

World Heritage Sites

Protected Areas and World Heritage



WET TROPICS OF QUEENSLAND AUSTRALIA

The wet tropical rainforests of northeast Queensland are of outstanding scientific importance for the concentration, diversity and endemism of their primitive Gondwanan flora, which records eight major stages in the earth's evolution during 35 million years of isolation. It has numerous rare, threatened and endangered species and the only recognised Aboriginal rainforest culture in Australia. It has great natural beauty from mountain peaks to mangrove forests, the country's highest waterfall, finest gorge scenery and a unique combination of rainforest with sandy beaches and coral reefs.

COUNTRY

Australia

NAME

Wet Tropics of Queensland

NATURAL WORLD HERITAGE SERIAL SITE

1988: Inscribed on the World Heritage List under Natural Criteria vii, viii, ix and x.

The site incorporates 19 national parks, 31 state forests (or parts of state forests), 5 timber reserves and 1 Aboriginal and Islander reserve.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]

IUCN MANAGEMENT CATEGORY

II National Parks

State forests and timber reserves: Unassigned

BIOGEOGRAPHICAL PROVINCE

Queensland Coastal (6.1.21)

GEOGRAPHICAL LOCATION

The area extends 3,125km along the northeast coast of Queensland paralleling the Great Barrier Reef from just south of Cooktown to just north of Townsville, between 15°39' to 19°17'S & 144°58' to 146°27'E.

DATES AND HISTORY OF ESTABLISHMENT

1892: Yarrabah Aboriginal and Islander Reserve created;

1921: Bellenden Ker National Park gazetted, managed by the Queensland Forestry Department;

1966: A National Park proposed to save especially the lowland rainforests from destruction by logging;

1975: Queensland National Parks and Wildlife Service created;

1993: Wet Tropics World Heritage Protection and Management Act passed, creating the Wet Tropics Management Authority (WTMA); 1998: the Wet Tropics Management Plan gazetted.

LAND TENURE

The site is in public ownership except for 17,000ha of private freehold. It comprises 574,217ha in National Parks, 76,025.6ha in Forest Reserves and State Forests, 69,765ha in timber reserves, and 94,808.5ha of leasehold and vacant federal lands used mostly by the defence forces (WTMA, 2004). The various tenures (freehold, leasehold, unallocated state land, state forest, timber reserve and national parks) are not altered by World Heritage status. The site falls within the jurisdiction of 14 local government authorities and some 80% of the site may also be subject to native title rights.

AREA

894,420ha. The area is bordered by the northern third of the Great Barrier Reef World Heritage site.

ALTITUDE

Ranges from sea-level to highlands at 600-900m with isolated peaks up to 1,622m (Mt Bartle Frere).

PHYSICAL FEATURES

The rainforest of northern Queensland straddles three major regions: the tablelands of the Great Divide, the Great Escarpment to their east, and the coastal plain. The tablelands are the undulating remnants of a warped elevated landscape scarred by vulcanism and characterised by scoria cones, lava cones and irregularly distributed maars the youngest of which are filled by Lakes Eacham and Barrine. They average 600-900m but rise to over 1,600m in Mt. Bartle Frere, the highest mountain in northern Australia. The Great Escarpment to the east retreated to its present position as the result of catastrophic erosion. It marks the limit of headward erosion of the tablelands above the coastal plain and is breached only by basalt flows, as in the Johnstone River system. It forms a belt of rugged topography, with rapid and ongoing geomorphological processes, varied environments, deeply incised gorges and numerous waterfalls; Wallaman Falls has the longest single drop (278m) of any waterfall in Australia. The plain is characterised by several steps where coastal submergence and retreats have led to river capture and the reversal of stream flow to the east.

The geological history can be divided into three phases: the formation in Palaeozoic times of a continental basement; initiation of northwest trending drainage in the Mesozoic; and intensified doming to the east about 50 million years ago when Australia began to separate from Antarctica and move north. By the late Tertiary the new continental margin had foundered, causing the coast to retreat to its present position. During the whole period since the time when the angiosperms evolved, the ancient continental landscape remained tectonically stable. Most of the underlying slates, greywacke and greenschist facies are marine Silurian, Devonian and Carboniferous sediments of the Hodgkinson basin and Broken River embayment, the largely schist and gneiss Barnard metamorphics outcropping in the south-east of the basin. The greatest concentrations of volcanics and granite occur at the southern end of the basin where it meets the embayment. The tablelands and some coastal areas were greatly disturbed by basalt flows throughout the Pliocene and Pleistocene.

The soils derive from a wide range of parent rocks, alluvia and rainfall gradients. The parent materials consist of acid igneous rocks, low-grade metamorphics, basalt, and alluvium derived from these. The alluvium of larger streams is of mixed origin; that of smaller streams may be from a single source. The oldest metamorphic rocks break down to moderately deep medium-textured red or yellow loams; granite rocks and acid volcanics to deeper red podzolic soils and xanthozems; and basalts to deep to very deep krasnozems. The high nutrient level of the basalt soils may have helped the rainforest to resist stress during the fluctuating climatic conditions of the Pleistocene glaciations (RCSQ, 1986). Moisture is the predominant influence on the coastal plains. As the drainage becomes poorer the soils change from gleyed podzols to humic gleys and acid peats. As usual with heavily leached soils of the wet tropics, most have extremely low contents of exchangeable calcium, magnesium and potassium, usually relatively high amounts of extractable aluminium and are poor in humus. Erosion can occur even under undisturbed rainforest (RCSQ, 1986).

Fringing reefs occur in the northern section of the region and are most extensively developed between the Daintree and Bloomfield rivers. The closeness of association between coastal rainforest, sand beach and

fringing coral reef which occurs off Cape Tribulation is unique in Australia, and a rare combination world-wide (RCSQ, 1986). The reefs form the northern two fifths of the Great Barrier Reef World Heritage Site.

