmaceae	*Polyosma hirsuta* C.T.White
Polyosmaceae	*Polyosma reducta* F.Muell.
Polyosmaceae	*Polyosma rigidiuscula* F.Muell. & F.M.Bailey ex F.M.Bailey
Polyosmaceae	*Polyosma* sp. (Mt Lewis B.P.Hyland RFK25241)#
Polyosmaceae	*Polyosma* sp. (Mt Windsor Tableland L.W.Jessup+ GJM1374) #
Proteaceae	*Alloxylon flammeum* P.H.Weston & Crisp
Proteaceae	*Alloxylon wickhamii* (W.Hill ex F.Muell.) P.H.Weston & Crisp
Proteaceae	*Athertonia diversifolia* (C.T.White) L.A.S.Johnson & B.G.Briggs
Proteaceae	*Austromuellera trinervia* C.T.White
Proteaceae	*Austromuellera valida* B.Hyland
Proteaceae	*Banksia aquilonia* (A.S.George) A.S.George
Proteaceae	*Banksia plagiocarpa* A.S.George
Proteaceae	*Buckinghamia celsissima* F.Muell.
Proteaceae	*Buckinghamia ferruginiflora* Foreman & B.Hyland
Proteaceae	*Cardwellia sublimis* F.Muell.
Proteaceae	*Carnarvonia araliifolia* F.Muell.
Proteaceae	*Catalepidia heyana* (F.M.Bailey) P.H.Weston

FAMILY	TAXON
Proteaceae	*Darlingia darlingiana* (F.Muell.) L.A.S.Johnson
Proteaceae	*Darlingia ferruginea* J.F.Bailey
Proteaceae	*Eidothea zoexylocarya* A.W.Douglas & B.Hyland
Proteaceae	*Helicia blakei* Foreman
Proteaceae	*Helicia grayi* Foreman
Proteaceae	*Helicia lamingtoniana* (F.M.Bailey) C.T.White ex L.S.Sm.
Proteaceae	*Helicia lewisensis* Foreman
Proteaceae	*Helicia nortoniana* (F.M.Bailey) F.M.Bailey
Proteaceae	*Helicia recurva* Foreman
Proteaceae	*Hicksbeachia pilosa* P.H.Weston
Proteaceae	*Hollandaea diabolica* A.J.Ford & P.H.Weston
Proteaceae	*Hollandaea porphyrocarpa* A.J.Ford & P.H.Weston
Proteaceae	*Hollandaea riparia* B.Hyland
Proteaceae	*Hollandaea sayeriana* (F.Muell.) L.S.Sm.
Proteaceae	*Lasjia grandis* (C.L.Gross & B.Hyland) P.H.Weston & A.R.Mast
Proteaceae	*Lasjia whelanii* (F.M.Bailey) P.H.Weston & A.R.Mast
Proteaceae	*Lomatia fraxinifolia* F.Muell. ex Benth.
Proteaceae	*Megahertzia amplexicaulis* A.S.George & B.Hyland
Proteaceae	*Musgravea heterophylla* L.S.Sm.
Proteaceae	*Musgravea stenostachya* F.Muell.
Proteaceae	*Neorites kevediana* L.S.Sm.
Proteaceae	*Nothorites megacarpus* (A.S.George & B.Hyland) P.H.Weston & A.R.Mast
Proteaceae	*Opisthiolepis heterophylla* L.S.Sm.
Proteaceae	*Orites fragrans* F.M.Bailey
Proteaceae	*Persoonia tropica* P.H.Weston & L.A.S.Johnson
Proteaceae	*Placospermum coriaceum* C.T.White & W.D.Francis
Proteaceae	*Sphalmium racemosum* (C.T.White) B.G.Briggs, B.Hyland & L.A.S.Johnson
Proteaceae	*Stenocarpus cryptocarpus* Foreman & B.Hyland
Proteaceae	*Stenocarpus davallioides* Foreman & B.Hyland
Proteaceae	*Stenocarpus reticulatus* C.T.White
Proteaceae	*Stenocarpus* sp. (Hinchinbrook Island F.D.Hockings AQ229860) #
Proteaceae	*Triunia erythrocarpa* Foreman
Proteaceae	*Triunia montana* (C.T.White) Foreman
Putranjivaceae	*Drypetes acuminata* P.I.Forst.
Putranjivaceae	*Drypetes iodoformis* L.S.Sm. ex P.I.Forst.
Paracryphiaceae	*Quintinia fawkneri* F.Muell.
Rhamnaceae	*Gouania australiana* F.Muell.
Rhamnaceae	*Sageretia hamosa* (Wall.) Brongn.
Rhamnaceae	*Schistocarpaea johnsonii* F.Muell.
Rousseaceae	*Abrophyllum* sp. (East Mulgrave RJ 486) #
Rubiaceae	*Aidia* sp. (Mt Lewis) #
Rubiaceae	*Antirhea* sp. (Mt Lewis BG 5733) #
Rubiaceae	*Atractocarpus fitzalanii* subsp. *tenuipes* Puttock
Rubiaceae	*Atractocarpus hirtus* (F.Muell.) Puttock

