

Update of Original Wet Tropics of Queensland Nomination Dossier

Stephen Goosem
Wet Tropics Management Authority
Cairns, Queensland, Australia. 4870.

Description and Inventory

Australia's *Wet Tropics of Queensland World Heritage Area* covers 894,420ha. It is located in the north-east coastal region of the State of Queensland, where it extends from just south of Cooktown to just north of Townsville. The World Heritage Area comprises a large proportion of the 1,849,725 ha Wet Tropics biogeographic region (Thackway & Cresswell 1995; Goosem *et al* 1999).



The rainforests of the Wet Tropics of Queensland are a relict of a vegetation type which was once much more widespread. Fossil pollen records have indicated that much of Australia was covered by closed forests some 50 to 100 million years ago. Australian rainforests are currently restricted to a series of discontinuous pockets extending for more than 6,000 km across northern Australia and along the east coast to Tasmania. Representatives of the sub-tropical and temperate rainforests are included in the *Central Eastern Rainforests Reserve World Heritage Area* in New South Wales and south-east Queensland and the cool temperate rainforests are included in the *Tasmanian Wilderness World Heritage Area*.

Australia has a total native forest area of almost 156 million hectares (National Land & Water Resources Audit 2001). With a land area of almost 769 million hectares, only about 20 per cent of the Australian continent is forested. It is estimated that rainforests currently cover just over 3.0 million hectares of Australia (National Land & Water Resources Audit 2001). The largest area of remaining rainforest in Australia is located in the Wet Tropics region of Queensland (27.6%) where most of the larger contiguous blocks are contained within the boundaries of the Wet Tropics of Queensland World Heritage Area (the Property) (**Table 1**). Due to its landscape diversity and latitudinal position, the Property supports a range of tropical, subtropical, temperate and monsoonal rainforest types found elsewhere in Australia, but nowhere else is the full range of these broad climatic rainforest types represented.

Table 1. Distribution of rainforest in Australia (km²)¹

ACT	SA	Vic	WA	NSW	NT	Tas	Qld	Australia	Wet Tropics ²	Property ²
0	0	407	16	2218	977	7055	19558	30231	8340	6690
0	0	1.3%	0.1%	7.3%	3.2%	23.3%	64.7%	100%	27.6%	22.1%

Source:¹National Land & Water Resources Audit 2001, ²Authority GIS

(i) Climate and hydrology

Many of the distinctive features of the region relate to the high rainfall and diverse terrain. The mean annual rainfall ranges from about 1,200 to over 8,000 millimetres (Nix 1991). Even in the wettest areas between Tully and Cairns there is a distinctly seasonal precipitation regime with over 60 per cent falling in the summer months (December to March) followed by a relatively dry season in mid-year. Tropical low pressure cells and cyclones that develop in the monsoonal trough commonly produce more than 250 millimetres of rain in a day during the wet season. Mt Bellenden Ker has recorded 1,140 millimetres of rain in a 24-hour period.

By comparison with other tropical rainforest areas in the world, the wetter parts of the region lie at the 'wet' to 'extremely wet' end of the hydrological spectrum. During the wet season when soil profiles are often saturated, high intensity rainfall may not be absorbed by the soil, and widespread overland flow can occur even on relatively steep slopes. The common occurrence of widespread overland flow, as distinct

from highly localised saturation overland flow in valley bottoms, channel margins and stream head locations, appears to be rare in other wet tropical rainforests of the world; indeed its absence has been regarded as characteristic. In this respect, the rainforests of the Wet Tropics appear to be exceptional (Walsh 1980).

On the coast, mean daily temperatures range from a maximum of 31°C to a minimum of 23°C. During winter the mean daily maximum and minimum temperature are about 5°C lower. The tablelands and uplands are cooler, with mean daily summer temperatures ranging from a maximum of 28°C to a minimum of 17°C. During winter, the mean daily maximum and minimum temperatures are 22°C and 9°C respectively. Temperatures on mountain summits may fall to 5°C and in the lowlands may be as high as 35°C (Nix 1991). Coastal humidity during the summer months is on average 78 per cent, but there are numerous days when it reaches into the high nineties.

(ii) Geology and geomorphology

The Property straddles three major geomorphic regions:

- tablelands of the Great Divide;
- coastal lowlands; and
- intermediate Great Escarpment.

The undulating tablelands are remnants of an elevated and warped landscape. The highlands rise to altitudes of 900 m with isolated peaks up to 1,622 m. To the east, the Great Escarpment marks the limit of headwards erosion into these tablelands from the coastal plain. It is a zone of rugged topography, rapid geomorphic processes and diverse environments. The escarpment is deeply incised by many gorges, and there are numerous waterfalls.

The geological history can be divided into three parts:

- formation of a relatively rigid and impermeable continental basement in the Palaeozoic;
- initiation of a north-west drainage in the Mesozoic; and
- intensified doming to the east in the late-Mesozoic-Cainozoic, culminating in continental rifting, ocean formation, partial foundering of the new continental margin with the coast retreating to its present position in the late Tertiary.

The bulk of the underlying rocks are marine Silurian, Devonian and Carboniferous sediments of the Hodgkinson Basin and Broken River Embayment. The greatest concentrations of volcanics and granite occur at the southern end of the Basin at its intersection with the trend of the Broken River Embayment.

Many of the granites were exposed by the end of the Palaeozoic and the beginning of the Mesozoic. Uplift of the tablelands shed drainage north-west during the Jurassic to the Tertiary period. Climatic change and geomorphic processes during the Quaternary led to repeated coastal retreat and marine submergence. These events influenced the reversal of stream flow to the east.

Stepwise coastal retreat and formation of the present juvenile upland coast has led to stream reversal and slope failure. One of the most striking elements of the landscape is the Great Escarpment, which has retreated to its present position as a result of catastrophic erosion and slope failure. Only where basalt flows run down valleys have the gradients of the Escarpment been locally reduced. In the Johnstone River valley system the escarpment is breached by a basalt ramp of moderate slope. The vulcanism of the Atherton Tablelands and adjacent volcanic provinces is characterised by scoria cones, lava cones and maars. Lakes Eacham and Barrine occupy the youngest maars. The tablelands and some coastal areas were greatly disturbed by basalt flows throughout the Pliocene-Pleistocene. However, the high nutrient status of the developing basalt soils may have proved advantageous to the rainforest in resisting stresses during the fluctuating climatic conditions associated with the Pleistocene glacial cycles.

(iii) Fringing reefs

Fringing reefs are extensively developed between the Daintree and Bloomfield rivers. The association between coastal rainforest and fringing coral reef to the extent that is manifest off Cape Tribulation appears to be undocumented elsewhere in the world and is thought to be a unique feature. The reefs are part of the Great Barrier Reef World Heritage Site.

(iv) Vegetation types

The major vegetation type in the Property is tropical rainforest but this is fringed and to some extent dissected by sclerophyll forests and woodlands, mangroves and swamps. The broad vegetation types represented within the Property are described below.

Rainforests

The rainforests of the Wet Tropics of Queensland occur across a diverse range of rainfall, soil type, drainage, altitude and evolutionary history. As a result there is a spectrum of rainforest plant communities and habitats recognised as being floristically and structurally the most diverse in Australia (Tracey 1982).

The rainforests of the wet tropics were classified into 13 major structural types including two which have sclerophyll (*Eucalyptus* and *Acacia*) components. The major types have further been classified into 27 broad communities correlating with climatic zones and soil parent material (Tracey & Webb 1975; Tracey 1982). All these communities occur in the Property and are listed in Appendix 3 of the original nomination document.

On the slopes and summits of the higher peaks where there is frequent cloud cover and strong winds there exist the wet submontane forests known as simply microphyll vine-fern forests and thickets. There is a high regional endemism of species in the floristic composition of these upland areas. Above 1,500 m on the Bellenden Ker Range the canopy, sometimes with the endemic *Leptospermum wooroonooran* dominant, is often low and dense and shows the streamlining effects of strong winds. On the summits there are many narrowly restricted species including *Dracophyllum sayeri*, *Cinnamomum propinquum*, *Rhododendron lochae*, *Flindersia oppositifolia*, *Orites fragrans* and *Uromyrtus metrosideros*,

The montane forests of the Mt Lewis and Mt Spurgeon area are also classified as simple microphyll vine-fern forests. However these forests, having many of their own endemics, differ floristically from those of the Bellenden Ker area. These include in the family Proteaceae, *Helicia recurva* and *Austromuellera trinervia*; *Prumnopitys ladei* in the family Podocarpaceae; the striking pink-flowered *Aceratium ferrugineum* in the family Elaeocarpaceae and the Mt Lewis palm *Archontophoenix purpurea*.

Floristically, the upland simple microphyll vine-fern forests and thickets are very different to the other rainforest types in the Wet Tropics, but they show a floristic affinity with the Australian temperate rainforests at higher latitudes and with montane rainforests of New Guinea and Indonesia. Shared genera with southern Australia include *Trochocarpa* and *Eucryphia*. *Rhododendron* and *Agapetes*, which are each represented in the Wet Tropics by a single species, are shared with New Guinea and Indonesia.

The most highly developed Australian rainforests occur on the wet lowlands. These complex mesophyll vine forests on colluvial footslopes and alluvial soils are represented in the Wet Tropics by small patches between Innisfail and Cape Tribulation. Characteristic trees include *Acmena graveolens*, *Backhousia bancroftii*, *Argyrodendron peralatum* and *Ristantia pachysperma*. Local endemism and disjunctions are common and are exemplified by *Storkiella australiensis* and *Idiospermum australiense*.

One of the most striking rainforest types is that dominated by the endemic Fan Palm, *Licuala ramsayi*. The type is restricted to small patches on poorly drained soils on the lowlands. Most has been cleared for sugar-cane farming and only 780 ha remain. Small patches (totalling 420 ha) of these palm forests are included in the World Heritage Area near Cowley Beach, Mission Beach, Yarrabah and north of the Daintree River.

Complex notophyll vine forests on the basalt soils of the Atherton Tablelands have by now been mostly cleared. What remains includes restricted and disjunct species such as *Athertonia diversifolia*, *Austromuellera trinervia* and *Austrobaileya scandens*. The drier remnant of the type is conserved in the World Heritage Area at the Curtain Fig (State Forest 452) and Severin Creek (State Forest 185) with the wetter type at Mt Hypipamee - The Crater National Park. The overlap of the wet and dry types is conserved in National Parks at Lake Barrine and Lake Eacham.

Complex mesophyll vine forest on very wet lowlands on beach sands is now extremely rare. The major occurrences at Kurrimine Beach and near the mouth of the Daintree River and at Noah Creek near Cape Tribulation are all represented in the World Heritage Area. Palms found in this type include *Arenga appendiculata*, *Archontophoenix alexandrae*, *Hydriosteles wendlandiana*, *Licuala ramsayi*, *Ptychosperma elegans* and in the Noah Creek area the narrowly restricted endemic *Normanbya normanbyi*. Conspicuous trees in the type include *Calophyllum inophyllum* on the beachfront; *Calophyllum sil*, *Syzygium forte*, *Acmena hemilampra* and *Podocarpus grayi* on the dunes; and in the wetter swales *Dillenia alata*, *Syzygium angophoroides* and *Randia fitzalani*. *Backhousia hughesii* is common in the community at Noah Creek.

In addition to these rarer forest types the World Heritage Area contains outstanding and extensive occurrences of mesophyll vine forests and simple notophyll vine forests found on the moist uplands and highlands.

Non-rainforest components

The inclusion of various non-rainforest types within the Property represent the drier end of the rainforest spectrum and because of the influence of fire, act as a transition between rainforest and non-rainforest vegetation. These transitional zones are dynamic and important in terms of long-term management, climate change, and for certain rainforest fauna that use sclerophyll forests on a seasonal basis. These ecotones are important not only for their intrinsic interest but as additional insurance of integrity under fluctuating climates. Their inclusion also adds substantially to the overall biodiversity values of the Property.

Tall Open Forests

Adjacent to the rainforest on the western margin of the World Heritage Area are tall open forests (wet sclerophyll forests) dominated by *Eucalyptus grandis* (Rose Gum), *E. resinifera* (Red Stringybark), *E. acmenioides* (White Stringybark), *Corymbia intermedia* (Pink Bloodwood), *Lophostemon confertus* (Brush Box) and *Syncarpia glomulifera* (Turpentine). Variation in species composition and concentration within these forests correlate with soil type, rainfall and fire frequency; as well these factors are reflected in understoreys of different compositions ranging from well developed rainforest elements to dense grass.

There is a striking contrast in the structure of the adjoining rainforest and wet sclerophyll forests of the Wet Tropics. This ecological situation is very different from rainforests and “campos cerrados” of Brazil and the moist evergreen-dry deciduous forests of India (Webb and Tracey 1981).

The narrow strip of tall open forest where it occurs adjacent to rainforest is important for the conservation of one of the mammals restricted to the World Heritage Area, the endangered *Bettongia tropica* (northern bettong) and the northern population of two other species of mammals restricted to this forest type - *Petaurus australis* (fluffy or yellow-bellied glider), and *Rattus lutreolus* (swamp rat).

Medium and Low Woodlands

Areas of medium and low eucalypt woodlands are also included in the World Heritage Area. These are examples of widespread vegetation types found today over most of tropical Australia. Their inclusion preserves the ecotones between rainforest and sclerophyll elements. The species compositions of both canopy and understorey differ in response to rainfall, soil type, fire frequency and vegetation history.

Paperbark Swamps

Melaleuca spp. (paperbarks) occur as the dominant tree species in poorly drained lowland coastal areas where the water table is near to or above ground level for most of the year. They usually occur as components of vegetation mosaics reflecting specific habitats including the *Melaleuca leucodendra* and *M. dealbata* complex in freshwater and brackish swales in old beach ridge systems; *M. quinquenervia* dominant in fresh water swamps; and *M. viridiflora* on solodic and saline sand plains. The *Melaleuca* communities often have distinct species including the epiphytes *Dischidia*, *Hydrophytum* and the Tea Tree Orchid, *Dendrobium canaliculatum*.

Mangroves

A high degree of species diversity of mangroves trees and shrubs (c. 30 species) occurs in the Wet Tropics, comparable to the diversity of those of New Guinea and Southeast Asia which are acclaimed as some of the richest mangrove areas in the world. Major areas include the Hinchinbrook Channel, the north bank of the Daintree River and Alexandra Bay north of the Daintree River.

Rainforests intergrade with the mangroves, sharing many species at the interface including *Diospyros littorea*, a species found only on the landward side of the mangroves.

The mangrove zone has a rich and varied epiphytic flora including ferns of the genus *Drynaria* and orchids of the genus *Dendrobium* and the Ant Plant, *Myrmecodia beccarii*. The ant *Iridomyrmex cordatus* that inhabits the *Myrmecodia* tends the larvae of the endangered butterfly *Hypochrysopteryx apollo*.

(v) Flora

Within the Property there are over 2840 recorded species of vascular plants, representing 1164 genera and 210 families. Of the genera, 75 are endemic to Australia and 43 are restricted to Queensland's Wet Tropics. More than 700 species, or 25 per cent of the total, are found only in this area.

The Wet Tropics of Queensland World Heritage Area plays a vital role in the conservation of the Australian members of the Southern Hemisphere family Proteaceae. At least 29 genera (some of which are still to be described) out of a world total of 76 occur in the Wet Tropics and over 40 species are restricted to the Property. The rainforest members of the Proteaceae, living or extinct, are claimed (Johnson and Briggs 1975) to be the ancestors of the sclerophyll species such as *Grevillea* and *Persoonia* that today form such an important part of the Australian vegetation. *Placospermum coriaceum*, one of the most primitive plants of the Proteaceae, occurs only in the- Wet Tropics.

Many examples of isolated populations of tree species occur throughout the rainforests of the- World Heritage Area, both on the lowlands and in the uplands. Species included on the lowlands are *Storkiella australiensis* and *Noahdendron nicholasii* which are restricted to near Cape Tribulation; *Idiospermum australiense* and *Lindsayomyrtus brachyandrus* have a disjunct distribution between the Cape Tribulation area and the Harveys Creek–Russell River area south of Cairns, both very wet humid tropical lowland areas. On the uplands *Sphalmium racemosum* and *Stenocarpus davalloides* have populations restricted to the Mt Carbine Tableland in the northern section of the-World Heritage Area, whereas *Lomatia fraxinifolia*, *Darlingia darlingiana* and *Cardwellia sublimis* are widespread. Much is yet unknown of the species distribution patterns in the tropical rainforests of the Wet Tropics.

The Property has a rich orchid flora. Of some 150 species present, about 59 have a restricted distribution with 43 having an extremely small range. *Dendrobium fleckeri*, *D. adae*, *D. carrii* with its creeping rhizome, *Bulbophyllum boonjie* and *Saccolabiopsis rectifolia* are a few examples of the restricted epiphytic orchids. Terrestrial orchids are also represented in the Property. The endemic Jewel Orchid, *Anoectochilus yatesiae*, is only found in the darkest, dense upland rainforests of this region.

The Property is also the home of one of the world's largest cycads, as well as one of the smallest. *Lepidozamia hopei* may grow to a height of about 20m. Its population today is scattered and disjunct. The small fern-like cycad, *Bowenia spectabilis*, is common in the understorey of rainforest-associated communities.

The richest concentrations of ferns and fern allies in Australia are found in the Wet Tropics. Of more than 250 species occurring in these rainforests, 46 are entirely restricted to the Property. Some 17 species have extremely restricted distributions within the Property. Of the five Australian endemic fern genera (Page and Clifford 1981), four occur in the Wet Tropics (*Coveniella*, *Neurosoria*, *Pteridoblechnum* and *Platyzoma*). *Pteridoblechnum* is the only endemic fern genus restricted to the tropical area of northeast Australia and is represented by *P. acuminatum* at Mt Spurgeon and Mossman Gorge and the widely distributed *P. neglectum*.

(vi) Fauna

In comparison with other regions in Australia, the Wet Tropics is extraordinarily rich in vertebrate and invertebrate species. Although the highest species densities occur at lower elevations, the proportion of species restricted to the region increases very markedly with elevation. With the exception of two fish species, the Cairns rainbowfish (*Cairnsichthys rhombosomoides*) and the Roman-nosed goby (*Awaous crassilabrus*), the lizard *Lygisaurus laevis* and the frog *Cophixalus exiguus* and the mammal, the Mahogany glider (*Petaurus gracilis*), the remaining endemic vertebrate species are most frequently recorded above 400 m and often above 600 m (Nix 1991). Several species, however, may be found at lower than usual elevations only in those areas characterised by high annual mean rainfall and frequent cloud cover, where mountains and ridges drop steeply to the sea. These include Lumholtz's tree-kangaroo (*Dendrolagus lumholtzi*), the musky rat-kangaroo (*Hypsiprymnodon moschatus*), the chowchilla (*Orthonyx spaldingii*), Victoria's riflebird (*Ptiloris victoriae*), the northern red-throated skink (*Carlia rubrigularis*), Boyd's forest dragon (*Gonocephalus boydii*), the Palmerston frog (*Cophixalus infacetus*) and the ornate litter frog (*Cophixalus ornatus*). The occurrences of these species below their normal altitudinal limits on wet cloudy coastal mountains and isolated mountains is known as the 'massenerhebung' or 'mountain mass' effect – many explanations have been offered to explain this phenomenon but none have proved adequate (Nix 1991).

Nix (1991) describes the Wet Tropics as an archipelago of mesotherm islands that are separated by dry and/or warm barriers. Nix's climatic analysis of Wet Tropics endemic vertebrates produced five distinct groups that emphasised the importance of altitudinal zonation in describing patterns of endemism within the region.

Mammals

Spatial and altitudinal distributions of Wet Tropics mammals are relatively well established (Winter *et al* 1984; Winter 1988, 1991; Winter *et al* 1991; Van Dyck 1991; Nix & Switzer 1991). Two subregions of mammalian faunal assemblages have been proposed (Winter *et al* 1984).

Patterns in diversity have been largely attributed to altitudinal preference (uplands have higher diversity), dispersal from New Guinea and the fluctuations in the size of rainforest refugia over the last 25,000 years (Schodde & Calaby 1972; Winter 1988, 1991a). Endemic rainforest specialists are considered to be "relict species of a once more widespread community" which are now primarily restricted to upland, cooler rainforests (Winter 1988; Nix 1991).

Birds

Broad distributions and habitat preferences of most Wet Tropics rainforest birds have been well documented (Kikkawa 1968, 1974, 1976, 1982, 1988, 1991a, 1991b; Schodde & Calaby 1972; Crome & Nix 1991; Ingram & Raven 1991; Williams *et al* 1996).

There are high levels of regional endemism in birds from the upland areas of the Wet Tropics. Many of these upland endemic species are considered relicts of either an older connection with the upland fauna of New Guinea or from an older, cool temperate, Australian fauna (Kikkawa *et al* 1981). Present upland rainforests in the Wet Tropics is a refugium and an “epicentre of evolution for low vagility animals” (Kikkawa *et al* 1981). In contrast, the lowland rainforests birds have a higher affinity with the Cape York Peninsula rainforests of far northern Queensland, with dispersal from the north being a more important process than the vicariance inferred by a “pattern of overlap among closely related species” in upland bird assemblages (Kikkawa *et al* 1981). Genetic studies (Joseph & Moritz 1994) suggests that vicariant evolution in historical rainforest refugia has been an important influence on the bird fauna, although the effects of this history have been more complex than previously thought, resulting in different patterns in different species. Genetic analysis also suggests that the time of important vicariant events is variable between species and much longer ago than the late Pleistocene contractions (Joseph & Moritz 1994).

Reptiles

The Wet Tropics is part of the Torresian biogeographic zone and has many representatives of recent reptile species invasions from the north (Cogger & Heatwole 1981). The Wet Tropics consists of a mixture of old endemics (Gondwanan origin) and recent invaders from New Guinea (Cogger & Heatwole 1981; Kikkawa *et al* 1981). Covacevich and Couper (1994) found that the areas of highest reptile diversity in the region are (in descending order) the Bellenden Ker Range/southern Lamb Range, Bloomfield, Mt Lewis/Mt Spurgeon/Windsor Tableland, Ravenshoe/Tully Falls, Kuranda, Paluma and Cardwell.

Frogs

The Wet Tropics contains the most diverse rainforest frog assemblage in Australia with very high levels of regional endemism (McDonald 1992). The Atherton Uplands, Carbine Uplands and Thornton Uplands are the core areas of high rainforest frog diversity (McDonald 1992). High diversity areas are characterised by high rainfall, granite parent rock and high altitude. In general the highest diversity areas are above 600 m with particularly important areas found above 1,000 m (Williams *et al* 1996). The highest lowland frog diversity area is found in the northern coastal section of the Wet Tropics – the Cape Tribulation Lowlands.

McDonald (1992) presents a comprehensive review on the patterns of distribution and diversity of Wet Tropics rainforest frogs. Since that report was published there have been dramatic declines in abundance in a number of species (Richards *et al* 1993). Four species (*Litoria nyakalensis*, *L. lorica*, *Taudactylus acutirostris*, *T. rheophilus*) cannot presently be found despite intense survey work. At least three other species (*Litoria nannotis*, *L. rheocola*, *Nyctimystes dayi*) have severely declined in upland areas (above 300 m) throughout their previous ranges.

Freshwater fish

The Wet Tropics sustains a very high diversity of freshwater fish relative to other Australian regions, parallel to that seen among the terrestrial vertebrates. The Wet Tropics supports 45% of Australia’s freshwater fish species, 70% of genera and 70% of families (Pusey 2001) – this is exceptional continental diversity for a small strip of land less than 70 km wide that passes through only 5 degrees of latitude.

Two of the endemic fish species, *Guyu wujalwujalensis* and *Cairnsichthys rhombosomoides* are very old paleoendemics. With the exception of *G. wujalwujalensis*, all the endemic fish species are found in either or both the Russell/Mulgrave and Johnstone rivers which form the core of freshwater fish diversity and endemism in the region (Pusey 2001). These three river systems encompass the wettest parts of the Wet Tropics and their catchments contain the region’s highest mountains, Mt Bartle Frere and Mt Bellenden Ker. These mountains are likely to have exerted a powerful influence on the distribution of rainfall in the area throughout the Pleistocene.

Most of the endemic species are found predominantly in the smaller tributary streams and not in the main stream channels. Most of the endemic species occur in riffle and rapid habitats, whereas elsewhere in Australia, species found in riffles and rapids are a very minor component of the freshwater fish fauna (Pusey 2001).

Invertebrates

Like other faunal groups, gross change takes place in the qualitative composition of invertebrate fauna along altitudinal gradients in the Wet Tropics. For example, the insects of the lowlands are very different from those that occur on nearby mountain slopes and summits. This has been particularly demonstrated by altitudinal transect surveys of insect fauna from sea level to the summits of three major mountain massifs in the region – the Bellenden Ker Range, Mossman Bluff and the Mt Sorrow Tableland. On Bellenden Ker there is only a 3% similarity between the insect fauna of the summit and that of the lowlands at the base of the mountain. A major transition in the insect fauna appears to take place at about 500-600 m altitude, which appears to coincide with the lower limit of regular fog precipitation. The lowland insect fauna is consistently more diverse (Monteith 1996).

High altitude insect surveys by Monteith (1994, 1996) has revealed a distinctive faunal component of insects with Gondwanan affinities and has established the Wet Tropics as a temperate refugial area of significance as great as that of Tasmania, New Zealand and the Border Ranges (Monteith 1996). Examples of these relict taxa include the primitive leafhopper genus *Myerslopella* (5 species) with its nearest relatives in Madagascar; the moss bug family *Peloriidiidae* (3 species) with relatives in Chile and New Zealand; the barkbug genus *Kumaressa* (1 species) whose nearest relative is in New Zealand; the arboreal carabid genus *Philipis* (33 species) which is the only member of its tribe outside South America; the stag beetle genus *Sphaenognathus* (1 species) otherwise restricted to Andean South America; the darkling beetle tribe *Adeliini* has 45 genera found in Chile, Australia, New Caledonia and New Zealand with six of these genera confined to the Wet Tropics (Monteith 1996) These ancient, relict insects of temperate affinity occur mostly above 800-900 m altitude. Many of the relict species are very localised and some are restricted to a single mountain peak.

Justification

Cultural property

(note: the Wet Tropics of Queensland was only listed as a natural property)

Natural property

The Wet Tropics of Queensland fulfils all four criteria described for inclusion of properties on the World Heritage List as a ‘natural heritage’ as defined under the World Heritage Convention.

(1) *Outstanding examples representing the major stages of the earth’s evolutionary history*

The Australian wet tropics region conserves in its biota elements that relate to 8 major stages in the earth’s evolutionary history: (a) The Age of the Pteridophytes, (b) The Age of the Conifers and Cycads, (c) The Age of the Angiosperms, (d) the final break-up of Gondwana, (e) the origins of the Australian sclerophyll flora and marsupial fauna, (6) the origin and radiation of the songbirds, (7) the mixing of the continental biota of the Australian and Asian continental plates and (8) the extreme effects of the Pleistocene glacial periods on tropical rainforest vegetation. It contains the most complete and diverse living record of the major stages in the evolutionary history of land plants (from the very first plants on land to the higher plants, the Gymnosperms and the Angiosperms), as well as one of the most important living records of the history of the marsupials and the world’s songbirds.

(a) The Age of the Pteridophytes

One of the most significant evolutionary events on this planet was the adaptation in the Palaeozoic (or Ancient) Era of plants to life on the land (White 1986). The earliest known (plant) forms were from the Silurian Period more than 400 million years ago. These were spore-producing plants that reached their greatest development 100 million years later during the Carboniferous Period. This stage of the earth's evolutionary history, involving the proliferation of club mosses (lycopods) and ferns, is commonly described as the Age of the Pteridophytes. The range of primitive relict genera representative of the major and most ancient evolutionary groups of pteridophytes occurring in the Wet Tropics is equalled only in the more extensive New Guinea rainforests that were once continuous with those of the Property (Clifford and Constantine 1980; Jones and Clemesha 1980).

These include all but one of the surviving genera of the ancient Classes of Psilotopsida (*Psilotum*, *Tmesipteris*) and Lycopsida (Lycopodiaceae, Selaginellaceae and Isoetaceae) that represent the earliest living ancestors of the two main branches of land plants. *Huperzia squarrosum*, the most primitive living lycopod most closely resembles *Baragwanathia longifolia*, the 415-million-year-old Silurian fossil lycopod from the famous Baragwanathia Flora at Yea in Victoria (Sporne 1975; White 1986). The Wet Tropics is a major centre of endemism and diversity for lycopods and the Selaginellaceae in Australia. Most *Huperzia* species in the Wet Tropics are now endangered or vulnerable to extinction.

The majority of today's ferns do not appear in the fossil record before the angiosperms (Kramer 1993). Only seven families of true ferns from the world's existing flora of about 36 families can be traced back to the earliest fossil record in the Early Carboniferous when most land lay in the tropical and subtropical zones within the one continent, Pangaea (Scott *et al.* 1985, Galtier and Scott 1985). The greatest evolutionary diversity for these seven ancient families (Lycopodiaceae, Selaginellaceae, Ophioglossaceae, Marattiaceae, Osmundaceae, Schizaeaceae and Gleicheniaceae) occurs in the Wet Tropics. Eighteen out of the 27 genera from all seven families are represented in the region by 41 species. These include the most primitive members of ancestral or ancient orders of ferns (Class Pteropsida) such as the Marattiales (*Angiopteris*, *Marattia*), Ophioglossales (*Botrychium*, *Helminthostachys*, *Ophioglossum*) and Osmundales (*Leptopteris*, *Todea*). The Osmundales is the sole survivor of the two true fern orders first detectable in the fossil record and is considered to have originated in the Australian portion of Pangaea (Dettman and Clifford 1991). This extremely ancient order which occupies an isolated position among the ferns (Sporne 1975, Clifford and Constantine 1980) has survived relatively unchanged to the present day. Two of the three genera in the order are restricted to the Southern Hemisphere. *Leptopteris* comprises seven species restricted to western Pacific countries originally part of Gondwanan Australia or its Pacific terranes (Polynesia, New Zealand, New Guinea and eastern Australia). The single Australian species, *L. fraseri* (Filmy King Fern) is restricted to the summit of Mt Bellenden Ker in the Wet Tropics and isolated warm temperate rainforests in New South Wales and Victoria.

The homosporous Ophioglossaceae are considered by some scientists to be living pro-gymnosperms and part of an evolutionary line leading to flowering plants via the gymnosperms (Kato 1988, 1990, 1991). Three of the four surviving genera occur in the Wet Tropics. The Ophioglossaceae appear in the Australian fossil record in the Late Tertiary (Dettman and Clifford 1991).

The Schizaeaceae and Gleicheniaceae are the oldest and most primitive families of the largest group of pteridophytes, the Filicales. All four genera of the Gleicheniaceae and three of the four genera of the Schizaeaceae occur in the Wet Tropics. *Actinostachys* is the most primitive genus in the Schizaeaceae and has a relict distribution in the Wet Tropics of Australia and Madagascar as well as occurring in tropical Asia. It first appears in the Australian fossil record in the Late Cretaceous. The Gleicheniaceae appears earlier in the Australian fossil record in the Middle Triassic (Dettman and Clifford 1991).

The Wet Tropics has the highest diversity of ferns in Australia and one of the highest levels of genetic diversity in the world. Thirty-one (86 per cent) of the 36 known families and 111 of the 364 described genera (30 per cent) of pteridophytes occur in the Wet Tropics. The Wet Tropics contains 64 per cent of species and 88 per cent of the genera of ferns occurring in Australia.