CLIMATE

The wetter parts of north-east Queensland are classed as wet to extreme wet on a global scale, with very high rainfall concentrated over the four-months of summer with a relatively dry winter. Widespread overland run-off, even on steep slopes, results from the intense rainfall onto saturated soils which is a common phenomenon not usual in other wet tropical rainforests. The mean annual rainfall ranges from 4,000mm near the coast to 1,200mm in the west, 75-90% falling between December and March. It is much higher on the mountain ranges, with an average of 8,529mm recorded on the summit of Mt Bellenden Ker (Bonnell *et al.*, 1983; WWF, 2001). Mean daily temperatures range from a maximum of 31°C to a minimum of 23°C on the coast, and are about 5°C lower in winter. The tablelands and uplands are cooler: mean daily temperatures range from a maximum of 28°C to a minimum of 17°C in summer and from 22°C to 9°C in winter. Coastal humidity averages 78% in summer but often reaches into the high nineties (DASETT, 1987). The coasts are also subject to strong tropical cyclones.

VEGETATION

The rainforests of Queensland's Wet Tropics are the remnants of a vegetation type once much more widespread, containing relicts from East Gondwanan forests which grew before Australia separated from Antarctica between approximately 53 to 45 million years ago, when much of the land mass was covered by closed forest. Since Australia was totally isolated for 35 million years these refugial forests preserve an almost complete record of eight major stages in the evolution of land plants and also of the mixing of flora and fauna which followed the collision of the Australian and Asian continental plates about 15 million years ago. They include representative species of the earliest clubmosses and ferns from the mid Palaeozoic 415 million years ago: the first seed-bearing cycads and conifers which succeeded them 80 million years later: the Araucariaceae, (5 spp.), Podocarpaceae (7 spp.), and Casuarinaceae (1 sp.); and the first angiosperms from some 200 million years ago, including 10 of the world's 19 most primitive angiosperm families, two being found only in the region: this is the world's highest concentration of such families, though several are small and virtually extinct. There are also hundreds of species from the great explosion of flowering plants which followed the Cretaceous-Tertiary extinction, perhaps because East Gondwana was relatively less affected by the event. As Antarctica iced over, and the Australian plate became more arid, its drift towards the tropics preserved the primitive life forms, animal as well as plant, in the equable climate of this northernmost extension, even during the Pleistocene glaciations. Sclerophylly, now dominant across Australia, developed in mid to late Miocene rainforests in early Tertiary rainforests and drought-adaptations developed in the mid to late Miocene in response to the growing aridity and infertile soils (Goosem, 2002).

These great forests now form a 6,000 kilometre discontinuous chain reaching from northern Australia down the east coast to Tasmania with the Wet Tropics site comprising almost half of that biogeographic region. That ecosystem has smaller outliers to the south: one extends from the Whitsunday Islands down to Carmila, and the smallest includes the Warginburra Peninsula and parts of the Normanby Range (WWF, 2001). The Wet Tropics can be described as an archipelago of mesothermic islands separated by dry or warm barriers. Many species were isolated in separate upland refugia where speciation was accelerated as the altitudinal gradient within local centres of endemism allowed for mobility of refugia as climates changed. Overall, about 710 species of Australian endemics are found only there. Due to this diversity of its landscape and the latitudinal gradient, the area supports a range of tropical, subtropical, temperate and monsoonal rainforest types found together nowhere else in Australia: 2,845 species of vascular plants have been recorded in 1,037 genera and 221 families, 75 of the genera being endemic to Australia and 50 restricted to the Queensland Wet Tropics (Goosem, 2002). There is much higher diversity at generic than at species level, with 340 genera represented by only one species. Of the 43 monotypic genera recorded to 1986, 28 were locally endemic (RCSQ, 1986). The conservation status and distribution of rare and threatened plants is summarised in DASETT (1987); in 2002, 351 species were officially rare or threatened: 42 plants were endangered and 54 vulnerable; 255 more were considered rare or threatened (WTMA, 2002) and 23% of its plant species are endemic. However, some important lowland centres of plant endemism, very depleted ecosystems and habitats critical for several endangered species are not protected. Most of the region's lowland and basalt tableland forest cover has been cleared for farms, and

large parts of the property have been selectively logged. As late as 2001 2,000 ha of rainforests of the region were still being cleared every year (WWF, 2001).

The predominant resulting wet tropical rainforest fringed and intermixed with sclerophyll forest, woodland and mangrove swamps. is floristically and structurally the most diverse rainforest in Australia. It includes 16 major structural types, further classified into 30 broad communities based on the area's range of climates and soils (WWF, 2001). On the coastal plain these range from the dominant wet lowland rainforest with mesophyll vine, fan palm, and coastal *Melaleuca* forests on waterlogged soils to very wet rainforests on sand containing rare species, intergrading with mangrove swamps. On the higher tableland, both wet and dry forests grow and its dry western edge has tall open wet sclerophyll forest and dry sclerophyll woodland. On the mountains both montane and sub-montane forest grow, with microphyll vines and a huge range of ferns, resembling temperate forest. Much of the lowland forest and basalt tablelands have been converted to farmland and much of the rest has been selectively logged. Where annual rainfall is less than 1,500mm, rainforest is restricted to alluvial soils along streams and sheltered gullies on south-facing slopes. Where soil and rainfall are not limiting, fire becomes the principal factor influencing both rainforest and eucalypt woodland (WWF, 2001).

