

A rare habitat feels the squeeze

Changed fire regimes since European settlement have enabled tropical rainforest in northern Queensland to advance into wet sclerophyll habitat. Peter Trott outlines the ensuing management debate, and the consequences for endemic plants and animals.

Confined between northern Queensland's inland savannas and the rainforests of the Wet Tropics World Heritage Area is a narrow strip of distinctive habitat known as the wet sclerophyll forest. The rough-barked mahogany trees (*Eucalyptus resinifera*) and majestic, silvery-pink rose gums (*E. grandis*) are a spectacular contrast to the tropical rainforest to the east, and the dry sclerophyll savanna woodlands that cover much of the inland to the west.

But due to changes in fire regimes along the 400-kilometre inland margin of the rainforest, the wet sclerophyll, and a number of its endemic inhabitants, are facing a death sentence.





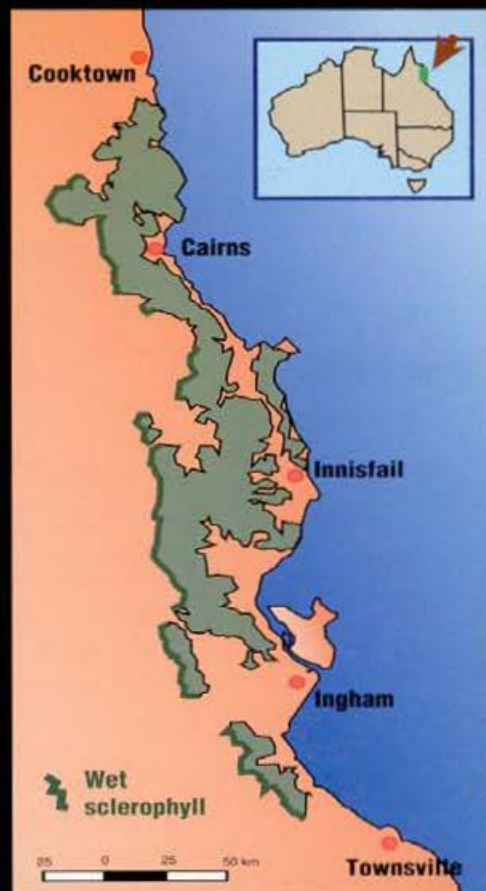
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The yellow-bellied glider (also known as the fluffy glider) is one of the endemic species affected by the advance of rainforest vegetation into wet sclerophyll habitat.



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The tropical bettong. Mycorrhizal truffles – which live symbiotically with most forest tree species – are an important component of the bettong's diet. In turn, the genetic dispersal of mycorrhizae depends on animals such as bettongs that dig up the spore-filled truffles, transporting the spores to other sites. Mycorrhizae extract mineral nutrients from the soil and exchange them for organic nutrients manufactured by the tree in photosynthesis. Scientists at CSIRO's Tropical Forest Research Centre are studying the distribution and dependence of animals in the wet sclerophyll forest habitat



Fire is vital to the regeneration of eucalypts in wet sclerophyll forests. Changes in fire regimes have allowed rainforest species to encroach on this rare habitat.

Top: A stand of *E. grandis* regenerated after fire several years ago.

Above: *E. grandis* regeneration after a hot fire.

Scientists at CSIRO's Tropical Forest Research Centre in Atherton have established that this unique habitat is being marginalised by the encroachment of rainforest. While many people may see expansion of rainforest as a good thing, the process is threatening to drive some endemic mammals to extinction.

Some conservationists would like to see a return to burning regimes like those during Aboriginal occupation of the area. Others believe that deliberate hot fires are an unacceptable intervention in processes which are not fully understood and that the deliberate lighting of fires that kill wildlife is unethical. Another view is that irreversible changes have occurred and the only way lost areas can be recovered would be by massive intervention using an array of management tools, not merely fire.

At stake is the possible survival of several endemic species including the northern race of the yellow-bellied glider or fluffy glider (*Petaurus australis reginae*), the tropical bettong (*Bettongia tropica*), the greater glider (*P. volans*), and existing communities of the red stringybark (*E. resinifera*), mahogany (*Syncarpia glomulifera*), and rose gum (*E. grandis*).

Other animals which may depend on this habitat include a small marsupial carnivore, the brush-tailed phascogale (*Tapoatafa pirata*) and several genetically-isolated populations of birds such as the eastern shrike tit, buff-rumped thornbill, white-naped honeyeater, white-cheeked honeyeater and eastern yellow robin.