The level of diversity and endemism among East Gondwanan fern taxa is exceptional. East Gondwanan fern genera include the monotypic endemic genus *Coveniella*, *Lastreopsis*, *Polystichum* (Aspleniaceae), the monotypic endemic genera *Pteridoblechnum* and *Steenisioblechnum* (Blechnaceae), *Oenotrichia* (Dennstaedtiaceae), *Leptopteris*, *Todea* (Osmundaceae), *Tmesipteris* (Tmesipteridaceae/Psilotaceae), and the Australian endemics *Lycopodiella* and *Huperzia* (Lycopodiaceae). The Wet Tropics is the major centre of endemism for *Huperzia* with 9 of the 12 known species occurring there. Seven of these are either endangered or vulnerable to extinction, with the Wet Tropics being the only known location for *H. lockyeri* and *H. marsupiformis*.

The Wet Tropics of Queensland is therefore one of the most significant centres of evolutionary diversity and survival for the most primitive and relict members of ancestral or ancient orders of spore-producing plants. As such the fern assemblages contribute the earliest chapter to one of the most complete living records of the evolution of land plants.

(b) The Age of the Conifers and Cycads

The origin of seed plants over 320 million years ago (Farjon *et al.* 1993) was one of the most significant events in the evolution of terrestrial vegetation, an adaptive breakthrough that allowed colonization of habitats that were inhospitable to spore-producing plants and triggered a Lower Carboniferous diversification of vascular plants. This event also significantly facilitated the evolutionary radiation of other terrestrial organisms (Rothwell and Erwin 1987). The cone-bearing Cycads and Southern Conifers are the most ancient of living seed plants, little changed from ancestors that flourished in the Jurassic Period, termed the 'Age of the Conifers and Cycads' between 136 and 195 million years ago (White 1986; Norstog 1987). The flora of this Period was a cosmopolitan flora of conifers, cycads, ferns, seed-ferns, ginkgos, herbaceous lycopods and horsetails. Jurassic fossils from the Talbragar Fish Beds near Gulgong in New South Wales reveal forests comprising *Agathis* and *Podocarpus* conifers with an understorey of the Cycadophyte, *Pentoxylon australica*. The closest modern counterpart of these forests occurs in the World Heritage area with a rare assemblage of *Agathis robusta*, *Podocarpus grayi* and *Lepidozamia hopei*.

The World Heritage area is a major centre of survival for the cycads. Ten genera and 121 species in four families of cycads are all that remain of a group that has been in existence relatively unchanged for at least 200 million years with the majority of species now considered as rare and threatened (Norstog 1987, Jones 1993).

Cycads as a group are thought to have originated in the East Gondwanan sector of Pangaea prior to its break-up. The cycads contain more primitive features than any other living group of gymnosperms. Cycads are the only gymnosperm known to fix nitrogen from the atmosphere which is achieved through a symbiotic relationship with blue-green algae in specialized root structure called coralloid roots (Jones 1993). The production of motile sperm cells is unique to cycads and one other gymnosperm, *Ginkgo biloba*. The discovery of this feature in 1896 was hailed as one of the most exciting botanical discoveries of all time, since it provided the missing link between gymnosperms and the ferns and fern allies (Jones 1993). The pollination syndrome of cycads involving primitive groups of insect vectors is believed to represent the most primitive pollination system known and the earliest examples of insect-plant symbiosis. The insect vectors involve ancestral beetle families such as Curculionidae (weevils) and Tenebrionidae (tenebrionid beetles), Languriidae, Anthribidae (mortar and carpenter bees), Boganiidae and Nitidulidae (Jones 1993). *Native bees from the genus Trigona pollinate Cycas media*. This genus is the oldest known bee with fossil records from the Cretaceous Period preceding the origin of flowering plants.

Three of the four cycad families (Boweniaceae, Cycadaceae, Zamiaceae) and three genera (*Bowenia*, *Cycas* and *Lepidozamia*) occur in the World Heritage area representing the highest diversity of cycad genera in Australia and the greatest diversity of major cycad groups anywhere in the world.

The genus *Cycas* is the most primitive of all the known cycads (Chase *et al.* 1993) with earliest fossils dated from the Lower Permian. It separated very early from other cycad genera as a distinct and isolated line of evolution. Australia has the highest diversity of *Cycas* species in the world with about 20 of the world's total of 30 species occurring there (Hill 1992). The most species rich area is along the east coast of Queensland north from Rockhampton. About 10 species occur in China and with single species in Malesia, Japan and south-east Asia, and in Polynesia, Madagascar and East Africa (Hill 1992). Most *Cycas* species are geographically isolated. All but two of the 9 *Cycas* species occurring in Queensland are rare (2) or vulnerable to extinction (5). One species occur within the Wet Tropics World Heritage area (*C. media*). Warm humid environments are thought to be the ancestral habitat of *Cycas*. Seasonally dry habitats are regarded as more recent.

The palm-like *Lepidozamia hopei*, restricted to the World Heritage area, is the tallest of all living cycads growing to heights of 20 metres (Johnston 1959; Clifford and Constantine 1980). A rare assemblage of *Lepidozamia hopei*, podocarp (*Podocarpus grayi*) and the araucarian, *Agathis robusta* in the World Heritage area represents the closest living counterpart of Jurassic forests fossilised remains of which are found in the Talbragar Fish Beds of New South Wales (White 1986). The Southern Cassowary, believed to have evolved in the Early Tertiary, is known to be significant for long distance dispersal of *Lepidozamia hopei*.

The fauna associated with these modern-day Jurassic forest analogues are equally ancient mostly dating from the same era. Larvae of the very "primitive" south-west Pacific moth family Agathiphagidae (kauri moths), the only surviving family within the entire suborder Aglossata, feed only on the seeds of *Agathis* (Robinson and Tuck 1976). Only two species survive - *A. queenslandicus* restricted to eastern Queensland, and *A. vitiensis* in the south-west Pacific. An endemic Australian subfamily of cynipoid wasps (Austrocynipinae) is associated with the seeds of *Araucaria*. A group of 'primitive' southern hemisphere weevils (Nemonychidae: Rhinorhynchinae) feed on the pollen of Araucariaceae and Podocarpaceae (Kuschel 1983, 1994). This family, the most primitive of the weevils, is now relict after having been the dominant group amongst all phytophagous beetles in the Upper Jurassic some 200 million years ago. The rainforests of the Wet Tropics and those of south-east Queensland contain the greatest known evolutionary diversity within this group. Members of the Tribe Rhinorhynchini within the subfamily Rhinorhynchinae resemble almost unchanged their fossil counterparts of the Upper Jurassic (Kuschel 1994).

Beetles of the subfamily Paracucujinae (family Boganiidae) are restricted to the Cycadaceae, feeding on pollen as both larvae and adults.

One of the smallest cycads in the world, restricted to rainforest and wet sclerophyll forests in the World Heritage area and McIlwraith Range on Cape York, is the fern-like *Bowenia spectabilis*. Fossil species of both *Bowenia* and *Lepidozamia* have only been recorded from Eocene deposits at Anglesea, Victoria (*B. oecenica* resembling *B. spectabilis*), Bacchus Marsh, Victoria (*L. hopeites* resembling *L. hopei*) and at Nerriga in New South Wales (*B. papillosa*, *L. foveolata*). *Bowenia* is the only known cycad with bipinnate leaves which, from the fossil record, appear not to have changed over 45 million years (Jones 1993). The family is endemic to Australia.

Forests containing the gymnosperm group, the araucarians, are of immense interest to science for they are among the most ancient and primitive of the world's surviving conifers. The Australian sector of Gondwana is considered to have been the site of origin of these austral or southern conifers. Both the Araucariaceae and Podocarpaceae dominate the Australian pre-Tertiary fossil record with a great diversity of species in the Jurassic and Cretaceous (Dettman 1994). They are regarded as the ancestral core of present-day perhumid rainforests that arose through progressive addition of angiosperms throughout the Cretaceous and Early Tertiary (Dettmann 1994).

Only two araucarian genera survive today. The greatest diversity of surviving evolutionary lineages of *Araucaria* and *Agathis* occur in the Property. Two species of *Agathis* endemic to the World Heritage area are rare. This area is also the most significant centre of survival for the major genetic lineages of

Prumnopitys and *Podocarpus*, the most dominant and closely related relict genera of the Podocarpaceae. At least 50 per cent of species in these two genera worldwide are now rare or at serious risk of extinction. The three endemic species of *Prumnopitys* and *Podocarpus* in the Wet Tropics area are considered rare with very small ranges and are therefore at risk (Farjon and Page 1993).

(c) The Age of the Angiosperms

The emergence of the angiosperms some 200 million years after the first appearance of the gymnosperms marked the beginning of one of the most fundamental changes in biological diversity on this planet. By late Cretaceous gymnosperms had largely been replaced by angiosperms, although the beginnings of the modern flora did not emerge until the Tertiary. The current estimates of 235 000 species of flowering plants represents 88.7 per cent of all plant species on earth (Raven 1987). The majority of flowering plants are dicotyledons (class Magnoliopsida), with 180 000 species in six subclasses — the Magnoliidae, Hamamelidae, Caryophyllidae, Dilleniidae, Rosidae and Asteridae (Cronquist 1988). According to the classification of Cronquist dicotyledons are organised into 321 families in 64 orders and the 55 000 species of monocotyledons (class Liliopsida) are arranged within five subclasses containing about 66 families in 19 orders (Cronquist 1988) although the actual organisation of many families between the subclasses is still in a state of flux (Liden 1992).

The origin of these flowering plants is one of the major unsolved questions of botany. East Gondwanan countries are known to contain the greatest concentration of archaic and relict taxa relating to the origins of flowering plants (Takhtajan 1987). The distribution of relict taxa in the individual continents reflects the timing of origin and spread of the different plant groups in relation to the rifting and drifting of continents once part of Gondwana.

The radiation of floras, as recorded in the fossil record, has occurred in discrete waves. The Australian wet tropics region contains outstanding examples representing 5 major elements in the history of the angiosperms.

Australia was once part of the southern supercontinent Gondwana. Other parts of that landmass were made up of the continents now known as Africa and South America (West Gondwana) and Antarctica, the subcontinent of India and the now island fragments including New Zealand, New Caledonia, New Guinea and Madagascar. Australia, New Zealand and New Guinea were part of East Gondwana.

A West Gondwanan origin has been proposed for the angiosperms (Raven and Axelrod 1974). Evidence suggests that diversification occurred quite rapidly and that a significant number of taxa had arisen before the break-up of Gondwana began about 120 million years ago. By this stage, angiosperms had appeared in the northern hemisphere and in South America and Southeast Gondwana (Antarctica and Australasia) and were apparently spreading in two essentially separate, diversifying streams (Schuster 1972, 1976). A significant part of the southern stream became essentially isolated in Australia when, about 50 million years ago, it finally broke away from Antarctica and rafted towards the tropics.

However, distributed throughout the Indo-Pacific regions are numerous fragments, or terranes, derived from the northern margin of the Australian section of Gondwana (Audley-Charles 1987, 1988 1991; Hutchison 1989; Burrett *et al.* 1991; Harbury *et al.* 1990; Metcalfe 1990; Veevers 1991a, 1991b). These fragments now form parts of South-east Asia, Indonesia and some Pacific islands. Audley-Charles (1987) has suggested that those terranes that rifted during the Cretaceous when angiosperms first evolved, acted as 'Noah's Arks', carrying with them an evolving Gondwanan angiosperm flora.

(i) *The richest assemblage of families of primitive flowering plants*

The first recognizable angiosperm pollen was *Clavatipollenites hughesii* described from the late Barremian and Aptian (Early Cretaceous) of southern England (Couper 1958) and has been found in southern Australia from the same time period at Koonwarra (Dettman 1986). It closely resembles that of the living New Caledonian genus *Ascarina* of the Chloranthaceae (Walker and Walker 1984) and

Austrobaileya of the Austrobaileyaceae, a monotypic family found only in the Wet Tropics (Endress and Honegger 1980). The most primitive and ancient orders of living flowering plants are the Magnoliales and Laurales. Of the 19 angiosperm families described as the most primitive (Walker 1976), 12 occur in the Wet Tropics, giving it the highest concentration of such families on earth. These families are: Annonaceae, Austrobaileyaceae, Eupomatiaceae, Himantandraceae, Myristicaceae and Winteraceae of the order Magnoliales; Atherospermataceae, Gyrocarpaceae, Hernandiaceae, Idiospermaceae, Lauraceae and Monimiaceae of the order Laurales.

(ii) *Species belonging to small, relict primitive angiosperm families*

The Australian Wet Tropics has the highest concentration of small, relict and virtually extinct, primitive angiosperm families in the world (Endress 1983). These are Austrobaileyaceae, Eupomatiaceae, Idiospermaceae and Himantandraceae. Two of these, the monospecific Austrobaileyaceae and Idiospermaceae are restricted to the region. The ditypic Eupomatiaceae and Himantandraceae extend outside of Australia, only to New Guinea and East Malesia (the Moluccas) respectively. They are probably the last few remnants of an ancient assemblage that have survived the attrition of rainforest during dry cycles of the last ice ages in the Pleistocene. *Eupomatia* fossils derive from the Cretaceous and have been discovered in America indicating a much larger former range.

(iii) *Orders occupying nodal positions in the evolution of the angiosperms*

Higher dicotyledonous angiosperms form five major groups accounting for 70 per cent of all living flowering plants (Cronquist 1981). The initial major radiation of these groups occurred in the Cretaceous with ancient members of the sub-classes Hamamelidae and Rosidae being especially important (Crane *et al.* 1986). The orders Hamamelidales, Rosales, Euphorbiales, Dilleniales, Violales, Theales, Celastrales and Gentianales, are considered to occupy major nodal positions in the evolution of the angiosperms (Takhtajan 1980; Cronquist 1981). Within these orders, key families with a relict distribution are of considerable importance. Those represented in the Wet Tropics are: Hamamelidales - Hamamelidaceae; Rosales - Alseuosmiaceae, Cunoniaceae, Davidsoniaceae, Escalloniaceae, Eucryphiaceae, Pittosporaceae; Celastrales - Aquifoliaceae, Icacinaceae, Celastraceae; Euphorbiales - Euphorbiaceae; Dilleniales - Dilleniaceae; Violales - Flacourtiaceae; Theales - Ochnaceae; Gentianales - Apocynaceae.

(iv) *Gondwanan angiosperm families of Cretaceous origin*

One of the most sudden and significant transformations of terrestrial plant life occurred in the Mid-Cretaceous leading to a vast and rapid spread of flowering plants throughout the world. Catastrophic events around the Cretaceous-Tertiary boundary led to major extinctions of angiosperm taxa. An estimated 75 per cent of all living species were lost, particularly in the northern hemisphere (Crowley and North 1991; Collinson 1990). However, East Gondwana in the southern hemisphere was relatively unaffected (Muller 1984), and consequently the highest concentrations of Cretaceous angiosperm families survived in that region, many of which were still present on the Australian landmass when it finally broke away from Antarctica. Today, the highest concentration of relict taxa from Cretaceous angiosperm families survive in the Australian Wet Tropics. Cretaceous families include the Cunoniaceae, Proteaceae, Winteraceae, Myrtaceae, Monimiaceae (Raven and Axelrod 1974), Rutaceae, Platanaceae, Sapindaceae, Aquifoliaceae, Callitrichaceae, Chloranthaceae, Gunneraceae, Trimeniaceae, Epacridaceae, Olacaceae and Loranthaceae (Dettman 1994).

Pollen similar to that of *Syzygium* and *Eugenia* (Myrtaceae) occurs in Campanian and Maastrichtian sediments on the Antarctic Peninsula (Dettman 1989) and the Paleocene of Australia (Dettman 1994). *Eugenia* is now represented in Australia by a single species endemic to the Wet Tropics. It is the largest genus in the Myrtaceae (~1000 species), concentrated today in tropical America, and the only genus shared between the Old World and New World. *Syzygium*, the second largest genus (~500 species), on the other hand occurs exclusively in the Old World with 55 species still remaining in Australia. The Wet Tropics is the most significant centre of survival in Australia with 31 species, 16 being endemic to the Property. Australia is also the outstanding centre of diversity and endemism for the entire family (73 of the world's 140 genera and 1361 out of the world's total of 3350 species). The Myrtaceae family are now

represented in the Wet Tropics by 41 genera and 124 species. Four mono- or ditypic genera are endemic to the wet tropics — *Barongia* (1sp.), *Sphaerantia* (2 spp.) and two undescribed monotypic genera.

(v) *East Gondwanan families or genera*

East Gondwana which included Australia, New Guinea, New Zealand and New Caledonia was a key area for the early radiations of flowering plants. Significant numbers of taxa believed to have originated in East Gondwana still survive in rainforests within these areas. The Australian wet tropics has a special position as the area with the longest continuous history as part of the parent landmass.

Angiosperm taxa recorded from the Wet Tropics and believed to have originated in East Gondwana includes 153 genera in 43 families.

(d) The Final Break-up of Gondwana

The final stage in the break-up of Gondwana had a profound effect on global climates and consequently on the evolution of all subsequent life forms (Kemp 1978). When Australia was still attached to Antarctica, warm equatorial currents reaching polewards ensured a generally more equably wet and warm climate. The detachment and northward drift of the Australian continent allowed the development of circumpolar currents. Temperature gradients between the equator and the poles increased dramatically and the Antarctic ice cap began to form. Forest types once mixed or closely juxtaposed now mostly became geographically separated and extensive regional extinctions of species occurred. However, the effects of global cooling and accompanying aridity were maximally compensated for in the Australian wet tropics region by the northward drift of Australia towards the tropics. As a consequence of this and a wide range of available altitudinal gradients, the Wet Tropics of Queensland is the only large part of the entire Australasian region where rainforests have persisted continuously since Gondwanan times (Barlow & Hyland 1988), preserving in the living flora the closest modern-day counterpart of the Gondwanan forests (Christophel, Collinson 1992).

Several groups regarded as likely relicts or early descendents of the Gondwanan fauna at the time of the final break-up are represented in the Wet Tropics. [Note that the flora that fall into this category have been included in parts (c) or (d).]

Of Australia's four families of frogs, the Myobatrachidae and Hylidae are believed to have had Gondwanan origins (Duellman and Trueb 1986; Tyler 1989; Roberts and Watson 1993). Close relatives are found in South America. Fossils from both families are found in Oligo-Miocene deposits at Riversleigh in north-western Queensland.

Molecular studies suggest that the major generic-level splits in the Australian frog fauna are very old (Roberts and Maxson 1985). Among the oldest lineages are *Mixophyes* and *Taudactylus* (Heyer and Liem 1976).

Of the six species in the genus *Taudactylus*, one of the most primitive groups of frogs in Australia, two are restricted to the Wet Tropics. *T. rheophilus* had been recorded only from the Bellenden Ker Range, Lamb Range, Carbine Tableland and Thornton Peak, all recognised refugial areas but has suffered massive declines over its entire former range. Prior to 1988, *T. acutirostris* occurred in upland streams throughout the World Heritage Area. However, it has since suffered a dramatic decline in numbers and its status is considered critical (Ingram and McDonald 1993)[See below, Criterion (iv).]. The catastrophic amphibian declines that have occurred in the Wet Tropics have recently been attributed to an amphibian fungal disease caused by *Batrachochytrium dendrobatidis*. *Mixophyes* is represented in the Wet Tropics by *M. schevilli*, the Northern Barred Frog. Molecular studies have shown *M. schevilli* to represent three species, each well differentiated (Donnellan *et al.* 1993).

Among the Australian reptile fauna, the geckoes of the subfamily Diplodactylinae and the endemic family of legless lizards (Pygopodidae) are generally accepted as having Gondwanan origins. Within the Wet

Tropics, the diplodactyline geckoes are represented by *Carphodactylus*, *Diplodactylus*, *Nephrurus*, *Oedura*, *Phyllurus* and *Saltuarius*. *Carphodactylus laevis*, the Chameleon Gecko, is the only member of the genus and is restricted to the Wet Tropics.

Fossils from the Riversleigh deposits show that dragons were present in Australia at least 15–20 million years ago (Covacevich *et al.* 1990). Australian dragons form two groups, one adapted to more mesic environments on the eastern coast and including *Hypsilurus* and *Physignathus*, and the other adapted to drier conditions including arid inland environments. Molecular studies suggest that the split between these two groups probably occurred between 15 and 20 million years ago with Australian *Hypsilurus* and *Physignathus* diverging at about the same time (Baverstock and Donnellan 1990). The fossil evidence shows that extant *P. lesueurii* has changed little from forms living in the rainforests of the Riversleigh area about 20 million years ago (Covacevich *et al.* 1990). *P. lesueurii*, the Eastern Water Dragon, occurs along the eastern Australian coast and is recorded from many locations in the Wet Tropics.

Hypsilurus, of which Australian species were formerly considered to belong to the predominantly Asian genus, *Gonocephalus*, and *Physignathus* are among the Australian dragons considered to have had an Asian origin. However, immunological studies of plasma albumin suggest that Australasian *Hypsilurus* are more closely related to other Australian dragons than to Asian *Gonocephalus* (Baverstock and Donnellan 1990). When considered together with the evidence from Riversleigh fossils, these data provide support for an Australian origin for *Hypsilurus* and *Physignathus* from a Gondwanan ancestor. There are just two species of *Hypsilurus* in Australia: Boyd's Forest Dragon, *H. boydii*, is confined to the Wet Tropics and the Southern Angle-headed Dragon, *H. spinipes*, is endemic to the rainforests of the central Australian coastal region. Other species occur in New Guinea, Moluccas and Solomon Islands.

Australian skinks fall into three groups, the *Sphenomorphus* group, *Egernia* group and *Eugongylus* group. All three groups are represented in the Oligo-Miocene fossil fauna of Riversleigh, and some taxa are practically indistinguishable from living forms (Hutchinson 1992). The Riversleigh fossils indicate that the Australian skink fauna has arisen from evolution within Australia rather than from a series of invasions as has been previously proposed. The fossil evidence, together with that from serum albumin studies (Baverstock and Donnellan 1990), suggests that the three major groups of skinks arose in the early Tertiary, around 60 million years ago. The *Egernia* and *Eugongylus* groups, which are almost entirely confined to the Australian region, may have arisen in Australian Gondwana (Hutchinson and Donnellan 1993). Hutchinson (1992) has compared the Riversleigh skink fauna with those of the rainforests of north-eastern and south-eastern Queensland. All three faunas are dominated by the *Sphenomorphus* group with the *Egernia* group present as a minor component. Of interest is the presence of the slender *Sphenomorphus* type at Riversleigh. Living members of this type have been placed in the genus *Glaphyromorphus* and, with one exception, they are confined to northern coastal Australia. Seven of the fourteen species occur in the Wet Tropics region and two species, *G. fuscicaudis* and *G. mjobergi*, are endemic to the World Heritage area. The similarity of the Riversleigh fossil of this type with *G. mjobergi* has been noted (Hutchinson 1992).

Of the birds occurring in the rainforests of the Wet Tropics, those with accepted Gondwanan origins include the Southern Cassowary (one of the world's few surviving giant flightless birds, the ratites) and the megapodes (mound-builders). Fossil records show that cassowaries were once much more widespread across Australia, but they are now restricted to north-east Australia and New Guinea. Of the three megapodes in Australia, two are found in the rainforests of the Wet Tropics - the Orange-footed Scrubfowl (*Megapodius reinwardt*) and the Australian Brush-turkey (*Alectura lathami*).

Songbirds of the Wet Tropics belonging to groups of likely Gondwanan origin are considered under (f) below.

Many primitive insects have been conserved in the Wet Tropics as relicts of the Gondwanan fauna, mainly in the upland areas. The moss bug, *Hackeriella taylori*, belongs to a small family found only in eastern Australia, New Zealand, New Caledonia and South America. The wingless water bug, *Austrovelia queenslandica*, is known only from Mt Sorrow–Mt Pieter Botte. The only other species in the genus is in

New Caledonia (Malipatil and Monteith 1983). The relict wingless genus of bark bugs, *Kumaressa*, which belongs to the small primitive subfamily Chinamyersiinae, is confined to Australia. *K. storeyi* occurs on Mt Bellenden Ker, Mt Bartle Frere and Mt Carbine Tableland. Two other species occur in the rainforests of central eastern Australia. The nearest relatives are in New Zealand. An ancient origin for the large stag beetle, *Sphaenognathus queenslandicus*, found only on Mt Lewis and Mt Windsor Tableland, is indicated by the occurrence of its closest relatives in South America. The flightless leafhopper genus, *Myerslopella*, known only from a few mountaintops in the Wet Tropics, belongs to a tribe otherwise known only from Madagascar, New Zealand and Juan Fernandez (Evans 1977). The small cockroach genus, *Tryonicus*, is represented in the Wet Tropics by the endemic species, *T. mackerrasae* and *T. montheithi*. *T. parvus* is found in the central eastern rainforests of Australia and the only other members of the genus are in New Caledonia.

The present-day distribution of most of these insects suggest their origins pre-date the separation of Australia and New Caledonia and New Zealand about 80 million years ago.

Even more ancient origins are indicated for a water beetle, *Terradessus caecus*, found only on Mt Sorrow and Thornton Peak and adapted for a terrestrial life (Watts 1982). The only other recorded occurrences of similarly adapted water beetles are in the highland forests of the Southern Himalayas and in the montane moss forests of New Caledonia (Brancucci 1985).

The presence of these ancient, relict insect taxa demonstrates the great antiquity of uninterrupted rainforest habitat in the Wet Tropics (Kikkawa *et al.* 1981).

The spider fauna of the Wet Tropics also includes many relict Gondwanan taxa. Australian spiders belong to two infra-orders, the Mygalomorphae ('trapdoor' spiders) and Araneomorphae ('true' spiders). Apart from one group now restricted to southeast Asia, the mygalomorphs are considered to be the most ancient and primitive group of spiders (Platnick and Sedgwick 1984). Of the 55 or so genera of 'trapdoor' spiders in Australia, more than 35 inhabit rainforest. Seventeen are recorded from the Wet Tropics. They include *Sason*, *Trittame*, *Cethegus*, *Masteria*, *Namirea*, *Cataxia*, *Homogona*, *Aname*, *Ixamatus*, *Namea*, *Xamiatus*, *Idiactis*, *Idiommata*, *Zophorame* and the newly described genera (Raven 1994), *Mandjelia*, *Moruga* and *Ozicrypta*.

Among the most primitive of the 'true' spiders (Araneomorphae) are members of the family Gradungulidae that is known only from New Zealand and Australia (Forster *et al.* 1987). The nearest relatives occur in South America. Of the twelve species in the family, three are restricted to the Wet Tropics. *Tarlina daviesae* is known only from Mt Finnigan at more than 1000 metres. *T. simipes* has been found at a few elevated sites between Cairns and Ravenshoe. The monotypic *Macrogradungula* is known only from Boulder Creek on the Walter Hill Range (*M. moonya*).

Another relict genus of 'true' spiders of likely Gondwanan origin is *Otira*. Six species occur in New Zealand, one in Tasmania and two (*O. summa* and *O. aquilonaria*) are recorded only from Bellenden Ker Range above 1000 m altitude (Davies 1986).

The Wet Tropics land snail fauna contains remarkably high numbers of the Gondwanan family Charopidae which occurs in south-eastern Australia, New Zealand and some subantarctic islands (Stanisic 1990). There are 86 species in the Wet Tropics (77 are undescribed), mainly in the cool uplands and especially on the mountain tops (Stanisic 1994). The refugial role of upland sites in the Property is indicated by a number of major disjunctions among relict taxa. The genus *Lenwebbia* contains just two species, one from the Bulburin area in south-eastern Queensland and the recently described *L. paluma* known only from the type locality in Mt Spec National Park in the Wet Tropics. Of the three species in the genus *Hedleyoconcha*, *H. ailaketoae* is recorded from Mt Bellenden Ker, while *H. delta* occurs at a number of sites from the central New South Wales coast to the Bunya Mountains and *H. addita* is found only on Lord Howe Island (Stanisic 1990).

(e) Biological evolution and radiation during 35 million years of isolated rafting of the Australian continental plate

Australia was an isolated landmass during several million critical years when the extant flora was being shaped (Truswell 1993). Climate change was a major influencing factor. After separation of the Australian landmass from Antarctica and during its isolated drift towards the equator, there was a general increase in aridity. At this time, major evolutionary radiations took place within the flora, particularly in the plant families Proteaceae, Myrtaceae, Casuarinaceae, Epacridaceae and Rutaceae, and within the marsupials. The wet tropics region contains the highest concentration of the surviving remnants of the ancestral stock from which evolved the sclerophyll flora and marsupial fauna that now dominate the Australian landscape. The rainforests of the region also contain a number of bird species that may represent the ancestral forms from which certain dry-adapted taxa have evolved (the Tumbunan avifauna)(Schodde 1982). [The passerine avifauna is considered in Section (f).]

Whilst sclerophyllly *per se* originated from rainforest stock during the early Tertiary as an adaptation to infertile soils (Barlow 1981) evolution of features related to aridity and fire did not appear in the fossil record until the Middle to Late Miocene (Martin 1994).

Primitive genera of the Proteaceae, the remnants of ancient Gondwanan origins, are found in the Wet Tropics. In this family that now comprises a very important component of Australia's sclerophyll flora, 12 seven of the genera are restricted to the wet tropics. At least three of these, *Placospermum*, *Sphalmium* and *Carnarvonia* are considered primitive. *Placospermum coriaceum* has the greatest array of primitive features of any living Proteaceous genus.

The important Casuarinaceae family that has its centre of diversity in Australia occupies habitats ranging from beaches to arid regions, with one genus occurring in rainforest. Fossil evidence indicates that the ancestral form was the East Gondwanan rainforest genus *Gymnostoma*, which was widespread in Australia during the early Tertiary (Hill 1987). *Gymnostoma* now has a relict distribution in Australia with just one species that is restricted to the Roaring Meg–Alexandra and Noah Creek valleys in the Wet Tropics. The earliest evidence of sclerophyll communities involving Casuarinaceae date from the Early–Middle Miocene (Macphail *et al.* 1994).

Most of the primitive members of the large Rutaceae family (150 genera, 1800 species) occur in rainforests (Stace *et al.* 1993). The family is considered to have originated in Gondwana (Armstrong 1983) before the Tertiary (Smith-White 1954, 1959). The Tribe Zanthoxyleae of the Rutaceae family is considered to have given rise to the Tribe Boronieae, a long isolated group of 20 genera occurring in Australia and New Caledonia (Waterman and Grundon 1983). There are 245 Australian species in the Boronieae which now so characterise this continent's sclerophyllous heathlands (Morley and Toelken 1983). Five species of the small genus *Euodia* together with the endemic genus *Medicosma* (5 species) occurring in the Wet Tropics from within the Zanthoxyleae Tribe have closest affinities to the ancestors of *Boronia* the largest and most widespread genus in the tribe Boronieae all 15 members of which have radiated out into open forest and heathland communities around Australia (Waterman and Grundon 1983, Stace *et al.* 1993).

The most primitive of the Australian marsupials are the dasyuroids, a basically carnivorous group that, probably, are preceded in the evolutionary history of the marsupials only by the didelphoids of South America. Immunological studies of abumins suggest that this group diverged from the diprotodont marsupials about 40 million years ago (Baverstock *et al.* 1990). Nine species of dasyuroids are found in the Wet Tropics including one restricted species, the Atherton Antechinus (*Antechinus godmani*), which is considered a relict species (Van Dyck 1982).