In greater detail the main lowland forest types are: 1) The dominant wet lowland rainforest with multi-storeyed vines on rich soils in warmer wetter areas. 2) Contrasting remnant stands of complex mesophyll vine forest on basalt-derived soils in the wet lowlands between Innisfail and Cape Tribulation; this type is considered closest to the humid tropical lowland forests of south-east Asia. 3) The striking endemic fan palm *Licuala ramsayi* rainforest now restricted to small patches on poorly drained lowland soils mostly cleared for sugar-cane farming: little more than 500 ha remain mainly within the Yarrabah Aboriginal Reserve with very little protected within a national park. 4) Coastal paperbark *Melaleuca* forest on poorly drained lowland coasts where the water table is near to or above ground level for most of the year, as at the mouth of the Daintree River (Tracey, 1982). Characteristic species in *Melaleuca* communities include the epiphytes *Dischidia* and *Hydrophytum* and the tea tree orchid *Dendrobium canaliculatum*. The understorey is mostly sedges. 5) Very wet notophyll vine rainforests on sand containing rare species, intergrade with mangroves, with many species at the interface including *Diospyros littorea*, which occurs only on the landward side of mangroves; also *Storkiella australiensis* and *Noahdendron nicholasii*, restricted to the Cape Tribulation area, and *Idiospermum australiense* and *Lindsayomyrtus brachyandrus* which are disjunctly distributed in the Cape Tribulation and the Harveys Creek-Russell River areas (DASETT, 1987). 6) Mangrove swamps with 29 species of trees and shrubs, comparable in diversity to those of New Guinea and South-east Asia, which are some of the richest mangrove swamps in the world. The highest diversity lies between Ingham and Innisfail (Galloway, 1982). The commonest genera are *Rhizophora* and *Bruguiera*, with *Ceriops* in some areas (Dowling & McDonald, 1982). The mangrove swamps are rich in salt marsh plants and epiphytes, the latter including the ant plant *Myrmecodia beccarii*.

The main upland forest types are: 7) wet vine forests where *Lomatia fraxinifolia*, *Darlingia darlingiana* and *Cardwellia sublimis* are widespread but *Sphalmium racemosum* and *Stenocarpus davalloides* are restricted to the Mt Carbine tableland in the north. One of the world's largest cycads grows there as well as one of the smallest. 8) Dry forests of *Eucalyptus* spp. on infertile basalt soils. 9) A narrow strip of tall open wet sclerophyll forest, which lines the rainforest, on its western edge. The sharp contrast in structure between these two forest types is unique to Australia, The strip of open forest, dominated by flooded gum *Eucalyptus grandis*, is crucial for the conservation of the northern populations of three mammals which are restricted to it. 10) Medium and low sclerophyll woodlands growing alongside these on infertile soils are predominantly species of *Eucalyptus*, *Acacia* and *Casuarina*, *Lophostemon suaveolens* and *Syncarpia glomulifera*. This forest type, widespread in Australia, is found along the western edge, in the Daintree Valley system and on the western slopes of the upper Mulgrave Valley. 11) Sub-montane fern forests: the richest concentrations of ferns and their allies in Australia are found in the region. 240 species are recorded in the rainforests, 46 being restricted to the area and some 17 to single locations. *Pteridoblechnum acuminatum* on Mt Spurgeon and Mossman Gorge and the widely distributed *P. neglectum* are a local endemic fern genus (RCSQ, 1986). 12) Montane forests with microphyll vines and ferns at higher wetter altitudes, resembling temperate forest. On the slopes and summits of the high peaks vine fern forests, hanging mosses and thickets grow where the low dense canopy shows the streamlining effect of persistent strong winds. Localised endemism is high, with floristic differences between the microphyll vine fern forests of the Bellenden Ker Range and those of the Mt Lewis and Mt Spurgeon. This

rainforest type is restricted to a few small sites on exposed mountain tops in tropical Australia, all within the region, but has affinities with Australian temperate rainforests at higher latitudes and with montane rainforests in New Guinea and Indonesia.

The area is important for the conservation of Australian members of the Proteaceae, ancestors of several major Australian sclerophylls: 29 genera and over 40 species are locally endemic, including *Placospermum coriaceum*, one of the most primitive members of the family (Johnson & Briggs, 1975). The rainforests have a rich orchid flora of some 150 species, 59 of which have a restricted distribution, and 43 an extremely small range. Of more than 260 species of ferns recorded in these rainforests (64% of the country's total), 46 are entirely restricted to the area and some 17 species confined to single locations. Of the five Australian endemic genera, four are present: *Coveniella*, *Neurosania*, *Pteridoblechnum* and *Platyzoma* (RCSQ, 1986) and of the four cycad families, three are present: Boweniaceae, Cycadaceae and Zamiaceae, with 8 species (21% of Australia's cycads), including one of the world's largest cycads, *Lepidozamia hopei*, which may grow to 20m, and one of the smallest, the locally endemic bipinnate zamia fern *Bowenia spectabilis* which is common in the understorey of rainforest-associated communities. There are also 15 species of conifer, 37% of Australia's total (Goosem, 2002).

FAUNA

All of Australia's marsupials and most of its other native animals originated in rainforests, of which the Wet Tropics is the most complete surviving remnant. Its fauna is rich despite the area being only some 0.26% of Australia's surface, partly because the relict flora has been accompanied by a relict fauna, and partly due to collision about 15 million years ago with the Asian plate. The site contains 35% of Australia's mammals, 30% of its marsupials, 58% of bats, 40% of birds, 29% of frogs, 20% of reptiles 42% of its freshwater fish, and 58% of its butterflies. Some 70 species of vertebrates are unique to the area. 82 are officially rare or threatened, with 13 classified as globally endangered and 18 as vulnerable. In species diversity and endemism, no fauna in Australia is richer than this tropical rainforest (Goosem, 2002). 12% of the region's mammals, 21% of its reptiles, 40% of its frogs and 10% of its freshwater fish are endemic.