FAMILY	TAXON
Rubiaceae	*Atractocarpus merikin* (F.M.Bailey) Puttock
Rubiaceae	*Bobea myrtoides* (F.Muell.) Valeton
Rubiaceae	*Coelospermum dasylobum* Halford & A.J.Ford
Rubiaceae	*Coelospermum purpureum* Halford & A.J.Ford
Rubiaceae	*Cyclophyllum costatum* (C.T.White) S.T.Reynolds & R.F.J.Hend.
Rubiaceae	*Cyclophyllum multiflorum* S.T.Reynolds & R.F.J.Hend.
Rubiaceae	*Cyclophyllum protractum* S.T.Reynolds & R.F.J.Hend.
Rubiaceae	*Gardenia actinocarpa* Puttock
Rubiaceae	*Gardenia ovularis* F.M.Bailey
Rubiaceae	*Gynochthodes oresbia* Halford & A.J.Ford
Rubiaceae	*Ixora baileyana* Bridson & L.G.Adams
Rubiaceae	*Ixora biflora* Fosberg
Rubiaceae	*Ixora oreogena* S.T.Reynolds & P.I.Forst.
Rubiaceae	*Morinda constipata* Halford & A.J.Ford
Rubiaceae	*Morinda podistra* Halford & A.J.Ford
Rubiaceae	*Morinda retropila* Halford & A.J.Ford
Rubiaceae	*Myrmecodia beccarii* Hook.f.
Rubiaceae	*Ophiorrhiza australiana* Benth. subsp. *australiana*
Rubiaceae	*Psychotria dallachiana* Benth.
Rubiaceae	*Psychotria* sp. (Daintree NP P.I.Forster+ PIF21974) #
Rubiaceae	*Psychotria* sp. (Mt Finnigan L.J.Brass 20044) #
Rubiaceae	*Psychotria* sp. (Mt Lewis V.K.Moriarty 2445) #
Rubiaceae	*Psychotria* sp. (Utchee Creek H.Flecker NQNC5313) #
Rubiaceae	*Psychotria submontana* Domin
Rubiaceae	*Psydrax laxiflorens* S.T.Reynolds & R.F.J.Hend.
Rubiaceae	*Psydrax montigena* S.T.Reynolds & R.F.J.Hend.
Rubiaceae	*Psydrax tropica* S.T.Reynolds & R.F.J.Hend.
Rubiaceae	*Randia audasii* C.T.White
Rubiaceae	*Tarenna monticola* S.T.Reynolds & P.I.Forst.
Rubiaceae	*Wendlandia basistaminea* F.Muell.
Rubiaceae	*Wendlandia connata* C.T.White
Rubiaceae	*Wendlandia inclusa* C.T.White
Rubiaceae	*Wendlandia urceolata* C.T.White
Rubiaceae	*Wendlandia psychotrioides* (F.Muell.) F.Muell.
Rutaceae	*Acronychia aberrans* T.G.Hartley
Rutaceae	*Acronychia acuminata* T.G.Hartley
Rutaceae	*Acronychia chooreechillum* (F.M.Bailey) C.T.White
Rutaceae	*Acronychia crassipetala* T.G.Hartley
Rutaceae	*Acronychia parviflora* C.T.White
Rutaceae	*Acronychia vestita* F.Muell.
Rutaceae	*Boronia excelsa* Duretto
Rutaceae	*Boronia jensziae* Duretto
Rutaceae	*Brombya platynema* F.Muell.
Rutaceae	*Brombya smithii* T.G.Hartley

FAMILY	TAXON
Rutaceae	*Citrus inodora* F.M.Bailey
Rutaceae	*Dinosperma longifolium* T.G.Hartley
Rutaceae	*Dinosperma stipitatum* (C.T.White & W.D.Francis) T.G.Hartley
Rutaceae	*Euodia hylandii* T.G.Hartley
Rutaceae	*Euodia pubifolia* T.G.Hartley
Rutaceae	*Flindersia acuminata* C.T.White
Rutaceae	*Flindersia bourjotiana* F.Muell.
Rutaceae	*Flindersia brayleyana* F.Muell.
Rutaceae	*Flindersia laevicarpa* C.T.White & W.D.Francis
Rutaceae	*Flindersia oppositifolia* (F.Muell.) T.G.Hartley & Jessup
Rutaceae	*Leionema ellipticum* Paul G.Wilson
Rutaceae	*Medicosma fareana* (F.Muell.) T.G.Hartley
Rutaceae	*Medicosma glandulosa* T.G.Hartley
Rutaceae	*Medicosma heterophylla* T.G.Hartley
Rutaceae	*Medicosma mulgraveana* T.G.Hartley
Rutaceae	*Medicosma sessiliflora* (C.T.White) T.G.Hartley
Rutaceae	*Melicope broadbentiana* F.M.Bailey
Rutaceae	*Melicope jonesii* T.G.Hartley
Rutaceae	*Zanthoxylum veneficum* F.M.Bailey
Rutaceae	*Zieria alata* Duretto & P.I.Forst.
Rutaceae	*Zieria insularis* Duretto & P.I.Forst.
Rutaceae	*Zieria madida* Duretto & P.I.Forst.
Rutaceae	*Zieria robertsiorum* J.A.Armstr.
Rutaceae	*Zieria whitei* J.A.Armstr. ex Duretto & P.I.Forst.
Salicaceae	*Casearia costulata* Jessup
Salicaceae	*Casearia grayi* Jessup
Salicaceae	*Casearia* sp. (Mission Beach B.P.Hyland 773) #
Salicaceae	*Xylosma* sp. (Mt Lewis G.Sankowsky+ 1108) #
Santalaceae	*Korthalsella japonica forma grayi* (Barlow) Molvray
Sapindaceae	*Arytera pauciflora* S.T.Reynolds
Sapindaceae	*Cupaniopsis cooperorum* P.I.Forst.
Sapindaceae	*Cupaniopsis dallachyi* S.T.Reynolds
Sapindaceae	*Cupaniopsis diploglottoides* Adema
Sapindaceae	*Cupaniopsis papillosa* P.I.Forst.
Sapindaceae	*Diploglottis* sp.(Palmerston) #
Sapindaceae	*Diploglottis bernieana* S.T.Reynolds
Sapindaceae	*Diploglottis bracteata* Leenh.
Sapindaceae	*Diploglottis harpullioides* S.T.Reynolds
Sapindaceae	*Diploglottis pedleyi* S.T.Reynolds
Sapindaceae	*Diploglottis smithii* S.T.Reynolds
Sapindaceae	*Guioa montana* C.T.White
Sapindaceae	*Guioa sarcopterifructa* Welzen
Sapindaceae	*Harpullia frutescens* F.M.Bailey
Sapindaceae	*Harpullia rhyticarpa* C.T.White & W.D.Francis

