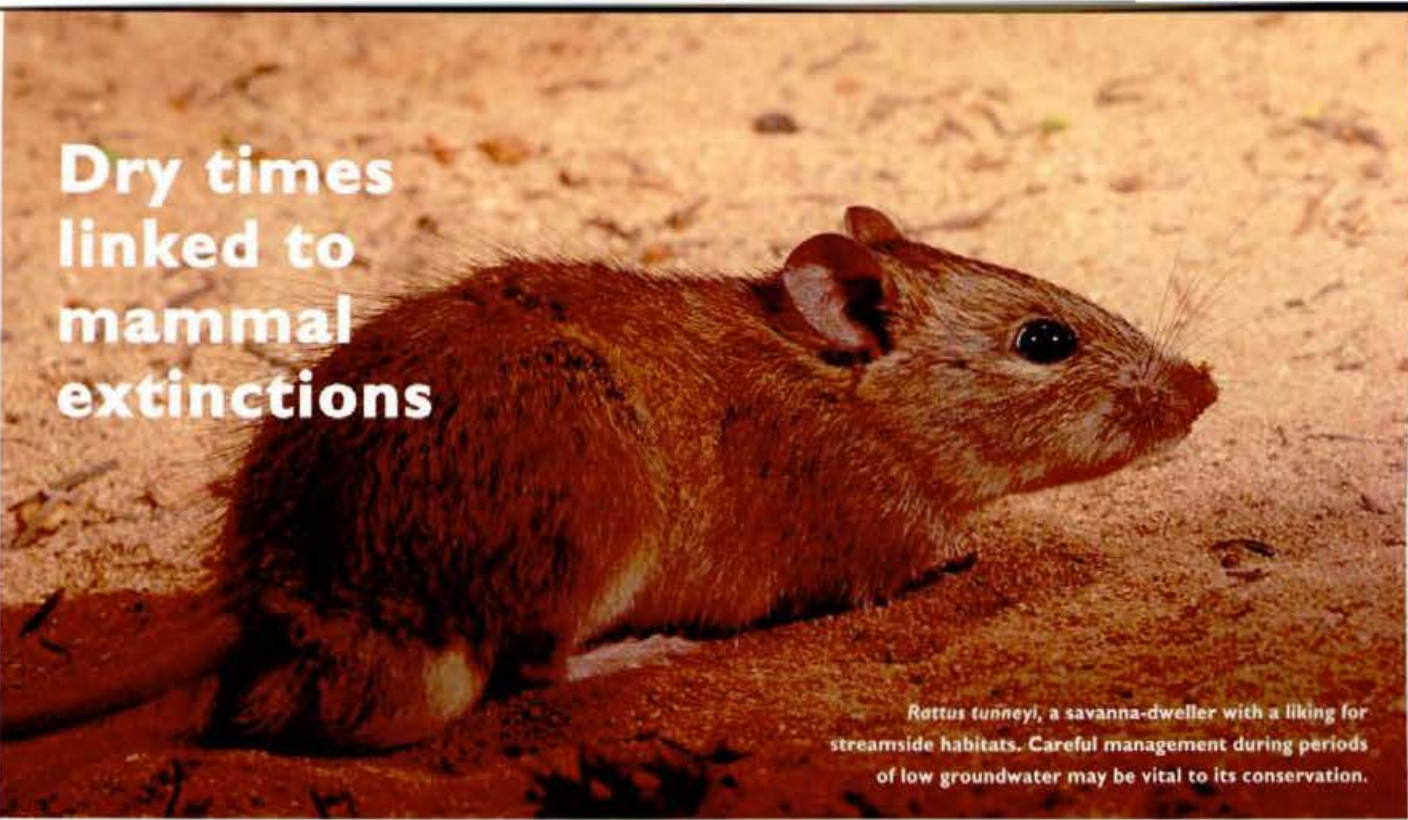


Dry times linked to mammal extinctions



Rattus tunneyi, a savanna-dweller with a liking for streamside habitats. Careful management during periods of low groundwater may be vital to its conservation.

Nearly 20 of Australia's mammal species have gone extinct in the past 200 years, and many others have experienced a substantial loss of range. Efforts to understand this loss traditionally have focused on human activities, such as the introduction of exotic predators, but this may not be the whole story.

A study led by Dick Braithwaite from CSIRO Wildlife and Ecology supports an alternative view that a range of factors, both intrinsic to the pre-settled environment, and human induced, are working in concert. The study examined relationships between populations of small and medium-sized mammals and the availability of permanent water at Kakadu National Park in the Northern Territory.

Northern Australia has not suffered the extensive extinctions of these smaller mammals that have occurred in central and southern Australia since European settlement, and is the last refuge for some species that were once common elsewhere in the country. But there has been a recent decline in populations of some of these animals, even in relatively pristine protected areas. During the same period, many waterholes have dried up and the previous strong association of mammals with riparian (streamside) vegetation has diminished.

To investigate these links, Braithwaite and his team analysed historical and recent data to determine mammal distributions and groundwater levels, both on a national scale, and for local sites at Kakadu. A number of rainy years build up the aquifer so that it seeps out water through the dry

season. But if there are more dry years than wet, the water levels are too low to allow seepage during the dry season.

The analyses revealed that groundwater levels increased strongly during the 1970s, but have declined markedly since. They also showed a strong correlation between mammal numbers and groundwater levels during the 1980s.

Extrapolation backwards in time predicted low levels of groundwater earlier this century (1900-1920s and 1940) corresponding with last records of now-extinct mammals from central Australia. A third trough in the early 1960s suggested another period of extinction in this region.

Savanna dwellers at risk

The study showed that populations of many small mammals in Australia's tropics are strongly associated with the availability of permanent water, and are vulnerable during periods of low groundwater levels. Land-use impacts on waterholes are therefore critical at these times.

Species occurring exclusively in savanna, but not also in rocky or wetland habitats, are most at risk. They are unable to take refuge in rocky or wetland habitats during periods of low water availability.

'Evolutionarily speaking, some species, which use both savanna and rocky areas, have been trapped by this process in the past, giving rise to the present richness of rocky endemic species,' Braithwaite says.

Further vulnerability characteristics were identified including size, smallness of population range and smallness of geographic range. On this basis, the species

in north-western Australia at highest risk during periods of low groundwater are the native rodents *Conilurus penicillatus* (Pakooma), *Mesembriomys gouldii* (Djintamoonga), *M. macrurus* (Koorrawal), *Antechinus bellus*, *Phascogale topoatafa* and *Rattus tunneyi* (Djini).

'Our recent benign groundwater history has coincided with an upsurge in environmental research and management efforts,' Braithwaite says. 'This historical accident has probably led us to overstate the negative effects of human impact and also our ability to change the course of biological history by ameliorating human impact. Our distorted view of these factors has further led us to over-emphasise research of a spatial nature to the detriment of temporal studies.'

Braithwaite says management must increasingly focus on ameliorating the impact of temporal variation, such as the timing of feral animal control campaigns. He says we must also consider the impact of human actions on the quality and quantity of groundwater.

This article is extracted from Braithwaite RW and Muller WJ (1997) Rainfall, groundwater and refuges: predicting extinctions of Australian tropical mammal species. Australian Journal of Ecology 22, 57-67. The Aboriginal rodent names are those recommended in the book Australian names for Australian rodents, published in 1995 by CSIRO and the Australian Nature Conservation Agency.

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