The 110 mammal species include 2 monotremes, 41 marsupials, 15 rodents and 36 bats (DASETT, 1987). Diversity is highest in the rainforest but is also high in rocky outcrop habitats. Of 672 terrestrial vertebrate species (32% of the continent's), 264 are rainforest species and 227 inhabit the wet sclerophyll forest. Endemism is high with 13 species in the rainforest. These include an antechinus Atherton antechinus *Antechinus godmani*, four ringtail possums, lemuroid ringtail possum, *Hemibelideus lemuroides*, green ringtail possum *Pseudochirops archeri*, Herbert River ringtail possum *Pseudochirulus herbertensis* and Daintree River ringtail possum *P.cinereus*, the mahogany glider, *Petaurus gracilis* (EN), the musky rat-kangaroo *Hypsiprymnodon moschatus* which is the smallest and in many ways the most primitive of the macropods, Australia's only two tree-kangaroos, the boongary *Dendrolagus lumholtzi* and Bennett's tree-kangaroo, *D. benettianus*, the northern bettong *Bettongia tropica* (EN) and one rodent, the pygmy white-tailed rat *Uromys hadrourus* (VU). The very restricted distributions of the antechinus and masked rat have been used to define two centres of endemism for flightless mammals within the area, northern and southern. There are also at least eight subspecies of mammals restricted to the region (Werren 1993). Several species of mammals are isolated from the major occurrence of the species, in two cases by over 2,000 km. One of these isolated species, the spotted-tailed quoll *Dasyurus maculatus*, is one of the largest and most ferocious of the carnivorous marsupials. Of the 36 species of bats, nine are Australian endemics and one is locally endemic, the insectivorous flute-nosed bat *Murina florium*. Three species of mammals are restricted to the tall open forest: yellow-bellied glider *Petaurus australis*, brush-tailed bettong *Bettongia penicillata* (CR) and swamp rat *Rattus lutreolus* (Winter *et al.*, 1984).

The avifauna of the rainforests of northern Queensland is the most diverse in Australia. More than 314 species (of the 370 species recorded from all habitat types of the ecoregion) are known, of which 112 species inhabit principally the closed forests, including mangroves (DASETT, 1987). Twenty-three species are either endemic to the region or have their Australian distributions largely confined to the area (Winter *et al.*, 1984). Nine of the 13 endemic species are confined to upland rainforests. These include the tooth-billed bowerbird *Scenopoeetes dentirostris*, golden bowerbird *Prionodura newtoniana*, bridled honeyeater *Lichenostomus frenatus*, fernwren *Oreoscopus gutturalis*, Atherton scrubwren *Sericornis keri*, mountain thornbill *Acanthiza katherina*, grey-headed robin *Heteromyias albispecularis*, northern logrunner or chowchilla *Orthonyx spaldingii* and Bower's shrikethrush *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 macleayanus*, Victoria's riflebird *Ptiloris victoriae* and the pied monarch *Arses kaupi*. The flightless southern cassowary *Casuarius casuarius johnsoni* (VU) is notable as one of the largest birds in the world, one of only three species of cassowary in the world found in Australia and is important for distributing the seeds of large-fruited plants.

The Wet Tropics contains the most diverse rainforest frog fauna in Australia with very high regional endemism particularly between 600m and 1,000m where the climate is relatively cool and commonly moist. There are 58 frog species in the region, 24 of which are regional endemics. Some species are regarded as rare such as the armoured mistfrog *Litoria lorica* (CR), the northern tinker frog *Taudactylus rheophilus* (CR), a representative of a primitive endemic genus, and the neglected, buzzing, scanty, inelegant, ornate and clicking rainforest frogs: *Cophixalus neglectus* (EN), *C. bombiens*, *C. exiguus*, *C. infacetus*, *C. ornatus*, and *C. hosmeri*, (Covacevich & McDonald, 1984). Of the 151 species of reptiles, 20 are restricted to the region. Several species, such as chameleon gecko *Carphodactylus laevis* and northern leaf-tailed gecko *Saltuarius cornutus*, have primitive characteristics. The skinks are particularly diverse group, with 54 species within the area (DASETT, 1987). 16 species are rare and very restricted, including the Bartle Frere skink *Leiolopisma jigurru*, which is found in the cool montane habitat near the summit of Mt Bartle Frere. This is the first record of a temperate relict species among the vertebrates of the area (Covacevich, 1984).

A recent survey of five sites along a 10km transect yielded over 5,000 species of insects and over 300 species of spiders (Monteith & Davies, 1984). The study indicated a high diversity of insects, but low populations for many species. Of particular biogeographic interest is the insect fauna preserved in the cool moist upland rainforests of the area. The present distribution of its insect fauna suggests an origin predating the separation of Australia, New Zealand and New Caledonia. There are many primitive relict species that are isolated from their nearest relatives by at least 1,500km. One species, the large stag beetle *Sphaenognathus queenslandicus*, which is found only on Mt Lewis and Mt Windsor Tableland, has close relatives only in South America (Moore, 1978). The highly diverse and numerous moth fauna of the area 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 xanthopygus* and *Polyeuta callimorpha* which are only known from several collections. The widespread Hercules moth *Coscinocera hercules*, one of the largest moths in the world with a wingspan up to 25cm, is also present (DASETT, 1987). Butterflies are well represented and include many restricted species such as purple brown eye *Chaetocneme porphyropis*, Australian hedge blue *Udara tenella* and Cairns birdwing *Ornithoptera priamus euphorion*, Australia's largest butterfly.

80 of the approximately 190 freshwater fish species in Australia live in the streams of the Wet Tropics (WTMA 2002) which contain 48 (two-thirds) of the continent's fish genera and 25 of Australia's 35 freshwater fish families (Pusey & Kennard, 1994). To date, nine endemic species have been identified. These include the Cairn's and Lake Eacham rainbowfish *Cairnsichthys rhombosomoides* (VU) and *Melanotaenia eachamensis* (VU), cod *Guyu wujalwujalensis*, catfish *Tandanus* sp., grunTERS *Hephaestus tulliensis*, and the gobies *Glossogobius* sp., *Stiphodon* sp. and *Schismatogobius* sp. Many species are yet to be formally described (Pusey 2001). This extra-ordinary diversity reflects the diversity of stream habitats and the highly variable but predictable seasonal flow rates. Six species of blue crayfish *Euastacus* are restricted to the area. *E. fleckeri* (EN) is found only on Mt Carbine Tableland, *E. robertsi* (CR) on Mt Finnigan and there is an undescribed species on the Bellenden Ker Range and Atherton Tableland. (Goosem, 2002). The highly restricted distribution of these temperate relicts parallels similar distributions among plants and other fauna, reflecting a long history of isolation on these mountain summits (Winter, 1987).