FAMILY	TAXON
Sapindaceae	*Jagera madida* P.I.Forst.
Sapindaceae	*Jagera pseudorhus* (A.Rich.) Radlk. var. *integerrima* S.T.Reynolds
Sapindaceae	*Lepiderema hirsuta* S.T.Reynolds
Sapindaceae	*Lepiderema ixiocarpa* S.T.Reynolds
Sapindaceae	*Lepiderema largiflorens* S.T.Reynolds
Sapindaceae	*Lepiderema sericolignis* (F.M.Bailey) Radlk.
Sapindaceae	*Mischarytera megaphylla* P.I.Forst.
Sapindaceae	*Mischocarpus albescens* S.T.Reynolds
Sapindaceae	*Mischocarpus grandissimus* (F.Muell.) Radlk.
Sapindaceae	*Mischocarpus montanus* C.T.White
Sapindaceae	*Rhysotoechia flavescens* Radlk.
Sapindaceae	*Rhysotoechia florulenta* S.T.Reynolds
Sapindaceae	*Rhysotoechia mortoniana* (F.Muell.) Radlk.
Sapindaceae	*Rhysotoechia robertsonii* (F.Muell.) Radlk.
Sapindaceae	*Sarcopteryx acuminata* S.T.Reynolds
Sapindaceae	*Sarcopteryx montana* S.T.Reynolds
Sapindaceae	*Sarcopteryx reticulata* S.T.Reynolds
Sapindaceae	*Sarcotoechia cuneata* Radlk.
Sapindaceae	*Sarcotoechia lanceolata* (C.T.White) S.T.Reynolds
Sapindaceae	*Sarcotoechia protracta* Radlk.
Sapindaceae	*Sarcotoechia serrata* S.T.Reynolds
Sapindaceae	*Sarcotoechia villosa* S.T.Reynolds
Sapindaceae	*Synima macrophylla* S.T.Reynolds
Sapindaceae	*Synima reynoldsiae* P.I.Forst.
Sapindaceae	*Toechima monticola* S.T.Reynolds
Sapindaceae	*Toechima pterocarpum* S.T.Reynolds
Sapotaceae	*Niemeyera* sp. (Mt Lewis A.K.Irvine 1402) #
Sapotaceae	*Planchonella asterocarpon* (P.Royen) Swenson, Bartish & Munzinger
Sapotaceae	*Planchonella euphlebia* (F.Muell.) W.D.Francis
Sapotaceae	*Pleioluma* sp. (Towalla)
Sapotaceae	*Pouteria brownlessiana* (F.Muell.) Baehni
Sapotaceae	*Pouteria pearsoniorum* Jessup
Sapotaceae	*Pouteria singuliflora* (C.T.White & W.D.Francis) Baehni
Sapotaceae	*Pouteria* sp. (Mt Lewis B.P.Hyland 579) #
Sapotaceae	*Sersalisia sessiliflora* (C.T.White) Aubrev.
Sapotaceae	*Sersalisia* sp. (Barong M.Tucker 22)
Sapotaceae	*Vanroyena castanosperma* (C.T.White) Aubrev.
Simaroubaceae	*Samadera baileyana* Oliv.
Simaroubaceae	*Samadera* sp. (Barong B.Gray 742) #
Solanaceae	*Solanum dimorphispinum* C.T.White
Solanaceae	*Solanum eminens* A.R.Bean
Solanaceae	*Solanum hamulosum* C.T.White
Solanaceae	*Solanum macoorai* F.M.Bailey
Solanaceae	*Solanum magnifolium* F.Muell.

FAMILY	TAXON
Stemonuraceae	*Irvingbaileya australis* (C.T.White) R.A.Howard
Stylidiaceae	*Stylidium confertum* A.R.Bean
Stylidiaceae	*Stylidium elachophyllum* A.R.Bean & M.T.Mathieson
Symplocaceae	*Symplocos ampulliformis* C.T.White
Symplocaceae	*Symplocos boonjee* Jessup
Symplocaceae	*Symplocos bullata* Jessup
Symplocaceae	*Symplocos crassiramifera* Noot.
Symplocaceae	*Symplocos cyanocarpa* C.T.White
Symplocaceae	*Symplocos glabra* Jessup
Symplocaceae	*Symplocos graniticola* Jessup
Symplocaceae	*Symplocos hayesii* C.T.White & W.D.Francis
Symplocaceae	*Symplocos hylandii* Noot.
Symplocaceae	*Symplocos oresbia* Jessup
Symplocaceae	*Symplocos wooroonooran* Jessup
Thymelaeaceae	*Lethedon setosa* (C.T.White) Kosterm.
Thymelaeaceae	*Phaleria biflorum* (C.T.White) Herber
Urticaceae	*Dendrocnide cordifolia* (L.S.Sm.) Jackes & M.Hurley
Vitaceae	*Cissus vinosa* Jackes
Vitaceae	*Tetrastigma crenatum* Jackes
Winteraceae	*Bubbia queenslandiana* Vink
Winteraceae	*Bubbia whiteana* A.C.Sm.
Winteraceae	*Tasmannia membranea* (F.Muell.) A.C.Sm.
Winteraceae	*Tasmannia* sp. (Mt Bellenden Ker J.R.Clarkson 6571) #
Zingiberaceae	*Alpinia arctiflora* (F.Muell.) Benth.
Zingiberaceae	*Alpinia hylandii* R.M.Sm.
Zingiberaceae	*Alpinia modesta* F.Muell. ex K.Schum.
Zingiberaceae	*Pleuranthodium racemigerum* (F.Muell.) R.M.Sm.

APPENDIX III – Threatened plants of the Wet Tropics

List of threatened vascular plant species found in the Wet Tropics Bioregion (from original HERBRECS data extract dated April 2014).

Key to symbols

undescribed species

a Conservation status under the Queensland *Nature Conservation Act 1992*: N = Near Threatened, V = Vulnerable, E = Endangered, X = Presumed Extinct.

b Conservation status under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. V = Vulnerable, E = Endangered, CE = Critically Endangered, X = Presumed Extinct.

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
FERNS AND LYCOPHYTES			
Amphineuron immersum (Blume) Holttum	E		Rainforest
Antrophyum plantagineum (Cav.) Kaulf.	N		Rainforest
Antrophyum subfalcatum Brack.	N		Rainforest
Asplenium pellucidum Lam.	V	V	Rainforest
Asplenium unilaterale Lam.	V		Rainforest
Asplenium wildii F.M.Bailey	V	V	Rainforest
Calochlaena villosa (C.Chr.) M.D.Turner & R.A.White	N		Rainforest
Chingia australis Holttum	E	E	Rainforest
Crepidomanes aphlebioides (Christ) Bostock	E		Rainforest
Crepidomanes majoriae (Watts) N.A.Wakef.	V		Rainforest
Ctenopteris walleri (Maiden & Betche) S.B.Andrews	V	V	Rainforest
Cyathea celebica Blume	N		Rainforest
Didymoglossum exiguum (Bedd.) Copel.	X		Rainforest
Didymoglossum mindorense (Christ) Ebihara & K.Iwats.	N		Rainforest
Diplazium cordifolium Blume	V	V	Rainforest
Diplazium pallidum (Blume) T.Moore	E	E	Rainforest
Dipteris conjugata Reinw.	N		Rainforest
Dryopteris hasseltii (Blume) C.Chr.	N		Rainforest
Dryopteris sparsa (Buch.-Ham. ex D.Don) Kuntze	V		Rainforest
Dryopteris wattsii M.McKeown, Sundue & Barrington	V		Rainforest
Elaphoglossum callifolium (Blume) T.Moore	N		Rainforest
Grammitis albosetosa (F.M.Bailey) Parris	N		Rainforest
Grammitis leonardii Parris	N		Rainforest
Grammitis reinwardtii Blume	V	V	Rainforest
Huperzia serrata (Thunb. ex Murray) Trevis.	X	X	Rainforest
Hymenophyllum digitatum (Sw.) Fosberg	V		Rainforest
Hymenophyllum gracilescens Domin	V		Rainforest
Hymenophyllum kerianum Watts	V		Rainforest

