

Highland Rainforest of the Wet Tropics



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Highland rainforest is one of the most threatened ecosystems in the Wet Tropics. Its loss would represent not just local extinction — but the loss of irreplaceable evolutionary history and planetary biodiversity.

Highland rainforest is very vulnerable to climate change. As temperatures increase, favourable conditions for highland adapted species retract to higher altitudes, leaving many species with nowhere to go.

The Eastern Forests of Far North Queensland, including the Wet Tropics highland rainforests, are a national priority place for landscape-scale recovery.

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Reference: Williams, S.E, et al, Highland Rainforest of the Wet Tropics - Nomination for EPBC listing as a Threatened Ecological Community, March 2025, Wet Tropics Management Authority
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We acknowledge the traditional custodians of land and sea on which we live and work, and pay our respects to elders past, present and future.

What is highland rainforest?

Highland Rainforest of the Wet Tropics is a unique ecological community that occurs above 800 metres of elevation on mountaintop plateaus and ridgelines.

Often described as tropical montane rainforest or cloud forest, it is shaped by high altitude, persistent cloud cover, mist, high rainfall and lower temperatures than the rest of the Wet Tropics.

These forests rake water from passing clouds, creating moist microclimates that contribute to creeks and river systems and maintain hydrological stability.

This ecosystem represents one of the most ancient, biologically complex, and evolutionarily important forest systems on Earth.

Ecological values

The Highland Rainforests of the Wet Tropics are a global biodiversity hotspot, characterised by:

- Exceptional species richness
- Many endemic species
- High evolutionary distinctiveness
- Ancient Gondwanan lineages
- Complex food webs
- Climate regulation
- Carbon sequestration
- Hydrological stability



Geography

Highland rainforest occurs across mountain systems from Cooktown to Townsville and includes Queensland's highest mountains - Bartle Frere and Bellenden Ker.

These highland systems form cool ecological islands, isolated by surrounding warmer lower lands, creating conditions for evolutionary divergence and species endemism.

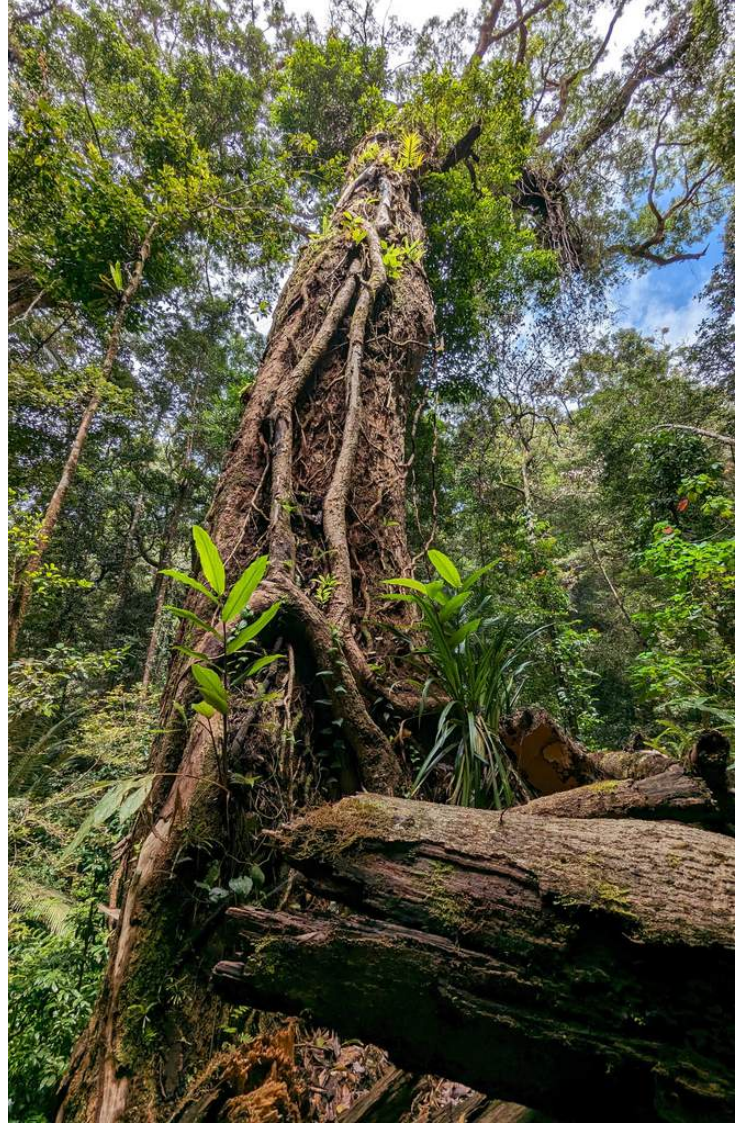
Much of the highland rainforest occurs within the Wet Tropics of Queensland World Heritage Area and national parks. These collectively form one of the most significant conservation landscapes in Australia.