CONSERVATION VALUE

The wet tropics of northeast Queensland is of outstanding scientific importance for its concentration and diversity of primitive flowering plants which record eight major stages in the earth's evolutionary history during 35 million years of isolation which has preserved a high level of endemism. They also encompass the origin and radiation of marsupials and songbirds, mixing of the continental biota of the Australian and Asian continental plates, and the extreme effects of the Pleistocene glacial periods on tropical rainforest

vegetation. The level of endemism is exceptionally high due to the long isolation, having the highest number of endemic genera per unit area after New Caledonia (Webb & Tracey, 1986; Morat *et al.*, 1986). It has great natural beauty, uniquely combining between Daintree River and Cedar Bay tropical rainforest with white sandy beaches and fringing reefs. It contains the highest waterfall and some of the finest gorge scenery in Australia and is the habitat for numerous rare, threatened and endangered species. The only recognised Australian Aboriginal rainforest culture is preserved in the area with an oral prehistory dating back 15,000 years (RCSQ, 1986). The site lies within a WWF Marine Global 200 Eco-region.

CULTURAL HERITAGE

Aboriginal occupation of the area between Cooktown and Cardwell probably dates back to the earliest human occupation of Australia c.40,000 years ago; even its oral pre-history goes back over 15,000 years: one of the recorded stories appears to describe the volcanic activity that produced some crater lakes 10-20,000 years ago. The northern tribes (Barrineans) may have been the first wave of the Aboriginal occupation of Australia, making theirs the world's oldest rainforest culture (DASETT, 1987). This differed markedly from that of most other Australian Aboriginal tribes, with heavy dependence on arboreal skills, use of toxic plants and unique weapons. Major centres of survival of the culture are on Bloomfield River and the upper Murray River. More than 20 distinct tribal groups occupied the area within traditional boundaries using a wide range of forest products, including several toxic plants that required complex treatment to make them safe to eat. Such intensive prehistoric use of toxic food plants is not recorded elsewhere. (Horsfall, 1984).

The area continues to hold great significance for the local Aboriginal communities, who see themselves as rainforest people. Each group has customary obligations for management of their country under Aboriginal law. To them, the Heritage Area is a series of complex living cultural landscapes where the natural features are interwoven with their religion, spiritual life, economic uses (food, medicines and tools), social and moral organisation. Their hunting and gathering within the site remains a legal right, though logging does not. 80% of the property is potentially claimable under the Native Title Act of 1993 and 16 native title claims have been logged. The Wet Tropics Natural Resource Management Board and Traditional Owners have indicated support for a renomination of the WHA based on cultural values. A detailed summary of the history of Aboriginal occupation is given in RCSQ (1986).

LOCAL HUMAN POPULATION

The first European to explore the wet tropics of Queensland was Edmund Kennedy in 1848. Later exploratory forays, were by G. Dalrymple in 1873, pioneering graziers and by loggers felling red cedar *Toona australis* who worked up the coast to the Daintree and Mossman Rivers by 1875. Tin mining began in the 1880s and the lowland rainforest was progressively cleared for sugar cane plantations along the entire northern coast to beyond Cooktown. The economy of the region has remained almost entirely dependent on primary production, though tourism has grown steadily since the 1950s (DASETT, 1987). The region is the most populous part of northern tropical Australia with around half a million residents. There are no urban centres in the site but most of the inhabitants live within 50km of the site's boundaries in the expanding towns of Townsville and Cairns, in small coastal towns and the closely settled farmland of the Atherton Tableland (Wet Tropics Management Authority, WTMA, pers. comm., 1995).

VISITORS AND VISITOR FACILITIES

The annual number of visitors to the region increased from 840,000 in 1985 to 2.4 million visits during the dry season, April to September, and 2.36 million during the wet season in 1995. The figure was predicted to double by 2016. In 2002 the WTMA recorded 4.4 million visitors, 1.76 million being local. Walking, guided tours, nature watching, bush-trekking and swimming are the main activities; also white-water rafting, wildlife spotlighting at night and aerial flights. Commercial tours bring about 1.5 million visitors to the area, with at least 100 tour companies offering trips to the region (WTM A, pers. comm., 1995). Accommodation ranges from luxurious resorts to camps. The main access is from Cairns airport and a cable car links Cairns to Kuranda.

SCIENTIFIC RESEARCH AND FACILITIES

A Co-operative Research Centre for Tropical Rainforest Ecology and Management was set up in August 1993 to assist the Wet Tropics Management Authority (WTMA) to develop appropriate management

responses to the threats and challenges of the site. Participants with the WTMA are the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the James Cook, Queensland and Griffith Universities. A Scientific Advisory Committee identifies and evaluates research needs in all areas of science social, biological and physical, evaluates the effectiveness of management strategies and advises on development proposals and perceived threats. Every six years the Authority provides a Periodic Report to the World Heritage Convention which contains up to date information about Wet Tropics research. In 1995 a range of research projects in six programs involved 84 scientists. They encompassed biodiversity, resource dynamics, socio-economic studies, integrated data exchange, education and technology transfer (WTMA pers. comm., 1995). By 2002, the WTMA periodic report listed over 100 proposed or ongoing research projects and nearly 400 articles and reports on the area within the preceding five years. A long-term WTMA regional vegetation and geology mapping project was due for completion in 2004. Major indicator studies cover environmental impact studies, vegetation mapping and mapping of rainforest dieback. The research and information needs (RAIN) report is regularly produced to inform management of the findings of relevant research. A national Tropical Forest Institute is to be established. (Environment Australia, 2003).