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
Hymenophyllum lobbii T.Moore	X	X	Rainforest
Hymenophyllum pallidum (Blume) Ebihara & K.Iwats.	N		Rainforest
Hymenophyllum whitei Goy	X	X	Rainforest
Lastreopsis grayi D.L.Jones	V		Rainforest
Lastreopsis tinarooensis Tindale	V		Rainforest
Lastreopsis walleri Tindale	V	V	Rainforest
Lemmaphyllum accedens (Blume) Donk	X	X	Sclerophyll
Lindsaea terrae-reginae K.U.Kramer	V		Rainforest
Lindsaea walkerae Hook.	N		Sclerophyll
Lycopodium volubile G.Forst.	X	X	Sclerophyll
Microsorum membranifolium (R.Br.) Ching	N		Rainforest
Monogramma dareicarpa Hook.	X	X	Rainforest
Oenotrichia dissecta (C.T.White & Goy) S.B.Andrews	N		Rainforest
Phlegmariurus dalhousieanus (Spring) A.R.Field & Bostock	E	E	Rainforest
Phlegmariurus filiformis (Sw.) W.H.Wagner	E	E	Rainforest
Phlegmariurus lockyeri (D.L.Jones & B.Gray) A.R.Field & Bostock	V	V	Rainforest
Phlegmariurus marsupiiformis (D.L.Jones & B.Gray) A.R.Field & Bostock	V	V	Rainforest
Phlegmariurus phlegmaria (L.) T.Sen & U.Sen	N		Rainforest
Phlegmariurus phlegmarioides (Gaudich.) A.R.Field & Bostock	V		Rainforest
Phlegmariurus squarrosus (G.Forst.) A.Love & D.Love	E	CE	Rainforest
Phlegmariurus tetrastichoides (A.R.Field & Bostock) A.R.Field & Bostock	V	V	Rainforest
Plesioneuron tuberculatum (Ces.) Holttum	E	E	Rainforest
Pneumatopteris costata (Brack.) Holttum	N		Rainforest
Polyphlebium endlicherianum (C.Presl) Ebihara & K.Iwats.	V		Rainforest
Pteridoblechnum acuminatum (C.T.White & Goy) Hennipman	N		Rainforest
Tmesipteris lanceolata P.A.Dang.	X	X	Rainforest
Conifers and Cycads			
Agathis microstachya J.F.Bailey & C.T.White	N		Rainforest
Prumnopitys ladei (F.M.Bailey) de Laub.	N		Rainforest
Flowering Plants			
Acacia homaloclada F.Muell.	V		Sclerophyll
Acacia hylonoma Pedley	V		Rainforest
Acacia longipedunculata Pedley	N		Sclerophyll
Acacia lumholtzii Pedley	V		Sclerophyll
Acacia purpureopetala F.M.Bailey	V	CE	Sclerophyll
Acalypha lyonsii P.I.Forst.	V		Rainforest
Aceratium ferrugineum C.T.White	N		Rainforest

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
Aceratium sericoleopsis Balgooy	N		Rainforest
Acianthus sublestus Dockrill	N		Rainforest
Acriopsis emarginata D.L.Jones & M.A.Clem.	V	V	Rainforest
Acronychia acuminata T.G.Hartley	N		Rainforest
Acrotriche baileyana (Domin) J.M.Powell	N		Rainforest
Actephila foetida Domin	V	V	Rainforest
Actephila sessilifolia Benth.	N		Rainforest
Aglaia brassii Merr. & L.M.Perry	N		Rainforest
Albizia sp. (Windsor Tableland B.Gray 2181) #	V		Rainforest
Alectryon semicinereus (F.Muell.) Radlk.	N		Rainforest
Alloxylon flammeum P.H.Weston & Crisp	V	V	Rainforest
Alpinia hylandii R.M.Sm.	N		Rainforest
Aphyllorchis anomala Dockrill	N		Rainforest
Aphyllorchis queenslandica Dockrill	N		Rainforest
Aponogeton bullosus H.Bruggen	E	E	Aquatic
Aponogeton prolifer Hellq. & S.W.L.Jacobs	E	E	Aquatic
Archidendron kanisii R.S.Cowan	E		Rainforest
Archidendropsis xanthoxylon (C.T.White & W.D.Francis) I.C.Nielsen	N		Rainforest
Archontophoenix myolensis Dowe	E	E	Rainforest
Ardisia fasciculata C.T.White	N		Rainforest
Arenga australasica (H.Wendl. & Drude) S.T.Blake ex H.E. Moore	V		Rainforest
Argophyllum cryptophlebum Zemann	N		Rainforest
Argyrodendron sp. (Boonjie B.P.Hyland RFK2139) #	N		Rainforest
Arthraxon hispidus (Thunb.) Makino	V	V	Sclerophyll
Arytera *dictyoneura* S.T.Reynolds	N		Rainforest
Austrobuxus megacarpus P.I.Forst.	N		Rainforest
Austromuellera trinervia C.T.White	N		Rainforest
Austromuellera valida B.Hyland	V		Rainforest
Banksia plagiocarpa A.S.George	V		Sclerophyll
Barongia lophandra Peter G.Wilson & B.Hyland	V		Rainforest
Beilschmiedia castrisinensis B.Hyland	N		Rainforest
Boea kinnearii (F.Muell.) B.L.Burtt	E		Rainforest
Bubbia queenslandiana subsp. *australis* Vink	N		Rainforest
Bubbia queenslandiana Vink subsp. *queenslandiana*	N		Rainforest
Bubbia whiteana A.C.Sm.	V		Rainforest
Buchanania mangoides F.Muell.	V		Rainforest
Buckinghamia ferruginiflora Foreman & B.Hyland	N		Rainforest
Bulbophyllum boonjee B.Gray & D.L.Jones	N		Rainforest
Bulbophyllum grandimesense B.Gray & D.L.Jones	N		Rainforest
Bulbophyllum windsorense B.Gray & D.L.Jones	N		Rainforest
Bulbophyllum wolfei B.Gray & D.L.Jones	N		Rainforest
Caesalpinia robusta (C.T.White) Pedley	N		Rainforest