Isolated islands

Much highland rainforest is protected within a network of national parks including:

- Cardwell Range
- Daintree
- Danbulla
- Dinden
- Gadgarra
- Girringun
- Koombooloomba
- Maalan
- Mount Hypipamee
- Mount Lewis
- Mount Spurgeon
- Mount Windsor
- Ngalba-Bulal
- Paluma Range
- Tully Falls
- Wooroonooran

Although highland rainforest in national parks is protected from clearing, it is not immune to some other threats.



Cultural values

For Rainforest Aboriginal Peoples, these landscapes are sacred living systems.

Mountains, peaks, rivers, forests and species are embedded in songlines, creation stories, totemic relationships, traditional ecological knowledge, cultural lore and seasonal calendars.

They remain places of ceremony, teaching and cultural continuity. Important cultural species include the cassowary, tree kangaroos and the rainforest scorpion.

Flora

There are 131 threatened plants species in highland rainforest

Highland rainforests are cool-climate tropical forests with:

- Dense canopies
- Small leaves
- Thick moss growth
- Abundant ferns
- Tree ferns
- Palms
- Orchids
- Lichens
- Vines
- Epiphytes

Canopies range from 10 to 40 metres in height.

In higher zones facing prevailing winds, forests become wind-sheared cloud forests, where trees are stunted, twisted and coated in ferns, orchids, mosses and liverworts.

It is one of the most evolutionarily important forest ecosystems on Earth, containing living representatives of some of the world's oldest surviving flowering plant lineages.

Some plants represent ancient evolutionary lineages, for example the purple kauri which is only found on Wet Tropics mountain-tops, and the Austrobaileya vine which reaches 1,100m above sea level.

Others are simply beautiful, such as the native rhododendron (pictured). Threatened plant species include velvet myrtle, eucryphia and Mt Lewis gossia.

Wet Tropics highland rainforest is as important as the Daintree rainforest.



Mosses

Highland rainforests are draped in lush, vibrant mosses. At elevations above 900 metres, persistent cloud cover, frequent rainfall and high humidity create the perfect conditions for mosses to flourish on almost every surface — from tree trunks and fallen logs to boulders and the forest floor.

These mosses form thick, spongy mats that help retain moisture, stabilise soil and provide critical microhabitats for invertebrates, fungi and tiny frogs.

Many belong to ancient Gondwanan lineages, reflecting the deep evolutionary history of the Wet Tropics' upland forests.

Together with liverworts and filmy ferns, they give the forest its distinctive emerald glow — a living testament to the cool, wet refugia that have sheltered rainforest life here for millions of years.



Wildlife

Highland Rainforest supports a range of unique fauna, many of which are listed as threatened. Some are now considered extinct.

Highland Rainforest fauna includes:

- **Threatened crayfish:** Balan spiny crayfish, Mt. Lewis Spiny Crayfish, Cardwell spiny crayfish.
- **Threatened frogs:** Armored Mist Frog, Mountain-top nursery frog, Mountain Mist Frog.
- **Endemic frogs:** Beautiful nursery frog
- **Endemic reptiles:** Bartle Frere Skink, Bartle Frere bar-sided skink, Mount Elliot Broad-Tailed Gecko.
- **Threatened birds:** Fern wren, Wet tropics brown gerygone, Mountain thornbill.
- **Endemic birds:** Golden Bowerbird, Tooth-billed bowerbird, Grey headed robin.
- **Threatened mammals:** Spotted-tailed quoll, Lemuroid ringtail possum.
- **Endemic mammals:** Green Ringtail Possum, Herbert River ringtail possum, Daintree River ringtail possum.



