

Climate Refugia: Lowland Rainforest

What are climate refugia?

Climate refugia are areas where the climate has remained relatively stable for tens of thousands of years, even as conditions changed elsewhere.

These natural havens provide a buffer against extreme climate shifts, helping species and habitats survive through time.

As a result, climate refugia often support a rich diversity of plants and animals – including rare, ancient, and highly localised species – and may even be places where new species evolve.

Protecting these areas is crucial. They are our best chance of continuing to provide refuge from a changing climate.

Lowland rainforest

Lowland tropical rainforest grows in the high-rainfall coastal stretch between Cooktown and Ingham, mostly below 100 metres in elevation. It's an ecosystem that thrives particularly well below 40 metres on rich alluvial and volcanic soils.

These forests are characterised by a diverse mix of tall, evergreen tree species, some rising above the main canopy. Large leaves, buttress roots, vines and palms give the rainforest its lush, layered structure.

A rich variety of wildlife depends on this habitat, including the southern cassowary, striped possum, tree frogs and the vibrant Ulysses butterfly.

More than 70 per cent of the original lowland tropical rainforest has been cleared. Listed as endangered under national environmental law, it is an ecological community of high conservation priority—one that urgently needs protection and restoration.



Where are lowland refugia?

Climate refugia for lowland tropical rainforest exist mainly in the Daintree lowlands and Cairns to Cardwell lowlands. A key highlight is the area between Bellenden Ker and the Malbon Thompson Ranges. The lower slopes of mountains like Bellenden Ker tend to have uniquely moderated microclimates. South of Cardwell, no significant lowland rainforest climate refugia have been identified.

Large permanent waterways are resilient to drying in severe dry seasons and therefore provide some medium-term refuge for adjacent lowland rainforest.

Fire & Flood

Lowland rainforests that remain untouched by fire for long periods are vital refugia for fire-sensitive threatened species. Many rare rainforest plants, including the iconic Idiot Fruit, survive today only because these areas have stayed fire-free. Keeping these refugia protected from fire is essential for their long-term survival.

Some areas, like the upper Mulgrave and Russell Rivers, are naturally protected from fire. Others, such as Ella Bay and Eubenangee, are more vulnerable. Appropriate burning in the surrounding fire-adapted vegetation helps shield these vulnerable forests from wildfire. The Queensland Parks and Wildlife Service (QPWS) is already applying these methods in some locations.

Complex landscapes offer diverse pockets of microclimate during extreme events, allowing species to survive and later recolonise damaged areas. In the Daintree, for example, adjacent valleys host unique watercourse plants. Cyclone Jasper's intense rainfall destroyed some riparian zones completely, while others—with different topography and aspect—were spared.

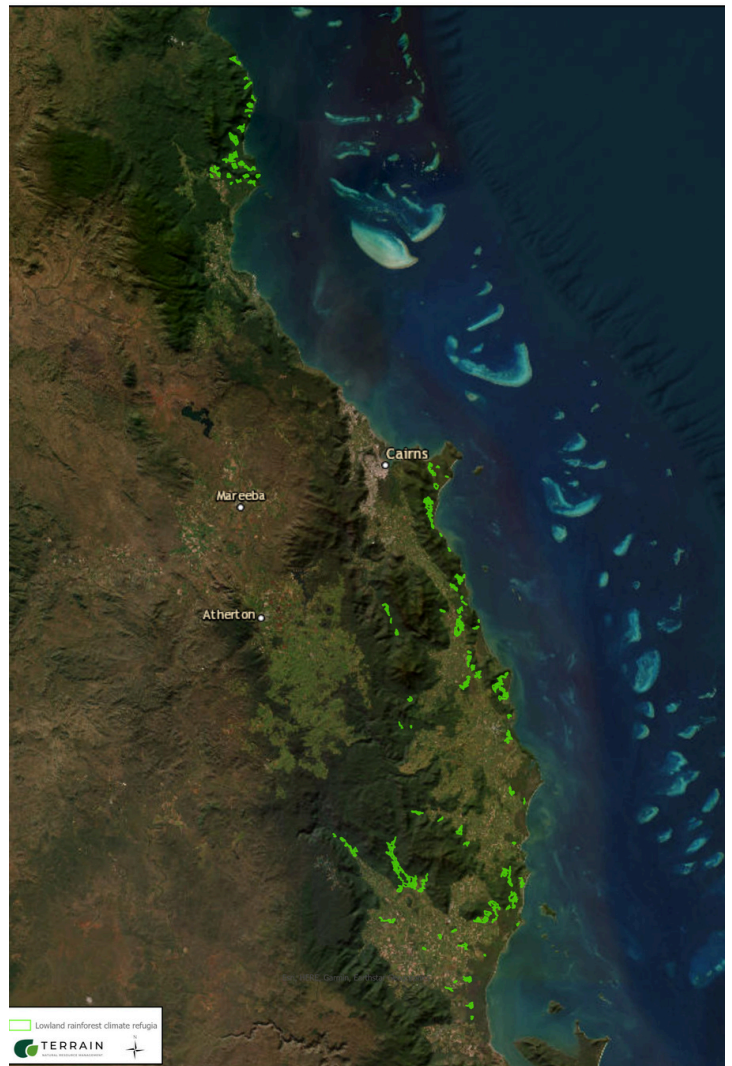
Actions

Climate refugia are a priority for protecting and investing in lowland rainforests. These refugia occur on both public and private land, and willing landholders can play a vital role in their protection and restoration.

Ways to support climate refugia:

- Protect refugia from clearing through conservation agreements
- Control weeds and pests to improve refugia condition
- Undertake revegetation to expand refugia areas
- Manage fire in surrounding areas to prevent it entering the refugia

Efforts can be prioritised in refugia that are most at risk, such as areas with high weed infestations or elevated fire risk.



Climate Change

Lowland rainforest, including climate refugia, may face increasing threats from climate change, such as:

- Extreme temperatures
- Extreme rainfall events
- Intense, slow-moving cyclones
- Sea level rise
- Hotter and more frequent fires

Different species will vary in their ability to adapt. Changes in temperature and rainfall may reduce the nutritional value of fruits and leaves for wildlife. Species that pollinate flowers or disperse seeds, may be compromised, such as the heat-stressed Spectacled Flying-fox.

Over time, the structure and composition of lowland rainforest may change, and fragmented habitats will limit the ability of species to adapt and survive.

*Photo credits: Chris Roach, Dr Martin Cohen, Terry Carmichael
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