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
Callerya pilipes (F.M.Bailey) Schot	N		Rainforest
Calochilus psednus D.L.Jones & Lavarack	E	E	Sclerophyll
Canarium acutifolium (DC.) Merr. var. *acutifolium*	V	V	Rainforest
Carex breviscapa C.B.Clarke	N		Sclerophyll
Carex rafflesiana Boott	N		Sclerophyll
Carronia pedicellata Forman	E	E	Rainforest
Cassia sp. (Paluma Range G.Sankowsky+ 450) #	N		Rainforest
Centotheca philippinensis (Merr.) C.Monod	N		Rainforest
Ceratopetalum corymbosum C.T.White	V		Rainforest
Ceratopetalum macrophyllum Hoogland	N		Rainforest
Cheilocostus potierae (F.Muell.) M.G.Harr. & Zich	E		Rainforest
Chiloglottis longiclavata D.L.Jones	N		Rainforest
Cinnamomum propinquum F.M.Bailey	V		Rainforest
Citrus inodora F.M.Bailey	V		Rainforest
Cladopus queenslandicus (Domin) C.D.K.Cook & Rutish.	N		Aquatic
Cleistanthus discolor Summerh.	N		Rainforest
Cleistanthus myrianthus (Hassk.) Kurz	N		Rainforest
Comesperma praecelsum F.Muell.	N		Sclerophyll
Corsia dispar D.L.Jones & B.Gray	N		Rainforest
Corybas abellianus Dockrill	N		Rainforest
Corybas cerasinus D.L.Jones & B.Gray	N		Sclerophyll
Corymbia rhodops (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson	V	V	Sclerophyll
Crepidium flavovirens D.L.Jones & M.A.Clem.	N		Rainforest
Crepidium lawleri (Lavarack & B.Gray) Szlach.	E	E	Sclerophyll
Croton densivestitus C.T.White & W.D.Francis	N		Rainforest
Cucumis costatus I.Telford	N		Sclerophyll
Cupaniopsis cooperorum P.I.Forst.	V		Rainforest
Cyclophyllum costatum (C.T.White) S.T.Reynolds & R.J.F.Hend.	V	V	Rainforest
Cyperus cephalotes Vahl	E	E	Sclerophyll
Dansiea elliptica Byrnes	N		Rainforest
Demorchis queenslandica (Dockrill) D.L.Jones & M.A.Clem.	N		Rainforest
Dendrobium bigibbum Lindl.	V	V	Rainforest
Dendrobium callitrophilum B.Gray & D.L.Jones	V	V	Sclerophyll
Dendrobium fellowsii F.Muell.	N		Rainforest
Dendrobium johannis Rchb.f.	V	V	Sclerophyll
Dendrobium mirbelianum Gaudich.	E	E	Sclerophyll
Dendrobium nindii W.Hill	E	E	Rainforest
Didymoplexis pallens Griff.	N		Sclerophyll
Dinghoua globularis (Ding Hou) R.H.Archer	N		Rainforest
Dinosperma longifolium T.G.Hartley	E		Rainforest

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
Dioclea hexandra (Ralph) Mabb.	V		Rainforest
Diospyros sp. (Mt Spurgeon C.T.White 10677) #	N		Rainforest
Diploglottis harpullioides S.T.Reynolds	N		Rainforest
Diploglottis pedleyi S.T.Reynolds	N		Rainforest
Dissiliaria tuckeri P.I.Forst.	V		Rainforest
Diuris oporina D.L.Jones	N		Sclerophyll
Dodonaea uncinata J.G.West	N		Sclerophyll
Dracophyllum sayeri F.Muell.	V		Rainforest
Drosera adelae F.Muell.	N		Sclerophyll
Drosera prolifera C.T.White	V	V	Rainforest
Drosera schizandra Diels	V	V	Rainforest
Eidothea zoexylocarya A.W.Douglas & B.Hyland	V		Rainforest
Elaeocarpus coorangooloo J.F.Bailey & C.T.White	N		Rainforest
Elaeocarpus stellaris L.S.Sm.	N		Rainforest
Elaeocarpus thelmae B.Hyland & Coode	N		Rainforest
Eleocharis retroflexa (Poir.) Urb.	V	V	Sclerophyll
Endiandra anthropophagorum Domin	N		Rainforest
Endiandra bellendenkerana B.Hyland	N		Rainforest
Endiandra cooperana B.Hyland	E	E	Rainforest
Endiandra dichrophylla F.Muell.	N		Rainforest
Endiandra globosa Maiden & Betche	N		Rainforest
Endiandra grayi B.Hyland	V		Rainforest
Endiandra jonesii B.Hyland	V		Rainforest
Endiandra microneura C.T.White	N		Rainforest
Endiandra phaeocarpa B.Hyland	V		Rainforest
Endiandra sideroxylon B.Hyland	N		Rainforest
Endressia wardellii (F.Muell.) Whiffin	N		Rainforest
Eria dischorensis Schltr.	N		Rainforest
Eria irukandjiana St.Cloud	N		Rainforest
Eucryphia wilkiei B.Hyland	V	V	Rainforest
Eulophia bicallosa (D.Don) P.Hunt & Summerh.	N		Sclerophyll
Euodia hylandii T.G.Hartley	N		Rainforest
Euodia pubifolia T.G.Hartley	V		Rainforest
Fimbristylis adjuncta S.T.Blake	E	E	Sclerophyll
Firmiana papuana Mildbr.	N		Rainforest
Flindersia oppositifolia (F.Muell.) T.G.Hartley & Jessup	N		Rainforest
Freycinetia marginata Blume	V		Rainforest
Freycinetia percostata Merr. & L.M.Perry	V		Rainforest
Gahnia insignis S.T.Blake	N		Sclerophyll
Garcinia brassii C.T.White	N		Rainforest
Gardenia actinocarpa Puttock	E	E	Rainforest
Garnotia stricta var. *longiseta* Hack.	N		Rainforest