Mountain top nursery frog

Mountain-top nursery frogs (*Cophixalus monticola*) have a tiny distribution on a few ridge tops.

Their limited distribution means that climate change and global warming are a major threat to their continued existence.

Breeding sites used to be common at 1100m, but these frogs are now moving higher up and are more likely to be located above 1250m.

Feral pigs are also a major threat. Exploding populations are ripping up the forest floor and causing major damage to frog habitat.

Northern spotted quoll

The northern spotted-tailed quoll is restricted to the Wet Tropics upland rainforest and, to a lesser extent, adjacent upland wet sclerophyll forest. Their abundance is higher above 1000 metres, except in the South Johnstone area.

Since the late 19th century, the species has disappeared from Mt Finnigan, Big Tableland, Cardwell Range and Paluma Range, and is now likely absent from most of a former extensive range on the Atherton Tablelands.

The current Wet Tropics population is estimated to be 221 individuals, and is declining. Threats include habitat loss and fragmentation, persecution, roadkill, poisoning from invasive cane toads, competition with introduced predators including feral cats, and climate change.

Researchers have recommended elevating the species from endangered to critically endangered under the EPBC Act.

Highland rainforest birds

Highland rainforest bird populations have declined recently - and significantly.

Lowland bird species are increasing in population and expanding into higher elevations. This uphill movement is increasing competition. Highland birds are becoming less abundant, more isolated, and confined to smaller areas, increasing their risk of extinction.

Rising temperatures due to climate change is the main driver of these changes, with warming benefiting lowland species while negatively affecting cooler-climate highland birds.

Overall, the Wet Tropics bird community is becoming more dominated by widespread lowland species, while unique highland species continue to decline.