It has been proposed that the earliest marsupials evolved in 'rainforests' on the basis that extant rainforest-dependent species are among the most primitive of their respective groups (Schodde and Calaby 1972). This is now generally accepted and the Oligo-Miocene rainforests have been described as the "Green Cradle" for Australia's dry-adapted marsupials (Archer *et al.* 1989). The Riversleigh deposits

are rich in marsupial fossils including taxa closely related to those living in the rainforests of the Wet Tropics. Indeed, the rainforests of the Wet Tropics represent the best surviving equivalent of the Oligo-Miocene rainforests of Riversleigh. They share several mammalian genera with the Oligo-Miocene Upper Site of Riversleigh, including *Hypsiprymnodon*, *Cercatetus*, *Pseudochirops* and *Trichosurus* (Archer *et al.* 1989).

The Musky Rat-kangaroo, *Hypsiprymnodon moschatus*, which is restricted to the World Heritage Area, is the most primitive of the kangaroos and the only living member of the group that has retained the mobile first toe on the hind foot, a characteristic of possums. It is unique in representing an early stage of evolution of macropods from an arboreal possum-like stock (Johnson and Strahan 1982).

The Wet Tropics area is particularly significant for the ringtail possums. Of the six species in Australia, five occur in the Wet Tropics World Heritage Area and the four rainforest-dependent species are all found only there. The Lemuroid Ringtail, *Hemibelideus lemuroides*, the only member of the genus, forms a single lineage with the Greater Glider, *Petauroides volans*, sharing a common ancestor with the remainder of the ringtails, *Pseudocheirus* and *Pseudochirops* species (Baverstock *et al.* 1990).

Birds confined to upland forests of eastern Australia and New Guinea (the Tumbunan fauna) are considered to include forms ancestral to dry-adapted species. Such ancestral forms occurring in the-Wet Tropics include the Southern Cassowary, Australian Brush-turkey, Emerald Dove and Australian King-Parrot (Schodde 1982).

(f) The origin and radiation of the songbirds (oscine passerines)

On the basis of protein electrophoretic studies, Christidis and Schodde (1991) speculate that the passerines may have originated in Gondwana where the order diverged in two major radiations, the suboscines in west Gondwana (South America) and the oscines in east Gondwana (Australasia).

DNA–DNA hybridisation studies by researchers at Yale University have led to a new classification that divides the oscine passerines into two major groups (parvorders), Corvida and Passerida. The studies suggest that the two groups diverged about 60 million years ago, when Australia was still part of Gondwana, and that the Corvida probably originated in that part of Gondwana that is now Australia (Sibley and Ahlquist 1985). As discussed earlier, the vegetation of Australasian Gondwana was then dominated by rainforest.

The Corvida includes 40 per cent of the world's songbird families. Most of the living members are confined to Australia and New Guinea. However, groups such as crows, jays, shrikes and cuckoo-shrikes have radiated to Eurasia and the Americas.

The Wet Tropics of Queensland is the most important area for several lineages of Australo-Papuan songbirds, eg the bowerbirds and the scrubwrens, thornbills and gerygones.

Bowerbirds, which are confined to Australia and New Guinea, are the only birds known to decorate their courting grounds (Slater 1974). There are about twenty species of bowerbirds, eight of which are endemic to Australia, ten to New Guinea and two shared. Five species are found in the Wet Tropics giving the region the highest diversity for the bowerbirds of any area in Australia. Two species, the Golden Bowerbird (*Prionodura newtoniana*) and Tooth-billed Bowerbird (*Ailuroedus dentirostris*), are endemic to higher altitude areas in the Wet Tropics. *Ailuroedus* may be the most ancient genus; the DNA-DNA hybridisation data suggest that *Ailuroedus* diverged from *Ptilonorhynchus* and *Chlamydia* more than 20 million years ago, although no data was provided for the other genera (Sibley and Ahlquist 1985).

The scrubwrens, mouse-warblers, gerygones and thornbills have generally been placed in the family Acanthizidae, but Sibley and Moore (1990) place them in the Pardalotidae (subfamily Acanthizinae). There are about 60 species, most being confined to Australia. Kikkawa (1991) lists 16 species as inhabiting closed forests. Ten of these occur in the Wet Tropics which is more than twice the number

found in any other area in Australia. Three are endemic to uplands of the Property: the Fernwren (*Oreoscopus gutteralis*), Atherton Scrubwren (*Sericornis kerri*) and Mountain Thornbill (*Acanthiza katherina*).

A likely relict species endemic to the Wet Tropics is the Chowchilla or Northern Logrunner, *Orthonyx spaldingii*. The only other species in the genus, *O. temminckii*, is found only in the rainforests of Central Eastern Australia and the highlands of New Guinea. On the basis of DNA-DNA hybridisation studies, *Orthonyx* has been placed in a separate family (Sibley and Ahlquist 1990, Sibley and Monroe 1990). Fossils of *Orthonyx* have been found in late Oligocene deposits (~25 million years) at Riversleigh in north-west Queensland (Boles 1993).

The Wet Tropics of Queensland is also of major importance in understanding the origins of the diverse bird fauna of New Guinea. Many genera are shared between the two areas. In at least some cases, this would appear to be the result of relatively ancient connections. One example is *Orthonyx* as discussed above. Another is the robin genus, *Heteromyias*. *H. cinereifrons* is endemic to the uplands of the Wet Tropics, whereas the only other species in the genus, *H. albispecularis*, is restricted to the highlands of New Guinea.

(g) The mixing of the continental biota of the Australian and Asian plates after 80 million years of separation

The Wet Tropics contains a unique record of a mixing of two continental floras and faunas that has no known parallel. This mixing occurred following the collision of the Australian and Asian continental plates about 15 million years ago. This collision was a unique event in that it mixed two evolutionary streams (both flora and fauna), in some cases of common origin, which had been largely separated for at least 80 million years. Whereas other continental collisions that led to a mixing of the biota have occurred, e.g., that of North and South America, none of those continents had such a long period of separation prior to collision.

Unlike New Guinea, parts of the Australian wet tropics represent a stable fragment of Gondwana in which rainforest has existed continuously and whose extant flora, together with fossil pollen deposits of unparalleled continuity and resolution, provide a unique record of the mixing of long separated floras. Genera considered to have been of Gondwanan or Laurasian descent but to have entered Australia following the collision of the Australian and Asian continental plates and occurring in the Wet Tropics include *Alangium*, *Allophylus*, *Althoffia*, *Alyxia*, *Anthocephalus*, *Barringtonia*, *Berrya*, *Bombax*, *Bulbophyllum*, *Calophyllum*, *Canthium*, *Celtis*, *Cordia*, *Epipogium*, *Garcinia*, *Gardinia*, *Leea*, *Lethedon*, *Melia*, *Oreodendron*, *Phaleria*, *Securinega*, *Trema*.

Among the fauna, two families of frogs provide outstanding examples of the impact on the biota of the collision of the Australian and Asian plates. These are the Microhylidae and Ranidae.

The microhylids occur in South America, Madagascar, southern Asia and New Guinea with just two genera occurring in Australia. Views are divided on the origins of the Australian microhylids. Savage (1973) proposed a Gondwanan origin with radiation in Australia and subsequent invasion of Asia via New Guinea, followed by extinction in Australia and a Pliocene reinvasion of northern Australia from New Guinea. Tyler (1979) proposed an Asian origin and entry into Australia via New Guinea. Australian microhylids are from two genera, *Cophixalus* and *Sphenophryne*. Not surprisingly, fifteen of the sixteen species are confined to north-eastern Australia with one species in the Northern Territory. Twelve species are endemic to the Wet Tropics region, although one (*C. mcdonaldi*) is restricted to Mt Elliott which lies just to the south of the World Heritage Area. All but one are rainforest species, the exception being *Cophixalus saxatilis* that lives among the boulder piles of the Black Trevelyan Range.

The only Australian member of the cosmopolitan family Ranidae is *Rana daemeli* that is restricted to Cape York Peninsula and eastern Arnhem Land and occurs throughout lower altitude areas in the Wet Tropics.

Recent reassessments of the origins of Australia's native birds suggest that only a few groups (other than migratory birds) have entered from Asia. Those belonging to this category are the Yellow-bellied Sunbird, Singing Bushlark, Mistletoe Bird, Metallic Starling, Silvereye, Pale White-eye, Yellow White-eye and White's Thrush (Schodde 1986; Schodde and Christidis 1987). With the exception of the Pale White-eye that occurs on islands of the Torres Strait, all are recorded from the Wet Tropics.

Of the Australian mammals, the rodents and bats are considered to have entered since connections with the Asian plate were established. Sixty per cent of Australia's bat species are found in the Wet Tropics. Several of the Australian rodent genera, including *Hydromys*, *Pogonomys*, *Uromys* and *Melomys*, have their centres of diversity in New Guinea and have entered Australia relatively recently. They represent a second wave of the "Old Endemics" among the rodents. *Melomys* has four species in Australia although one of these, found only on Bramble Cay in Torres Strait, may only be a variant of the Cape York *Melomys* that occurs only around the tip of Cape York Peninsula. The other two species occur in the Wet Tropics. *Pogonomys* and *Uromys* have only one and two species respectively in Australia. The Giant White-tailed Rat, *U. caudimaculatus*, occurs on the eastern side of Cape York Peninsula including the Wet Tropics. The Prehensile-tailed Rat, *P. mollipilosis*, occurs as two disjunct populations, one in the Iron Range area on Cape York Peninsula and the other in the Wet Tropics.

(h) The extreme effects of the Pleistocene glacial periods on tropical rainforest vegetation

Even though marked changes in global climates had occurred during the Tertiary, it was not until about 2.5 million years ago, that a series of dramatic changes of climate, the Pleistocene ice ages, began, which changed the face of the earth, causing extinctions, speciations and profound distributions of plants and animals (Livingstone and van der Hammen 1978). Fossil-based data from Southern Hemisphere continents suggest that the effects of Pleistocene glacial periods were greatest in Australia (Kershaw 1984). Fossil pollen records going back over 200 000 years, of unparalleled continuity and resolution for this period, from three sites within the Wet Tropics region, Butcher's Creek, Lynch's Crater and Lake Euramoo, indicate that the rainforest underwent severe contractions during the Pleistocene glacial periods. Uniquely among tropical rainforest areas, there were many extinctions and near extinctions within the Wet Tropics (*Nothofagus* c.f. *brassii*, *Phyllocladus* spp., and *Dacrydium* spp. - all large, long-lived trees). Outstanding examples of ancient taxa that survived and persist as relicts within the Wet Tropics of Queensland World Heritage Area today include the Araucariaceae (5 species) and Podocarpaceae (7 species) and Casuarinaceae (1 species, *Gymnostoma*).

The peak of glaciation occurred at 18 000 BP, sea levels were at their lowest for the past 150 000 years (Kershaw 1989).

(2) Outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial ecosystems and communities of plants

Geological history involving the separation and drifting of continents, vulcanism, mountain building and erosion has profoundly influenced the evolutionary history of life on earth. The tropical rainforests, in particular, are one of the most significant biomes harbouring the majority of the earth's genetic diversity (Raven 1983, Walker 1986).

Processes resulting in areas of exceptional species richness or of high endemism are of outstanding scientific interest.

Much of the world's humid tropics is of 'recent origin', the newly expanding environments generating areas of exceptional species richness such as in the equably wet, lowland humid regions of peninsular Malaysia, New Guinea, the African Cameroons and the north-western and eastern foothills of the Andes (Ashton 1981). Endemism in these areas of species richness is surprisingly low.

However, the long-isolated ancient floras of New Caledonia, Madagascar and the Australian wet tropics have exceptionally high levels of endemism. These centres of endemism are not only historically important but also significant as diverse pools of unique genetic material retaining elements over the widest evolutionary time span and of potential significance in new radiations in a world of changing global climates and ongoing continental drift.

The Australian wet tropics centre of endemism is unique as part of an ancient continental as opposed to island landscape, uplifted more than 100 million years ago and tectonically stable for the greater part of the period of angiosperm evolution.

The level of endemism within the rainforest flora of the Australian wet tropics (43 genera and 500 species 7000 square kilometres of rainforest)(White 1983). The Australian wet tropics is second only to New Caledonia in the number of endemic genera conserved per unit area (Webb and Tracey 1981, Morat *et al.* 1986, 1993). The former suffered the greater degree of Pleistocene extinctions which was exacerbated by the Aboriginal use of fire (Kershaw 1984). Of the surviving endemic genera 75 per cent are monotypic and none contain more than a few species.

Many of the endemic species and genera are narrowly restricted within the Wet Tropics and several local centres of endemism have been identified (Keto 1986). All encompass altitudinal gradients within the most equably wet climatic zones allowing for mobility of refugia and survival of relict taxa during climatic fluctuations on geological time scales (Nix 1980).

The rapid and ongoing ecological, biological and geological processes occurring in the Australian wet tropics region have left many species restricted to upland areas and divided by altitudinal barriers into two or more disjunct allopatric populations. As allopatry is an important mechanism of speciation, these species may be regarded as potential examples of ongoing evolution.

Among the plants, genera best exhibiting allopatric (occupying different areas) speciation include *Haplostichanthus*, *Pseuduvaria*, *Elaeocarpus*, *Ceratopetalum*, *Polyosma*, *Endiandra*, *Uromyrtus*, *Pilidiostigma*, *Buckinghamia*, *Orites*, *Stenocarpus*, *Sarcotoechia*, *Bubbia*, *Planchonella* and *Symplocos*. Some outstanding examples of disjunctions that may eventually lead to new species are *Denhamia viridissima* (Mts Lewis, Bellenden Ker and Bartle Frere), *Elaeocarpus linsmithii* (Mts Lewis and Bartle Frere), *E. thelmae* (Alexandra Creek and Mt Windsor Tableland), *Trochocarpa bellendenkerensis* (Thornton Peak, Mts Bellenden Ker and Bartle Frere), *Glochidion pruinatum* (Thornton Peak and Mt Bellenden Ker), *Flindersia oppositifolia* (Thornton Peak and Mt Bellenden Ker), *Endiandra* sp. 'Boonjie' (Mt Lewis and the Boonjie area), *Litsea* sp. 'Mt Lewis' (Thornton Peak and Carbine Tableland), *Orites fragrans* (Thornton Peak, Mts Lewis, Bellenden Ker and Bartle Frere, and Boonjie), *Triana montana* (Mts Spurgeon, Lewis, Bellenden Ker and Bartle Frere), *Wendlandia connata* (Mts Hemmant and Spurgeon), *W. urceolata* (Thornton Peak, Mts Spurgeon and Bartle Frere), *Bubbia queenslandica* subspecies *queenslandica* (Noah Creek, Mts Spurgeon and Lewis) and *Symplocos ampulliformis* (Mt Hemmant, Mt Windsor Tableland and Mts Spurgeon and Lewis).

Several species of fauna restricted to the Wet Tropics also occur as two or more disjunct populations: the Mountain Mistfrog, *Litoria nyakalensis*, has been recorded from a number of localities between the McDowall Range and Kirrama Range, all at altitudes above about 400 metres; the Northern Tinkerfrog, *Taudactylus rheophilus*, occurs as four allopatric populations on Thornton Peak, Carbine Tableland, Lamb Range and Bellenden Ker Range, all at altitudes above 900 metres (*L. nyakalensis* and *T. rheophilus* were not found at any site during a survey in 1991–92.); the Lemuroid Ringtail Possum (*Hemibelideus lemuroides*) occurs on the Atherton Uplands and Mt Carbine Tableland and differences between these isolated populations have been noted (Trenerry and Werren 1993); Lumholtz's Tree-kangaroo (*Dendrolagus lumholtzi*) also occurs on the Atherton Uplands and at Mt Carbine Tableland; the Thornton Peak Melomys (*Melomys hadrourus*) occurs at Thornton Peak and Mt Carbine Tableland.

Species with disjunct populations outside the wet tropics similarly have potential for allopatric speciation. There are numerous examples among the plants including, *Maytenus bilocularis*, *Cassia marksiana*,

Pseudoweinmannia lachnocarpa, *Pollia crispata*, *Dysoxylum fraserianum*, *Premna lignum-vitae*, *Ixora beckleri*, *Euodia micrococca*, *Ripogonum discolor*, *R. elseyanum* and *Phaleria chermsideana*. Among the animals the following species occur in the Wet Tropics as populations isolated by ecological barriers and many of which are recognised as subspecies:

- Brown Antechinus (*Antechinus stuartii adustus*)
- Yellow-footed Antechinus (*Antechinus flavipes rubeculus*)
- Common Dunnart (*Sminthopsis murina tatei*)
- Red-cheeked Dunnart (*Sminthopsis virginiae virginiae*)
- White-footed Dunnart (*Sminthopsis leucopus*)
- Spotted-tailed Quoll (*Dasyrurus maculatus gracilis*)
- Koala (*Phascolarctus cinereus adustus*)
- Fluffy Glider (*Petaurus australis reginae*)
- Long-tailed Pygmy-possum (*Cercatetus caudatus macrurus*)
- Red-legged Pademelon (*Thylogale stigmata*)
- Little Cave Bat [*Vespadelus (Eptesicus) pumilus*]
- Golden-tipped Bat (*Kerivoula papuensis*)
- Bush Rat (*Rattus fuscipes coracius*)
- Cape York Rat (*Rattus leucopus cooktownensis*)
- Swamp Rat (*Rattus lutreolus lacus*)
- Australian King Parrot (*Alisterus scapularis minor*)
- Double-eyed Fig-Parrot (*Cyclopsitta diophthalma macleayana*)
- Pale-yellow Robin (*Tregellasia capito nana*)
- Yellow-breasted Boatbill (*Machaerirhynchus flaviventer secundus*)
- Brown Gerygone (*Gerygone mouki mouki*)
- Grey Fantail (*Rhipidura fuliginosa frerei*)
- Eastern Whipbird (*Psophodes olivaceus lateralis*)
- Spotted Catbird (*Ailuroedus melanotis maculosus*)
- Satin Bowerbird (*Ptilonorhynchus violaceus minor*)

Recent studies have shown a surprising level of genetic diversity within the Prickly Forest Skink, *Gnypetoscincus queenslandiae*. The studies were directed at determining the level of variation within mitochondrial DNA and a range of enzymes from specimens collected at seven different sites throughout the species range of 275 kilometres. The results show a major genetic break, clearly separating it into northern (Cape Tribulation to Mt Lewis) and southern (Mt Bartle Frere to Mt Sullivan) populations (Moritz *et al.* 1993). The authors conclude that the northern and southern populations “appear to represent very distinct evolutionary lineages that should be considered separately in any analyses of ecology, biogeography and conservation status”. The magnitude of the genetic difference between the two populations is of such an order that geographic separation probably occurred more than 5 million years ago (Moritz *et al.* 1993). There is every reason from a management point of view to consider the two populations as separate species.

Also conserved in Wet Tropics are communities of forests considered to be early segregates from rainforests. The Tall Open Forests on the drier western margins of the rainforest are significant as part of an evolutionary continuum of rainforest and sclerophyll forests. Eucalypts that now dominate the Australian landscape are considered to have evolved from rainforest stock and radiated into drier environments from the margins of closed forests (Gill *et al.* 1985). The first appearance of these wet sclerophyll forests in the fossil record was by the late Miocene (Truswell 1993).

Within the listed area, especially at the Cowley–Kurrimine Beach area and the mouth of the Murray River, active geological processes including coastline progradation have produced dynamic mosaics of rainforests, melaleuca and mangrove forests, and sandridge and swale communities. These complexes contain some of the oldest extant roots of an evolutionary continuum that originated from ancestral rainforests.

The Wet Tropics of Queensland includes variations in elevation above sea level and changes in topography and soil types and thus conserves the full diversity and complexity of the rainforest and associated communities present.

(3) *Superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance*

The Wet Tropics of Queensland World Heritage Area is one of the most significant regional ecosystems in the world. Despite its relatively small size, the exceptionally high genetic diversity and endemism make it a superlative example of tropical rainforest. It has been described as a key to the origins and ancient habitats of primitive flowering plants; as a key to the processes of past climatic sifting of taxa and community types; and as a biological link with temperate and other tropical zones (Webb 1984).

Northern Australia has been postulated as a major centre of evolution of rainforest flora (Kershaw *et al.* 1984). The living history of this evolution is best conserved in the listed area.

Apart from the diverse tropical rainforests that present a complex array of life forms, there are outstanding features of natural beauty and magnificent sweeping landscapes.

Between the Daintree River and Cedar Bay there is exceptional coastal scenery that combines tropical rainforest, white sandy beaches and fringing reefs just offshore. Considering the extent of the fringing reef, adjacent as it is to a rainforested continental coastline, this rainforest–reef association is probably unique in the world.

Rugged mountain peaks and gorges are among the dominating superlative features of the landscape. The stark peak of Mt Pieter Botte with its massive granite outcrops provides extensive vistas of undisturbed forest and the valley of the magnificent Roaring Meg Creek which in its lower reaches descends rapidly through a series of spectacular waterfalls and cascades. The region between the Bellenden Ker Range and the Atherton Uplands including the Walter Hill Range contains superb gorge scenery with swiftly flowing rivers. The Russell, Mulgrave and Johnstone Rivers are wild rivers and have become popular with canoeists.

In this area of high rainfall and rugged topography, spectacular waterfalls abound. Wallaman Falls on Stony Creek, dropping 278 metres into a deep canyon, has the longest single drop of any waterfall in Australia.

The winding channels of the Hinchinbrook Channel contain the most extensive mangroves in the region, providing a rich visual mosaic of rainforest and mangroves. The view to the east from this part of the Wet Tropics is backed by the magnificent scenery of Hinchinbrook Island, part of the Great Barrier Reef World Heritage Area.

(4) *The most important and significant habitats for in situ conservation of biological diversity, including those containing threatened species of plants and animals of outstanding universal value from the point of view of science and conservation*

The Wet Tropics is a major centre of biological diversity and provides the only habitat for numerous threatened species. Although accounting for only 0.26 percent of the Australian continent, the Wet Tropics conserves much of Australia's biodiversity (**Table 2**).

Table 2. Importance of the Wet Tropics to Australia's biodiversity

Taxonomic group	Percentage of Australia's total
Plants	
fern species	65
cycad species	21
conifer species	37
orchid species	30
vascular plant species	26
Animals	
mammal species including:	35
• marsupials	30
• bats	58
• rodents	25
bird species	40
frog species	29
reptile species	20
freshwater fish species	42
butterfly species	58
dung beetle species	42
barkbug species	46
weta species	50

Plant diversity

Within the Property there are over 2800 recorded species of vascular plants (**Table 3**), representing at least 1037 genera and 221 families. The outstanding significance of the Property is that it contains many taxa representing long, distinct lineages preserving a greater degree of evolutionary heritage than places with a similar number of species but containing a succession of closely allied forms. This is reflected in the very high plant diversity at the higher taxonomic levels such as numbers of plant genera and families represented in the Wet Tropics. Seventy-five genera are endemic to Australia and 43 are restricted to the Wet Tropics. Over 700 species are restricted to the Property.

Table 3. Plant diversity recorded within the Property

Class	Number		
	families	genera	species
Fork ferns	2	2	4
Tassel ferns	2	4	12
True ferns	29	86	251
Cycads	3	3	8
Conifers	3	6	15
Monocots	42	220	541
Dicots	140	716	2014
Total	221	1037	2845

Of the 19 angiosperm families described as the most primitive (Takhtajan 1969), 12 occur in the Wet Tropics, giving it the highest concentration of primitive plant families on earth (**Table 4**). Several of these (eg. Austrobaileyaceae, Eupomatiaceae, Idiospermaceae and Himantandraceae) are now small, relict and virtually extinct families. Two of these, the monospecific Austrobaileyaceae and Idiospermaceae are restricted Wet Tropics endemic families. The ditypic Eupomatiaceae and Himantandraceae extend outside of Australia, only to New Guinea and East Malesia respectively. These relict primitive families represent the last few remnants of an ancient assemblage that have survived the attrition of rainforest during the extreme climatic fluctuations of the past.

Table 4. Primitive angiosperm families found in the Wet Tropics.

Family	Number present in Wet Tropics		Number present worldwide ¹	
	genera	species	genera	species
Magnoliales				
• Annonaceae	12	30	130	2300
• Austrobaileyaceae	1	1	1	1
• Eupomatiaceae	1	2	1	2
• Himantandraceae	1	1	1	1
• Myristicaceae	1	2	15	300
• Winteraceae	2	7	9	100
Laurales				
• Hernandiaceae (including Gyrocarpaceae)	2	2	4	60
• Idiospermaceae	1	1	1	1
• Lauraceae	8	83	50	3000
• Monimiaceae (including Atherospermataceae)	14	27	30	450

¹Hyland & Whiffen (1993)

Endemism is particularly high in 33 angiosperm and six gymnosperm and fern families, most of which are old, primitive or relict and with a high proportion of species that are geographically rare. The majority of plants in the rainforests of the Wet Tropics have a restricted distribution either as isolated or disjunct populations. High concentrations of monotypic genera reflecting the refugial nature of the rainforests are found at several locations. Of the 49 monotypic genera in the Property (represented by a single surviving species), 19 are considered rare.

Animal diversity

Although the Wet Tropics of Queensland World Heritage Area represents only about 0.1 per cent of the land surface of the continent, it has a large and diverse share of the Australian continent's fauna (**Table 5**), including more rainforest dependent endemic vertebrates than any other area in Australia. Most of these endemics are confined to the cooler, upland rainforests and are considered to be relicts from formerly widespread temperate environments (Switzer 1991). At least 663 terrestrial vertebrate species have been recorded in the bioregion (DASETT, 1987; Williams *et al* 1996; Williams pers com) which represents 32% of Australia's terrestrial vertebrate fauna (**Table 5**). Of this total, 259 are rainforest species (**Table 6**). The wet sclerophyll forest that forms a narrow band on the western edge of the rainforest is very rich in vertebrate species with at least 227 species in only 72,000 ha. This high diversity (but low regional endemism) is due to this habitat being an overlap zone between rainforest and dry sclerophyll forests and woodlands. There are only five species of vertebrates that are confined to the wet sclerophyll forest in the Wet Tropics and of these only one is a regional endemic.

Within the Property occur 35 per cent of Australia's mammal species (including 30 per cent of the marsupial species, 58 per cent of the bat species and 25 per cent of the rodent species), 40 per cent of the bird species, 29 per cent of the frog species, 20 per cent of the reptile species, 42 per cent of the freshwater fish species and about 58 per cent of the butterfly species of Australia. There are at least 70 species of vertebrate animals unique to the Wet Tropics. In addition, there are numerous invertebrate species endemic to the Property. In terms of species diversity and endemism, no area in Australia appears to have greater biological significance than the tropical rainforest of north Queensland (Switzer 1991, Williams *et al* 1996, WTMA 2001).

Table 5. Comparative Wet Tropics vertebrate diversity

Vertebrate Group	No. of Wet Tropics species	% of Australian total	No of endemic species	Level of regional endemism
Mammals	110	35%	13	12%
Birds	314	40%	13	4%
Reptiles	151	20%	27	21%
Frogs	58	28%	24	40%
Freshwater fish	80	42%	8	10%
Total	741	33%	85	11%
Terrestrial Total	663	32%	77	12%

Source: Williams *et al.* (1996), DASETT (1987), Pusey & Kennard (1994), EPA (1999), Williams unpublished data (2002), Burrows (2002)

A breakdown of the region's terrestrial vertebrate fauna by broad habitat preference and regional endemism is presented in **Table 6**. The apparent higher totals presented in this table compared to **Table 5** recognises the fact that some species utilise more than one broad habitat type. Although the dry sclerophyll forests contain the highest overall diversity of vertebrate species, there is low proportional regional endemism (4%). In contrast, the rainforest fauna includes 66 species that are found only in the Wet Tropics or 25% of the rainforest terrestrial vertebrate species are endemic to the region (Williams *et al.* 1996).

Table 6. Number of Wet Tropics terrestrial faunal species by broad habitat preference.

	rain forest	wet sclerophyll	dry sclerophyll	grassland	rocky outcrops	caves	freshwater	mangroves
mammals	51	43	71	13	8	9	3	8
birds	112	107	174	48	3	-	73	63
reptiles	65	61	108	24	27	1	16	14
frogs	31	16	35	20	1	-	30	2
total	259	227	388	105	39	10	124	87
% regional endemism	25%	7%	4%	0%	21%	0%	4%	2%

Source: Williams *et al.* 1996.

Mammals

The mammal fauna includes 2 monotremes, 41 marsupials, 15 rodents and 36 bats. The Wet Tropics has a range of rainforest-specialist mammals, in contrast with south-eastern Australia where there are none, indicating a long continuous history of rainforest in the region (Winter 1988, 1991). Of the thirteen endemic species, only the Mahogany Glider and Tropical Bettong are not rainforest dependent. In addition to the endemic species, there are at least eight subspecies of mammals restricted to the area. Most of the rainforest-dependent endemics are restricted to the uplands and, as a consequence, they occur as a number of isolated populations (Winter 1991). One example is the Lemuroid Ringtail Possum that occurs only above 550 m with the larger population in the Atherton Uplands and a smaller population on Mt Carbine Tableland, the two being separated by the Black Mountain Corridor. The Mt Carbine Tableland population of the Lemuroid Ringtail Possum occurs only above about 1000 m and is characterised by a much higher proportion of pale-furred individuals ('white' lemuroids) (Trenerry and Werren 1993). The endemic species include one antechinus (Atherton Antechinus, *Antechinus godmani*), four ringtail possums (Lemuroid Ringtail Possum, *Hemibelideus lemuroides*; Green Ringtail Possum, *Pseudochirops archeri*; Herbert River Ringtail Possum, *Pseudocheirus herbertensis*; Daintree River Ringtail Possum, *P. cinereus*), one glider (Mahogany Glider, *Petaurus gracilis*), one rat-kangaroo (Musky Rat-kangaroo, *Hypsiprymnodon moschatus*), Australia's only two tree-kangaroos (Lumholtz's Tree-kangaroo, *Dendrolagus lumholtzi*; Bennett's Tree-kangaroo, *D. benettianus*), one bettong (Northern Bettong, *Bettongia tropica*) and one rodent (Masked white-tailed Rat, *Uromys hadrourus*). Only the tree-kangaroos, the musky rat-kangaroo and the long-tailed pigmy-possum are found from sea level to mountaintops.

Winter *et al.* (1984) defined two distinct sub-regions for the distribution of the endemic rainforest mammals of The Wet Tropics, the southern one centred on the Atherton Uplands and the northern one on

Thornton Peak, with Mt Carbine Tableland representing an overlap area. The Atherton Antechinus occurs only in the southern sub-region, as does the Herbert River Ringtail Possum, though the latter also has an isolated population on the Seaview Range towards the southern end of the World Heritage Area. The Daintree River Ringtail Possum occurs in the northern sub-region and on Mt Carbine and Mt Windsor Tablelands. The distributions of the two tree-kangaroos do not overlap. *Dendrolagus lumholtzi* occurs in the southern sub-region and on Mt Carbine Tableland, while *D. bennettianus* occurs in the northern sub-region and on Mt Windsor Tableland.

The Musky Rat-kangaroo is of particular interest. It is the smallest and, in many respects, the most primitive of the kangaroo group, and represents an early stage in the evolution of kangaroos from an arboreal possum-like stock.