MANAGEMENT

A series of national park proposals designed to protect the full range of the remaining habitats of the Wet Tropics was launched in 1966 by L. Webb in *The Identification and Conservation of Habitat Types in the Wet Tropic Lowlands of North Queensland*, the first scientific reference to the international significance of the lowland rainforests (lands under 1,000m). The proposals were confined to the lowlands because of the extraordinary development pressures placed on them from about 1955 onwards. A strong tradition of opposition developed, backed by the Queensland state government, to the withdrawal of rainforests from commercial exploitation. In 1974 a UNESCO Biosphere Reserve under the Man and the Biosphere programme was suggested but the State government declined to proceed. Clearing for a new Cape Tribulation - Bloomfield road in 1983 was blocked by protesters which drew the Federal government into the debate and in 1986 the Commonwealth established a \$22.5 million National Rainforest Conservation Program though the Queensland Government still refused to participate and supported a massive forest clearing of 42,900ha in the lower Tully River valley. The World Heritage listing of the Wet Tropics of Queensland in 1988 thus occurred after years of campaigns for and against logging the rainforests which were considered to be sustainable by a large section of the regional community which resented the listing because of its impact on the logging industry. Pressure from the Commonwealth government eventually secured the designation.

The main legal instruments for protection of the site are the Queensland Wet Tropics World Heritage Protection and Management Act of 1993, and the Commonwealth Wet Tropics of Queensland World Heritage Area Conservation Act 1994. The two acts were needed because of the strength of the development pressures facing the conservationists. They resupported by five conservation Acts. The management of the World Heritage national parks and the state forests is on three levels. A State-Commonwealth Ministerial Council coordinates policies and funding; the Queensland Department of Environment & Heritage and the Department of Natural Resources manage the day-to-day aspects of the area with timber reserves in the site being managed by the Queensland Department of Primary Industries & Resource Management. The Wet Tropics Management Authority manages the heritage area itself following the Wet Tropics Management Plan, agreed in 1998 with all the local stakeholders. It is responsible for policy and planning, research and monitoring, funding, education and interpretation, involvement of Aboriginal communities and managing threats. It is advised by Community Consultative and Scientific Advisory Committees. It has also established three key stakeholder liaison groups: Landowners and Neighbours Liaison Group, Tourism Industry Liaison Group, and Conservation Liaison Group which provide arenas for the WTMA to seek consensus on major management issues.

Preparation of the Wet Tropics Management Plan started in 1992 and after a long process of relationship building with the regional community, was finally gazetted by the Governor of Queensland in 1998. A Wet Tropics Regional Agreement was also agreed between the WTMA and the indigenous people and a renomination of the area for its cultural values was considered. The WTMA partners the Co-operative Research Centre for Tropical Rainforest Ecology and Management research program which is designed to benefit management of the Area. The Authority funds weed eradication programs and funds state government departments to operate fire management programs in the area. Professional trappers have

worked on a successful pilot feral pig trapping program in the site and adjacent properties (WTMA, pers.comm., 1995). Plans for environmental restoration have included strategic tree planting, re-establishing wildlife corridors, rehabilitation of degraded road verges, and decommissioning of obsolete infrastructure. There have been several projects examining freshwater management and infrastructure planning and dieback outbreaks (Environment Australia, 2003).

WTMA is now a referral agency providing terms of reference for Environmental Impact Statements for developments on properties inside or having a common boundary with the World Heritage Area. In 1994-95, it acquired eight parcels of land in and around the Area, six of which have been gazetted as National Parks with the remaining two vested in the Crown for national park status. These combine a variety of forest types to create a cassowary corridor in the Hull River area at Mission Beach (WTMA, pers. comm., 1995). The Authority has released a *Wet Tropics Nature-Based Tourism Strategy*, a *Wet Tropics Conservation Strategy*, a *Wet Tropics Vertebrate Pest Risk Assessment Scheme* and a *Weed Risk Assessment System*. Reactive Monitoring Reports are made to support the management of the site on the management of native and introduced species and the interaction of land use and human impacts. Each year it is required to report to the Australian and Queensland Parliaments on the health of the World Heritage Area and every six years it provides a Periodic Report to the World Heritage Convention.

MANAGEMENT CONSTRAINTS

The complex tenure and ownership of such a large area extending over 14 jurisdictions, presents many challenges to consistent management. The present national park system is considered inadequate, with less than 5% of many rainforest types protected (Cassells, 1988). These include some of the rarest types, among which the mesophyll vine forest and notophyll vine forest that occur on beach sand are totally unprotected (RSCQ, 1986). Survival of rainforests in state forests and timber reserves is not assured in view of the Department of Forestry's continuing policy of 'sustained yield' logging. For example, Mount Windsor Tableland and Downey Creek, two of the last remaining areas of virgin forests, were logged in the 1980s (Aitken & Leigh, 1987). Although the limited data available from northern Queensland indicate that its rainforests can withstand selective logging without incurring major losses of species or ecosystem instability (Cassells, 1987), there is considerable uncertainty about the reliability of current estimates of sustained yield (Cassells, 1988). And even selective logging disrupts the forests in ways that take decades to heal.

Other threats and risks to the site include pressure on endemic & restricted species, sensitivity to climatic change such as floods, droughts and fire, environmental pests, invasive plants and animals, imported diseases and forest dieback. Some 508 exotic plant species have been identified and 28 naturalised animals, several becoming pests, notably pig, cat and dog (WTMA, 2003). There is invasion of cleared and disturbed forests by *Lantana camara* and tobacco *Solanum mauritianum*, tree deaths caused by the woody vine *Thunbergia grandiflora* introduced from northern India, and outbreaks of soil fungus *Phytophthora cinnamomi* in logged areas, causing patch deaths of trees and shrubs (DASETT, 1987).