The wet sclerophyll is a continuous-canopy forest dominated by tall eucalypts (45-60 m) with a dense grass or shrub understorey. It occurs where high rainfall would support tall rainforest were it not for fire. This area is a discontinuous strip up to 4 km wide along the western margin of the rainforest and covers about 54 000 ha (see map).

Tropical rainforest does not normally carry fire, even during the dry season, and once rainforest becomes established with closed canopy preventing the growth of annual grasses and herbs, this becomes a fire

break. Eucalyptus forest, on the other hand, has evolved under fire regimes which are required for its regeneration. These fires also kill weeds and seedlings of rainforest species whose shade would prevent the germination of eucalypts.

In pre-European times fire was a common occurrence throughout much of Australia, promoted by natural agents such as lightning and by Aborigines. But since European arrival these regimes have been modified to prevent damage to settlements and to maximise the grazing potential of savanna country.

Graziers have restricted fires to times of low temperature and windspeed and to burn frequently so there is no large accumulation of fuel. For this reason the hot, wild fires which periodically burned up to the rainforest edge have been largely prevented and this has allowed the encroachment of rainforest, forming as advancing firebreaks as far as the soil types and rainfall allow.

Scientists and land managers have long noted changes in the composition of forest where fire is excluded or controlled. But only in the past few years has the full extent of replacement of eucalyptus forest by rainforest over the past half century been measured.

Dr Graham Harrington and Keith Sanderson of CSIRO's Tropical Forest Research Centre in Atherton have been systematically comparing aerial photos taken in the 1940s with recent photographs. The process involves working over stereo pairs of photographs, identifying the vegetation and plotting the boundaries of the different forest types and then ground-truthing the data by inspecting sample sites.

The comparisons show that more than half the area of wet sclerophyll forest which had a grassy understorey in 1943 now has a rainforest understorey and most of the wet sclerophyll which had a rainforest understorey in 1943 has now lost its eucalyptus component and become closed rainforest.

While the process of identifying the changes in forest composition over this 50-year period is simplified

Research needed into fire treatments

Rupert Russell, who has spent much of the past 10 years studying the behaviour of fluffy gliders, is anxious about the use of fire to maintain this forest.

Describing himself as a 'philosopher-naturalist' Russell says that deliberate burning is 'a cruelty to the forest', the results of which are largely unknown and unresearched.

He concedes that areas of wet sclerophyll have been overtaken by rainforest. But he cites areas of wet sclerophyll inhabited by fluffy gliders on the Daintree, Windsor Tableland and Tomoulin which he believes to be in no danger of early capture by rainforest.

'Wet sclerophyll may be disappearing due to a set of phenomena of which fire is just one item,' Russell says. 'Rainfall volume and annual distribution patterns, drought frequency, severe frost, grazing pressures, logging and not least, the likelihood that some rainforest

species have evolved to a greater tolerance of occasional droughts and fires, are all factors to consider.'

Fire management is likely to kill den trees and cause fire scarring of viable mature trees which would be killed by subsequent fires. The time of burning is critical in relation to seed fall from the trees and availability of moisture for germination.'

Russell says there is an argument for some detailed research on limited areas to determine the likely outcomes of a range of fire treatments. But until this is done there is insufficient reason to burn in the hope that it will maintain the wet sclerophyll.

'If the wet sclerophyll dies out from North Queensland this will be a sad loss of grand forests and intriguing animals such as the fluffy glider and northern bettong, but it will be a gain for equally grand rainforest trees and animals such as the Lumholtz tree kangaroo and lemuroid ringtail possum,' he says.





Above: *Eucalyptus resinifera*, a yellow-bellied glider feed tree, invaded by rainforest understorey. This tree will eventually become moribund as epiphytes and parasites grow on it and the rainforest matures.

Above left: Wet sclerophyll forest with a typical, grassy understorey.

Left: Wet sclerophyll invaded by species from the rainforest to the east.



by the availability of aerial photos and supporting anecdotal information, the causes of the process are less clear.

Harrington believes there are two likely scenarios. The first is that there is a post-settlement change resulting from fires being less intense than previously and therefore not reaching and killing the advancing front of rainforest.

The second scenario is that the measured changes are part of a long-term oscillation between advance of rainforest and rare, extremely-intense fires under conditions of high temperature and windspeed, low humidity and high fuel load. These would penetrate several hundred metres into the rainforest, reclaiming the area as open forest for a time. The change may not be a result of modern management, but merely part of a long-term swings between eucalypt establishment events after rare fires and intervening periods of rainforest domination.