The endangered Mahogany Glider (*Petaurus gracilis*) was rediscovered in 1989 after having been essentially forgotten for more than a century (Van Dyck 1993). It has been found only at a few localities in lowland woodland between Ingham and Tully. Over 80% of its habitat had been cleared for sugar cane, plantation pine, bananas and cattle. There are estimated to be only 2000 – 3000 Mahogany Gliders left in the wild (http://www.qmuseum.qld.gov.au/features/endangered/animals/mag_glider.asp)

The endangered Northern Bettong (*Bettongia tropica*) was once widely distributed in a range of tall and medium sclerophyll habitats in the uplands of the Wet Tropics region (Hilbert *et al* 2001) but are known to currently occur at only three locations: Mt Carbine Tableland (a very small, restricted and low density population), Lamb Range (including the Davies Creek, Emu Creek and Tinaroo sub-populations which are genetically distinct but geographically close)(Pope *et al* 2000) and Coane Range (a recently discovered small disjunct population in the southern section of the region. A total north-south spread of 340km.

In addition to the endemic species, there are at least eight subspecies of mammals restricted to the region (Werren 1993). These include the Yellow-footed Antechinus, *Antechinus flavipes rubeculus*, Brown Antechinus, *A. stuartii adustus*, Common Dunnart, *Sminthopsis murina tatei*, Godman's Rock-wallaby, *Petrogale godmani godmani*, Swamp Wallaby, *Wallabia bicolor mastersii*, Bush Rat, *Rattus fuscipes coracius*, Cape York Rat, *Rattus leucopus cooktownensis* and Swamp Rat, *Rattus lutreolus lacus*. In addition, a subspecies of the Long-tailed Pygmy-possum, *Cercartetus caudatus macrurus*, a tiny marsupial with a head and body length of about 10 cm, is restricted to the Wet Tropics with another subspecies occurring in New Guinea (Atherton and Haffenden 1991).

Diversity in the Australian bat fauna reaches its peak in The Wet Tropics (Richards 1991). At least 36 species have been recorded (Williams *et al* 1996), virtually all of which make use of rainforest for roosting or foraging or both (Richards 1991). Several species are considered endangered or vulnerable.

The White-footed Dunnart, *Sminthopsis leucopus*, which has been recorded from the Atherton Uplands, provides an outstanding example of disjunct occurrence. It is otherwise found only in south-eastern Australia and Tasmania.

Birds

The avifauna of the Wet Tropics is regarded as diverse. More than 314 species are either confined to, or have part or most of their range in the region (Williams *et al* 1996; Williams unpublished data 2002). Of these, more than 112 species principally inhabit rainforests in addition to other less rainforest-dependent species. Twenty-three species are either endemic to the region or have their Australian distributions largely confined to the region. Of the thirteen endemic species, nine are restricted to upland rainforests. These include the Tooth-billed Bowerbird (*Scenopoetes dentiostriis*), Golden Bowerbird (*Prionodura newtoniana*), Bridled Honeyeater (*Lichenostomus frenatus*), Fernwren (*Oreoscopus gutturalis*), Atherton Scrubwren (*Sericornis kerri*), Mountain Thornbill (*Acanthiza katherina*), Grey-headed Robin (*Heteromyias albispecularis*), Northern Logrunner or Chowchilla (*Orthonyx spaldingii*) and Bower's

Shrike-thrush (*Colluricincla boweri*). All 13 endemic species have close relatives in the highlands of New Guinea.

Another four bird species that are restricted to the Wet Tropics but not confined to higher altitudes are the Lesser Sooty Owl (*Tyto multipunctata*), Macleay's Honeyeater (*Xanthotis macleayana*), Victoria's Riflebird (*Ptiloris victoriae*) and the Pied Monarch (*Arses kaupi*).

It has been noted that the number of bird species endemic to Wet Tropics belies the richness of the avifauna (Crome and Nix 1991). Many other species have most of their range within the Property and at least another ten birds have subspecies restricted to the Wet Tropics. These include the Australian King Parrot (*Alisterus scapularis minor*), Double-eyed Fig-Parrot (*Cyclopsitta diophthalma macleayana*), Pale-yellow Robin (*Tregellasia capito nana*), Yellow-breasted Boatbill (*Machaerirhynchus flaviventer secundus*), Grey Fantail (*Rhipidura fuliginosa frerei*), Eastern Whipbird (*Psophodes olivaceus lateralis*), Brown Gerygone (*Gerygone mouki mouki*), Spotted Catbird (*Ailuroedus melanotis maculosus*), Satin Bowerbird (*Ptilonorhynchus violaceus minor*) and Boobook Owl (*Ninox novaeseelandiae lurida*).

Included among the birds of the World Heritage Area is one of the largest birds in the world, the flightless *Casuarius casuarius johnsonii*, the Australian subspecies of the Southern Cassowary. Standing up to two metres in height, it is one of only three species of cassowary in the world, all of which occur in New Guinea. The majority of the Australian distribution is in the Wet Tropics with a lesser occurrence in Cape York Peninsula. The cassowary is an important 'keystone' species, being responsible for dispersal of many large-fruited rainforest plants (Crome and Moore 1988).

The Golden Bowerbird is the only Australian member of a small group of bowerbirds, otherwise restricted to New Guinea, that build 'maypole' bowers. The bower is based around two towers that may be up to three metres high and one metre apart with a display pole perched between them (Frith 1976).

Many of the birds of the Wet Tropics have close relatives in New Guinea. One such species is the Grey-headed Robin that is often considered to be conspecific with *Heteromyias (Poecilodryas) albispecularis*, the Ashy Robin of the central highlands of New Guinea (Sibley and Monroe 1990).

There are just two members of the logrunner family, Orthonychidae. *Orthonyx spaldingii* is restricted to the Wet Tropics while *O. temminckii* occurs in New Guinea and in central eastern Australia, the two sites being around 2500 kilometres apart. A similar pattern is seen in the case of the Lesser Sooty Owl, one of the Wet Tropics endemics, and the Sooty Owl (*Tyto tenebricosa*) that occurs in New Guinea and south-eastern Australia.

One species shared with New Guinea is the Buff-breasted Paradise-Kingfisher (*Tanysiptera sylvia*) that migrates in the wet season to breed in Australia, where it is largely restricted to the Wet Tropics and Cape York Peninsula.

Frogs

The Wet Tropics contains the most diverse rainforest frog assemblage in Australia with very levels of regional endemism (Covacevich and McDonald 1993). Upland areas between 600 and 1,000 metres are particularly important. There are 58 species of frog in the region, 24 of which are regional endemics. Twenty-one of the 31 rainforest dependent frogs are only found in the Wet Tropics (McDonald 1992).

All but two of the endemic species are rainforest-dependent; the exceptions are the Black Mountain Frog (*Cophixalus saxatilis*) and the Magnificent Brood Frog (*Pseudophryne covacevichae*). *Cophixalus saxatilis* inhabits the granite boulder areas of the Black Trevethan Range while *Pseudophryne covacevichae* has a very restricted distribution and is only found in seepage areas in eucalypt forest near Ravenshoe. Of the rainforest frogs found in the region, 76 per cent are endemic. Included among these are some very restricted species. One species of tree frog, *Litoria lorica*, has been recorded only from about 450 m altitude in the Thornton Peak area. One of the Narrow-mouthed Frogs, *Cophixalus neglectus*,

occurs only on the Bellenden Ker Range while *C. bombiens* is restricted to the Mt Windsor Tableland; *C. hosmeri* is restricted to the Carbine Tableland and *C. exiguus* to the Mt Finnigan area. Another rare frog *Taudactylus rheophilus* is found only on the Bellenden Ker Range, Lamb Range, Mt Carbine Tableland and Thornton Peak. Adding to the level of endemism, the myobatrachid frog *Mixophyes shevilli* has been shown to represent three species although the work has not yet been formally published.

Seven species of endemic, stream dwelling, rainforest dependent frog have suffered sudden, precipitous declines over their entire ranges in the last few years.

Reptiles

The Wet Tropics consists of a mixture of old endemics (Gondwanic) and recent invaders from New Guinea. There are about 151 species of reptiles within the Wet Tropics (Williams *et al* 1996; WTMA 2002). About 65 species of reptile have been recorded in rainforests. Of these, 29 are rainforest specialists of which 20 species are regional endemics, making the level of reptile endemism in the Wet Tropics the highest in Australian rainforests (Covacevich 1993). The skinks are a particularly diverse group within the Wet Tropics with sixteen locally endemic species (Covacevich & Couper, 1994).

Freshwater Fish

The Wet Tropics region has a greater diversity of freshwater fishes than any other in Australia (Trenner and Werren 1991). Of around 190 freshwater fish species in Australia, over 80 occur in streams of the Wet Tropics (Pusey 2001; WTMA 2002). To date, nine endemic species have been identified. The endemic species cover a wide range of taxa including: rainbowfish (*Cairnsichthys rhombosomoides*, *Melanotaenia eachamensis*), catfishes (*Tandanus* sp.), grunners (*Hephaestus tulliensis*), cod (*Guyu wujalwujalensis*), and gobies (*Stiphodon allen*, *Glossogobius* sp. and *Schismatogobius* sp.) Many species are yet to be formally described (Pusey 2001). The region contains two-thirds (48 genera) of the continent's fish genera and 25 (71%) of Australia's 35 freshwater fish families (Pusey & Kennard, 1994). This extraordinary diversity reflects the diversity of stream habitats and the highly variable but predictable seasonal flow rates.

Invertebrates

The Wet Tropics has the richest insect fauna in Australia (Monteith 1996). A transect of five sites along an altitudinal gradient on the Bellenden Ker Range found more than 4000 species (Monteith and Davies 1991). Of particular biogeographic interest is the fauna preserved in the upland rainforests of the Wet Tropics, where the climate is relatively cool and commonly moist. Many of the taxa occurring in these sites show links with southern hemisphere taxa that suggest Gondwanan origins. There are many primitive, relict species that are isolated from their nearest relatives by at least 1500 kilometres. One species, the large stag beetle, *Sphaenognathus queenslandicus*, which is found only on Mt Lewis and Mt Windsor Tableland, has its closest relatives in South America.

The highly diverse and numerous moth fauna of the Property includes many rainforest endemic species including the brilliantly coloured *Aenetus monabilis*, one of the largest moths with a wing span up to 18cm, and the very restricted *Douea xanthopygs* and *Polyeuta callimorpha* which are only known from several collections. The most spectacular of Australia's moths, the Hercules Moth (*Coscinocera hercules*), one of the largest moths in the world with a wing span up to 25 cm, occurs in the Wet Tropics and further north to Iron Range.

There are more than 230 species of butterflies recorded from the Wet Tropics, including many restricted species such as the evening flying Purple Brown Eye (*Chaetocneme porphyropis*) and the Australian Hedge Blue (*Udara tenella*). The Cairns Birdwing, *Troides priamus*, which occurs in the Wet Tropics, the mid-eastern coast of Queensland and on Cape York Peninsula, is the largest butterfly in Australia.

The insects show clearly a striking phenomenon of the montane biota of the Wet Tropics, namely, the restriction of many species to specific mountain massifs such that each mountaintop has its own unique

suite of species. Studies on the flightless carabid beetles have been particularly significant in identifying important mountain systems (Monteith 1994, 1996). The Bellenden Ker Range and the Mt Carbine Tableland have been identified as particularly significant (Monteith 1996).

The Wet Tropics is also an outstanding area for wetas or giant king crickets. Twenty-six species occur in the region which is half of the Australian total. Four of the nine genera found in the Wet Tropics, involving eight species, are endemic to the Property. All the known winged species, including the two most primitive in the world, occur in the Wet Tropics (Johns 1994).

The spider fauna of the Wet Tropics is also diverse. The transect of the Bellenden Ker Range referred to above found more than 300 species of spiders (Monteith and Davies 1991). The spiders show a similar distribution to that of the insects and other fauna with numerous species restricted to mountaintops. For example, species restricted to the Bellenden Ker Range include the 'trapdoor' spiders *Namea nebulosa*, *N. olympus* and *Ozicrypta wrightae*, a new species (and new genus) in the family Barychelidae (Raven 1994), and the 'true' spiders *Spinanapis ker*, *S. frere*, *Otira summa*, *O. aquilonaria*, *Manjala pallida*, *Bakala episinoides*, *Jacksonoides distinctus*, *Sondra variabilis*, *Tauala alveolatus*, *T. lepidus*, *Australomimetus andreae*, *Mimetus hannemanni*, *M. catulli* and *Tasmanoonops septentrionalis*.

Among the 'true' spiders of the Wet Tropics there are some particularly primitive species, including *Tarlia daviesae*, *T. simipes* and *Macrogradungula moonya*. Apart from some taxa in southeast Australia, the nearest relatives are in South America and New Zealand.

The invertebrate fauna of the freshwater streams of the Wet Tropics is not well known. Studies on crayfish show there are at least six species of crayfish restricted to cool, permanent streams above 800 m in the Property. *Eastacus fleckeri* is found only above 1000 m on Mt Carbine Tableland, *E. robertsi* above 1000 m on Mt Finnigan and Thornton Peak, *E. balanensis* on the Bellenden Ker Range and Lamb Range, and *E. yigara*, *Cherax parvus* and an undescribed species of *Macrobrachium* all in the upper Tully River on the Cardwell Range (Short and Davie 1993). Two Wet Tropics streams, Yuccabine Creek and Birthday Creek, have recorded the highest diversity of stream invertebrates in Australia (Pearson *et al* 1986) or anywhere on earth (Burrows 2002 citing R. Pearson pers. comm.).

Land snails form an extraordinarily diverse group within the fauna of the Wet Tropics. An analysis by the Queensland Museum identified 217 native species, of which 185 (85 per cent) are endemic to the region (Stanisic *et al.* 1994). More than half the species occur in the Atherton Uplands. Predictably, other centres of diversity include Mt Carbine Tableland and Thornton Peak, but also less predictably Malbon Thompson Range and Mt Bakers Blue.

Rare & threatened species

Many species in the Wet Tropics, particularly rainforest species, are naturally rare. Relative rarity is influenced by several factors that may influence a species total potential population size such as its geographic range, its local abundance, and its ubiquity of occurrence within its range. It is often the case that species with small geographic ranges also have low local abundance, and are often patchily distributed within their ranges. These characteristics, either independently or in combination, increase the potential for extinction and make such species sensitive to environmental change/disturbance.

In the tables that follow, the legal status of plants and animals are based on the lists contained within Queensland's wildlife legislation (*Nature Conservation (Wildlife) Regulation 1994*).

Rare & threatened plants

The Wet Tropics bioregion has a total of 351 officially listed rare or threatened plant species (**Table 7**, **Table 8**). Of the 29 recognised recent plant extinctions in Queensland, 17 were formally endemic to the Wet Tropics. The presumed extinct species, in general, have not been recorded for over 50 years. The high proportion of the State's presumed extinct, endangered and vulnerable plants coming from the Wet

Tropics highlights the vulnerability, small population size and restricted distribution of many of the bioregion's plants and the pattern and extent of past habitat clearing.

Table 7. Rare and threatened Wet Tropics plants¹.

Class	Extinct	Endangered	Vulnerable	Rare	Totals
Hornworts	0	0	0	0	0
Liverworts	0	0	0	0	0
Mosses	0	0	0	0	0
Fern allies					
• fork ferns	1	0	0	0	1
• spike mosses	0	0	0	0	0
• club mosses	2	3	4	1	10
Ferns	7	4	7	27	45
Cycads	0	0	1	0	1
Conifers	0	0	0	3	3
Monocotyledons	3	10	8	42	63
Dicotyledons	7	18	31	180	236
TOTAL	20	35	51	253	359

¹Nature Conservation (Wildlife) Regulation 1994 (includes all amendments up to SL No. 354 of 2000)

Table 8. Percentage of total known Wet Tropics flora considered rare or threatened

Class	Threatened (%) (extinct+endangered+vulnerable)	Rare or Threatened (%) (extinct+endangered+vulnerable+rare)
Hornworts	0.0	0.0
Liverworts	0.0	0.0
Mosses	0.0	0.0
Fern allies		
• fork ferns	20.0	20.0
• spike mosses	0.0	0.0
• club mosses	69.0	77.0
Ferns	6.6	16.5
Cycads	12.5	12.5
Conifers	0.0	24.4
Monocotyledons	3.0	9.1
Dicotyledons	2.5	10.7
TOTAL	3.3	11.2

Included in the list are many rare and very restricted species belonging to the primitive angiosperm families referred to earlier in relation to The Age of the Angiosperms. These include *Idiospermum australiense* (Idiospermaceae), eight undescribed species of *Haplosticanthus* (Annonaceae), *Wilkiea wardelli* and *Tetrasyandra* sp. (Monimiaceae), *Endiandra anthropophagorum* and *E. microneura* (Lauraceae). There are also rare species within two undescribed genera in the Myrtaceae family, both with very restricted distributions. As noted earlier, the genera, *Barongia*, *Ristantia* and *Sphaerantia* may have considerable significance in relation to the evolution of sclerophyllous Myrtaceae taxa.

The list of rare and threatened species includes 16 monotypic genera restricted to the wet tropics. They are *Austromuellera trinervia*, *Baileyoxylon lanceolatum*, *Barongia lophandra*, *Crispiloba disperma*, *Hexaspora pubescens*, *Kuntheria pedunculata*, *Lenbrassia australiana*, *Mitrantia bilocularis*, Gen. nov. Q2, *Neostrearia fleckeri*, *Noahdendron nicholasii*, *Normanbya normanbyi*, *Oreodendron biflorum*, *Ostrearia australiana*, *Sphalmium racimosum* and *Whyanbeelia terraereginae*. Rare species in endemic ditypic genera include *Buckinghamia ferruginiflora*, *Darlingia ferruginea*, *Hypsophila halleyana*, *Peripentadenia mearsii*, *P. phelpsii*, *Sphaerantia chartacea* and *S. discolor*.

Within the Proteaceae there are several rare and very restricted species including *Alloxylon flammeum*, *Helicia blakei*, *H. recurva*, and undescribed species of *Carnarvonia*, *Orites* and two entirely new genera.

There are at least 70 species recorded only from the type locality and another 80 or so restricted endemic species for which current records indicate a north-south distribution of less than 25 kilometres.

Rare & threatened animals

The Wet Tropics has a total of 82 animal species officially listed as either rare or threatened. Endangered fauna include seven frog species, three marsupials, one bird and two butterflies (Tables 9 & 10). A further 16 vertebrate species are classified as vulnerable.

Table 9. Rare and threatened Wet Tropics animals¹.

Status	Mammals	Birds	Reptiles	Frogs	Fish	Butterflies	TOTAL
Extinct	0	0	0	0	0	0	0
Endangered	6	6	0	7	0	0	19
Vulnerable	5	10	2	3	0	1	21
Rare	10	17	15	11	0	0	53
TOTAL	21	33	17	21	0	1	93

¹*Nature Conservation (Wildlife) Regulation 1994* (including all amendments up to SL No. 354 of 2000), *EPA Wildnet (2001)*

Table 10. Percentage of total known Wet Tropics vertebrate fauna considered rare or threatened

Class	Threatened (%) (extinct+endangered+vulnerable)	Rare or Threatened (%) (extinct+endangered+vulnerable+rare)
Mammals	10.0	19.1
Birds	5.1	10.5
Reptiles	1.3	11.3
Frogs	17.2	36.2
TOTAL	6.0	14.0

References

- Archer, M., Godthelp, H., Hand, S.J. & Megirian, D. (1989). Fossil mammals of Riversleigh, north-western Queensland: preliminary overview of biostratigraphy, correlation and environmental change. *Australian Zoologist* 25: 29-65.
- Armstrong, J.A. (1983). Rutaceae. In: Morley, B.D. & Toelken, H.R. (eds). *Flowering Plants of Australia*. Rigby, Adelaide.
- Ashton, P.S. (1981). Techniques for the identification and conservation of threatened species in tropical forests. In: Synge, H. (ed). *Biological Aspects of Rare Plant Conservation*. John Wiley & Sons.
- Atherton, R.G. & Haffenden, A.T. (1991). Long-tailed pygmy possum. In: Strahan, R. (ed). *The Australian Museum Complete Book of Australian Mammals*. Collins, Angus & Robertson, North Ryde, New South Wales.
- Audley-Charles, M.G. (1987). Dispersal of Gondwanaland: relevance to evolution of angiosperms. In: Whitmore, T.C. (ed). *Biogeographical Evolution of the Malay Archipelago*. Oxford University Press, Oxford. Pp5-25.

- Audley-Charles, M.G. (1988). Evolution of the southern margin of Tethys (north Australian region) from Early Permian to Late Cretaceous. In: Audley-Charles, M.G. & Hallam, A. (eds). *Gondwana and Tethys. Geol. Soc. London Special Publ.* 37: 79-100.
- Audley-Charles, M.G. (1991). Tectonics of the New Guinea Area. *Annual Review of Earth and Planetary Science* 19: 17-41.
- Barlow, B.A. & Hyland, B.P.M. (1988). The origin of the flora of Australia's wet tropics. In: Kitching, R. (ed). *The Ecology of Australia's Wet Tropics*. Proc. Ecological Society of Australia 15: 1-17.
- Barlow, B.A. (1981). *The Australian Flora: its origin and evolution*. Fl. Australia 1: 25-76.
- Baverstock, P.R. & Donnellan, S.C. (1990). Molecular evolution in Australian dragons and skinks: a progress report. *Memoirs of the Queensland Museum* 29: 323-331.
- Boles, W.E. (1993). A logrunner *Orthonyx* (Passeriformes: Orthonychidae) from the Miocene of Riversleigh, north-western Queensland. *Emu* 93: 44-49.
- Bonell, M. & Gilmour, D.A. (1978). The development of overland flow in a tropical rainforest catchment. *J. Hydrology*: 39: 365-382.
- Brancucci (1985). *Typhlodessus monteithi* n. gen. N. sp., a blind terrestrial Dytiscidae (Coleoptera) from New Caledonia. *Bull. Soc. Ent. Suisse* 58: 467-470.
- Burrett, C., Duhig, N., Berry, R. & Varne, R. (1991). Asian and south-western Pacific continental terranes derived from Gondwana, and their biogeographic significance. In: Ladiges, P.Y., Humphries, C.J. & Martinelli, L.W. (eds). *Austral Biogeography*. CSIRO Melbourne. Pp. 13-24.
- Burrows, D. (2002). *Fish Stocking and the Distribution and Potential Impact of Translocated Fishes in Streams of the Wet Tropics Region, Northern Queensland*. Report to the Wet Tropics Management Authority ACTFR Report No. 02/04.
- Christidis, L. & Schodde, R. (1991). Genetic differentiation in the white-browed scrubwren (*Sericornis frontalis*) complex (Aves: Acanthizidae). *Australian J. Zoology* 39: 709-718.
- Clifford, H.T. & Constantine, J. (1980). *Ferns, Fern Allies and Conifers of Australia*. University of Queensland Press, Brisbane.
- Collinson, M.E. (1990). Plant evolution and ecology during the early Cainozoic diversification. *Advances in Botanical Research* 17: 1-98.
- Couper, R.A. (1958). British Mesozoic microspores and pollen grains. A systematic and stratigraphic study. *Palaeontographica* 103: 75-119.
- Covacevich, J. (1993). *Detailed Distributions of Reptiles of the World Heritage Area (with analysis)*. Report to Wet Tropics Management Authority, Cairns.
- Covacevich, J., Couper, P., Molnar, R.E., Witten, G. & Young, W. (1990). Miocene dragons from Riversleigh: new data on the history of the family Agamidae (Reptilia: Squamata) in Australia. *Memoirs of the Queensland Museum* 29: 339-360.
- Covacevich, J.A. & Couper, P.J. (1994). *Reptiles of the Wet Tropics Biogeographic Region: records of the Queensland and Australian Museums, with analysis*. Report to the Wet Tropics Management Authority, Cairns.
- Covacevich, J.A. & McDonald, K.R. (1993). Distribution and conservation of frogs and reptiles of Queensland. *Memoirs of the Queensland Museum* 34: 189-199.
- Crane, P.R., Friis, E.M. & Pedersen, K.R. (1986). Lower Cretaceous angiosperm flowers: fossil evidence on early radiation of dicotyledons. *Science* 232: 852-854.

- Crane, P.R., Friis, E.M. & Pedersen, K.R. (1986). Lower Cretaceous angiosperms flowers: fossil evidence on early radiation of dicotyledons. *Science* 232: 852-854.
- Crome, F & Nix, H. (1991). Birds. In H.A. Nix and M. Switzer (eds), *Kowari 1: Rainforest Animals: Atlas of Vertebrates Endemic to Australia's Wet Tropics*. Australian National Parks and Wildlife Service, Canberra, pp 55-69.
- Crome, F.J.H. & Moore, L.A. (1988). *The Southern Cassowary in North Queensland – A Pilot Study*. Volumes I-IV, A report prepared for the Queensland National Parks and Wildlife service and the Australian National Parks and Wildlife Service. CSIRO, Atherton.
- Cronquist, A. (1988). *The Evolution and Classification of Flowering Plants. Second Edition*. New York Botanical Garden, New York. 555pp.
- Cronquist, A.J. (1981). *An Integrated System of Classification of Flowering Plants*. Columbia University Press, New York.
- Crowley, T.J. & North, G.R. (1991). *Paleoclimatology*. Oxford University Press, New York.
- Davies, V.T. (1986). New Australian species of *Otira* Forster & Wilton, 1973, and *Storenosoma* Hogg, 1900 (Araneae: Amaurobiidae). *Memoirs of the Queensland Museum* 22: 237-251.
- DASETT (1987). *Nomination of the Wet Tropical Rainforests of North-east Australia by the Government of Australia for Inclusion in the World Heritage List*. Department of Arts, Sport, the Environment, Tourism and Territories. Canberra. December 1987.
- Dettmann, M.E. & Clifford, H.T. (1991). *The Ecology and Evolution of Australian Fossil Ferns: Implications for Fossil Fuels*. National Energy Research, Development and Demonstration Report No. 1184. Dept. Primary Industries and Energy, Canberra.
- Dettmann, M.E. (1986). Early Cretaceous palynoflora of subsurface strata correlative with the Koonwarra fossil bed, Victoria. In: Jell, P.A. & Roberts, J. (eds). *Plants and Invertebrates from the Lower Cretaceous Koonwarra Fossil Bed, South Gippsland, Victoria*. Association of Australian Palaeontologists, Sydney.
- Dettmann, M.E. (1989). Antarctica: Cretaceous cradle of austral temperate rainforests? In: Crame, J.A. (ed). *Origins and Evolution of the Antarctic Biota*. Geological Society, Bath. Pp. 89-105.
- Dettmann, M.E. (1994). Cretaceous vegetation: the microfossil record. In: Hill, R.S. (ed). *History of the Australian Vegetation: Cretaceous to Recent*. Cambridge University Press, Cambridge. Pp. 143-170.
- Donnellan, S., Adams, M., Hutchinson, M. & Baverstock, P.R. (1993). The identification of cryptic species in the Australian herpetofauna: a high research priority. In: Lunney, D. & Ayres, D. (eds). *Herpetology in Australia, a Diverse Discipline*. Surrey Beatty & Sons, Chipping-Norton, Australia.
- Duellman, W.E. & Trueb, L. (1986). *Biology of Amphibians*. McGraw-Hill, New York.
- Endress, P.K. & Honegger, R. (1980). The pollen of the Austrobaileyaceae and its phylogenetic significance. *Grana* 19: 177-182.
- Endress, P.K. (1983). Dispersal and distribution in some small archaic relict angiosperm families (Austrobaileyaceae, Eupomatiaceae, Himantandraceae, Idiospermoideae-Calycanthaceae). *Sonderbd. Naturwiss ver Hamburg* 7: 201-217.
- EPA (1999). *State of the Environment Queensland 1999*. Environmental Protection Agency, Brisbane.
- Evans, J.W. (1977). The leafhoppers and froghoppers of Australia and New Zealand. *Records of the Australian Museum* 31: 83-129.
- Forster, R.R., Platnick, N.I. & Gray, M.R. (1987). A review of the spider superfamilies Hypochiloidea and Austrochiloidea (Araneae, Araneomorphae). *Bull. Amer. Museum Nat. Hist.* 185: 1-116.
- Frith, H.J. (ed) (1976). *Reader's Digest Complete Book of Australian Birds*. Reader's Digest Services Pty. Ltd.

- Galtier, J. & Scott, A.C. (1985). Diversification of early ferns. *Proc. Royal Soc. Edinburgh* 86B: 289-301.
- Gill, A.M., Belbin, L. & Chippendale, G.M. (1985). *Phytogeography of Eucalyptus in Australia*. Australian Flora and Fauna Series 3. Australian Government Publishing Service, Canberra.
- Harbury, N.A., Jones, M.E., Audley-Charles, M.G., Metcalf, I. & Mohamed, K.I. (1990). Structural evolution of Mesozoic Peninsular Malaysia. *J. Geol. Soc. London* 147: 11-26.
- Heyer, W.R. & Liem, D.S. (1976). Analysis of the intergeneric relationships of the Australian frog family Myobatrachidae. *Smithsonian Contributions to Zoology No. 233*. Smithsonian Institution Press, Washington.
- Hilbert, D.W., Graham, A. & Parker, T. (2001). Tall open forest and woodland habitats in the wet tropics: responses to climate change and implications for the northern bettong (*Bettongia tropica*). *Tropical Forest Research Series* 1: 1-45.
- Hill, R.S. (1987). Discovery of *Nothofagus* fruits corresponding to an important Tertiary pollen type. *Nature*: 327: 56-58.
- Hill, R.S. (1992). *Nothofagus*: Evolution from a southern perspective. *Trends Ecol. Evol.* 7: 190-194.
- Hutchinson, C.S. (1989). Displaced terranes of the southwest Pacific. In: Ben-Avraham, Z. (ed). *The Evolution of the Pacific Ocean Margins*. Oxford University Press, New York. Pp. 161-175.
- Hutchison, C.S. (1989). *Geological Evolution of South-east Asia*. Clarendon Press, Oxford.
- Hyland, B.P.M. & Whiffin, T. (1993). *Australian Tropical Rain Forest Trees: An Interactive Identification System*, Volume 2. CSIRO. Melbourne.
- Ingram, G.J. & McDonald, K.R. (1993). An update on the decline of Queensland's frogs. In: Lunney, D. & Ayers, D. (eds). *Herpetology in Australia: a Diverse Discipline*. Surrey Beatty & Sons, Chipping-Norton, Australia. Pp. 297-303.
- Johns, P. (1994). *Wetas (King Crickets) of North Queensland*. Report to Wet Tropics Management Authority, Cairns.
- Johnson, L.A.S. (1959). The families of Cycads and the Zamiaceae of Australia. *Proc. Linn. Soc. New South Wales* 84: 64-117.
- Johnson, L.A.S., and Briggs, B.G. (1975). On the Proteaceae - the evolution and classification of a southern family. *Botanical Journal of the Linnean Society* 70: 83-182.
- Johnson, P.M. & Strahan, R. (1982) A further description of the Musky Rat-kangaroo, *Hypsiprymnodon moschatus* Ramsay 1876 (Marsupialia, Potoroidae) with notes on its biology. *Australian Zoology* 21: 27-46.
- Jones, D.L. & Clemesha, S.C. (1980). *Australian Ferns and Fern Allies*. Reed Books, French's Forest, New South Wales.
- Jones, D.L. (1993). *Cycads of the World*. Reed, Chatswood. New South Wales.
- Kemp, E.M. (1978). Tertiary climatic evolution and vegetation history in the south-east Indian Ocean region. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 24: 169-208.
- Kershaw, A.P. (1984). Late Cenozoic plant extinctions in Australia. In: Martin, P.S. & Klein, R.G. (eds). *Quaternary Extinctions: A Prehistoric Revolution*. University of Arizona Press. pp. 691-707.
- Kershaw, A.P. (1989). Late Cainozoic vegetation of Australasia. In: Huntley & Webb (eds). *Vegetation History*. Junk, The Hague.
- Kershaw, A.P., Sluiter, I.R., Dawson, J., Wagstaff, B.E. & Whitelaw, M. (1984). The history of rainforest in Australia – evidence from pollen. In: Werren, G.L. & Kershaw, A.P. (eds). *Australian National Rainforests Study Volume 1*. Report to World Wildlife Fund (Project 44). Geography Department, Monash University, Melbourne. Pp. 462-477.