The integrity of the region's national parks is not inviolate, as shown by the construction of a highly controversial road through Cape Tribulation National Park, and reports of subsequent illegal logging within that Park. Other areas are threatened by regional population growth with concurrent habitat fragmentation and modification by construction, roads and dams, land clearance, agricultural expansion for sugarcane and altered drainage patterns. Some 1,217 km of public roads and a number of power lines fragment the World Heritage Area and some ten local authorities draw their water supply from within it. A very controversial commercial development, the Skyrail cablecar, was built in 1995. Its effects on the free movement of canopy-dwelling species across the line of the cableway is unknown as are other impacts of tourism in its area. A proposal to augment the hydroelectric facility at Tully Millstream was opposed and rejected, but there exists the potential for similar developments. Continual dialogue and agreement on codes of practice are therefore necessary to preserve the world heritage values of the site.

STAFF

In 2002 there were was a permanent staff of 30 positions in heritage conservation, management planning, community relations and corporate services programmes, supplemented by temporary contract staff. In-house training is routinely given (Environment Australia, 2003).

BUDGET

In 2000-2001 the Authority had a total operating budget of about US\$7,430,000, combining funds provided by the Commonwealth and Queensland governments (WTMA, 2002). In 2004 this included US\$5,343 for in-house training (WTMA, 2004), reflecting the lack of adequate funding. Some funds are raised by the Australian Rainforest Foundation which works to protect and enhance the threatened ecosystem, and raises money from private citizens and corporations to support four major programs.

LOCAL ADDRESSES

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REFERENCES

The principal source for the above information was the original nomination for World Heritage status.

Aitken, S. & Leigh, C. (1987). Queensland's Daintree rain forest at risk. *Ambio* 16: 134-141.

Bonell, M., Gilmour, D. & Cassells, D. (1983). Runoff generation in tropical rainforests of northeast Queensland, Australia, and the implications for land use management. In *Hydrology of Humid Tropical Regions with Particular Reference to the Hydrological Effects of Agriculture and Forestry Practice*. Proceedings of the Hamburg Symposium, August 1983. IAHS Publication No.140.

Cassells, D. (1987). *North Queensland Wet Tropical Rainforests Proposed World Heritage Listing*. Submission to Australian Government. 16 pp.

----- (1988). Appendix 2. Comments on the dispute between the Queensland Government and the Commonwealth Government over the nomination of the Wet Tropical Rainforests for the World Heritage List. *Letter to R. A. Hynes*, Chairman, Northern Rainforests Management Agency, Cairns.

----- Bonell, M., Gilmour, D. & Valentine, P. (1986). *Conservation and Management of Australia's Tropical Rainforests: Local Realities and Global Responsibilities*. Paper prepared for an Ecological Society of Australia Symposium on the Ecology of Australia's Wet Tropics, University of Queensland. 34 pp.

Commonwealth of Australia (1996). *National Strategy for the Conservation of Australia's Biological Diversity*, DEST, Canberra.

Covacevich, J. (1984). A biogeographically significant new species of *Leiolopisma* (Scincidae) from north-eastern Queensland. *Memoirs of the Queensland Museum* 21: 401-411.

----- & McDonald, K. (1984). Frogs and reptiles of tropical and sub-tropical eastern Australian rainforests: distribution patterns and conservation. In Werren, G. & Kershaw, A. (eds), *Australian Rainforest Study*, Vol.3. Proceedings of a workshop on the Past, Present and Future of Australian Rainforests, Griffith University, Brisbane.

Crome, F. & Nix, H. (1991). Birds. pp.55-69 In Nix, H. & Switzer, M. (eds) *Kowari 1: Rainforest Animals: Atlas of Vertebrates Endemic to Australia's Wet Tropics*. Australian National Parks and Wildlife Service, Canberra, Australia.

DASETT (1986). *Nomination of Wet Tropical Rainforests of North-east Australia by the Government of Australia for inclusion in the World Heritage List*. Department of Arts, Sports, the Environment, Tourism and Territories. 31 pp. [Contains a comprehensive bibliography].

Dowling, R. & McDonald, T. (1982). Mangrove communities of Queensland. In Clough, B. (ed.), *Mangrove Ecosystems in Australia: Structure, Function and Management*. Australian Institute of Marine Science, with Australian National University Press, Canberra. pp. 79-94.

Environment Australia. (2002). *Report on the State of Conservation of the Wet Tropics of Queensland*. Australian National Periodic Report on the Application of the World Heritage Convention. Section II. Wet Tropics Management Authority, Cairns, Queensland. [Contains a bibliography of 77 recent references]

----- (2003). *Australia. Wet Tropics of Queensland*. State of Conservation of the World Heritage Properties in the Asia-Pacific Region. Section II. Summary. Wet Tropics Management Authority, Cairns, Queensland.

Frawley, K. (1983). *A History of Forest and Land Management in Queensland with Particular Reference to the North Queensland Rainforest*. Report to the Rainforest Conservation Society of Queensland. 715 pp.

Galloway, R. (1982). Distributions and physiological patterns of Australian mangroves. In Clough, B. (ed.), *Mangrove Ecosystems of Australia: Structure, Function and Management*. Australian Institute of Marine Science, in association with Australian National University Press, Canberra. Pp. 31-54.

Goosem, S. (2002). *Update of Original Wet Tropics of Queensland Nomination Dossier*. Wet Tropics Management Authority. Cairns, Queensland.

----- Morgan, G. & Kemp, J. (1999). Wet Tropics. pp.1-73. In Sattler, S. & Williams, R. (eds). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane,

Harrington, G. & Sanderson, K. (1993). *Vegetation Changes at the Rainforest / Wet Sclerophyll Boundary in the Wet Tropics of North Queensland 1940s - 1990s*. Report to the Wet Tropics Management Authority, Cairns.