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
Gastrodia urceolata D.L.Jones	V		Rainforest
Genoplesium alticola D.L.Jones & B.Gray	N		Sclerophyll
Genoplesium tectum D.L.Jones	E	E	Sclerophyll
Glochidion pruinosum Airy Shaw	N		Rainforest
Glochidion pungens Airy Shaw	N		Rainforest
Goodyera grandis (Blume) Blume	N		Rainforest
Goodyera viridiflora (Blume) Blume	N		Rainforest
Grevillea glossadenia McGill.	V	V	Sclerophyll
Gymnostoma australianum L.A.S.Johnson	V		Rainforest
Habenaria rumphii (Brongn.) Lindl.	N		Sclerophyll
Haplostichanthus submontanus Jessup subsp. *submontanus*	N		Rainforest
Haplostichanthus submontanus subsp. *sessiliflorus* Jessup	N		Rainforest
Harpullia ramiflora Radlk.	N		Rainforest
Hedyotis novoguineensis Merr. & L.M.Perry	E		Sclerophyll
Helicia grayi Foreman	N		Rainforest
Helicia lamingtoniana (F.M.Bailey) C.T.White ex L.S.Sm.	N		Rainforest
Helicia lewisensis Foreman	V		Rainforest
Helicia recurva Foreman	N		Rainforest
Hemmantia webbii Whiffin	N		Rainforest
Hexaspora pubescens C.T.White	V	V	Rainforest
Hollandaea riparia B.Hyland	V		Rainforest
Hollandaea sayeriana (F.Muell.) L.S.Sm.	N		Rainforest
Homoranthus porteri (C.T.White) Craven & S.R.Jones	V	V	Sclerophyll
Hypserpa smilacifolia Diels	N		Rainforest
Ichnanthus pallens var. major (Nees) Stieber	N		Rainforest
Ilex sp. (Gadgarra B.P.Hyland RFK2011) #	N		Rainforest
Kunzea sp. (Herbert River R.J.Cumming 11309) #	N		Sclerophyll
Lasjia grandis (C.L.Gross & B.Hyland) P.H.Weston & A.R.Mast	V		Rainforest
Leionema ellipticum Paul G.Wilson	V		Rainforest
Lenbrassia australiana (C.T.White) G.W.Gillett var. *australiana*	N		Rainforest
Lenbrassia australiana var. *glabrescens* B.D.Morley	N		Rainforest
Lepiderema hirsuta S.T.Reynolds	N		Rainforest
Lepiderema largiflorens S.T.Reynolds	N		Rainforest
Leucopogon malayanus subsp. *novoguineensis* (Sleumer) Pedley	V		Rainforest
Linospadix microcaryus (Domin) Burret	N		Rainforest
Linospadix palmerianus (F.M.Bailey) Burret	N		Rainforest
Liparis simmondsii F.M.Bailey	N		Rainforest
Litsea granitica B.Hyland	V		Rainforest

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
Livistona drudei F.Muell. ex Drude	V		Sclerophyll
Lobelia membranacea R.Br.	N		Sclerophyll
Lysiana filifolia Barlow	N		Sclerophyll
Mammea touriga (C.T.White & W.D.Francis) L.S.Sm.	N		Rainforest
Marsdenia araujacea F.Muell.	X	X	Rainforest
Marsdenia brevifolia (Benth.) P.I.Forst.	V	V	Sclerophyll
Marsdenia hemiptera Rchb.	N		Rainforest
Marsdenia rara P.I.Forst.	V		Sclerophyll
Marsdenia straminea P.I.Forst.	V		Rainforest
Medicosma glandulosa T.G.Hartley	N		Rainforest
Megahertzia amplexicaulis A.S.George & B.Hyland	N		Rainforest
Meiogyne hirsuta (Jessup) Jessup	N		Rainforest
Melaleuca sylvana Craven & A.J.Ford	E		Sclerophyll
Melaleuca uxorum Craven G.Holmes & Sankowsky	E		Sclerophyll
Mesua larnachiana (F.Muell.) Kosterm.	V		Rainforest
Micromyrtus delicata A.R.Bean	E		Sclerophyll
Mischocarpus albescens S.T.Reynolds	N		Rainforest
Mitrantia bilocularis Peter G.Wilson & B.Hyland	V		Rainforest
Musa fitzalanii F.Muell.	X	X	Rainforest
Musa jackeyi W.Hill	E		Rainforest
Myrmecodia beccarii Hook.f.	V	V	Rainforest
Neololeba atra (Lindl.) Widjaja	N		Rainforest
Neostrearia fleckeri L.S.Sm.	N		Rainforest
Nepenthes mirabilis (Lour.) Druce (Bramston Beach population)	E		Sclerophyll
Nicotiana wuttkei J.R.Clarkson & Symon	E		Sclerophyll
Noahdendron nicholasii P.K.Endress B.Hyland & Tracey	E		Rainforest
Oenanthe javanica DC.	N		Sclerophyll
Oldenlandia polyclada (F.Muell.) F.Muell.	N		Sclerophyll
Oldenlandia tenelliflora var. *papuana* Valeton	X		Rainforest
Pandanus gemmifer H.St.John	N		Rainforest
Paramapania parvibractea (C.B.Clarke) Uittien	N		Rainforest
Pararistolochia praevenosa (F.Muell.) Michael J.Parsons	N		Rainforest
Parsonsia bartlensis J.B.Williams	V		Rainforest
Parsonsia largiflorens (F.Muell. ex Benth.) S.T.Blake	E		Rainforest
Parsonsia wildensis J.B.Williams	V		Sclerophyll
Parsonsia wongabelensis J.B.Williams	E		Rainforest
Paspalidium scabrifolium S.T.Blake	N		Sclerophyll
Peperomia bellendenkerensis Domin	N		Rainforest
Peripentadenia mearsii (C.T.White) L.S.Sm.	N		Rainforest
Peripentadenia phelpsii B.Hyland & Coode	V		Rainforest
Peripleura scabra (DC.) G.L.Nesom	N		Sclerophyll