- Keto, A.I. (1986). Centres of endemism among the flora of the wet tropical rainforests of North Queensland. p.30 in Abstracts: *The Ecology of Australia's Wet Tropics Symposium*. Ecological Society of Australia/Australian Systematic Botany Society.
- Kikkawa, J. (1991). Avifauna of Australian rainforest. In: Werren, G.L. & Kershaw, A.P. (eds). *The Rainforest Legacy Volume 2*. Australian Government Publishing Service, Canberra. Pp. 187-196.
- Kikkawa, J., Monteith, G.B. & Ingram, G.J. (1981). Cape York Peninsula: a major region of faunal interchange. In: Keast, A. (ed). *Ecological Biogeography of Australia*. Junk, The Hague.
- Kuschel, G. (1983). Past and present of the relict family Nemonychidae (Coleoptera: Curculionidae). *Geo Journal* 7: 499-504.
- Kuschel, G. (1994). Nemonychidae of Australia, New Guinea and New Caledonia. In: Zimmerman, E.C. (ed). *Australian Weevils Volume 1*.
- Liden, M. (1992). Evolution and classification of seed plants. *Progress in Botany* 53: 282-317.
- Livingstone, D.A. & van der Hammen, T. (1978). Palaeography and palaeoclimatology. In: UNESCO/UNEP/FAO (eds). *Tropical Forest Ecosystems*. UNESCO, Paris.
- Macphail, M.K., Alley, N., Truswell, E.M. & Sluiter, I.R. (1994). Early Tertiary vegetation: evidence from spores and pollen. In: Hill, R.S. (ed). *History of the Australian Vegetation: Cretaceous to Recent*. Cambridge University Press, Cambridge. Pp. 189-261.
- Malipatil, M.B. & Monteith, G.B. (1983). One new genus and four new species of terrestrial Mesoveliidae (Hemiptera: Gerromorpha) from Australia and New Caledonia. *Australian J. Zoology* 31: 943-955.
- Martin, H.A. (1994). Australian Tertiary phytogeography: evidence from palynology.. In: Hill, R.S. (ed). *History of the Australian Vegetation: Cretaceous to Recent*. Cambridge University Press, Cambridge. Pp. 104-142.
- Metcalf, I. (1990). Allochthonous terrane processes in southeast Asia. *Philos. Trans. Royal Soc. London* 331: 625-640.
- Monteith, G. & Davies, V.T. (1991). Preliminary account of a survey of arthropods along an altitudinal rainforest transect in tropical Queensland. In: Werren, G.L. & Kershaw, A.P. (eds). *The Rainforest Legacy Volume 2*. Australian Government Publishing Service, Canberra. Pp. 345-362.
- Monteith, G. B. (1996) *Distribution, altitudinal zonation and conservation criteria for low vagility and southern relict insects of the Wet Tropics. Part 2*. Wet Tropics Management Authority, Cairns.
- Monteith, G. B. (1996) *Distribution, altitudinal zonation and conservation criteria for low vagility and southern relict insects of the Queensland Wet Tropics, Part 1*. Wet Tropics Management Authority, Cairns .
- Monteith, G.B. (1994). *Distribution and Altitudinal Zonation of low Vagility Insects of the Queensland Wet Tropics*. Report to the Wet Tropics Management Authority, Cairns.
- Morat P, Veillon J M & Mackee H F (1986). Cladistic relationships of New Caledonian rainforest phanerogams. *Telopea* 2(6): 631-679.
- Morat, P., Veillon, J.M. & Mackee, H.F. (1986). Cladistic relationships of New Caledonian rainforest phanerogams. *Telopea* 2: 631-679.
- Moritz, C., Joseph, L. and Adams, M. (1993). Cryptic diversity in an endemic rainforest skink (*Gnypetoscincus queenslandiae*). *Biodiversity and Conservation*, 2 : 412-425.
- Morley, B.D. & Toelken, H.R. (1983). *Flowering Plants in Australia*. Rigby, Adelaide.
- Muller, J. (1984). Significance of fossil pollen for angiosperm history. *Ann. Missouri Bot. Gardens* 71: 419-443.

- National Land & Water Resources Audit (2001). *Native vegetation in Australia: major vegetation groups and their representation in the Australian landscape*. Australian Natural Resources Atlas V2.0. Commonwealth of Australia.
- Nix, H. (1980). Environmental determinants of biogeography and evolution in Terra Australis. In: Barker, W.R. & Greensland, J.M. (eds). *Evolution of the Flora and Fauna of Arid Australia*. Peacock Publications, Adelaide. Pp. 47-66.
- Nix, H. (1991). Biogeography: pattern and process. In H.A. Nix and M. Switzer (eds), *Kowari 1: Rainforest Animals: Atlas of Vertebrates Endemic to Australia's Wet Tropics*. Australian National Parks and Wildlife Service, Canberra, pp 11-41.
- Norstog, K. (1987). Cycads and the origin of insect pollination. *Am. Scientist* 75: 270-279.
- Page, C.T. & Clifford, H.T. (1981). Ecological biogeography of Australian conifers and ferns. In: Keast, A. (ed). *Ecological Biogeography of Australia*. Junk, The Hague. Pp 471-498.
- Pearson, R.G., Benson, L.J. and Smith, R.E.W. (1986). Diversity and abundance of the fauna of Yuccabine Creek, a tropical rainforest stream. *Limnology in Australia*. Pages 329-342 In: de Dekker, P. and Williams, W.D.W. (eds.). *Limnology in Australia*, CSIRO, Melbourne.
- Platnick, N.I. & Sedgwick, W.C. (1984). A revision of the spider genus *Liphistius* (Araneae, Mesothelae). *Amer. Mus. Novitates* 2781: 1-31.
- Pope, L.C., Estoup, A. & Moritz, C. (2000). Phylogeography and population structure of an ecotonal marsupial, *Bettongia tropica*, determined using mtDNA and microsatellites. *Molecular Ecology* 9: 2041-2053.
- Pusey, B. (2001). Fishes in the forest: high biodiversity and endemism. *Using Rainforest Research*, Cooperative Research Centre for Tropical Rainforest Ecology and Management, Cairns.
- Pusey, B.J. & Kennard, M.J. (1994). *The Freshwater Fish Fauna of the Wet Tropics Region of Northern Queensland*. Report to the Wet Tropics Management Authority, Cairns.
- Raven, P.H. & Axelrod, D.I. (1974). Angiosperm biogeography and past continental movement. *Ann. Missouri Bot. Gardens* 61: 539-673.
- Raven, P.H. (1983). The challenge of tropical biology. *Bull. Entomol. Soc. Am.* 29: 4-12.
- Raven, P.H. (1987). The scope of the plant conservation problem world-wide. In: Bramwell, D., Hamann, O., Heywood, V. & Syngé, H. (eds). *Botanic Gardens and the World Conservation Strategy*. Academic Press, London. Pp. 19-29.
- Raven, R.J. (1994). A monograph of the mygalomorph spider family Barychelidae in Australia and the western Pacific. *Memoirs of the Queensland Museum* 35 (2).
- Richards, G.C. (1991). Conservation status of the rainforest bat fauna of northern Queensland. In: Werren, G.L. & Kershaw, A.P. (eds). *The Rainforest Legacy Volume 2*. Australian Government Publishing Service, Canberra. Pp. 177-186.
- Roberts, J.D. & Maxson, L.R. (1985). Tertiary speciation models in Australian anurans: molecular data challenge Pleistocene scenario. *Evolution* 39: 324-334.
- Roberts, J.D. & Watson, G.F. (1993). Biogeography and phylogeny of the anura. In: Glasby, C.J., Ross, G.J.B. & Beesley, P.L. (eds). *Fauna of Australia: Volume 2a, Amphibia and Reptilia*. Australian Government Publishing Service, Canberra.
- Rothwell, G.W. & Erwin, D.M. (1987). Origin of seed plants: an aneurophyte/seed-fern link elaborated. *Amer. J. Bot.* 74: 970-973.
- Schodde, R. & Calaby, J.H. (1972). The biogeography of the Australo-Papuan bird and mammal faunas in relation to Torres Strait. In: Walker, D (ed). *Bridge and Barrier: The Natural and Cultural History of Torres Strait*. Australian National University Press, Canberra. Pp 257-300.

- Schodde, R. & Christidis, L. (1987). Songbird similarities stem not from common ancestors but from environment. *The Age*, 12 May. P.22.
- Schodde, R. (1982). Origin, adaptation and evolution of birds in arid Australia. In: Barker, W.R & Greenslade, P.J.M. (eds). *Evolution of the Flora and Fauna of Arid Australia*. Peacock Publications, Frewville South Australia. Pp. 191-224.
- Schodde, R. (1986). The origins of Australian birds. In: Schodde, R. & Tidemann, S.C. (ed). *Reader's Digest Complete Book of Australian Birds (second edition)*. Reader's Digest, Sydney. Pp. 36-39.
- Schuster, R.M. (1972). Continental movements, "Wallace's Line" and Indomalayan-Australasian dispersal of land plants: some eclectic concepts. *Botanical Review* 38: 3-86.
- Schuster, R.M. (1976). Plate tectonics and its bearing on the geographical origin and dispersal of angiosperms. In: Beck, C.B. (ed). *Origin and Early Evolution of Angiosperms*. Columbia University Press, New York. Pp. 48-138.
- Scott, A.C., Galtier, J. & Clayton, G. (1985). *Rev. Palaeobot. Palynol.* 44: 81-99.
- Short, J.W. and Davie, P.J.F. (1993). Two new species of freshwater crayfish (Crustacea: Decapoda: Parastacidae) from northeastern Queensland rainforest. *Memoirs of the Queensland Museum* 34: 69-80.
- Sibley, C.G. & Ahlquist, J.E. (1985). The phylogeny and classification of the Australo-Papuan passerines. *Emu* 85: 1-14.
- Sibley, C.G. & Ahlquist, J.E. (1990). *Phylogeny and Classification of Birds. A study in molecular evolution*. Yale University Press, New Haven.
- Sibley, C.G. & Monroe Jr, B.L. (1990). *Distribution and Taxonomy of Birds of the World*. Yale University Press, New Haven.
- Slater, P. (1974). Stage-makers, gardeners and avenue-builders. In: Scott, P. (ed). *The World Atlas of Birds*. Mitchell Beazley Publishers, London. Pp. 198-199.
- Smith-White, S. (1954). Chromosome numbers in the Boronieae (Rutaceae) and their bearing on the evolutionary development of the tribe in the Australian flora. *Austral. J. Bot.* 2: 287-303.
- Smith-White, S. (1959). Cytological evolution in the Australian flora. *Cold Spring Harbour Symp. Quant. Biol.* 24: 273-289.
- Sporne, K.R. (1975). *The Morphology of Pteridophytes*. Hutchinson, London.
- Stanisic, J. (1990). Systematics and biogeography of eastern Australian Charopidae (Mollusca, Pulmonata) from subtropical rainforests. *Memoirs of the Queensland Museum* 30: 1-241.
- Stanisic, J. (1994). The distribution and patterns of species diversity of land snails of eastern Australia. *Memoirs of the Queensland Museum* 36: 207-214.
- Stanisic, J., Eddie, C., Hill, A. & Potter, D. (1994). *A Preliminary Report on the Distribution of Land Snails Occurring in the Wet Tropics Area*. Report to the Wet Tropics Management Authority, Cairns.
- Switzer, M. (1991). Introduction. In H.A. Nix and M. Switzer (eds), *Kowari 1: Rainforest Animals: Atlas of Vertebrates Endemic to Australia's Wet Tropics*. Australian National Parks and Wildlife Service, Canberra, pp 1-11.
- Takhtajan, A. (1969). *Flowering Plants. Origin and Dispersal*. Oliver & Boyd. Edinburgh.
- Takhtjan, A. (1980). Outline of the classification of flowering plants (Magnoliophyta). *Bot. Rev.* 46: 225-359.
- Takhtajan, A. (1987). Flowering plant origin and dispersal: the cradle of angiosperms revisited. In: Whitmore, T.C. (ed). *Biogeographical Evolution of the Malay Archipelago*. Oxford University Press, Oxford. Pp. 26-31.
- Tracey, J.G., & Webb, L.J. (1975). *Vegetation of the Humid Tropical Region of North Queensland (15 maps at 1:100,000 scale + key)*. CSIRO, Indooroopilly.

- Tracey, J.G. (1982). *The Vegetation of the Humid Tropics of North Queensland*, CSIRO, Melbourne.
- Trenerry M P & Werren G L (1991). Fishes. (in) Nix H A and Switzer M A (eds) *Kowari I - Rainforest Animals: Atlas of Vertebrates Endemic to Australia's Wet Tropics*. Australian National Parks and Wildlife Service, Canberra:104.
- Trenerry, M.P. & Werren, G.L. (1993). Possum assemblages in rainforest of the Carbine uplands, NEQ, with special reference to *Hemibelidius lemuroids*. *Memoirs of the Queensland Museum* 34: 188.
- Truswell, E. (1993). Vegetation changes in the Australian tertiary in response to climatic and phytogeographic forcing factors. *Australian Systematic Botany* 6: 533-557.
- Tyler, M.J. (1979). Herpetofaunal relationships of South America with Australia. In: Duellman, W.F. (ed). *The South American Herpetofauna*. Kansas Museum of Natural History Monograph 7.
- Tyler, M.J. (1989). *Australian Frogs*. Viking O'Neil, Penguin Books Australia, Ringwood, Victoria.
- Van Dyck, S. (1982). The status and relationships of the Atherton Antechinus, *Antechinus godmani* (Marsupialia: Dasyuridae). *Australian Mammalogy* 5: 195-210.
- Van Dyck, S. (1993). The taxonomy and distribution of *Petaurus gracilis* (Marsuialia: Petauridae), with notes on its ecology and conservation status. *Memoirs of the Queensland Museum* 33: 77-122.
- Veevers, J.J. (1991a). Phanerozoic Australia in the changing configuration of Proto-Pangea through Gondwanaland and Pangea to the present dispersed continents. In: Ladiges, P.Y., Humphries, C.J. & Martinelli, L.W. (eds). *Austral Biogeography*. CSIRO Melbourne. Pp. 1-12.
- Veevers, J.J. (1991b). Review of seafloor spreading around Australia. I. Synthesis of the patterns of spreading. *Aust. J. Earth Sci.* 38: 373-389.
- Walker, D. (1986). Tropical rainforests. *Sci. Prog. Oxf.* 70: 461-472.
- Walker, J.W. & Walker, A.G. (1984). Ultrastructure of lower Cretaceous angiosperm pollen and the origin and early evolution of flowering plants. *Ann. Missouri Bot. Gardens* 71: 464-521.
- Walker, J.W. (1976). Comparative pollen morphology and phylogeny of the Ranalean Complex. In: Beck, C.B. (ed). *Origin and Early Evolution of Angiosperms*. Columbia University Press, New York. Pp. 241-299.
- Walsh, R.F.D. (1980). Runoff processes and models in the humid tropics. *Zeitschrift für Geomorphologie N.F. Suppl.* 36: 176-202.
- Waterman, P.G. & Grundon, M.F. (1983). *Chemistry and Chemical Taxonomy of the Rutales*. Academic Press, London.
- Watts, C.H.S. (1982). A blind terrestrial water beetle from Australia. *Memoirs of the Queensland Museum* 20: 527-531.
- Webb, L.J. & Tracey, J.G. (1981). The rainforests of northern Australia. In R.H. Groves (ed), *Australian Vegetation*. Cambridge University Press, Cambridge, pp 67-101.
- Webb, L.J. (1984). Conservation status of the rainforests of north Queensland. In Werren, G.L. and Kershaw, A.P. (Eds), *Australian Rainforest Study, Vol.3*. (Proceedings of a workshop on The Past, Present and Future of Australian Rainforests, Griffith University, Brisbane).
- Werren, G. (1993). *A Regional Action Plan for the Conservation of Rare and/or Threatened Wet Tropics Biota: Proceedings of a Workshop of Technical Specialists*, report to the Wet Tropics Management Authority, Cairns.
- White, F. (1983). *The Vegetation of Africa*. UNESCO, Switzerland.
- White, M.E. (1986). *The Greening of Gondwana*. Reed Books, Sydney.
- Williams, S., Pearson, R. and Walsh, P. (1996). Distributions and biodiversity of the terrestrial vertebrates of Australia's Wet Tropics: a review of current knowledge'. *Pacific Conservation Biology*, 2 : 327-362

- Winter, J.W. (1988). Ecological specialization of mammals in Australian tropical and sub-tropical rainforest: refugial or ecological determinism? *Proc. Ecological Soc. Aust.* 15: 127-138.
- Winter, J.W. (1991). Mammals. In H.A. Nix and M. Switzer, (eds), *Kowari 1: Rainforest Animals: Atlas of Vertebrates Endemic to Australia's Wet Tropics*. Australian National Parks and Wildlife Service, Canberra, pp 43-55.
- Winter, J.W., Bell, F.C., Pahl, L.I. and Atherton, R.G. (1984). The specific habitats of selected north-eastern Australian rainforest mammals. Report to World Wildlife Fund, Sydney. 135pp.
- WTMA (2001). *State of Wet Tropics 2000-2001*. Wet Tropics Management Authority, Cairns.
- WTMA (2002). *State of Wet Tropics 2001-2002*. Wet Tropics Management Authority, Cairns.

Appendix 1

Boundary Description (as described in the original 1988 Nomination Dossier)

PREAMBLE

Real Property Descriptions shown hereunder are taken from the 1:100 000 cadastral map series, published by the Department of Mapping and Surveying, Brisbane, Queensland. The maps used are:

<u>Name</u>	<u>Map No.</u>	<u>Drawn and Published Date</u>
Atherton	7963	Oct. 1982
Bartle Frere	8063	Aug. 1974
Cairns	8064	June 1974
Cardwell	8161	May 1974
Cooper Point	8163	May 1974
Helenvale	7966	Feb. 1980
Ingham	8160	Feb. 1974
Innisfail	8162	Oct. 1981
Kangerou Hills	8060	March 1981
Kirrama	8061	July 1981
Mossman	7965	May 1979
Kavenshoe	7962	Oct. 1982
Rollingstone	8159	June 1974
Rumula	7964	June 1979
Tully	8062	Oct. 1979

Descriptions are current only to the drawn and published date of the corresponding map. All co-ordinate values referred to are Australian Map Grid (AMG) Zone 55 co-ordinates.

HERITAGE LISTING

All those pieces of land in the State of Queensland, Counties of Banks, Cardwell, Chelmsford, Dagmar, Nares, Solander, Wairuna, Wilkie Gray, Parishes of Alcock, Alexandra, Annan, Amy, Ashton, Bankton, Bartle Frere, Ballenden Ker, Berwick, Blackfriars, Blencoe, Bloomfield, Cairns, Cleland, Clerk, Cromwell, Dagmar, Danbulla, Dedin, Dinden, Dirran, Dulanban, East Barron, Ellerbeck, Gadgarra, Garioch, Garrawall, Gledy, Glenbora, Gore, Grafton, Herberton, Herkes, Hinchinbrook, Hulburn, Hull, Ismellie, Japoon, Johnstone, Jordan, Kanawarra, Kirrama, Leach, Leefe, Marathon, Meunga, Mone Mone, Monkhouse, Mourilyan, Mowbray, Niagara, Noah, Ongera, Palmerston, Phipps, Pitt, Ramleh, Kavenshoe, Riflemead, Rockingham, Russell, Salisbury, Smithfield, Sophia, Spring, Spurgeon, St. Giles, Stone, Tribulation, Trinity, Victory, Waterview, Whyanbeel, Whypalla, containing a total area (including roads) of about 9 200 square kilometres, being bounded by lines edged in green on plan catalogue numbers NI.5-273, sheets 1 to 15, in the Surveying and Land Information Group, Commonwealth Department of Administrative Services, Brisbane, Queensland, and being

1. National Parks 25, 26, 133, 150, 155, 164, 166, 202, 212, 226, 255, 279, 353, 398, 477, 545, 546, 547, 553, 574, 575, 584, 645 (excluding that part commencing at the intersection of the western alignment of the Bruce Highway and the eastern alignment of the North Coast Railway about 3 kilometres south from Cunn Station in the Parish of Pitt, southerly by the western alignment of the Bruce Highway to its intersection with the eastern alignment of the North Coast Railway and northerly by that alignment to the point of commencement), 647, 763, 771, 880, 904, 1024, 1110, 1311, 1351, 1353, 1356, 1357, 1391, 1392, 1394, 1447, 1468, 1608.

2. State Forests 34 (being that part south-west of a straight line commencing from the most southerly point of Lot 18 on Wg.63, Parish of Hinchinbrook, south-easterly to the most westerly point of Lot 6 on Wg.32, Parish of Clement, thence by that boundary of Lot 6 south-easterly to the next corner and by a straight line from that corner south-westerly to the Parish boundary), 42 (excluding that part within the Parish of Victory to the west of Lot 50 on Sr.52, Parish of Victory), 50 (being that part south of a straight line commencing from the most southerly point of Lot 27 on Wg.71, Parish of Hinchinbrook, south-easterly to the most northerly point of Lot 14 on Wg.51, Parish of Hinchinbrook), 78, 143 (excluding that part to the west of a line from the western corner of TR.65 northerly to Half Ton Creek at a point E 308000, N 8176250, thence downstream to the McLeod River and to its intersection with Spurgeon Creek, thence northerly to the easternmost corner of Curraghmore Holding), 144 (being that part to the east and north of a line from a point E 283000 and N 8211800 on its northern boundary south to E 283000 and N 8201800, thence generally southerly along a road to a point E 286000 and N 8197000, thence east to the western boundary of NP.133), 185 (being that part generally north and east of a line commencing at a point on the western boundary of SF.185 and being the north-west corner of Lot 107V on Nr.4325, Parish of Danbulla, thence east along the northern boundary of said Lot 107V to its intersection with the west boundary of Lot 108V on Nr.4181, Parish of Danbulla, north and east along that boundary to its intersection with the western alignment of a road 60.35 metres wide, northerly along that alignment to its intersection with the boundary of land under the control of the Commissioner for Irrigation, westerly along that boundary to its intersection with Platypus Creek and easterly to its intersection with the north-western alignment of a road 60.35 metres wide, generally easterly and north-easterly along that alignment to its intersection with Downfall Creek, north-easterly by a line to a point on Kauri Creek 110 metres upstream of its intersection with Palm Gully, east by a line to its intersection with the south-eastern alignment of a road 60.35 metres wide, south-east by a line to its intersection with an eastern tributary and 475 metres upstream from Coi Creek, downstream by that tributary to Coi Creek, upstream by Coi Creek for 475 metres, west by a line to its intersection with the boundary of R.440 (Scenic Reserve, Lake Euramoo), generally

skirting the eastern, northern, western and part of the southern boundary of R.440 to its intersection with the eastern alignment of a road and south-south-easterly by a line to a point on Mobo Creek where it intersects the south-eastern boundary of SF.185), 190 (excluding Lot 530 on Cwl.1823, Parish of Rockingham), 194 (being that part generally south-east of a line commencing at Stewart Head, thence northerly to the south-eastern corner of Lot 213 on Cwl.380, Parish of Herberton, thence northerly along said Lot boundary to its north-eastern corner, thence north-westerly along the north-eastern boundary of road fronting said Lot to the southernmost point of Lot 215 on Cwl.342, Parish of Herberton, thence north-easterly skirting the south-eastern boundaries of said Lot and R.207, thence generally in a south-easterly, north-easterly and north-westerly direction skirting the south-western, south-eastern and north-eastern boundaries of R.189 to the intersection of the County boundary with the Parish boundary (between Barron and East Barron) at the crest of Herberton Range, thence easterly along said Parish boundary to the north-western corner of Lot 69V on N.157.396, Parish of Barron, thence skirting the western and southern boundaries of the latter and Lot 70V on N.157.396, Parish of Barron, to the north-western corner of Timber Reserve 930, thence south-westerly and south-easterly following the north-western and south-western boundaries of said Timber Reserve to the northernmost point of Timber Reserve 931, thence generally south-westerly along the north-western boundary of the latter to its westernmost point, thence south-easterly in a straight line to the north-west corner of National Park 353), 251, 268 (being that part north and east of a line commencing at a point on the crest of Seaview Range at the intersection of the County boundary with the Parish boundary (Waterview and Berwick), thence following the County boundary generally east to a point on the crest of Seaview Range, approximate AMG co-ordinates E 408600, N 7907500, then generally south to Paluma Ewan Road at a point approximately E 409400, N 7896400 then generally east to Blue Gum Creek at a point approximately E 414600, N 7895400 and then by a straight line south-easterly to the southernmost corner of SF 268), 310 (excluding those parts -

(i) Wholly within SF 310 and commencing at a point E 360150, N 8087750, thence generally north-easterly, south-easterly, south-westerly and north-westerly through:

E 360140, N 8087950
E 360210, N 8088000
E 360350, N 8088470
E 360550, N 8088580
E 360700, N 8088250
E 360500, N 8087800
E 360370, N 8087650

to the point of commencement, and

(ii) Commencing at the corner of SF 310 which is nearest to the east corner of Lot 14 on Nr.1126, Parish of Gadgarra, thence westerly along the boundary of SF 310 for 186 metres and 157 metres, generally north-easterly, easterly, southerly and westerly through -

E 360280 and N 8087250, E 361075 and N 8087350, E 361200 and N 8087150, E 361180 and N 8086800, E 361450 and N 8086700, E 361540 and N 8086600, E 361610 and N 8086600, E 361660 and N 8086700, E 361800 and N 8086700, E 361840 and N 8087070, E 361940 and N 8087150, E 362050 and N 8087000, E 362310 and N 8087350, E 362350 and N 8087300, E 362610 and N 8087450, E 362640 and N 8087700, E 363090 and N 8087500, E 363090 and N 8087400, E 363350 and N 8087400, E 363550 and N 8087550, E 364340 and N 8087550, E 364450 and N 8087400, E 364760 and N 8087550, E 364810 and N 8087400, E 364800 and N 8087150, E 364400 and N 8087150, E 364390 and N 8086800, E 364450 and N 8086700, E 364420 and N 8086450, E 364840 and N 8086100, E 364320 and N 8086200, E 364120 and N 8086200, E 364120 and N 8086600, E 363990 and N 8086600, E 363900 and N 8086500, E 362460 and N 8086000

to a point 150 metres north west of the north corner and on the extension of the north-eastern boundary of Lot 18 on Nr.560 Parish of Gadgarra and generally westerly along the south-west boundary of SF.310 to the point of commencement), 344, 350, 452, 458 (being that part formed by the north and western boundary of Lot 46, Parish of Stone, to a point on the boundary E 380750, N 7922800 thence by a line south-easterly to a point E 380000 N 7921450 thence westerly along the northern boundary of Lot 36, Parish of Stone to its north-western corner, thence following the county boundary generally north-westerly to the intersection of the Parishes of Stone, Barrett and Ryeburn, thence by a line north-westerly to the south-eastern corner of Seaview Holding, then northerly along the eastern boundary of Seaview Holding until it meets with NP.547, thence east, thence north along the boundary of NP.547 to the boundary of Oak Hills Holding, thence south-easterly along this boundary to the ridge at the intersection of Oak Hills and Henrietta Holdings thence easterly along the boundary of Henrietta Holding to the intersection with Parish boundaries of Ashton and Lannercost, then generally south-easterly along this parish boundary to the north-eastern corner of Lot 46 in the Parish of Stone), 461 (excluding the area north of a line commencing at the most southerly corner of Lot 18 on Cwl.483, Parish of Glenbora, thence south easterly to E 381900, N 7980550, thence easterly to the parish boundary (Glenbora and Ellerbeck) E 393200, N 7977150, thence generally southerly along the parish boundary to the most easterly point of the Parish of Glenbora, thence south-easterly to the south-west corner of Lot 1V on Car.124.204, Parish of Ellerbeck also excluding an area east of a straight line commencing at the most southerly point of Lot 107 on Cwl.652, Parish of Meunga, south-westerly to the eastern end of the most northerly boundary line of Lot 4V on Cwl.4, Parish of Meunga, and excluding an area south of a straight line commencing from the north-western corner of the said Lot 4V south-westerly to

the north-eastern corner of Lot 76 on Cwl.474, Parish of Meunga), 475, 486, 591 (excluding Lot 131, Parish of Garrawalt, and the area south-east of a line commencing at the most northerly point of Lot 166, Parish of Leach, and following Broadwater Creek generally north-east to the eastern corner of NP.546, thence south-easterly to E 393700, N 7962450, thence east to E 396000, N 7962800 near Canoe Creek, thence south-easterly to E 397000, N 7960800, thence south-easterly to E 398000, N 7959700, thence east to E 399900, N 7959700, thence north-easterly to a point between Dalrymple Creek and a Stock Route E 400900, N 7960400, thence south-easterly to E 402000, N 7958700, thence south to E 402100, N 7958600, thence east to the crest of Cardwell Range south of Bishop Peak at the north-west corner of Lot 9 on Cwl.1936, Parish of Pitt), 599, 605, 607 (excluding that part generally west of a line commencing at a point on the south-western boundary of SF.607 being the north-east corner of TR.1322, thence north by an eastern boundary of Adler Hill Holding and its extension to the east corner of Lot 111 on Nr.572, Parish of Uanbulla, generally easterly and north-westerly by the eastern boundary of Adler Hill Holding to Mandarin Rock, east-north-easterly by a line to the intersection of Pandanus Creek and the west boundary of Pt A on Nr.4302, Parish of Uinden, north by that boundary to the north-west corner of Pt A on Nr.4302, north-north-westerly by a line to the west end of the south boundary of the Parish of Cairns, being a point on the eastern boundary of Lot 24 on Nr.4303, Parish of Uinden, north-easterly by that boundary to its intersection with the left bank of Shotael Creek, downstream by that bank to its intersection with the western extension of the south boundary of Lot 52V on N.157.402, Parish of Cairns, west by that extension to its intersection with the right bank of the Clohesy River and being a point on the north-west boundary of SF.607), 608, 644 (excluding those parts -

(i) north of a line commencing at the south-east corner of Lot 1V, Parish of Ellerbeck, south-easterly to E 404850, N 7964800, thence east-north-easterly to the western boundary of the North Coast Railway,

(ii) commencing at that point on the western alignment of the Bruce Highway which is due west of the North Coast Railway at Conn Station in the Parish of Pitt, southerly by that western alignment to its intersection with the western alignment of the North Coast Railway, southerly by that western alignment to its intersection with the boundary of NP.645, north-westerly by a line to E 405800 N 7960400 and north-easterly to the point of commencement), 650, 675, 700, 750, 755, 756 (excluding the area north of a straight line commencing at the most northerly point of Lot 42 on Cwl.973, Parish of Meunga, thence easterly to a point on the west bank of Deep Creek on the projection of the southern boundary of Lot 85 on Cwl.646, Parish of Meunga), 757, 758, 910, 933, 1073 (excluding that part to the west and south of a line commencing at the intersection of Flaggy Creek and the boundary of SF.1073 at Christmas Pocket, thence north-westerly to a point E 342000, N 8154800, thence westerly to a

point E 339600, N 8154800, thence southerly to a point on the boundary of R1219 approximately 1.3 kilometres from the north-west corner of R1219 and excluding that part within a line commencing at the south-western corner of Lot 144, Parish of Smithfield, thence west by a line to the intersection with a track approximately 100 metres west of Flaggy Creek, then by that track southerly and easterly to its intersection with the western boundary of Lot 18V, Parish of Smithfield, then by the northern boundaries of Lots 10V and 13V, Parish of Smithfield, to the north-east corner of Lot 13V, then by a line north-easterly to the most southerly corner of Lot 144, Parish of Smithfield, then by that boundary westerly to the point of commencement), 1137, 1185, 1195, 1229 (excluding those parts -

(i) east and south of lines from a point on the southern boundary of R 1219 2.7 kilometres from the south-western corner to a point at co-ordinates of E 341500 and N 8145300, thence to the intersection of the County and Parish boundaries (Mar and Garioch) and thence to the intersection of the Little Mitchell River and the eastern boundary of Mt Molloy Holding,

(ii) south west of a line from that aforesaid intersection to a point on the State Forest boundary 3.1 kilometres west of the south-western corner of Lot 13V,

(iii) north of a line from the south eastern corner of Lot 125, Parish of Garioch to the intersection of southern boundary of Lot 125 extended easterly and a road at co-ordinates of E 336000 and N 8158000), 1232, 1245, 1276, 1469.