Horsfall, N. (1984). The Prehistoric occupation of Australian rainforests. In Werren, G. & Kershaw, A. (eds), *Australian Rainforest Study*, Vol. 3. Proceedings of a workshop on the Past, Present and Future of Australian Rainforests, Griffith University, Brisbane.

IUCN (2007). *The Red List of Threatened Species*. IUCN, Gland, Switzerland / Cambridge, U.K.

Johnson, L. & Briggs, B. (1975). On the Proteaceae - the evolution and classification of a southern family. *Botanical Journal of the Linnean Society* 70: 83-182.

Kikkawa, J. (1982). Ecological association of birds and vegetation structure in wet tropical forests of Australia. *Australian Journal of Ecology* 7: 325-345.

----- (1984). The avifauna of Australian rainforests. In Werren, G. & Kershaw, A. (eds), *Australian Rainforest Study*, Vol.3. Proceedings of a workshop on the Past, Present and Future of Australian Rainforests, Griffith University, Brisbane.

----- (1991). Avifauna of Australian rainforest. In Werren, G. & Kershaw, A. (eds). *The Rainforest Legacy* Volume 2. Australian Government Publishing Service, Canberra. pp. 187-196.

Leigh, J., Boden, R. & Briggs, J. (1984). *Extinct and Endangered Plants of Australia*. McMillan Company of Australia Pty Ltd, Melbourne.

McDonald, K (1992). *Distribution Patterns and Conservation Status of North Queensland Rainforest Frogs*. Conservation report No.1. Queensland Department of Environment & Heritage, Brisbane.

Mackey, B., Nix, H., Stein, J., Cork, S. & Bullen, F. (1989). Assessing the representativeness of the Wet Tropics of Queensland World Heritage Property Australia. *Biological Conservation* 50(1-4): 279-303.

Monteith, G. & Davies, V. (1984). *Preliminary Account of a Survey of Arthropods (Insects and Spiders) Along an Altitudinal Rainforest Transect in Tropical Queensland*. Unpublished report.

- Morat, Ph., Veillon, J-M. & MacKee, H. (1986). Floristic relationships of New Caledonian rainforest phanerogams. *Telopea* 2: 631-679.
- Nix, H. (1991). Biogeography: pattern and process. In Nix, H. & Switzer, M. (eds), *Kowari 1: Rainforest Animals: Atlas of Vertebrates Endemic to Australia's Wet Tropics*. Australian National Parks and Wildlife Service, Canberra, pp. 11-41.
- Pusey, B. & Kennard, M. (1994). *The Freshwater Fish Fauna of the Wet Tropics Region of Northern Queensland*. Report to the Wet Tropics Management Authority, Cairns, Australia.
- Queensland Department of Forestry (1983). *Rainforest Research in North Queensland*. Government Printer, Brisbane. 52 pp.
- Rainforest Conservation Society of Queensland (RCSQ)(1986). *Tropical Rainforests of North Queensland. Their Conservation Significance*. Special Australian Heritage Publication Series No.3. Canberra. 195 pp. [Contains a comprehensive bibliography]
- Saunders, G. (1987). *Conservation - a Case for Co-operation Between Governments*. Paper presented to NADC Annual Conference, Bundaberg, 16-17 October 1987. 7 pp.
- Singh, G., Kershaw, A. & Clark, R. (1981). Quaternary vegetation and fire history in Australia. In Gill, A.M., Groves, R. & Noble, I. (eds), *Fire and the Australian Biota*. Australian Academy of Science, Canberra. Pp. 23-54.
- Sluiter, I. & Kershaw, A. (1982). The nature of Late Tertiary vegetation in Australia. *Alcheringa* 6: 211-222.
- Tracey, J. (1982). *The vegetation of the humid tropical region of north Queensland*. Commonwealth Scientific and Industrial Research Organisation, Melbourne.
- Tracey, J. & Webb, L. (1975). *Vegetation of the Humid Tropical Region of North Queensland (15 maps at 1:100,000 scale + key)*. CSIRO, Indooroopilly.
- Valentine, P. (1983). *Rainforest Recreation: a Review of Experience in Northern Australia*. Paper presented to the Past, Present and Future of Australian Rainforests Workshop, Griffith University, Brisbane. 13 pp.
- Walsh, R. (1980). Runoff processes and models in the humid tropics. *Zeitschrift für Geomorphologie N.F. Suppl.* 36: 176-202.
- Webb, L. (1984). Conservation status of the rainforests of north Queensland. In Werren, G. & Kershaw, A. (eds), *Australian Rainforest Study, Vol.3*. (Proceedings of a workshop on The Past, Present and Future of Australian Rainforests, Griffith University, Brisbane.
- & Tracey, J. (1981a). The rainforests of northern Australia. In Groves, R. (ed.), *Australian Vegetation*. Cambridge University Press, Cambridge. pp. 67-101.
- (1981b). Australian rainforest: patterns and change. In Keast, A. (ed.), *Ecological Biogeography of Australia*. Junk, The Hague. pp. 605-694.
- Werren, G. (2001). *Environmental Weeds of the Wet Tropics Bioregion: Risk Assessment and Priority Ranking*. Rainforest CRC, Cairns, Australia.
- & Kershaw, A. (eds) (1983). *Australian Rainforest Study, Vol.3*. Proceedings of a workshop on the Past, Present and Future of Australian Rainforests, Griffith University, Brisbane.
- Williams, S., Pearson, R. & 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. (1991). Mammals. In Nix, H. & 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.

----- Bell, F., Pahl, L. & Atherton, R. (1984). The Specific Habitats of Selected Northeastern Australian Rainforest Mammals. Mimeographed report to World Wildlife Fund, Sydney.

WTMA (2004). *Annual Report and State of the Wet Tropics Report 2003-2004*. Wet Tropics Management Authority. Cairns.

WWF (2001). *Queensland Tropical Rain Forests* (AAO117). WildWorld report, World Wildlife Fund.

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