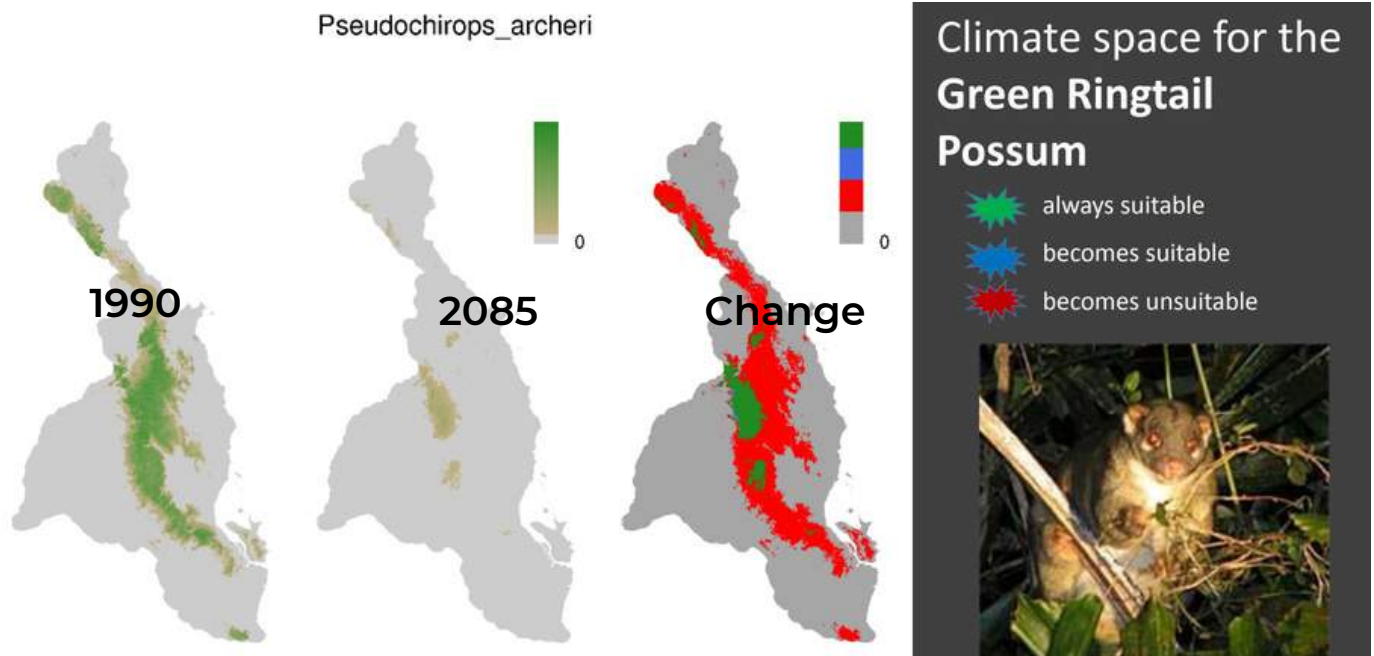


Climate Change and a Shrinking Habitat

Highland rainforests function as long-term climate refugia that enable species to persist and evolve over millions of years.

During past ice ages, species retreated into these cool uplands and survived climatic extremes.

Today, they again serve as refuges for species escaping rising temperatures — making them essential for biodiversity survival under climate change.



Climate change is impacting on highland rainforest causing warming, heat stress and rainfall extremes, and lifting cloud layers that provide vital dry season moisture.

As temperatures rise, species shift upslope. Highland rainforests are shrinking from below as warm-adapted species move upward. This creates the **“escalator to extinction”** effect — where species retract towards mountain summits, with nowhere left to go.

This leads to a reduction in the area of suitable habitat, increased isolation, genetic decline, increased extinction risk and ecosystem instability. Climate change compounds existing threats.



Other threats

- Population fragmentation due to altitudinal isolation
- Invasive animal species - feral cats and pigs
- Frog diseases - chytrid fungus
- Plant diseases - myrtle rust fungus and dieback (phytophthora)
- High biomass grasses on ecotones
- Fire intrusion into fire-free systems
- Lifting cloud base



Chytrid fungus

Chytrid fungus is a microscopic fungal pathogen, *Batrachochytrium dendrobatidis*, that infects amphibians, particularly frogs.

The Wet Tropics was one of the first places in the world where it caused catastrophic frog declines.

It is a major challenge for highland forests.

The species most affected are:

- Mountain Mist-frog (*Litoria nyakalensis*), Sharp-snouted Day-frog (*Taudactylus acutirostris*) and Tinkling Day-frog (*Taudactylus rheophilus*) - presumed extinct
- Armoured Mistfrog (*Litoria lorica*) – thought extinct until rediscovered in 2008 near Mt Spurgeon.
- Waterfall Frog (*Litoria nannotis*) – heavily impacted but surviving in warmer areas e.g. where they can bask in the sun.
- Common Mistfrog (*Litoria rheocola*) – declined sharply in highlands but surviving in lower altitudes.

What's happening to save it?

Some standard solutions for recovering forest ecosystems won't work as well with highland rainforest. For example, creating more habitat through revegetation is limited by land availability on mountain tops.

Activities, currently underway, that support highland forest recovery include:

- Threatened species recovery plans
- Indigenous ranger programs
- Climate monitoring
- Invasive species control
- Disease surveillance
- Habitat restoration
- Species translocations
- Conservation research

Potential future actions

- Listing highland forests as a Threatened Ecological Community
- Revegetation of available cleared areas in climate refugia
- Assisted migration
- Genetic conservation programs
- Climate-adaptive reserve design including landscape-scale connectivity corridors
- Stronger biosecurity laws
- Landscape-scale connectivity corridors
- Long-term biodiversity monitoring
- Indigenous co-governance systems
- Improved biosecurity tools and stronger, more targeted biosecurity management
- Ex-situ conservation such as captive breeding and establishing plants in reserves in suitable climates





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