3. Timber Reserves 55, 65, 86, 100, 110, 140, 141, 165 (excluding those parts north-west and west of lines commencing at the north-east corner of Lot 1V, Parish of Spring, then proceeding north-easterly to a point E 308500, N 8245000, and thence north-westerly along a range to the most south-eastern corner of the Parish of Gore thence west along the Parish boundary about 1.8 kilometres thence north to the mountain range to a point about 0.2 kilometres generally south-east of North Sampson Mountain thence along the range north-westerly to North Sampson Mountain thence north-easterly to E 312000, N 8254800, south to E 312000, N 8254000, thence east and north to Mount Walker, thence east for 750 metres, north for 750 metres and north-easterly to the south-eastern corner of R.128 and by the eastern and northern boundaries of that reserve to its north-western corner, thence north-easterly to the south-eastern corner of Lot 57V, Parish of Monkhouse, also excluding that part to the north of a line from the south-east corner of R76 to the intersection of the southern alignment of a road adjoining Lot 10V, on Bk.672, Parish of Monkhouse and Waterfall Creek, also excluding an area to the west and south of a line beginning on the Daintree River at its intersection with the northern boundary of NP.133 and proceeding downstream to Boolbun Creek, thence by that creek upstream to its intersection with Colleghan Creek, thence by

the boundary of the Parish of Bloomfield northerly and westerly to the eastern boundary of Lot 1V, Parish of Sporing), 244, 315, 785, 1230, 1231, 1244 (excluding that part to the north-east described as Lot 215 on Nr.1154, Parish of Johnstone), 1344.

4. Various Reserves 5, 10, 24, 45, 49, 52, 54, 58, 60, 67, 79, 91, 98, 113, 129, 135, 169, 189 (excluding that part generally north-west of a line commencing at the south-eastern corner of Lot 216 on Cwl.342, Parish of Herberton, and proceeding north-easterly to the intersection of the County boundary with the Parish boundary (between Barron and East Barron) at the crest of Herberton Range), 204 (excluding that part to the north of a line from May Peak to the mouth of Buddabadoo Creek), 227, 228 (excluding that part commencing at the northern tip of Constantine Point, southerly along the High Water Mark for 1800 metres, west by a line for 490 metres, north-west by a line to its intersection with the right bank of the Russell River and downstream by that bank to the point of commencement), 229, 242, 271, 350, 379, 405, 423, 440, 446, 466, 473, 486 (excluding all the land to the west and south of a line commencing at the intersection of the Parishes of Ramleh, Timsah and Bankton and running in a northerly direction along the Parish boundary to a point at Coordinates E 347150, N 8023900 and then in a westerly direction to a point, Coordinates E 343800, N 8023500 on the Yorke Holding Boundary), 523, 524, 525, 534, 554, 599, 748, 753, 843, 865, 881, 884, 899 (excluding that part to the south-east of a line from Red Cliff Pt south to the intersection of the boundary of TR.315), 1007, 1044 (being the western severance of Lot 99V on Nr.3568, Parish of East Barron), 1083, 1097, 1219 (excluding that part east of a line commencing at a point on the northern boundary 2.6 kilometres from the north-western corner, thence to a point on the southern boundary 2.7 kilometres from the south-western corner), 1234, 1235, 1236, 1272, 1273, 1315, 1317 (excluding that part of its north-eastern access arm east of a line between the points E 396500, N 8079000, E 395800, N 8078700 and E 395500, N 8077800), 1323, 1385, 1458, 1508.
5. Freehold lands

Parish of Alcock: Lot 33 being Commonwealth land acquired by compulsory process by notification in the Commonwealth of Australia Gazette No.50 dated 15 June 1967;

Parish of Alexandra: Lots 12 on Bs.5, 17 and 18 on Bs.14, 52V on Bk.157.151, 65V on Bk.157.161, 83 on Sr.598 (being that part north of a line from the south-east corner of Lot 191 to a point on the eastern boundary approximately 600 metres from the north-east corner of the subject block), 190 on Bk.157.46 (excluding that part south-west of a line from a point on its western boundary approximately 800 metres north of its south-west corner, to its south-east corner) and 191 on Bk.157.46 (excluding an area bounded by lines from a point on its western boundary approximately 800 metres south of the intersecting road to a point on the

eastern boundary approximately 800 metres north of the south-west corner of Lot 190, thence by that boundary south to the south-east corner of Lot 191, thence by its southern boundary west for approximately 300 metres, thence generally northerly for 600 metres and generally north-west to the western boundary 900 metres south of the point of commencement, thence by that boundary north to that point),

Parish of Bellenden Ker: Lots 2V and 3V on N.157.232,

Parish of Cairns: Lot 33V on Nr.157.287,

Parish of Dagmar: Lot 116

Parish of Dirran: Lots 257 on Nr.1301, 297 on Nr.2510 (excluding those parts

(i) west of a line commencing at the southernmost corner of Lot 297 northerly to a point on its north-west boundary at E 346700, N 8052800, and

(ii) its eastern severance),

298 on Nr.709 (excluding its south-eastern severance), 299 on Nr.710 (being that part north-west of a straight line commencing at a point on its south-western boundary at E 347500, N 8053600 northerly to the Beatrice River),

Parish of Maunga: Lots 39 on Cwl.134, 43 on Cwl.371, 50 on Cwl.373,

Parish of Mourilyan: Lot 12 on Nr.2593, Commonwealth Acquisition 789 Sub A (excluding Lindquist Island),

Parish of Noah: Lot 8 on Sr.138, Lot 1 on Sr.135 (being that part north-east of a line commencing on its south-east boundary approximately 100 metres north of its south-east corner, proceeding approximately 500 metres parallel to the southern boundary, thence northerly to the northern boundary),

Parish of Rockingham: Lot 271 on Cwl.1978 (being that part south-east of a straight line commencing at the north-east corner of R.229, thence north-easterly to the coastline at Tam O'Shanter Point - Co-ordinates E 404700, N 8012800),

Parish of Russell: Lots 7V on N.157.282, 33 on Nr.5073, 331 on N.157.128 (excluding that part to the west of the Graham Range),

Parish of Whyanbeel: Lots 176 on Sr.265 (being that part east of a line from the south-west corner of Lot 145 south to the southern boundary of the subject block), 297 on Sr.184.

6. Leasehold lands

Parish of Alcock: Part C on Cwl.2539,

Parish of Alexandra: Lots 7 on Sr.235, 39 on Sr.17, 51V on Bk.157.159, 54V, 62 on Sr.272, 77 on Sr.312, 78 and 79 on Sr.313, 82 on Sr.487(excluding an area bounded by a line beginning on the eastern boundary of Lot 83 on Sr.596, approximately 600 metres from the north-east corner of that block and proceeding south-easterly to the north-east corner of Lot 275, thence by the northern boundary of that lot to its north-west corner, thence southerly along its western boundary to a road, thence north-westerly by that road to the eastern boundary of Lot 83, thence by that boundary north to the point of commencement);

Parish of Bartle Frere: Lot 18 on Nr.3737;

Parish of Bellenden Ker: Lots 71 on Nr.594 (excluding that part enclosed by a line commencing at a point on the western boundary approximately 200 metres from the north-west corner then by a line generally east for approximately 300 metres, thence by a line generally south for approximately 600 metres thence by a line west to the boundary of Lot 71 thence by the western boundary northerly to the point of commencement), 114 on Nr.979, 125, 142 and 143 on Nr.1976, 145, 146, 199, 200, 208 and 209 on Nr.5584, 323 on N.157.221;

Parish of Blackfriars: Lots 10 and 12 on Ws.140, 13 on Wg. 176 (being that part east of a line commencing at a point on the crest of Seaview Range on the County boundary separating the Counties of Cardwell and Wilkie Grey, approximate AMG Co-ordinates E 408600, N 7907500, generally southerly to Poluna Ewan Road at a point approximate co-ordinates E 409400, N 7896400);

Parish of Bloomfield: Lot 3 on Sr.576 (being that part east of Boolbun Creek);

Parish of Cairns: Lots 52V on N.157.402, 164 on Nr.1735, 502 on Nr.5053 (excluding that part to the west of a line commencing on the northern boundary of Lot 502 approximately 1000 metres from the north east corner and proceeding generally south to the Clohesy River approximately 200 metres west of the junction with Ganyan Creek);

Parish of Clerk: Lots 24 on Sr.448, 27 on Sr.587, Lot 29 on Sr.617;

Parish of Clement: Lot 49 (pt) on Wg.150 (as per SF.34);

Parish of Danbulla: Lot 181 on Nr.3596;

Parish of Uinden: Pt.A on Nr.4302, Lot 24 on Nr.4303 (being that part north of a line from the most southern corner of Lot 502, Parish of Cairns, due east to a point on Shoteal Creek);

Parish of Dirran: Lots 159 on Cwl.162, 209 on Nr.598, 341 on Nr.1040, 542 on Nr.2620 (being that part south west of a straight line commencing at a point on its north western boundary - Co-ordinates E 348000, N 8052500, thence south easterly to a point on its south eastern boundary - Co-ordinates E 348400, N 8052000),

Parish of Dulanban: Lot 23 on Nr.5250, M.L.36,

Parish of East Barron: Lots 109 on Nr.2518, 410, 434, 435, 436 on Nr.1754,

Parish of Gadgarra: Lots 82 to 85 on Nr.3562, 99, 100 on Nr.1674,

Parish of Garioch: Lot 225 on Da.247 (excluding that part south end west of lines from the intersection of the County and Parish boundaries (Mar and Garioch) westerly to the intersection of the Little Mitchell River and the eastern boundary of Mount Molloy Holding, thence north-west to a point on the State Forest boundary approximately 3.1 kilometres west of the south west corner of Lot 13V Parish of Garioch),

Parish of Garrawalt: Lot 104,

Parish of Glady: Lots 10V on Nr.797, 150 on Nr.1812 (excluding that part to the east of the road designated on plan Nr.2558), 161 and 162 on Nr.766, 167, 168, 170 and 171 on Nr.777, 176 on Nr.4225 (excluding that part to the east of a line commencing at the north west corner of Lot 176, generally easterly and southerly through E 383450, N 8069850, E 383400, N 8069620, E 383540, N 8069550 and E 383500, N 8069270 to E 383400, N 8069230 and south-east by a line to its intersection with the north-western boundary of Lot 270, Parish of Glady), 177 on Nr.4225, 182 on Nr.2625, 185 on Nr.2580, 186 on Nr.2558, 187 on Nr.3154, 196, 197, 198, 199 on Nr.2261, 200 on Nr.815, 201 on Nr.2678 (excluding that part to the east of the road designated on plan Nr.2558), 267, 277, 280 (excluding an area of 38.9 hectares west of a line commencing at a point on the southern boundary of that lot at a point 300 metres east of the north west corner of Lot 55V on N.157.620 and proceeding northerly parallel to the eastern boundary of that Lot to the northern boundary), 288,

Parish of Hinchinbrook: Lots 19 on Wg.63, 40 on Wg.113, 89, 92 on Wg.188 (being that part south of a straight line commencing from the most southerly point of Lot 27 on Wg.71 Parish of Hinchinbrook, south-easterly to the most northerly point of Lot 14, on Wg.51, Parish of Hinchinbrook), 93 on Wg.271 (excluding that part north of a straight line commencing from the south-east corner of Lot 89, Parish of Hinchinbrook, north-easterly to the most westerly point of Lot 27, Parish of Hinchinbrook),

Parish of Jordon: Parts A and B on Nr.5692,

Parish of Kanawarra: Lot 2 on Da.226(excluding that part to the west of a line from the Western corner of TR.65 northerly to Half Ton Creek at a point E 308000, N 8176250, thence downstream to the McLeod River and by that river to its intersection with the north western boundary of Lot 2);

Parish of Kirrama: Lots 1 on Cwl.2735, 2 on Cwl.2754,

Parish of Leach: Lot 115 on Cwl.2044,

Parish of Japoon: Part B on Nr.5892, Lots 67,68,69,74 and 75 on Nr.681, 114,115,116,117,118,119,120 and 121 on Nr.762, 132,133 and 136 on Nr.1046, 134 and 135 on Nr.1095, 167 and 168, 180 and 181 on Nr.1005, 190,191,192,193,194,195, 197 and 198 on Nr.1114, 206, 207, 208 and 209 on Nr.1888, 244, 251;

Parish of Meunga: Lots 48,49 and 51 on Cwl.373, 151 on Cwl.2574, 156 on Cwl.2623(excluding that part north of a straight line commencing at the most northerly point of Lot 42 on Cwl.973, Parish of Meunga, thence easterly to a point on the west bank of Deep Creek on the projection of the southern boundary of Lot 85 on Cwl.646, Parish of Meunga) Part A (excluding that part north of a straight line commencing at the most northerly point of Lot 42 on Cwl.973, Parish of Meunga, thence easterly to a point on the west bank of Deep Creek on the projection of the southern boundary of Lot 85 on Cwl.646, Parish of Meunga), 165 on Cwl.2781(being that part east of a line commencing at E 394000, N 7984800 thence south to the north eastern corner of Lot 120 on Cwl.2048 Parish of Meunga);

Parish of Mona Mona: Lot 26 on Nr.5148(being that part north and west of lines from a point on the southern boundary of R1219 at co-ordinates E 340500 and N 8149000 to a point at co-ordinates E 341500 and N 8145300 and thence to the intersection of the County and Parish boundaries (Mar and Garioch);

Parish of Monkhouse: Lots 3 on Bs.43, 37V on Bs.25, 38V on Bk.157.97;

Parish of Ungera: Lots 32 on Cwl.1586, 33 on Cwl.1738, 36 on Cwl.254;

Parish of Palmerston: Lot 11 on Nr.2635,

Parish of Pitt: Lot 10 on Cwl.1635,

Parish of Ramleh: Lots 5 on Cwl.2204, 6, Koombooloomba Dam;

Parish of Ravenshoe: Lots 121 on Cwl.178, 125 on Cwl.1976, 128 on Cwl.206, 142,143 and 144 on Cwl.1976, 179 on Cwl.205, 222 and 224 on Cwl.219, 225 and 226 on Cwl.259, 234 on Cwl.208, 269 on Cwl.269 (being that part east of a line commencing at a point E 337800, N 8042100 on the western corner of a road to Mt Pandanus then by a line to a point E 337800, N 8041400 on the north west boundary of Lot 1V on Car.124.221 Parish of Ismailie), 291 on Cwl.1592;

Parish of Riflemead: Lot 70,

Parish of Rockingham: Lots 1 on Cwl.46, 4 and 5 on Cwl.55, 85, 86 on Cwl.296, 108 on Cwl.299, 213 on Cwl.1333, 225 on Cwl.598, 414 on Cwl.131, 418, 419 and 429 on Cwl.818, 446 and 447 on Cwl.878, 450 on Cwl.1788 (being that part north of a straight line commencing at the south east corner of Lot 526 on Cwl.1600, thence north easterly to the north west corner of R.89), 526 on Cwl.1600, 534 on Cwl.1665, 547 on Cwl. 1770, 585,

Parish of Russell: Lots 6V and 7V on N 157.282, 29V on N.157.683, 31 on Nr.4104, 40 on Nr.5543(excluding that part east of a line commencing at the northern most corner of Lot 40, thence south to the southern boundary of that Lot), 41 on Nr.5470(excluding all that part to the east and north of a line commencing at a point on the northern boundary at Easting 393000, then south to a point E 393000, N 8077400, thence east 200 metres, then north 300 metres, then north easterly to a point E 393900, N 8078400, thence north westerly to Bramston Beach Road, thence along the road to a point E 394800, N 8080100, thence south 300 metres, thence north easterly to a point on the western boundary of Lot 13, Parish of Russell, 100 metres from the north-west corner of said lot), 42 on Nr.5469 (excluding that part to the east of a line commencing at the north-east corner of the eastern severance of lot 42, thence along the eastern boundary of R1317 to a point E 396500, N 8079000, thence south-westerly to a point E 395600, N 8078700, thence southerly to a point E 395500, N 8077800, thence south-east to the south-western corner of Lot 8 Parish of Russell), 85 on Nr.4807, 86 on Nr.4808, 88 and 89 on Nr.4809, 108 on Nr.1570,

Parish of Salisbury: Lots 59 on N.157.687, 82 on Sr.607,

Parish of Smithfield: Lot 124 on Nr.4313,

Parish of Sophia: Lots 105 on Nr.5260, 110 on Nr.4704,

Parish of Stone: Lot 46 (excluding that part east of a line commencing at the most south-western point of Lot 23, Parish of Stone, proceeding along a line south-easterly to a point approximately E 380750, N 7922800).

Parish of Trinity: Lots 101 on Nr.3480, 159 on Nr.4604, 163 on Nr.4741, 172 on Nr.5631,

Parish of Waterview: Lot 99 on Cwl.2612, M.H.P.Lo. 9435, 9441 and 9883,

Parish of Whyanbeel: Lots 45 on Nr.283, 76 on Sr.38 (being that part south of a line from the southern corner of its western-most boundary east to the north-eastern boundary of the subject block), 117 on N.157.164, 156 on Nr.38, 308 on Sr.247, 333, 335 and 336.

7. Holdings

Brooklyn (excluding that part generally west and south of lines commencing at the north west corner of Lot 47 Parish of Riflemead, thence to the eastern most corner of Lot 32 Parish of Riflemead, then to the western-most corner of TR.65), Cashmere (being that part east of a straight line commencing at E 347600, N 8005250 thence southerly to E 347750, N 8000500 on the crest of a range), Dotswood (being that part north-east of a line commencing on the boundary of Dotswood Holding at the eastern corner of Tareela Block No 1, Parish of St.Giles, on the Paluma Range, thence south-westerly along the boundary of Tareela Block No 1 to a point approximately 1500 metres from the southern corner of Tareela Block No 1 then generally north-westerly to E 433000 N 7872200 to E 430900 N 7881500 thence to the St Giles parish boundary at a point approximately 850 metres along that boundary north-easterly from the western corner of Tareela Block No. 2, thence south-west to a point on the Holborn Parish boundary approximately 3800 metres north-easterly along that boundary from the western corner of Tareela Block No. 1, Parish of St Giles, thence westerly to E 424900 N 7883750 and north-westerly to Banana Creek at a point E 423500 N 7888200 and by that creek south-westerly to the most southerly corner of SF.268), Henrietta (being that part west of Stony Creek), Herbert River (being that part east of a line commencing at a point on the south bank of the Herbert River E 357650, N 7972700 thence south easterly to the western corner of NP.25, thence southerly to the Parish boundary (Herkes and Cromwell E 360300, N 7962000), Hervey (being that part north of the southern boundary of Tareela Block No 2), Kirrama (being that part north east of a line commencing at E 347600, N 8005250, thence southerly to E 347750, N 8000500, thence easterly to E 350100, N 8000500, thence south easterly to E 354450, N 7996400, thence easterly to E 355900, N 7996300, thence south-easterly to E 359550, N 7990600, thence south to a point on the Parish boundary (Blencoe and Kirrama) and Kirrama Holding boundary, E 359500, N 7988700, thence proceeding along the boundary of Kirrama Holding generally south-easterly and north-easterly to Mount Collins, thence proceeding south-easterly to the parish boundary (Kirrama and Niagara) at the most westerly corner of SF.350 thence, south westerly to the north bank of the Herbert River at a point E 357700, N 7972700), Leefe, Oak Hills (being that part east of a line from a point E 360200, N 7955650 generally southerly to a point E 360080, N 7952200, thence generally south easterly to a point E 369550, N 7947700, thence generally south-easterly to a point E 371150, N 7942200), Ullera Creek (excluding that part north of a straight line commencing from the most southerly point of Lot 27 on Wg.71, Parish of Hinchinbrook, south-easterly to the most northerly point of Lot 14 on Wg.51, Parish of Hinchinbrook), Seaview (being that part of Seaview Holding north and west of a line commencing at a point E 375000, N 7940400 on the eastern boundary of Seaview Holding proceeding west to the range at a point E 371700 N 794800 thence generally north-westerly to the boundary of Seaview and Oak Hills Holding at a point E 371150 N 7942200), Wairuna (being that part east of a

straight line commencing at a point on the northern boundary E 360300, N 7962000, thence south to the southern boundary of Wairuna Holding E 360200, N 7956000), Wooroora (being that part north-east of a line commencing at a point on Charmillin Creek Co-ordinates E 342000, N 8038000, thence north-westerly to a point on the north-west boundary of Lot 1V on Car.124.221, Parish of Ismailia, Co-ordinates E 337800, N 8041400), Yourka (being that part east of a straight line commencing at E 347400, N 8007900 thence southerly to E 347800, N 8005250).

8. Vacant Crown Lands

(a) In the Parish of Alexandra, Lots 173, 202, 203, 226 and 272, bounded by NP.164, TR.165, Lots 173, 226, 144, R.98, Lots 179, 147, 8, 148, 272, 257, 33, 32, 186, Road, Lots 189, 130, 191, 30V, 31V, 36V, 188, 38V, 42V, 43V and 202,

(b) In the Parish of Alexandra bounded by NP.164, Parish of Noah, Lot 203, Cooper Creek and Lot 202,

(c) In the Parish of Alexandra bounded by Lots 54V, R.79, High Water Mark of the Coral Sea, Lots 62 and 203,

(d) In the Parish of Alexandra bounded by Lot 78, Hutchinson Creek, Lots 187, 44V, 43V, 46V, 54V, R.79 and the High Water Mark of the Coral Sea,

(e) In the Parish of Alexandra bounded by Lot 78, High Water Mark of the High Water Mark of the Coral Sea, Lot 77, R.52, Lots 65V, 18, 17, 11, 57V, 35, 37, 82, 190, 6V, 13V, 23V, 22V, 29V, 28V, 21V, 26V, 25V, and 79,

(f) In the Parish of Ashton, to the west of NP 547 bounded by Oak Hills Holding,

(g) In the Parish of Berwick, east of a line commencing at the most southerly point of Lot 24V on Car.124.272, Parish of Berwick, thence south-westerly to E 396000 N 7910600 and thence east to the crest of Seaview Range at the junction of the parish boundary (Kangaroo Hills and Blackfriars) with the county boundary (Cardwell and Wilkie Gray) and bounded on the east by SF.268,

(h) In the Parish of Dulanban, containing an area of about 8 ha, approximately 400 metres south of Lot 23 on Nr.5250, Parish of Dulanban and bounded on the north-west and south-west by TR.315 and on the north-east and south-east by R.899,

(i) In the Parishes of Gadgerra and Grafton bounded by SF.310, SF.700, SF.675 and Lot 123, Parish of Grafton excluding Lots 86, 87, 90, 91, 96, 97, 99 and 101, Parish of Gadgerra,

(j) In the Parishes of Gladly and Russell, bounded on the east by the High Water Mark of the Coral Sea, between the south-east corner of Lot 108, Parish of Russell, and the

north-east corner of Lot 10V, Parish of Gladly and generally on the south by the said Lot 10V and Lots 198, 197, 196, 90V, 76V, 77V, Parish of Gladly and generally on the west by Lots 239V, 64V, 282, 88V, 95, 280 and 86V, Parish of Gladly, Lots 89 and 88, Parish of Russell, Lot 54V, Parish of Gladly, Lot 43V 49V, 87, 86, 85, 84, NP.1357, Lots 45V, 44V and 331, Parish of Russell and again on the east generally by Lots 40, 41, 33, 42 and 8, Parish of Russell, and on the north generally by Lot 8, Parish of Russell and an unsurveyed line more or less north-easterly from the most easterly corner of the said Lot 8 to the High Water Mark of the Coral Sea and thence bounded again on the east generally from the said high water mark to the north-eastern corner of Lot 108, Parish of Russell, by the High Water Mark of the Coral Sea, thence bounded again on the south, east and north by the said Lot 108,

(k) In the Parish of Gladly, commencing at the south-west corner of Lot 224, being a point on the left bank of the Johnstone River, generally westerly upstream by the said left bank to its intersection with McMillan Track being an eastern corner of the Parish of Palmerston, generally westerly and northerly by SF.755 to the western boundary of Lot 187, Parish of Gladly and generally easterly and southerly by the said Lot 187 and Lots 220, 201, 288, 205, 192, 193, 195, 180, 178, 135, 176, 177, 270, 174, 162, 171, 170, 169, 168, 167, 12, 153, 16, 125A, 17, 15, 97, 279, 9, 224, 271 and 224 again, Parish of Gladly, to the point of commencement, excluding Lots 291, 255, 263, 266, 267, 272 and 277, Parish of Gladly;

(l) In the Parish of Hull, between the High Water Mark of the Coral Sea and a line commencing at a point on the north-eastern bank of an inlet north-east of the northern corner of R.979 and proceeding north-north-westerly to the southern boundary of NP.1608 on a straight line projection to the junction point of the most westerly boundary of NP. 1608 and the southern boundary of Lot 486 on Nr.5779 Parish of Hull, and thence easterly by the southern boundary of NP. 1608 to the High Water Mark of the Coral Sea,

(m) In the Parish of Leefe excluding Leefe Holding;

(n) In the Parishes of Marathon and Pitt, bounded by the southern boundary of N.P.645, Hinchinbrook Channel, Enterprise Channel, the Herbert River, Lots 41, 522, 31V, 78, 77, 15, 49, 2, 1, 2, 9, 63, 25V, 76, 29V, and 64 in the Parish of Marathon, thence by the Railway Reserve generally north-westerly to the southern boundary of NP.645,

(o) In the Parish of Mourilyan, north and east of the town of Mourilyan Harbour to the southern boundary of R.554;

(p) In the Parish of Niagara bounded by lines commencing at the most easterly point of Kirrama Holding thence proceeding along the range generally east following the southern boundary of SF.350 to its intersection with the western boundary of NP.545, thence proceeding along the boundary of

NP.545 along the mountain range generally south and west to the most south-easterly corner of Kirrama Holding, thence north-easterly along the Kirrama Holding boundary to the most easterly point of Kirrama Holding;

(q) In the Parish of Riflemead north of Lot 47 on Oa.335 Parish of Riflemead, west of part of the boundaries of the Parishes of Riflemead and Garioch and south-east of part of the Brooklyn Holding boundary;

(r) In the Parish of Rockingham on Tam O'Shanter Point south of the southern boundary of Lot 271 on Cwl.1978, Parish of Rockingham;

(s) In the Parish of Rockingham bounded by SF.1137, Lots 483B and 271, the right bank of the North Hull River and the left bank of the Hull River;

(t) In the Parish of Russell commencing at a point about 3 kilometres south along the High Water Mark of the Coral Sea, from Constantine Point and bounded by High Water Mark of the Coral Sea, SF.1185 and R.228;

(u) In the Parishes of Tribulation and Noah east of TR.165 between the eastern boundary of R.24 and the eastern and part of the northern boundary of Lot 14 Parish of Tribulation and part of the parish boundaries of Noah and Alexandra;

(v) In the Parish of Waterview bounded on the west by the county boundary (between Wilkie Gray and Cardwell), on the east and north-east by the western boundary of NP.477 and on the south by a straight line proceeding due west to the aforementioned county boundary from a corner of NP.477 at the north-western end of that boundary line of said NP.477 extending north-westerly from Section 1, Town of Paluma;

(w) In the Parish of Whyanbeel bounded by Lot 217, Daintree River, Crocodile Creek and Lot 264, excluding Lot 76, Parish of Whyanbeel;

(x) In the Parish of Rockingham bounded by Lots 606, 41 and 543 and NP.647;

(y) In the Parish of Rockingham bounded by road adjacent to NP.647 and Lots 586 and 40V, Lots 543, 586 and 450, NP.647, Carmoo Creek and the Hull River downstream from Carmoo Creek;

(z) In the Parish of Rockingham bounded by Lots 483D, 604, 51V, 1, 4, 5, 3, 6, 387 and 386, SF.1137 and the parish boundary;

(aa) In the Parish of Rockingham bounded by Lots 1, 4, 86 and 586 and SF.190;

(bb) In the Parish of Waterview bounded by NP.477, SF.268 and the county boundary between the Counties of Cardwell and Wilkie Gray.

9. (i) Sections 1 to 16, Town of Woolanmaroo,

(ii) Town of Palmerston.