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
Peristylus banfieldii (F.M.Bailey) Lavarack	N		Sclerophyll
Phaius australis F.Muell.	E	E	Sclerophyll
Phaius pictus T.E.Hunt	V	V	Rainforest
Phalaenopsis amabilis subsp. *rosenstromii* (F.M.Bailey) Christenson	E	E	Rainforest
Phaleria biflora (C.T.White) Herber	V	V	Rainforest
Phyllanthera grayi (P.I.Forst.) Venter	V		Rainforest
Phyllanthus brassii C.T.White	V		Rainforest
Piper mestonii F.M.Bailey	N		Rainforest
Plectranthus amoenus P.I.Forst.	V		Sclerophyll
Plectranthus gratus S.T.Blake	V	V	Sclerophyll
Plectranthus spectabilis S.T.Blake	N		Sclerophyll
Polyalthia xanthocarpa B.Xue & R.M.K.Saunders	N		Rainforest
Polyosma rigidiuscula F.Muell. & F.M.Bailey ex F.M.Bailey	N		Rainforest
Polyscias bellendenkerensis (F.M.Bailey) Philipson	V	V	Rainforest
Pothos brassii B.L.Burtt	N		Rainforest
Prostanthera albohirta C.T.White	X	X	Sclerophyll
Prostanthera clotteniana (F.M.Bailey) A.R.Bean	E	CE	Sclerophyll
Prostanthera sp. (Dinden P.I.Forster+ PIF17342) #	E		Sclerophyll
Pseuduvaria froggattii (F.Muell.) Jessup	N		Rainforest
Pseuduvaria hylandii Jessup	N		Rainforest
Pseuduvaria mulgraveana Jessup var. *mulgraveana*	N		Rainforest
Pseuduvaria mulgraveana var. *glabrescens* Jessup	N		Rainforest
Pseuduvaria villosa Jessup	N		Rainforest
Randia audasii C.T.White	N		Rainforest
Remusatia vivipara (Roxb.) Schott	N		Rainforest
Rhamphicarpa australiensis Steenis	N		Sclerophyll
Rhaphidospora cavernarum (F.Muell.) R.M.Barker	V		Rainforest
Rhodamnia longisepala N.Snow & A.J.Ford	E		Rainforest
Ristantia gouldii Peter G.Wilson & B.Hyland	V	V	Rainforest
Romnalda ophiopogonoides Conran P.I.Forst. & Donnon	V		Rainforest
Rourea brachyandra F.Muell.	N		Rainforest
Ryparosa kurrangii B.L.Webber	N		Rainforest
Samadera baileyana Oliv.	N		Rainforest
Sankowskya stipularis P.I.Forst.	E	E	Rainforest
Sarcopteryx acuminata S.T.Reynolds	N		Rainforest
Sarcopteryx montana S.T.Reynolds	N		Rainforest
Sauropus macranthus Hassk.	V	V	Rainforest
Schizomeria whitei Mattf.	N		Rainforest
Senegalia albizioides (Pedley) Pedley	N		Rainforest
Solanum hamulosum C.T.White	E		Rainforest
Spathoglottis paulinae F.Muell.	N		Rainforest

TAXON	CONSERVATION STATUS, QLD[A]	CONSERVATION STATUS, CWLTH[B]	HABITAT
Sphaerantia chartacea Peter G.Wilson & B.Hyland	N		Rainforest
Sphaerantia discolor Peter G.Wilson & B.Hyland	V		Rainforest
Steganthera australiana C.T.White	N		Rainforest
Steganthera laxiflora subsp. *lewisensis* Whiffin	N		Rainforest
Stenocarpus cryptocarpus Foreman & B.Hyland	N		Rainforest
Stenocarpus davallioides Foreman & B.Hyland	V		Rainforest
Stockwellia quadrifida D.J.Carr S.G.M.Carr & B.Hyland	N		Rainforest
Strongylodon lucidus (G.Forst.) Seem.	N		Rainforest
Symplocos ampulliformis C.T.White	N		Rainforest
Symplocos crassiramifera Noot.	V		Rainforest
Symplocos graniticola Jessup	V		Rainforest
Symplocos oresbia Jessup	N		Rainforest
Symplocos wooroonooran Jessup	N		Rainforest
Syzygium glenum Craven	E		Rainforest
Syzygium malaccense (L.) Merr. & L.M.Perry	N		Rainforest
Syzygium mulgraveanum (B.Hyland) Craven & Biffin	N		Rainforest
Taeniophyllum confertum B.Gray & D.L.Jones	N		Rainforest
Taeniophyllum lobatum Dockrill	N		Rainforest
Tetramolopium sp. (Mt Bowen D.G.Fell+ DGF1224) #	V		Sclerophyll
Thaleropia queenslandica (L.S.Sm.) Peter G.Wilson	N		Rainforest
Toechima pterocarpum S.T.Reynolds	E	E	Rainforest
Trachymene geraniifolia F.M.Bailey	N		Sclerophyll
Triplarina nitchaga A.R.Bean	V	V	Sclerophyll
Tristellateia australasiae A.Rich.	N		Rainforest
Tylophora rupicola P.I.Forst.	E	E	Sclerophyll
Uncaria cordata (Lour.) Merr. var. cordata	N		Rainforest
Vrydagzynea grayi D.L.Jones & M.A.Clem.	E	E	Rainforest
Wendlandia basistaminea F.Muell.	N		Rainforest
Wendlandia connata C.T.White	N		Rainforest
Wendlandia psychotrioides (F.Muell.) F.Muell.	X		Rainforest
Wetria australiensis P.I.Forst.	V		Rainforest
Whyanbeelia terrae-reginae Airy Shaw & B.Hyland	N		Rainforest
Wilkiea sp. (McDowall Range J.G.Tracey 14552) #	N		Rainforest
Xanthophyllum fragrans C.T.White	N		Rainforest
Xanthostemon formosus Peter G.Wilson	E	E	Rainforest
Xanthostemon graniticus Peter G.Wilson	N		Rainforest
Xanthostemon verticillatus (C.T.White & W.D.Francis) L.S.Sm.	V		Rainforest
Xylosma sp. (Mt Lewis G.Sankowsky+ 1108) #	V		Rainforest
Zeuxine polygonoides (F.Muell.) P.J.Cribb	V	V	Rainforest
Zieria obovata (C.T.White) J.A.Armstr.	V	V	Sclerophyll
Zieria rimulosa C.T.White	V	V	Sclerophyll

