



# Using Rainforest Research

## How roads and powerlines impact on rainforest micro-climate

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Roads and powerline corridors are two major forms of human-made linear clearings which traverse the Wet Tropics World Heritage Area (WTWHA) - 1800 kilometres of such linear clearings dissect and fragment the entire region. Having twice their length in edges, management of the impacts of these clearings constitutes a major challenge facing management authorities.

*Edge effects* is the name given to impacts that occur at the rainforest edge or rainforest / clearing interface. They comprise a number of biological and physical changes which interact with each other to result in cumulative impacts on rainforest ecosystems. Changes to ecological processes associated with clearings have repeatedly been shown to extend from 10 to 100m into the adjacent rainforest.

The flora and fauna of tropical rainforests are particularly susceptible to edge effects due to:

- small, extinction-prone populations
- low reproduction rates
- poor recolonising ability in modified habitats
- interactions between species,
- high bias towards habitat specialisation

Edge effect studies conducted in the WTWHA have focused on ecological changes at natural forest gaps and



Roads and powerlines through rainforest create linear barriers where edge effects occur and impact upon the rainforest



remnant rainforest edges, together with impacts of linear clearings as barriers to fauna movements.

### Why examine impacts of linear clearings on microclimate?

Impacts of linear clearings have been identified as a primary concern of resource managers. Microclimate variables such as sunlight, temperature and relative humidity strongly affect the biology of an area. Relationships between microclimate variables and biological processes are complex and respond in unique ways to impacts. It is hypothesised that microclimate and other edge effects may penetrate further into the rainforest interior if linear clearings are very wide, are devoid of vegetation or have no canopy cover over them.

Susan Siegenthaler, a Rainforest CRC student, examined the edge effects of linear clearings on microclimate as part of the Centre's *Impacts of Roads and Powerlines Project*.

### Objectives of the research

The research had two main objectives:

- To quantify the differences in microclimate variables at the rainforest / clearing interface and the forest interior; and
- To estimate the intensity of microclimate edge effects associated with linear clearings of differing widths and degree of canopy cover.

Providing science for the conservation and management of Australia's World Heritage tropical rainforests.



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The Rainforest CRC is a research partnership involving the Commonwealth and Queensland State governments, the Wet Tropics Management Authority, the tourism industry, Aboriginal groups, CSIRO, James Cook University, Griffith University and The University of Queensland

Microclimate variables were measured during wet and dry seasons on three different types of linear clearings:

- Narrow clearing with canopy cover (unsealed single lane road with a closed canopy)
- Slightly wider clearing with no canopy cover (road with grassy verges), and
- Wide clearing with no canopy cover (powerline corridor).

### Impacts on microclimate at the rainforest / clearing interface

Significant findings emerged from the research:

All three linear clearing types exhibited impacts on microclimate variables at the rainforest/clearing interface in comparison with the canopy interior.

Microclimate edge effects were measured to extend up to 50m into the rainforest interior.

Statistically significant differences across wet and dry seasons between the three linear clearing types were also indicated.

Penetration of edge effects in the wet season tended to be lower for air and soil temperatures and higher for sunlight and relative humidity.



Degree of canopy cover over unsealed roads through the rainforest is shown to have a significant bearing on intensity of edge effects

### Does clearing width and degree of canopy cover influence the intensity of microclimate edge effects?

Rainforest adjacent to wide clearings with no canopy cover, such as a powerline corridor, experienced greater intensity and penetration of microclimate edge effects in comparison to rainforest adjacent to narrow clearings with either canopy cover or no canopy cover.

Edge effects on all microclimate variables penetrated further than the edge zone of 0 to 8 metres on the wide clearings with no canopy cover.

Narrow clearings over which canopy cover is maintained experienced lower levels of intensity and penetration of microclimate edge effects than the other two types of linear clearing assessed.

### Management implications

This research has demonstrated that linear clearings produce microclimate edge effects of differing intensities. The degree of microclimate edge effect is influenced by the characteristics of the linear clearing. Maintenance of canopy cover, together with narrow width of linear clearings reduces both the intensity and penetration distance of microclimate edge effects. Other impacts of linear clearings, including the impact of barriers to fauna movements are also reduced through the maintenance of canopy cover.

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