Appendix 2

GEOLOGICAL TIME SCALE

Era	Geological Period	Age of Boundaries (m.y.)
C A E N O Z O I C	Holocene	0.01
	Pleistocene	
	Pliocene	1.8
	Upper Miocene	5
	Middle Miocene	10.5
	Lower Miocene	16
	Lower Oligocene	22.5
	Upper Oligocene	30
	Lower Tertiary	
	Eocene	37.5
Palaeocene	53.5	
M E S O Z O I C	Cretaceous	65
	Jurassic	135
	Triassic	192
		225

(this table has been copied from the original 1988 Nomination Dossier)

Gondwanic Angiosperm Families of Cretaceous Origin

Alseuosmiaceae

Crispiloba

Annonaceae

Cananga

Desmos

Goniothalamus

Haplostichanthus

Meiogyne

Melodorum

Polyalthia

Pseuduvaria

Rauwenhoffia

Xylopi

Aquifoliaceae

Ilex

Arecaceae

Nypa

Austrobaileyaceae

Austrobaileya

Bombacaceae

Bombax

Ebenaceae

Diospyros

Ericaceae

Rhododendron

Eupomatiaceae

Eupomatia

Malpighiaceae

Tristellateia

Myrtaceae

Metrosideros

Nymphaeaceae

Nymphaea

Olacaceae

Ximena

Pandanaceae

Pandanus

Proteaceae

Alloxylon

Athertonia

Austromuelleria

Buckinghamia

Cardwellia

Darlingia

Grevillea

Helicia

Lomatia

Macadamia

Musgravea

Neorites

Opisthiolepis

Orites

Placospermum

Sphalmium

Stenocarpus

Triuna

Restionaceae

Leptocarpa

Sapindaceae

Cupaniopsis

Aquifoliaceae

Sphenostemon

Sapotaceae

Chrysophyllum

Niemeyera

Planchonella

Pouteria

Symplocaceae

Symplocos

Winteraceae

Bubbia

East Gondwanic Angiosperm Families and Genera

Alseuosmiaceae

Crispiloba

Aquifoliaceae

Sphenostemon

Anacardiaceae

Blepharocarya

Euroschinus

Pleiogynium

Annonaceae

Meiogyne

Fitzalania

Haplosticanthus

Apiaceae

Trachymene

Araliaceae

Cephalalaria

Delarbrea

Mackinlaya

Balanopaceae

Balanops

Bignoniaceae

Deplanchea

Neosepicaea

Pandorea

Tecomanthe

Burseraceae

Canarium

Caesalpiniaceae

Storckiella

Casuarinaceae

Gymnostoma

Corynocarpaceae

Corynocarpus

Cunoniaceae

Caldcluvia

Acsmithia

Ceratopetalum

Geissois

Gillbeea

Pseudoweinmannia

Pullea

Schizomeria

Droseraceae

Drosera

Elaeocarpaceae

Aceratium

Elaeocarpus

Peripentadenia

Sloanea

Epacridaceae

Acrotriche

Leucopogon

Dracophyllum

Trochocarpa

Ericaceae

Agapetes

Escalloniaceae

Argophyllum

Polyosma

Quintinia

Eucryphiaceae

Eucryphia

Euphorbiaceae

Alchornea

Aleurites

Antidesma

Austrobuxus

Baloghia

Bertya

Bischofia

Breynia

Choriceras

Codiaeum

Dissiliaria

Fontainea

Hylandia

Omalanthus

Omphalea

Rockinghamia
Sankowskya
Sauropus
Whyanbeelia

Gesneriaceae

Boea
Cyrtandra
Lenbrassia

Himantandraceae

Galbulimima

Lauraceae

Beilschmiedia
Cinnamomum
Cryptocarya
Endiandra
Litsea
Neolitsea

Loranthaceae

Amyema
Decaisnina

Malpighiaceae

Rhyssopterys

Meliaceae

Aglaia
Anthocarapa
Dysoxylum
Vavaea

Monimiaceae

Stegathera

Myrsinaceae

Tapeinosperma

Myrtaceae

Austromyrtus
Metrosideros
Rhodamnia
Rhodomyrtus
Tristaniopsis
Uromyrtus
Xanthostemon

Orchidaceae

Drymoanthus
Pachystoma

Podostemaceae

Cladopus

Proteaceae

Athertonia
Austromuellera
Buckinghamia
Cardwellia
Darlingia
Grevillea
Helicia
Lomatia
Macadamia
Musgravea
Neorites
Opisthiolepis
Alloxylon
Orites
Placospermum
Sphalmium
Stenocarpus
Triunia

Rhamnaceae

Emmenosperma
Pomaderris
Schistocarpha

Rutaceae

Acronychia
Boronia
Bosistoia
Brombya
Euodia
Flindersia
Geijera
Halfordia
Medicosma
Melicope
Citrus
Zanthoxylum
Zieria

Santalaceae

Anthobolus
Exocarpos
Santalum

Sapindaceae

Alectryon
Arytera
Cupaniopsis

Elattostachys
Guioa
Harpullia
Jagera
Mischocarpus
Rhysotoechia
Sarcopteryx
Sarcotoechia
Synima
Toechima

Sapotaceae

Chrysophyllum
Niemeyera
Planchonella
Pouteria

Smilacaceae

Eustrephus

Solanaceae

Duboisia

Stackhousiaceae

Stackhousia

Thymelaeaceae

Lethedon
Oreodendron
Phaleria

Winteraceae

Bubbia
Tasmania

Appendix 5

Primary and Secondary Australian Stocks of Birds

Pardalotidae

<i>Acanthiza katherina</i>	mountain thornbill
<i>Oreoscopus gutturalis</i>	fernwren
<i>Gerygone mouki</i>	brown gerygone
<i>Gerygone palpebrosa</i>	fairy gerygone
<i>Sericornis citreogularis</i>	yellow-throated scrubwren
<i>Sericornis kerri</i>	Atherton scrubwren
<i>Sericornis magnirostris</i>	large-billed scrubwren

Campephagidae

<i>Coracina papuensis</i>	white-bellied cuckoo-shrike
<i>Lalage leucomela</i>	varied triller

Climacteridae

<i>Cormobates leucophaeus minor</i>	white-throated treecreeper
-------------------------------------	----------------------------

Artamidae

<i>Cracticus quoyi</i>	black butcherbird
------------------------	-------------------

Meliphagidae

<i>Acanthorhynchus tenuirostris</i>	eastern spinebill
<i>Lichenostomus frenatus</i>	bridled honeyeater
<i>Meliphaga gracilis</i>	graceful honeyeater
<i>Meliphaga notata</i>	yellow-spotted honeyeater
<i>Xanthotis macleayana</i>	Macleay's honeyeater

Dicruridae

<i>Arses kaupi</i>	piebald monarch
<i>Machaerirhynchus flaviventer</i>	yellow-breasted boatbill
<i>Monarcha trivirgatus</i>	spectacled monarch

Petroicidae

<i>Heteromyias albispecularis</i>	grey-headed robin
<i>Tregellasia capito</i>	pale-yellow robin

Pachycephalidae

<i>Colluricincla boweri</i>	Bower's shrike-thrush
<i>Colluricincla megarrhyncha</i>	little shrike-thrush
<i>Pachycephala simplex peninsulae</i>	grey whistler

Ptilonorhynchidae

<i>Scenopoeetes dentirostris</i>	tooth-billed bowerbird
<i>Ailuroedus melanotis</i>	spotted catbird
<i>Prionodura newtoniana</i>	golden bowerbird
<i>Ptilonorhynchus violaceus</i>	satin bowerbird

Ptiloris victoriae

Victoria's riflebird

Appendix 6a

Rare and Threatened Plant Species

Taxa	Conservation Status
Acanthaceae	
<i>Rhaphidospora cavernarum</i>	X
Annonaceae	
<i>Artabotrys</i> sp. (Claudie River B.Gray 3240)	R
<i>Haplostichanthus</i> sp. (Coopers Creek B.Gray 2433)	R
<i>Haplostichanthus</i> sp. (Mt Finnigan L.W.Jessup 632)	R
<i>Haplostichanthus</i> sp. (Topaz L.W.Jessup 520)	R
<i>Meiogyne</i> sp. (Henrietta Creek L.W.Jessup 512)	R
<i>Polyalthia</i> sp. (Wyvuri B.P.Hyland RFK2632)	R
<i>Pseuduvaria froggattii</i>	R
<i>Pseuduvaria hylandii</i>	R
<i>Pseuduvaria mulgraveana</i>	R
<i>Pseuduvaria mulgraveana</i> var. <i>glabrescens</i>	R
<i>Pseuduvaria mulgraveana</i> var. <i>mulgraveana</i>	R
<i>Pseuduvaria villosa</i>	R
Apiaceae	
<i>Oenanthe javanica</i>	R
<i>Trachymene geraniifolia</i>	R
Apocynaceae	
<i>Parsonsia bartlensis</i>	V
<i>Parsonsia largiflorens</i>	R
<i>Parsonsia lenticellata</i>	R
<i>Parsonsia wildensis</i>	R
Aponogetonaceae	
<i>Aponogeton bullosus</i>	E
<i>Aponogeton elongatus</i>	R
<i>Aponogeton elongatus</i> subsp. <i>elongatus</i>	R
<i>Aponogeton proliferus</i>	E
Aquifoliaceae	
<i>Ilex</i> sp. (Gadgarra B.P.Hyland RFK2011)	R
Araceae	
<i>Pothos brassii</i>	R
Araliaceae	
<i>Polyscias bellendenkerensis</i>	R
Araucariaceae	
<i>Agathis microstachya</i>	R

Taxa	Conservation Status
Arecaceae	
<i>Archontophoenix myolensis</i>	E
<i>Calamus aruensis</i>	R
<i>Linospadix microcarya</i>	R
<i>Linospadix palmeriana</i>	R
<i>Livistona drudei</i>	V
Aristolochiaceae	
<i>Pararistolochia praevenosa</i>	R
Asclepiadaceae	
<i>Marsdenia araujacea</i>	X
<i>Marsdenia hemiptera</i>	R
<i>Marsdenia rara</i>	V
<i>Marsdenia straminea</i>	V
<i>Phyllanthera grayi</i>	R
<i>Tylophora rupicola</i>	E
Aspleniaceae	
<i>Asplenium athertonense</i>	R
<i>Asplenium excisum</i>	R
<i>Asplenium pellucidum</i>	V
<i>Asplenium unilaterale</i>	V
<i>Asplenium wildii</i>	V
Asteraceae	
<i>Peripleura scabra</i>	R
<i>Tetramolopium</i> sp. (Mt Bowen D.G.Fell+ DGF1224)	R
Athyriaceae	
<i>Diplazium cordifolium</i>	V
<i>Diplazium pallidum</i>	E
Blechnaceae	
<i>Pteridoblechnum acuminatum</i>	R
Burseraceae	
<i>Canarium acutifolium</i> var. <i>acutifolium</i>	V
Caesalpiniaceae	
<i>Caesalpinia robusta</i>	R
<i>Cassia</i> sp. (Paluma Range G.Sankowsky+ 450)	R
Casuarinaceae	
<i>Gymnostoma australianum</i>	R
Celastraceae	
<i>Euonymus globularis</i>	R

Taxa	Conservation Status
<i>Hexaspora pubescens</i>	V
Clusiaceae	
<i>Garcinia brassii</i>	R
<i>Mammea touriga</i>	R
<i>Mesua larnachiana</i>	R
Combretaceae	
<i>Dansiea elliptica</i>	R
<i>Macropteranthes montana</i>	V
Connaraceae	
<i>Rourea brachyandra</i>	R
Convolvulaceae	
<i>Argyreia soutteri</i>	X
Corsiaceae	
<i>Corsia</i> sp. (Herberton Range B.Gray 3994)	R
Cunoniaceae	
<i>Ceratopetalum corymbosum</i>	R
<i>Ceratopetalum macrophyllum</i>	R
<i>Schizomeria whitei</i>	R
Cupressaceae	
<i>Callitris baileyi</i>	R
Cyatheaceae	
<i>Cyathea baileyana</i>	R
<i>Cyathea celebica</i>	R
Cycadaceae	
<i>Cycas platyphylla</i>	V
Cyperaceae	
<i>Carex breviscapa</i>	R
<i>Carex cruciata</i> var. <i>rafflesiana</i>	R
<i>Cyperus cephalotes</i>	E
<i>Eleocharis retroflexa</i>	V
<i>Fimbristylis adjuncta</i>	E
<i>Gahnia insignis</i>	R
<i>Paramapania parvibractea</i>	R
Dennstaedtiaceae	
<i>Oenotrichia dissecta</i>	R

Taxa	Conservation Status
Dicksoniaceae	
<i>Calochlaena villosa</i>	R
Dipteridaceae	
<i>Dipteris conjugata</i>	R
Droseraceae	
<i>Drosera adelaie</i>	R
<i>Drosera prolifera</i>	V
<i>Drosera schizandra</i>	V
Dryopteridaceae	
<i>Dryopteris hasseltii</i>	R
<i>Dryopteris sparsa</i>	V
<i>Lastreopsis grayi</i>	R
<i>Lastreopsis tinarooensis</i>	R
<i>Lastreopsis walleri</i>	R
<i>Revwattsia fragilis</i>	R
Ebenaceae	
<i>Diospyros sp.</i> (Bamaga B.P.Hyland 2517)	R
<i>Diospyros sp.</i> (Mt Lewis L.S.Smith 10107)	R
<i>Diospyros sp.</i> (Mt Spurgeon C.T.White 10677)	R
Elaeocarpaceae	
<i>Aceratium ferrugineum</i>	R
<i>Aceratium sericoleopsis</i>	R
<i>Elaeocarpus coorangooloo</i>	R
<i>Elaeocarpus johnsonii</i>	R
<i>Elaeocarpus stellaris</i>	R
<i>Elaeocarpus thelmae</i>	R
<i>Peripentadenia mearsii</i>	R
<i>Peripentadenia phelpsii</i>	R
Epacridaceae	
<i>Acrotriche baileyana</i>	R
<i>Dracophyllum sayeri</i>	R
<i>Leucopogon malayanus subsp. novoguineensis</i>	R
Eucryphiaceae	
<i>Eucryphia wilkiei</i>	V
<i>Acalypha lyonsii</i>	V
Euphorbiaceae	
<i>Actephila foetida</i>	V
<i>Actephila sessilifolia</i>	R
<i>Austrobuxus megacarpus</i>	R
<i>Cleistanthus discolor</i>	R

Taxa	Conservation Status
<i>Cleistanthus myrianthus</i>	R
<i>Croton densivestitus</i>	R
<i>Dissiliaria tuckeri</i>	V
<i>Glochidion pruinatum</i>	R
<i>Glochidion pungens</i>	R
<i>Macaranga polyadenia</i>	R
<i>Phyllanthus brassii</i>	R
<i>Sankowskya stipularis</i>	E
<i>Sauropus macranthus</i>	R
<i>Wetria australiensis</i>	V
<i>Whyanbeelia terrae-reginae</i>	R
Fabaceae	
<i>Callerya pilipes</i>	R
<i>Dioclea hexandra</i>	V
<i>Strongylodon lucidus</i>	R
Flacourtiaceae	
<i>Ryparosa javanica</i>	R
<i>Xylosma</i> sp. (Mt Lewis G.Sankowsky+ 1108)	R
Gesneriaceae	
<i>Boea kinnearii</i>	E
<i>Lenbrassia australiana</i> var. <i>australiana</i>	R
<i>Lenbrassia australiana</i> var. <i>glabrescens</i>	R
Grammitidaceae	
<i>Ctenopteris walleri</i>	V
<i>Grammitis albosetosa</i>	R
<i>Grammitis leonardii</i>	R
<i>Grammitis reinwardtii</i>	V
Grossulariaceae	
<i>Argophyllum cryptophlebium</i>	R
<i>Polyosma rigidiuscula</i>	R
Hamamelidaceae	
<i>Neostrearia fleckeri</i>	R
<i>Noahdendron nicholasii</i>	E
Hymenophyllaceae	
<i>Crepidomanes aphlebioides</i>	E
<i>Crepidomanes endlicherianum</i>	R
<i>Crepidomanes majoriae</i>	R
<i>Crepidomanes pallidum</i>	R
<i>Hymenophyllum gracilescens</i>	R
<i>Hymenophyllum kerianum</i>	R
<i>Hymenophyllum lobbii</i>	X
<i>Hymenophyllum whitei</i>	X

Taxa	Conservation Status
<i>Trichomanes exiguum</i>	X
<i>Trichomanes mindorense</i>	R
Lamiaceae	
<i>Plectranthus amoenus</i>	V
<i>Plectranthus gratus</i>	V
<i>Plectranthus spectabilis</i>	R
<i>Prostanthera</i> sp. (Dinden P.I.Forster+ PIF17342)	E
Lauraceae	
<i>Beilschmiedia castrisinensis</i>	R
<i>Beilschmiedia volckii</i>	R
<i>Cinnamomum propinquum</i>	R
<i>Endiandra anthropophagorum</i>	R
<i>Endiandra bellendenkerana</i>	R
<i>Endiandra cooperana</i>	E
<i>Endiandra dichrophylla</i>	R
<i>Endiandra globosa</i>	R
<i>Endiandra grayi</i>	R
<i>Endiandra jonesii</i>	R
<i>Endiandra microneura</i>	R
<i>Endiandra phaeocarpa</i>	R
<i>Endiandra sideroxylon</i>	R
<i>Litsea granitica</i>	R
Lindsaeaceae	
<i>Lindsaea pulchella</i> var. <i>blanda</i>	X
<i>Lindsaea terrae-reginae</i>	R
Lomariopsidaceae	
<i>Elaphoglossum callifolium</i>	R
Lycopodiaceae	
<i>Huperzia dalhousieana</i>	E
<i>Huperzia filiformis</i>	E
<i>Huperzia lockyeri</i>	V
<i>Huperzia marsupiiiformis</i>	V
<i>Huperzia phlegmaria</i>	R
<i>Huperzia phlegmarioides</i>	V
<i>Huperzia prolifera</i>	V
<i>Huperzia serrata</i>	X
<i>Huperzia squarrosa</i>	E
<i>Lycopodium volubile</i>	X
Malpighiaceae	
<i>Tristellateia australasiae</i>	R

Taxa	Conservation Status
Meliaceae	
<i>Aglaia brassii</i>	R
Menispermaceae	
<i>Carronia pedicellata</i>	E
<i>Hypserpa smilacifolia</i>	R
Mimosaceae	
<i>Acacia homaloclada</i>	R
<i>Acacia hylonoma</i>	R
<i>Acacia longipedunculata</i>	R
<i>Acacia meiosperma</i>	R
<i>Acacia polyadenia</i>	R
<i>Acacia purpureopetala</i>	V
<i>Acacia ramiflora</i>	E
<i>Albizia</i> sp. (Windsor Tableland B.Gray 2181)	R
<i>Archidendron kanisii</i>	E
<i>Archidendropsis xanthoxylon</i>	R
Monimiaceae	
<i>Gen.(Aq20546) sp.</i> (Mt Hemmant L.J.Webb+ 10908)	R
<i>Gen.(Aq385424) sp.</i> (McDowall Range J.G.Tracey 14552)	R
<i>Stegathera australiana</i>	R
<i>Tetrasyandra</i> sp. (Mt Lewis B.P.Hyland 1053)	R
<i>Wilkiea</i> sp. (Mt Lewis L.J.Webb+ 10501)	R
<i>Wilkiea wardellii</i>	R
Musaceae	
<i>Musa fitzalanii</i>	X
<i>Musa jackeyi</i>	R
Myrsinaceae	
<i>Tapeinosperma flueckigeri</i>	X
Myrtaceae	
<i>Acmena</i> sp. (Cooper Creek P.I.Forster+ PIF15557)	E
<i>Barongia lophandra</i>	R
<i>Corymbia leptoloma</i>	V
<i>Corymbia rhodops</i>	V
<i>Eucalyptus lockyeri</i>	R
<i>Eucalyptus lockyeri</i> subsp. <i>exuta</i>	R
<i>Eucalyptus lockyeri</i> subsp. <i>lockyeri</i>	R
<i>Eucalyptus pachycalyx</i> subsp. <i>pachycalyx</i>	R
<i>Gossia lewisensis</i>	R
<i>Gossia lucida</i>	R
<i>Homoranthus porteri</i>	V
<i>Kunzea</i> sp. (Herbert River R.J.Cumming 11309)	R
<i>Leptospermum purpurascens</i>	R

Taxa	Conservation Status
<i>Micromyrtus delicata</i>	E
<i>Mitrantia bilocularis</i>	R
<i>Rhodomyrtus effusa</i>	R
<i>Ristantia gouldii</i>	R
<i>Sphaerantia chartacea</i>	R
<i>Sphaerantia discolor</i>	R
<i>Stockwellia quadrifida</i>	R
<i>Syzygium malaccense</i>	R
<i>Thaleropia queenslandica</i>	R
<i>Triplarina nitchaga</i>	V
<i>Waterhousea mulgraveana</i>	R
<i>Xanthostemon formosus</i>	E
<i>Xanthostemon graniticus</i>	R
<i>Xanthostemon verticillatus</i>	R
Nepenthaceae	
<i>Nepenthes mirabilis</i>	E
Orchidaceae	
<i>Acianthus amplexicaulis</i>	R
<i>Acianthus sublestus</i>	R
<i>Aphyllorchis anomala</i>	R
<i>Aphyllorchis queenslandica</i>	R
<i>Bulbophyllum boonjee</i>	R
<i>Bulbophyllum grandimesense</i>	R
<i>Bulbophyllum windsorensense</i>	R
<i>Chiloglottis longiclavata</i>	R
<i>Corybas abellianus</i>	R
<i>Corybas cerasinus</i>	R
<i>Crepidium flavovirens</i>	R
<i>Dendrobium callitrophilum</i>	V
<i>Dendrobium johannis</i>	V
<i>Dendrobium mirbelianum</i>	E
<i>Didymoplexis pallens</i>	R
<i>Diplocaulobium masonii</i>	X
<i>Diuris oporina</i>	R
<i>Gastrodia queenslandica</i>	R
<i>Gastrodia urceolata</i>	R
<i>Genoplesium alticola</i>	R
<i>Genoplesium tectum</i>	E
<i>Goodyera grandis</i>	R
<i>Goodyera viridiflora</i>	R
<i>Habenaria rumphii</i>	R
<i>Liparis simmondsii</i>	R
<i>Oberonia attenuata</i>	X
<i>Peristylus banfieldii</i>	R
<i>Phalaenopsis amabilis subsp. rosenstromii</i>	E
<i>Spathoglottis paulinae</i>	R
<i>Taeniophyllum lobatum</i>	R

Taxa	Conservation Status
<i>Vrydagzynea paludosa</i>	E
<i>Zeuxine polygonoides</i>	V
Pandanaceae	
<i>Freycinetia marginata</i>	V
<i>Freycinetia percostata</i>	V
<i>Pandanus gemmifer</i>	R
Piperaceae	
<i>Peperomia bellendenkerensis</i>	R
<i>Piper mestonii</i>	R
Poaceae	
<i>Arthraxon hispidus</i>	V
<i>Bambusa forbesii</i>	R
<i>Centotheca philippinensis</i>	R
<i>Garnotia stricta</i> var. <i>longiseta</i>	R
<i>Ichnanthus pallens</i> var. <i>majus</i>	R
Podocarpaceae	
<i>Prumnopitys ladei</i>	R
Podostemaceae	
<i>Cladopus queenslandicus</i>	R
Polygalaceae	
<i>Comesperma praecelsum</i>	R
Polypodiaceae	
<i>Lemmaphyllum accedens</i>	X
<i>Microsorium membranifolium</i>	R
Proteaceae	
<i>Alloxylon flammeum</i>	V
<i>Austromuelleria trinervia</i>	R
<i>Austromuelleria valida</i>	R
<i>Banksia plagiocarpa</i>	R
<i>Buckinghamia ferruginiflora</i>	R
<i>Eidothea zoexylocarya</i>	R
<i>Grevillea glossadenia</i>	V
<i>Helicia grayi</i>	R
<i>Helicia lamingtoniana</i>	R
<i>Helicia lewisensis</i>	R
<i>Helicia recurva</i>	R
<i>Hollandaea riparia</i>	R
<i>Hollandaea sayeriana</i>	R
<i>Macadamia grandis</i>	R
<i>Megahertzia amplexicaulis</i>	R
<i>Stenocarpus cryptocarpus</i>	R

Taxa	Conservation Status
<i>Stenocarpus davallioides</i>	R
Rhamnaceae	
<i>Gouania australiana</i>	R
Rubiaceae	
<i>Cyclophyllum costatum</i>	V
<i>Gardenia actinocarpa</i>	E
<i>Hedyotis novoguineensis</i>	E
<i>Myrmecodia beccarii</i>	V
<i>Oldenlandia polyclada</i>	R
<i>Oldenlandia tenelliflora</i> var. <i>papuana</i>	X
<i>Randia audasii</i>	R
<i>Wendlandia basistaminea</i>	R
<i>Wendlandia connata</i>	R
<i>Wendlandia psychotrioides</i>	X
Rutaceae	
<i>Acronychia acuminata</i>	R
<i>Citrus inodora</i>	V
<i>Dinosperma longifolium</i>	E
<i>Euodia hylandii</i>	R
<i>Euodia pubifolia</i>	V
<i>Flindersia oppositifolia</i>	R
<i>Leionema ellipticum</i>	V
<i>Medicosma glandulosa</i>	R
<i>Zieria obovata</i>	V
<i>Zieria</i> sp. (Russell River S.Johnson in 1892)	X
Sapindaceae	
<i>Alectryon semicinereus</i>	R
<i>Arytera dictyoneura</i>	R
<i>Atalaya rigida</i>	R
<i>Cupaniopsis cooperorum</i>	V
<i>Diploglottis harpullioides</i>	R
<i>Diploglottis pedleyi</i>	R
<i>Dodonaea uncinata</i>	R
<i>Harpullia ramiflora</i>	R
<i>Jagera javanica</i> subsp. <i>australiana</i>	R
<i>Lepiderema hirsuta</i>	R
<i>Lepiderema largiflorens</i>	R
<i>Mischocarpus albescens</i>	R
<i>Sarcopteryx acuminata</i>	R
<i>Sarcopteryx montana</i>	R
<i>Sarcotoechia villosa</i>	R
<i>Toechima pterocarpum</i>	E

Taxa	Conservation Status
Scrophulariaceae	
<i>Rhamphicarpa australiensis</i>	R
Simaroubaceae	
<i>Quassia baileyana</i>	R
<i>Quassia bidwillii</i>	V
Solanaceae	
<i>Nicotiana wuttkei</i>	E
<i>Solanum dimorphispinum</i>	R
<i>Solanum hamulosum</i>	R
Sterculiaceae	
<i>Argyrodendron</i> sp. (Boonjie B.P.Hyland RFK2139)	R
<i>Argyrodendron</i> sp. (Whyanbeel B.P.Hyland RFK1106)	R
<i>Firmiana papuana</i>	R
Symplocaceae	
<i>Symplocos ampulliformis</i>	R
<i>Symplocos crassiramifera</i>	R
<i>Symplocos graniticola</i>	R
<i>Symplocos</i> sp. (Mt Finnigan L.J.Brass 20129)	R
<i>Symplocos stawellii</i> var. <i>montana</i>	R
Thelypteridaceae	
<i>Amphineuron immersum</i>	X
<i>Chingia australis</i>	E
<i>Plesioneuron tuberculatum</i>	E
<i>Pneumatopteris costata</i>	R
Thymelaeaceae	
<i>Phaleria biflora</i>	R
Tmesipteridaceae	
<i>Tmesipteris lanceolata</i>	X
Vittariaceae	
<i>Antrophyum plantagineum</i>	R
<i>Antrophyum subfalcatum</i>	R
<i>Monogramma dareicarpa</i>	X
Winteraceae	
<i>Bubbia queenslandiana</i> subsp. <i>australis</i>	R
<i>Bubbia queenslandiana</i> subsp. <i>queenslandiana</i>	R
<i>Bubbia whiteana</i>	R
Xanthophyllaceae	
<i>Xanthophyllum fragrans</i>	R

Taxa	Conservation Status
Zingiberaceae	
<i>Alpinia hylandii</i>	R
<i>Amomum dallachyi</i>	R
<i>Costus potierae</i>	E

Appendix 6b

Rare and Threatened Animal Species

Taxa	Common Name	Status
Amphibians		
Hylidae		
<i>Litoria genimaculata</i>	tapping green eyed frog	R
<i>Litoria lorica</i>	little waterfall frog	E
<i>Litoria nannotis</i>	waterfall frog	E
<i>Litoria nyakalensis</i>	mountain mistfrog	E
<i>Litoria revelata</i>	whirring treefrog	R
<i>Litoria rheocola</i>	common mistfrog	E
<i>Nyctimystes dayi</i>	Australian lacelid	E
Microhylidae		
<i>Austrochaperina fryi</i>	peeping whistlefrog	R
<i>Austrochaperina robusta</i>	robust whistlefrog	R
<i>Cophixalus aenigma</i>	tapping nursery-frog	R
<i>Cophixalus bombiens</i>	buzzing nurseryfrog	R
<i>Cophixalus concinnus</i>	beautiful nursery-frog	R
<i>Cophixalus exiguus</i>	dainty nurseryfrog	R
<i>Cophixalus hosmeri</i>	rattling nurseryfrog	R
<i>Cophixalus infacetus</i>	creaking nurseryfrog	R
<i>Cophixalus monticola</i>	mountain nurseryfrog	R
<i>Cophixalus neglectus</i>	Bellenden Ker nurseryfrog	V
<i>Cophixalus saxatilis</i>	Black Mountain boulderfrog	V
Myobatrachidae		
<i>Pseudophryne covacevichae</i>	magnificent broodfrog	V
<i>Taudactylus acutirostris</i>	sharp snouted dayfrog	E
<i>Taudactylus rheophilus</i>	northern tinkerfrog	E
Birds		
Accipitridae		
<i>Accipiter novaehollandiae</i>	grey goshawk	R
<i>Erythrotriorchis radiatus</i>	red goshawk	E
<i>Lophoictinia isura</i>	square-tailed kite	R
Anatidae		
<i>Nettapus coromandelianus</i>	cotton pygmy-goose	R
<i>Stictonetta naevosa</i>	freckled duck	R
<i>Tadorna radjah</i>	radjah shelduck	R
Apodidae		
<i>Collocalia spodiopygius</i>	white-rumped swiftlet	R
Burhinidae		
<i>Esacus neglectus</i>	beach stone-curlew	V

Taxa	Common Name	Status
Cacatuidae		
<i>Calyptorhynchus lathami</i>	glossy black-cockatoo	V
Casuariidae		
<i>Casuarius casuarius johnsonii</i>	southern cassowary	E
Ciconiidae		
<i>Ephippiorhynchus asiaticus</i>	black-necked stork	R
Falconidae		
<i>Falco hypoleucos</i>	grey falcon	R
Haematopodidae		
<i>Haematopus fuliginosus</i>	sooty oystercatcher	R
Laridae		
<i>Sterna albifrons</i>	little tern	E
Meliphagidae		
<i>Grantiella picta</i>	painted honeyeater	R
<i>Melithreptus gularis</i>	black-chinned honeyeater	R
<i>Melithreptus gularis laetior</i>	golden-backed honeyeater	R
<i>Xanthomyza phrygia</i>	regent honeyeater	E
Passeridae		
<i>Erythrura gouldiae</i>	Gouldian finch	E
<i>Erythrura trichroa</i>	blue-faced parrot-finch	R
<i>Heteromunia pectoralis</i>	pictorella mannikin	R
<i>Neochmia phaeton</i>	crimson finch	V
<i>Neochmia phaeton iredalei</i>	crimson finch	V
Psittacidae		
<i>Cyclopsitta diophthalma macleayana</i>	Macleay's fig-parrot	V
<i>Lathamus discolor</i>	swift parrot	E
Rallidae		
<i>Rallus pectoralis</i>	Lewin's rail	R
Scolopacidae		
<i>Numenius madagascariensis</i>	eastern curlew	R
Strigidae		
<i>Ninox rufa queenslandica</i>	rufous owl	V
<i>Ninox strenua</i>	powerful owl	V
Turnicidae		
<i>Turnix melanogaster</i>	black-breasted button-quail	V
<i>Turnix olivii</i>	buff-breasted button-quail	V

Taxa	Common Name	Status
Tytonidae		
<i>Tyto novaehollandiae kimberli</i>	masked owl	V
<i>Tyto tenebricosa</i>	sooty owl	R
Insects		
Lycaenidae		
<i>Hypochrysops apollo apollo</i>	Apollo jewel	V
Mammals		
Dasyuridae		
<i>Antechinus godmani</i>	Atherton antechinus	R
<i>Dasyurus maculatus gracilis</i>	spotted-tailed quoll	E
Emballonuridae		
<i>Saccolaimus saccolaimus nudicluniatus</i>	bare-rumped sheathtail bat	E
<i>Taphozous australis</i>	coastal sheathtail bat	V
Hipposideridae		
<i>Hipposideros cervinus</i>	fawn leaf-nosed bat	V
<i>Hipposideros diadema reginae</i>	diadem leaf-nosed bat	R
Macropodidae		
<i>Dendrolagus bennettianus</i>	Bennett's tree-kangaroo	R
<i>Dendrolagus lumholtzi</i>	Lumholtz's tree-kangaroo	R
<i>Petrogale mareeba</i>	Mareeba rock-wallaby	R
<i>Petrogale sharmani</i>	Sharman's rock-wallaby	E
Megadermatidae		
<i>Macroderma gigas</i>	ghost bat	V
Petauridae		
<i>Petaurus australis unnamed subsp.</i>	yellow-bellied glider	V
<i>Petaurus gracilis</i>	mahogany glider	E
Potoroidae		
<i>Bettongia tropica</i>	northern bettong	E
Pseudocheiridae		
<i>Hemibelideus lemuroides</i>	lemuroid ringtail possum	R
<i>Pseudochirops archeri</i>	green ringtail possum	R
<i>Pseudochirulus cinereus</i>	Daintree River ringtail possum	R
<i>Pseudochirulus herbertensis</i>	Herbert River ringtail possum	R
Rhinolophidae		
<i>Rhinolophus philippinensis</i>	greater large-eared horseshoe bat	E
Vespertilionidae		
<i>Kerivoula papuensis</i>	golden-tipped bat	R
<i>Murina florum</i>	tube-nosed insectivorous bat	V

Taxa	Common Name	Status
Reptiles		
Crocodylidae		
<i>Crocodylus porosus</i>	estuarine crocodile	V
Elapidae		
<i>Acanthophis antarcticus</i>	common death adder	R
<i>Furina barnardi</i>	yellow-naped snake	R
<i>Simoselaps warro</i>	robust burrowing snake	R
Gekkonidae		
<i>Nactus galgajuga</i>	Black Mountain gecko	R
Pygopodidae		
<i>Delma mitella</i>	Atherton delma	R
Scincidae		
<i>Calyptotis thorntonensis</i>	Thornton Peak skink	R
<i>Carlia scirtetis</i>	Black Mountain rainbow-skink	R
<i>Coeranoscincus frontalis</i>	legless lizard	R
<i>Egernia rugosa</i>	yakka skink	V
<i>Eulamprus frerei</i>	skink	R
<i>Eulamprus tigrinus</i>	rainforest water skink	R
<i>Glaphyromorphus mjobergi</i>	skink	R
<i>Lampropholis robertsi</i>	skink	R
<i>Techmarscincus jigurru</i>	Bartle Frere Skink	R
Typhlopidae		
<i>Ramphotyphlops broomi</i>	faint-striped blind snake	R
Varanidae		
<i>Varanus semiremex</i>	rusty monitor	R

Wet Tropics of Queensland World Heritage Area (WTWHA)

Response Report: ACIUCN Recommendations WTWHA, October 2000

Background

At its meeting of 7 September 2000 the Australian Committee for IUCN (ACIUCN) adopted its report *Wet Tropics of Queensland World Heritage Area: Condition, Management and Threats* including a set of 'focused recommendations' (Appendix A). The following is the State Party's response and report in relation to these focused recommendations.