'The eucalypt trees probably survive much more than 300 years so a fire return time of 100-200 years would maintain the tree population,' Harrington says.

'However, in this scenario, enough

open eucalypt forest habitat must have survived in the past to maintain the yellow-bellied glider, which cannot glide in the cluttered rainforest environment.

'The long term viability of the yellow-bellied glider would depend on its ability to withstand periodic exclusion from parts of its range and recolonise when fire recreates suitable habitat.'

Yellow-bellied gliders are absent from isolated areas of wet sclerophyll forest such as Mt Spec and the Lamb Range which may support the hypothesis relating to infrequent fire and occasional localised loss of glider habitat.

No fire, no wet sclerophyll

Principal conservation officer with the Queensland Department of Environment and Heritage, Peter Stanton, favours the permanent-change hypothesis, noting that catastrophic fires such as occur in southern Australia do not occur in the sclerophyll forests of the wet tropics because the hot part of the year is also the wet season, humidity is never low by southern forest standards and fuel build up never reaches the levels which occur in southern forests.

'It is obvious that unless there is fire in the system, it (the wet-sclerophyll) disappears,' he said.

Stanton has worked in northern forests for the past 35 years including 15 years in the Queensland Forest Service and eight years as regional director of the Queensland National Parks and Wildlife Service. He has been a lone voice in the advocacy of fire in forest management.

Stanton says that some areas of eucalypt forest that have been enveloped by rainforest will never burn under any circumstances.

He says without recognition of the vital role of fire in maintenance of these forests, within 15 years most of the wet sclerophyll will be in a condition that will not allow its regeneration under any natural event.

'It is not a case of playing God,' Stanton says. 'It is a matter of maintaining the status quo. Without that the options will be gone.'

'Aggressive, introduced weeds such as lantana, and the building of roads, powerlines and firebreaks have made the environment a different place, where doing nothing will not return things to their former state. The wet sclerophyll will just disappear and with it any species

which are dependent on it.

'It is a case of the past being irrelevant to the future in terms of management.'

An effective fire management program for the wet sclerophyll forests – most of which are in the World Heritage Area under the control of the Wet Tropics Management Authority – is likely to face widespread hostility, particularly from those who do not realise fire is a normal and essential part of the ecology of much of the Australian landscape.

Stanton says it is paradoxical who are so concerned for these mammals with specialised habitat are unable to understand that fires are essential to their survival.

He says the problems of developing effective fire management for the wet sclerophyll are only partly to do with understanding the ecology: the rest are political. 'It will be a brave person who comes out and drops the first match,' he says.

On one point Stanton agrees with the opponents of burning. He says that in some areas no amount of burning will restore the open forest to its former composition. This is due to factors such as



Tibor Hegedus

Artist Angela Halpin prepares illustrations of the rainforest for a computer game at the Skyrail centre. To the right is one of her illustrations.

Forest secrets to be told

As the opening of Queensland's Skyrail cableway draws near, CSIRO's rainforest display for the interpretive centre at Dean's Lookout is beginning to take shape.

Artists, writers, photographers, builders and model-makers are involved in developing the display. They are working with staff from the Tropical Forest Research Centre at Atherton and Information Services at East Melbourne to reveal some of the hidden features that make the rainforest a unique and exciting place.

In its first year of operation the \$30 million Skyrail cableway is expected to carry more than 250 000 people over the 7.5-kilometre route between the Cairns suburb of Smithfield and Kuranda.

Gondolas will skim over the rainforest canopy, dipping down to two stopping points, the Rainforest Station and Dean's Lookout. Skyrail has erected a \$650 000 interpretive centre building at Dean's Lookout to house the CSIRO display.

Travellers will be able to view the spectacular Barron Falls from a lookout connected to the interpretive centre by a boardwalk. At the centre they will find a display combining interactive computer programs, digital sound recordings, high-quality graphics and life-like items from the rainforest.

Key themes will explain why tropical rainforests are so rich and diverse, and explore the forces and processes affecting the forest ecosystem. The display is due for completion for the opening of Skyrail in August this year.

introduced weed species and management practices carried out on adjacent land.

Gross disturbance such as logging can promote eucalypt regeneration, Stanton says. But this is not an option in the World Heritage Area.

Stanton says that logging – as practised before the closure of these forests by the inclusion of the Wet Tropics on the World Heritage List in 1988 – would have eventually removed all the old hollow trees which provide essential wildlife habitat. He says tree hollows can take 100 to 300 years to develop.

More about the forest

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