Terms and abbreviations

ancient flowering plant	A living member of any of the lineages which diverged early in the evolution of the flowering plants. Includes plants belonging to the orders Amborellales, Austrobaileyales, Canellales, Chloranthales, Laurales, Magnoliales, Nymphaeales and Piperales. Although belonging to ancient lineages, individual plant species may themselves be relatively young.
angiosperm	Flowering plant.
basal lineage	For any group of organisms, a basal lineage is a subgroup whose evolutionary pathway diverged from the main group at a very early stage. A basal lineage may retain features of its ancestors that have been lost or modified in its relatives. Such features are called 'primitive'.
biodiversity	The variability among living organisms and the ecological complexes of which they are part, including diversity within species, between species and of ecosysytems. Compare 'phylogenetic diversity'.
bioregion	Biogeographical region.
biota	The flora and fauna (including microorganisms and fungi) of a region.
DNA	Deoxyribonucleic acid. The main repository of genetic information in multicellular life. The DNA code can be used a source of information in determining an organism's ancestry.
endemic	Native and restricted to a particular area. For example, *Eucalyptus camaldulensis* (river red gum) is endemic to Australia and *diospermum australiense* (idiot fruit) is endemic to the Wet Tropics bioregion.
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999.
epiphyte	A plant which lives its entire life on another plant. For example, *Platycerium superbum* (staghorn fern) lives in the branches of rainforest trees. An epiphyte is not a parasite, because it draws no nutrient from its supporting plant.
eudicots	A large and diverse lineage of modern angiosperms. Includes familiar plant families such as the Proteaceae (macadamia/banksia), Vitaceae (grape family), Rutaceae (citrus family), Lamiaceae (mint family) and Asteraceae (daisy family). The lineages of the ANITA grade, Chloranthales, Magnoliales, Laurales, Canellales, Piperales and the monocots diverged before the evolution of the eudicot group.
ex situ	'Off site'. Often used to refer to conservation approaches involving translocation of plants to safe places outside of their natural geographical range.
family	In biology, refers to a taxonomic rank between order and genus. All modern family names end in "aceae".
Gondwana	The name given to the more southerly of two supercontinents (the other being Laurasia) that was part of the Pangaea supercontinent which existed from approximately 700 to 180 mya. It separated from Laurasia 200-180mya. Gondwana included most of the landmasses in today's Southern Hemisphere, including Antarctica, South America, Africa, Madagascar, and the Australian continent, as well as the Arabian Peninsula and the Indian Subcontinent, which have now drifted entirely into the Northern Hemisphere.
Great Divide	The highest ridgeline of the Great Dividing Range of eastern Australia, the line of which separates west-flowing and east-flowing streams.
Great Escarpment	A single escarpment that runs east of the Great Dividing Range almost the entire length of eastern Australia and attains a height of several hundred metres. The Great Escarpment originated by scarp retreat from a new continental edge created by continental rifting at the eastern edge of Australia about 80 mya.

in situ	'On site'. Often used to refer to conservation approaches which manage plants at places within their natural geographical range.
irreplaceability	A measure of a protected area's potential contribution to broad conservation goals. Conversely, it is a measure of the extent to which the loss of a site reduces the options for meeting those goals. An area that provides the principal, or sole, habitat for many threatened species is rated very high.
IUCN	International Union for the Conservation of Nature.
JCU	James Cook University.
lignin	A complex organic polymer found in plant cells. It provides a stiffening function to cell walls, and is a major component of wood.
lineage	The ancestry or pedigree of an organism.
monocots	A contraction of 'monocotyledons'. A large group of angiosperms characterised by a single seed leaf, and (usually) flower parts organised in groups of three. Includes the orchids, palms, lilies and grasses.
monoty pic	A genus or family containing just one species.
mya	Million years ago.
NCA	Queensland *Nature Conservation Act 1992*.
NCR	Queensland *Nature Conservation* (Wildlife) Regulation 2006, a regulation made under the *Nature Conservation Act 1992*.
near threatened	Under the NCA, a near threatened species is a species of limited distribution, or one whose population size has unexpectedly declined, or the population size/ distribution of the species is small, or whose survival is otherwise affected in the wild that it might be become threatened.
orographic	When referring to rainfall, orographic rain is precipitation generated when moisture laden air is forced upwards when it encounters a mountain or range. Orographic rain is the most important dry season source of rainfall in the Wet Tropics bioregion.
OUV	Outstanding Universal Value is the central concept in listing under the World Heritage Convention. It means a place has cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. The permanent protection of this heritage is of the highest importance to the international community as a whole. Therefore, a place identified as having Outstanding Universal Value is a place of exceptional importance for the whole world.
phylogenetics	The study of evolutionary relationships amongst organisms.
phylogenetic diversity	A measure of biodiversity which incorporates evolutionary difference between species.
phylogeny	A hypothesis of the evolutionary history and relationships between a group of organisms, often illustrated as an evolutionary tree.
rare species	A species which is uncommon, scarce, or infrequently encountered. Rare species may have very restricted distributions and/or small population sizes and/or have individuals which are highly scattered. Rare species may or may not be listed as threatened under government legislation.
RE	Regional ecosystem. A vegetation community in a bioregion that is consistently associated with a particular combination of geology, land form and soil.

refugium/refugia	A geographic locality which, for reasons of climate, geography and geology, has been protected from severe environmental changes that have impacted the greater surrounding landscape over geological time. Provides a safe haven for species that have gone extinct elsewhere as a result of environmental change.
sclerophyll	'Hard leaf'. Refers to plants with tough, leathery leaves , which are typical of species which undergo significant water or nutrient stress. Commonly used as a term to describe species from dry woodlands and forests (e.g. *Acacia, Banksia, Eucalyptus*), sclerophylly is also a feature of the leaves of many rainforest canopy species and vines.
Sahul	The land mass comprising Australia and its surrounding continental shelf formed during historical glacial maxima, when falling sea levels exposed the shelf and created land bridges between continental Australia and adjacent islands e.g. Australia and New Guinea.
sensu	In the sense of (Latin).
s.l. or sensu lato	'In the broad sense'. Refers to a broadly defined taxon that some authors consider to comprise a number of separate species.
subclass	In biology, refers to a taxonomic rank between class and order. Refers to large, broadly related groups.
Sunda	The land mass comprising southeast Asia and its surrounding continental shelf formed during historical glacial maxima when falling sea levels exposed continental shelves and created land bridges between the Asian mainland and adjacent islands e.g. the Malay Peninsula and Sumatra.
Threatened	A threatened species is one listed as Vulnerable, Endangered or Critically Endangered under the EPBC Act or the NCA.
tribe	In biology, refers to a taxonomic rank between family and genus. Tribal divisions are used to subdivide large families, and are useful in describing geographical distributions.
UNEP	United Nations Environment Program.
UNESCO	United Nations Educational, Scientific and Cultural Organisation.
vascular	Pertaining to veins. Vascular plants are plants with well-developed veins, which facilitate transport of water and nutrients through the body of the plant; the monocots and eudicots are all vascular plants.
Wet Tropics	The Wet Tropics bioregion which contains the Wet Tropics of Queensland World Heritage Area.
WHA	Wet Tropics of Queensland World Heritage Area which is located mostly within the Wet Tropics bioregion.

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Mesophyll rainforest. © Mike Trennery

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