The ACIUCN 2000 report referred to the focused recommendations under four Priority Action Areas:

1. Support for Management of the WTWHA
2. Management of Native and Introduced Species
3. Management of Land Use and Human Impacts within and beyond the Boundaries of the WTWHA
4. Strategic Issues for Future Management

The Response Report will be a basis for monitoring the implementation of the focused recommendations. It is noted however, that a number of issues identified in the focused recommendations may require substantial socio-economic change often at scales of a greater order than that associated with direct management of the immediate WTWHA. Climatic change and global warming is one case in point, another being modifications required to land use and human impacts beyond the boundaries of the WTWHA. Some of these modifications will require the cooperation and commitment of the international community and can be expected to take some years to achieve.

Primary Goal and WTMA Strategic Plan (1998 - 2003):

The Primary Goal is "to provide for the implementation of Australia's international duty for the protection, conservation, presentation, rehabilitation and transmission to future generations of the Wet Tropics of Queensland World Heritage Area, within the meaning of the World Heritage Convention." Under its *Strategic Plan (1998 - 2003)* WTMA will pursue a number of long term strategic outcomes through its management of the area to achieve the primary goal. These are:

1. World Heritage Values and natural processes effectively protected and conserved.
2. Degraded Areas rehabilitated.
3. Widespread recognition, appreciation and guardianship of ecological, cultural and economic values.
4. The community benefits through use and enjoyment of the Area.
5. Effective management through strategic partnerships

6. Effective participation by Rainforest Aboriginal people in management of the Area.
7. An organisational culture based upon excellence, innovation, service delivery and accountability.

A number of key actions are identified under each strategic outcome which will be pursued by the Authority over the period of the Strategic Plan (1998 - 2003).

Format for Response Report:

At the WTWHA level, the ACIUCN focused recommendations are generally in accord with the broader goals of the Authority's Strategic Plan which is designed to meet requirements for management of the World Heritage Area. The Response Report links the ACIUCN recommendations with actions identified in the Strategic Plan as follows:

Under each of the ACIUCN four Priority Action Areas the following information is provided in tabular form:

Column 1: ***ACIUCN Recommended Actions***

- lists the key components of the focused recommendations. This establishes the basic criteria against which responses to ACIUCN recommended actions may be monitored.
- the reader should refer to the Focused Recommendations of the ACIUCN Report for the background rationale on which recommended actions are based.

Column 2: ***Lead Agency (and others involved)***

- refers to key agency or body that has primary statutory responsibility or lead influence (and other agencies with a major supporting or facilitation function) in responding to ACIUCN Recommended Actions

Column 3: ***Response Report***

- refers to responses made in relation to recommended actions
- where responses relate directly to actions identified in the Strategic Plan they are identified with (SP)
- This November 2000 Response Report establishes the State Parties 'benchmark' response to the ACIUCN focused recommendations of September 2000

Column 4: ***Current Status***

- refers to current status or progress made in relation to response (ie November 2000 in this instance)

ATTACHMENT 2

Abbreviations used in the table are:

AST	Alliance for Sustainable Tourism	QPWS	Queensland Parks and Wildlife Service
CCC	Community Consultative Committee, WTMA	R&T	rare and threatened species
CMA	Cooperative Management Agreement	RAIN report	Research and Information Needs report, WTMA 2000
CSLG	Conservation Sector Liaison Group, WTMA	Rainforest CRC	Rainforest Cooperative Research Centre, Cairns
DCILGPS	Queensland Department of Communication and Information, Local Government, Planning and Sport	SAC	Scientific Advisory Committee, WTMA
DME	Department of Minerals and Energy Queensland	SP	Strategic Plan 1998 - 2003, WTMA
DNR	Department of Natural Resources Queensland	TILG	Tourism Industry Liaison Group, WTMA
DSC	Douglas Shire Council	TTNQ	Tourism Tropical North Queensland
EA	Environment Australia	WEB	World Wide Web
EAA	Ecotourism Association of Australia	WH	World Heritage
EPA	Queensland Environmental Protection Agency	WT	Wet Tropics
LNLG	Landholders and Neighbours Liaison Group, WTMA	WTMA	Wet Tropics Management Authority
MinCon	Wet Tropics Ministerial Council	WTMP	<i>Wet Tropics Management Plan 1998</i>
PAF	Principal Agencies Forum (comprises WTMA, DNR, QPWS)		

1. Support for Management of the WTWHA

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
Intergovernmental Agreement <ul style="list-style-type: none"> ▪ Commonwealth and Queensland Governments to pursue revised intergovernmental agreement which incorporates a new financial agreement to ensure adequate and sustained resources for management of the WTWHA. 	MinCon (WTMA, QPWS, DNR, EA)	<ul style="list-style-type: none"> ▪ review Intergovernmental Agreement ▪ work with Commonwealth and State Governments to develop new financial agreement (SP) ▪ work with QPWS, DNR and the Commonwealth to better identify the total costs of management of the WHA and to identify in draft budgets (SP) 	<ul style="list-style-type: none"> ▪ under review by MinCon ▪ under review by MinCon
WTMA Strategic Plan 1998-2003 <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided to ensure Strategic Plan is fully implement 	MinCon (WTMA)	<ul style="list-style-type: none"> ▪ MinCon endorsed the Strategic Plan with implementation subject to normal budget processes 	<ul style="list-style-type: none"> ▪ in progress to 2003 ▪ this response report is an indicator of progressive implementation of key components the Strategic Plan related to ACIUCN recommendations
Wet Tropics Management Plan <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided to ensure Plan is fully implemented 	MinCon, WTMA	<ul style="list-style-type: none"> ▪ gazettal and implementation of the Management Plan (SP) ▪ develop WTMP section 62 permit assessment guidelines (SP) 	<ul style="list-style-type: none"> ▪ <i>Wet Tropics Management Plan</i> commenced operation in September 1998 ▪ WTMP permit decision process in place ▪ formal WTMP guidelines relating to electricity infrastructure, seed collection and consultation with Aboriginal interests in relation to permit assessments in operation Any other Works in Progress?
field management capacity <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided 	MinCon, WTMA, DNR, QPWS	<ul style="list-style-type: none"> ▪ work with QPWS and DNR to achieve appropriate field staffing levels (SP) ▪ develop annual service agreements between WTMA, QPWS and DNR as the basis of an integrated Land Management Program in the World Heritage Area (SP) 	<ul style="list-style-type: none"> ▪ Role of Management Services Plan incorporated in Financial Agreement currently under review by MinCon ▪ annual service agreements being developed and will progressively be refined and improved

ATTACHMENT 2

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
<p>education and appreciation about WTWHA and its protection</p> <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided. 	<p>WTMA (DNR, QPWS)</p>	<ul style="list-style-type: none"> ▪ continue and broaden targeted community education and support programs (SP) ▪ develop a WTMA homepage on the Internet (SP) ▪ develop educational programs that target the local community (SP) ▪ recognise community achievements through award programs (SP) ▪ prepare guidelines on good land management practice for education of private land holders (SP) 	<ul style="list-style-type: none"> ▪ WTMA has coordinated the development of 9 Wet Tropics information centres throughout the region Other presentation initiatives include WT newsletters, WT newspaper, WT volunteers, interpretation signage at visitor sites ▪ WTMA WEB site established with community information about management of the WTWHA ▪ annual Cassowary Awards have been introduced and are ongoing ▪ draft guidelines regarding private water supplies prepared, 'undesirable plants' information and identikit in preparation

ATTACHMENT 2

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
<p>establishing partnerships</p> <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided. 	<p>WTMA</p>	<ul style="list-style-type: none"> ▪ develop a coordinated approach with QPWS and DNR to improve functional relationships between principal land management agencies of WTWHA through Principal Agencies Forum (SP) ▪ develop a day-to-day management agreement that outlines the operating framework between WTMA, QPWS and DNR (SP) ▪ establish stakeholders liaison groups with neighbours/ landholders, tourism industry, conservation movement (SP) ▪ actively contribute to investigations of Rainforest Centre of Excellence (SP) ▪ develop good neighbours program (SP) ▪ pursue CMAs where the agreement would contribute to achieving the Primary Goal (SP) ▪ develop “Friends of the Wet Tropics World Heritage Area” program (SP) 	<ul style="list-style-type: none"> ▪ PAF established and operating on regular basis ▪ annual service agreements being introduced and will progressively be refined and improved ▪ key stakeholder liaison and advisory committees established with regular meeting eg SAC, CCC, TILG, Bama Wabu, LNLG, CSLG ▪ WTMA participating as active member of taskforce ▪ 25 CMAs with private land holders predominantly associated with Daintree Rescue Package; CMA with Mona Mona Aboriginal community pending.

ATTACHMENT 2

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
<p>research for improved management</p> <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided. 	<p>WTMA, EA, Rainforest CRC (EPA, DNR)</p> <p>WTMA</p> <p>WTMA</p>	<ul style="list-style-type: none"> ▪ develop a research strategy supported by WTMA/QPWS/DNR and Rainforest CRC (SP) ▪ complete vegetation mapping at 1:50 000 scale (SP) ▪ commission research into appropriate rehabilitation techniques (SP) 	<ul style="list-style-type: none"> ▪ Research and Information Needs (RAIN) report developed to identify and encourage priority research required for improved management of WHA ▪ funding for another seven years operation of the Rainforest CRC with active participation of WTMA and establishment of project support groups to foster research activities in line with World Heritage information needs ▪ WTMA annual commitment of \$150,000 plus in-kind staff time to promote focused research by Rainforest CRC ▪ continued progress towards completion of detailed vegetation mapping program for the whole Wet Tropics bioregion (due for completion 2002) ▪ research trials commissioned into best practice rehabilitation techniques associated with infrastructure corridors (roads, powerlines) ▪ WTMA-funded research projects associated with impacts of 'visitation and use' and 'roads and powerlines' completed under Rainforest CRC, 2000
<p>WTWHA monitoring</p> <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided. 	<p>WTMA, (ACIUCN)</p> <p>WTMA</p>	<ul style="list-style-type: none"> ▪ develop comprehensive monitoring program to support State of Wet Tropics reporting (SP) ▪ maintain regular surveys to continue monitoring levels of community support (SP) 	<ul style="list-style-type: none"> ▪ statutory State of Wet Tropics reporting continues on an annual basis ▪ set of 'core indicators' established as a component of State of Wet Tropics Reporting process ▪ development of a more comprehensive and integrated monitoring system incorporating supplementary indicator sets in progress ▪ WTMA commissioning of Rainforest CRC into remote sensing technology and feasibility assessment for application in monitoring of WH condition ▪ 1996 community attitudes survey conducted. 1999 landholders and neighbours survey conducted

ATTACHMENT 2

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
<p>provision and maintenance of visitor facilities</p> <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided. 	<p>DNR, QPWS, WTMA</p>	<ul style="list-style-type: none"> ▪ develop a 5 year program for visitor infrastructure investment directed at both tourists and local visitors. Work to secure capital works allocations from Government initiatives (SP) ▪ develop a program with QPWS and DNR that provides for effective maintenance of infrastructure and a visible presence by rangers (SP) 	<ul style="list-style-type: none"> ▪ indicative 5 year budget requirements prepared for visitor sites ▪ development of NBTS implementation schedule underway ▪ facilitation of Federation funding support for WT visitor site and walking track initiatives ▪ development of additional visitor facilities (eg Daintree, Barron Gorge viewing areas and boardwalks)
<p>strategic planning capacity</p> <ul style="list-style-type: none"> ▪ adequate and sustained resources should be provided ▪ review of WTMP commencing 2003 	<p>WTMA</p> <p>WTMA WTMA</p>	<ul style="list-style-type: none"> ▪ develop a Nature-based Tourism Strategy (SP) ▪ develop a Walking Strategy (SP) ▪ develop a Conservation Strategy 	<ul style="list-style-type: none"> ▪ completion of <i>Wet Tropics Management Plan 1998</i> ▪ completion of WTMA policy document <i>Protection through Partnerships</i> ▪ completion of Wet Tropics Nature Based Tourism Strategy August 2000 ▪ completion of draft Wet Tropics Walking Strategy November 2000. Released for public consultation. ▪ draft terms of reference for Conservation Strategy under development

2. Management of Native and Introduced Species

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
Management of Native Species That substantial effort be applied to address the protection of native flora and fauna through:			
research <ul style="list-style-type: none"> ▪ control of current feral and exotic species ▪ management of introduction of new threatening species ▪ identify and address threats to sensitive native species <ul style="list-style-type: none"> ▪ management of fire 	WTMA (Rainforest CRC, DNR, QPWS)	<ul style="list-style-type: none"> ▪ develop an agreed process for quantifying threats to WH values and produce a priority order for development of mitigation strategies (SP) ▪ commission research and programs into effective control mechanisms for priority pest species (SP) 	<ul style="list-style-type: none"> ▪ WTMA Research and Information Needs 2000 (RAIN) report developed to provide research focus ▪ WTMA commissioning of Rainforest CRC research associated with identification of priority weed threats for the WHA (2000) ▪ WTMA commissioning of Rainforest CRC research associated with identification of priority vertebrate pests ▪ research by DNR on ecology of key weed species (harungana, pond apple, hymenachne, African tulip) ▪ WTMA-commissioned research into ecological impacts and control options for feral pigs ▪ WTMA-commissioned research into <i>Phytophthora cinnamomi</i> associated with forest dieback (2000) ▪ Rainforest CRC fire research regarding: wet sclerophyll forests and fire ecology; Aboriginal cultural fire management practices of the Daintree area; fire management trials associated with habitat of endangered northern bettong
partnership building <ul style="list-style-type: none"> ▪ management of fire ▪ control of current feral and exotic species ▪ management of introduction of new threatening species ▪ identify and address threats to sensitive native species 	WTMA (QPWS, DNR)	<ul style="list-style-type: none"> ▪ develop Fire Management Strategy and individual plans in consultation with land owners/land managers (SP) ▪ develop integrated mitigation strategies between WTMA/QPWS /DNR for known threats (SP) 	<ul style="list-style-type: none"> ▪ introduction of Local Government Pest Management Plans includes listing of environmental weeds ▪ major integrated field management activities undertaken include weed and pest management and control (eg harungana, pond apple, pig trapping)

ATTACHMENT 2

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
planning <ul style="list-style-type: none"> ▪ management of fire 	WTMA, DNR, QPWS	<ul style="list-style-type: none"> ▪ develop Fire Management Strategy (SP) ▪ develop individual fire management plans with major land owners and Native Title interests (SP) 	<ul style="list-style-type: none"> ▪ draft Fire Management Strategy under development ▪ fire management plans for priority areas of Unallocated State Lands within WHA developed
<ul style="list-style-type: none"> ▪ control of current feral and exotic species ▪ management of introduction of new threatening species ▪ identify and address threats to sensitive native species 	WTMA, DNR, QPWS	<ul style="list-style-type: none"> ▪ develop a strategy for prioritised weed and pest control with QPWS, DNR (SP) 	<ul style="list-style-type: none"> ▪ introduction of Local Government Pest Management Plans includes listing of environmental weeds ▪ WTMA participation in relation to control of papaya fruit fly and palm leaf beetle through DPI
education	WTMA, DNR, QPWS	<ul style="list-style-type: none"> ▪ develop educational programs that target the local community (SP) 	<ul style="list-style-type: none"> ▪ WTMA 'undesirable plants' information and identikit in preparation

3. Management of Land Use and Human Impacts within and beyond the Boundaries of the WTWHA

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
<p>Land use and human impacts beyond WTWHA boundaries</p> <ul style="list-style-type: none"> ▪ management of land use in the region should ensure potential impacts on the WTWHA are properly considered through appropriate regional planning, impact assessment, impact minimisation and monitoring 	<p>DCILGPS, local governments (EPA, QPWS, DNR, EA, WTMA)</p>	<ul style="list-style-type: none"> ▪ build protocols with local governments regarding early consultation in planning and development approval processes (SP) 	<ul style="list-style-type: none"> ▪ FNQ 2010 Regional Plan completed during 2000 which provides a strategic regional planning and policy framework for local government planning schemes (including environmental considerations) ▪ WTMA involvement in Regional Plan implementation coordination process ▪ Commencement of Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> on 16 July 2000 ▪ introduction of Queensland <i>Vegetation Management Act 1999</i>
<ul style="list-style-type: none"> ▪ strategic land acquisition to mitigate habitat fragmentation 	<p>WTMA, EPA</p>	<ul style="list-style-type: none"> ▪ where required, seek funds for targeted land purchase (SP) 	<ul style="list-style-type: none"> ▪ priority land acquisition program in place ▪ over 100 properties have been acquired in the Daintree - Cape Tribulation area primarily under the Daintree Rescue Package ▪ 12 other properties have also been purchased to protect habitat and mitigate fragmentation effects associated with WH values
<p>provision of community services infrastructure within WTWHA boundaries</p> <ul style="list-style-type: none"> ▪ ensure any proposals for provision of new or upgrades to infrastructure are subject to environmental impact assessment, impact minimisation and monitoring, and that the design for such facilities be required to make the fullest use of 	<p>WTMA</p>	<ul style="list-style-type: none"> ▪ develop and implement impact assessment procedures to meet ACIUCN recommendations 	<ul style="list-style-type: none"> ▪ statutory impact assessment procedures introduced under WTMP including assessment principles and criteria which meet aspects raised in Recommended Actions ▪ <i>Environment Protection and Biodiversity Conservation Act 1999</i> applies where an action is likely to have a significant impact on the World Heritage values of the Wet Tropics of Queensland World Heritage property

ATTACHMENT 2

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
measures to avoid and address fragmentation of habitat of native species	WTMA (EPA, DNR, infrastructure agencies)	<ul style="list-style-type: none"> ▪ develop and implement Codes of Practice with infrastructure agencies (SP) 	<ul style="list-style-type: none"> ▪ codes of practice for both electricity and roads infrastructure developed and in operation ▪ draft codes of practice for water infrastructure developed
Tully Millstream Dam proposals <ul style="list-style-type: none"> ▪ should be rejected 	DME, (WTMA, EPA)	<ul style="list-style-type: none"> ▪ WTMP zoning prohibits construction of such structures in WHA. Any proposal would necessitate consideration under the WTMP rezoning application process including associated environmental impact assessments and public consultation phases prior to consideration by WTMA. 	<ul style="list-style-type: none"> ▪ no recent or active proposals with WTMA regarding Tully Millstream Dam project ▪ alternative wind generation capacity for region being developed ▪ alternative electricity supply options to region being implemented by Queensland Government
extension of the electricity grid north of the Daintree River <ul style="list-style-type: none"> ▪ should be rejected (nb. ACIUCN may review its position on this matter pending finalisation of the current Futures Study) 	DSC, DME, DCILGPS (MinCon, WTMA, QPWS, EA)	<ul style="list-style-type: none"> ▪ develop consensus on prudent and feasible options to protect World Heritage values (SP) 	<ul style="list-style-type: none"> ▪ Daintree Futures Study seeking alternative solutions to potential biodiversity impacts resulting from realisation of existing urban development potential in Daintree-Cape Tribulation area ▪ Queensland Government has revoked the distribution authority for Ergon Energy north of the Daintree River
tourism activities and developments <ul style="list-style-type: none"> ▪ management of tourism both within the Wet Tropics region in general and within the WTWHA in particular should ensure potential impacts on the WTWHA are properly considered through appropriate strategic planning, impact assessment, impact minimisation and monitoring 	WTMA, QPWS, DNR (TQ, AST, EAA, TTNQ)	<ul style="list-style-type: none"> ▪ develop a Nature Based Tourism Strategy (SP) ▪ develop a Walking Track Strategy (SP) ▪ work with the tourism industry to establish an appropriate tour guides accreditation scheme (SP) ▪ develop a comprehensive Interpretive Strategy (SP) ▪ develop a Code of Conduct for visitor behaviour in consultation with tourism industry (SP) 	<ul style="list-style-type: none"> ▪ completion of Wet Tropics Nature Based Tourism Strategy 2000 ▪ completion of draft Wet Tropics Walking Strategy ▪ QPWS/WTMA/DNR/industry working group established to progress development of WT tourism operation accreditation scheme and integrated tourism permit system ▪ an objective of the WT Marketing Action Plan (under development) is to promote appropriate visitor behaviour within the WTWHA

ATTACHMENT 2

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
climatic change <ul style="list-style-type: none"> ▪ take into account implications of climatic change 	EA (WTMA, Rainforest CRC)	<ul style="list-style-type: none"> ▪ maintain a watching brief on emerging assessments of future impacts (SP) 	<ul style="list-style-type: none"> ▪ current Rainforest CRC modelling research project has relevance to climatic change and potential future implications related to land cover changes

4. Strategic Issues for Future Management

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
Indigenous Interests			
<ul style="list-style-type: none"> ▪ cultural values of area for indigenous people should be formally documented 	EA, EPA, indigenous interests (WTMA, QPWS, DNR)	<ul style="list-style-type: none"> ▪ identify and promote awareness of cultural values (SP) 	<ul style="list-style-type: none"> ▪ under consideration by MinCon and in context of Interim Negotiating Forum
<ul style="list-style-type: none"> ▪ increased indigenous involvement in management negotiated with traditional owners and their representatives 	WTMA, DNR, QPWS MinCon MinCon, (WTMA) WTMA (MinCon)	<ul style="list-style-type: none"> ▪ work with QPWS and DNR to establish consistent protocols and other forms of agreement with Rainforest Aboriginal People (SP) ▪ seek whole of Government approval on non-contentious recommendations in Review of Aboriginal Involvement in Management of Wet Tropics (SP) ▪ progress the Interim Negotiating Forum (INF) as the principal means of achieving resolution of contentious recommendations, including appropriate resourcing support for effective participation of Rainforest Aboriginal People in the INF (SP) 	<ul style="list-style-type: none"> ▪ completion of Review of Aboriginal Involvement in Management of Wet Tropics ▪ interim protocols for involvement of Aboriginal interests in planning in operation ▪ formal WTMP guidelines relating to consultation with Aboriginal interests in relation to permit assessments in operation ▪ non-contentious recommendations of Review endorsed by MinCon ▪ INF negotiator in position approved and preliminary stages of process commenced ▪ support budget provided to Bama Wabu
Boundary Review <ul style="list-style-type: none"> ▪ area be renominated for its cultural values and to take account of any changes to boundaries to increase the integrity of the area 	EA, MinCon, WTMA, (EPA, indigenous interests)	<ul style="list-style-type: none"> ▪ facilitate and support any assessment undertaken of cultural values by the Commonwealth as a first stage of possible World Heritage re-nomination (SP) ▪ assess the need for a comprehensive boundary review, in context of bioregional planning (SP) 	<ul style="list-style-type: none"> ▪ under consideration by MinCon ▪ under consideration by MinCon

ATTACHMENT 2

Recommended Action(s)	Lead agency (and others involved)	Response Report (SP = identified in WTMA Strategic Plan 1998 - 2003)	Current Status
Board and Conservation Interests <ul style="list-style-type: none"> ▪ at least one member of WTMA Board be a person recognised by the conservation movement as a person having conservation expertise 	MinCon (WTMA)		<ul style="list-style-type: none"> ▪ Triennial Board Member appointments under consideration by MinCon

APPENDIX A

WET TROPICS OF QUEENSLAND WORLD HERITAGE AREA - FOCUSED
RECOMMENDATIONS BASED ON THE ACIUCN REPORT

The World Heritage Committee at its meeting in December 1999 requested that IUCN and the State Party provide a detailed and up-to-date state of conservation report for the Wet Tropics of Queensland, including a focused set of recommendations and a plan for their implementation as had been developed for the Great Barrier Reef World Heritage Area. It noted and commended the consultative process involving stakeholders undertaken in arriving at the Great Barrier Reef reports.

On 7 September 2000 the Australian Committee for IUCN (ACIUCN) adopted its report *Wet Tropics of Queensland World Heritage Area: Condition, Management & Threats* during its 42nd Ordinary Meeting.

At the same time, the meeting considered a draft set of focused recommendations. These were arrived at following a clustering analysis of the recommendations contained in the September 2000 report with the aim of identifying recommendations for priority actions. ACIUCN formally adopted the focused recommendations during its 42nd Ordinary Meeting on 7 September 2000.

The analysis identified four priority action areas:

1. Support for Management of the Wet Tropics of Queensland World Heritage Area (*Recommendations 13 and 19 in the ACIUCN Report*)

The Wet Tropics of Queensland World Heritage Area was inscribed on the World Heritage List in September 1988. It is subject to many and changing pressures and interactions of human use which can impact on its complex and incompletely understood ecosystems. The first Wet Tropics Management Plan was not completed until May 1998. Implementation of that plan requires ongoing commitment of expertise and resources.

ACIUCN recommends that the Commonwealth and Queensland governments commit to a strategy, including a revised intergovernmental agreement incorporating a new financial agreement, which will provide and sustain adequate resources to enable the Wet Tropics Management Plan and the Strategic Plan 1998-2003 to be fully implemented. This should be done with particular regard to field management, education, partnership building, research, monitoring, provision and maintenance of facilities and the capacity for strategic analysis and planning such as that required for the review of the Plan in 2003.

2. **Management of Native and Introduced Species** (*Recommendations 2, 3, 4, 10, 17 and 18 in the ACIUCN Report*)

The needs and most appropriate management regimes for management of many native plant and animal species are poorly understood. Matters of concern include optimum fire management strategies and the factors underlying the decline in several frog species.

There is also a need to address the problems caused by exotic plant and animal species, introduced for agricultural or domestic purposes, which have now become weed, feral or invasive species threatening native plant and animal communities.

ACIUCN recommends that substantial effort be applied to research, education, partnership building, and planning to address the protection of native vegetation, the management of fire, the control of current feral and exotic species and the management of the introduction of species in order to minimise the risk of impacts on native flora and fauna and to identify and address the threats to sensitive native species.

3. **Management of Land Use and Human Impacts Within and Beyond the Boundaries of the Wet Tropics of Queensland World Heritage Area** (*Recommendations 5, 6, 7, 8, 9, 11, 12 and 15 in the ACIUCN Report*)

Long term protection of the Wet Tropics of Queensland World Heritage Area and its associated values depends on containing and minimising the impacts of human use and activity upon the native flora, fauna and ecological processes. The provision of services for human use and access can have significant adverse impacts.

There is concern at the potential for ecological damage within the area as a result of provision of roads and electricity, the extraction of water, the development of facilities for tourism and the effects of climate change and global warming. There is also concern that inappropriate management of lands and crop species in the region but outside the area have the potential to create adverse impacts within the Wet Tropics of Queensland World Heritage Area and the adjoining Great Barrier Reef World Heritage Area.

ACIUCN recommends that management of land use and the provision of services for residential, urban, industrial and tourism developments be subject to full environmental assessment, impact minimisation and monitoring, taking into account the implications of climate change. The design for such facilities should be required to avoid and address fragmentation of habitat of native species through the fullest use of measures including strategic land acquisition.

ACIUCN reiterates policies adopted at earlier meetings which call for the rejection of proposals to construct the Tully Millstream Dam and to extend the electricity grid north of the Daintree River but recognises that it may be appropriate to review its position on mains power north of the Daintree when the Daintree Futures Study (which seeks to secure a sustainable future for the Daintree coastal region) is finalised.

4. Strategic Issues for Future Management (*Recommendations 1, 14 and 16 in the ACIUCN Report*)

The current Strategic Plan covers the period 1998 – 2003 and identifies the need to review the boundaries of the Wet Tropics of Queensland World Heritage Area. The principal objective of such a review should be to increase the integrity of the world heritage area. Since the area was inscribed, greater understanding has developed of the cultural values of the area, the need for greater indigenous involvement in the management of the area and the factors affecting the integrity of the boundaries for several distinctive species.

ACIUCN recommends that the cultural values of the area for indigenous people should be formally documented and that there should be increased indigenous involvement in management negotiated with traditional owners and their representatives.

ACIUCN also recommends that the area be renominated for its cultural values and to take account of any changes to boundaries to increase the integrity of the area which may arise from the boundary review.

ACIUCN further recommends that at least one member of the Board of the Wet Tropics Management Authority be a person recognised by the conservation movement as a person having conservation expertise.