Living with fire in the tropical savannas

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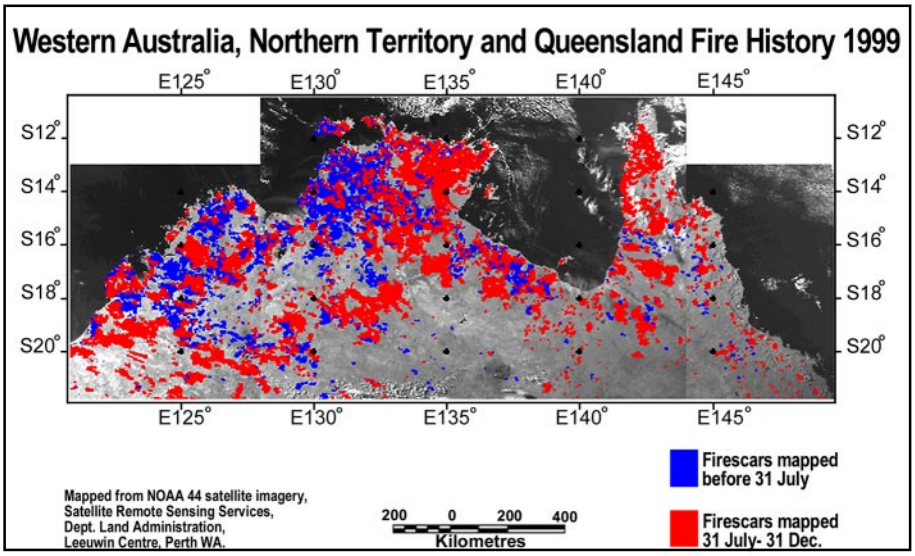

Fire is an important part of Australia's tropical savannas. Every year the rain and warmth of the summer wet season, from November to April, promotes lush grass growth. The long dry season from May to October then dries the grasses out. Temperatures increase as the fuel dries, so that by the end of the dry season conditions across vast areas are primed for wildfires. These late fires, illustrated by the red areas in the map above, are widespread throughout northern Australia.

People living in the savanna country have to live with this reality: that managing the country to a large extent means managing fire. Wildfires can have devastating impacts on plants and animals as well as endangering lives and property. But, as part of the natural cycle in the savannas, fire also brings benefits. It promotes 'green pick' favoured by stock and wildlife, regenerates food plants such as yams, and creates habitat for various native reptiles, mammals and birds.

Communication, collaboration and education are keys to improving fire management across the north.

Research into fire

Further scientific research is also essential—finding out more about the impacts of different burning patterns—developing economically and ecologically sustainable fire-management regimes and understanding regional fire histories from satellite data. These are the goals of the fire program run by the Tropical Savannas CRC and involve researchers and user groups from across the north.

Generalisations about the effects of different fire patterns on native fauna are hard to draw from research to date. A study in Kakadu National Park that involved subjecting large plots to either no fire, early dry-season fire, progressive fire through the season or intense late dry-season fire found that each regime benefited some species and disadvantaged others. For example, lizards did best, and kangaroos and wallabies worst, with early or progressive fires. Overall, though, late fires and no fire regimes tended to be more harmful than beneficial to fauna. Early burning had the least impact, which is why it is backed as a management tool in the savannas.

Land degradation and weeds

Evidence from savanna cattle runs, particularly in north Queensland, suggests that a lack of burning in recent decades has contributed to widespread land-management problems. One of the reasons for the absence of fire—in addition to a reluctance by many graziers to risk burning their fodder—is that increased stocking rates have reduced the availability of fuel. This has resulted in reduced fresh pasture growth, deteriorating pasture species composition, erosion, and a growing problem with woody weeds.

In most cases, fire is the only tool available to graziers for tackling these nuisance shrubs. While much remains to be learnt about which fire regimes will be most effective, it seems that intense fires generally have the biggest impact. This raises questions such as how to adjust stocking to allow the fuel build-up needed to carry hot fires and how to manage the fires safely.

In some situations, frequent low-intensity fires may be as effective as less frequent intense fires. Where the choice exists, this is likely to be the preferred alternative as it should be best for pasture rejuvenation, reducing the hazards of wildfire and the general health of the tropical savanna environment.

Characteristics of savanna fires

The sorghum grasses that dominate the understorey across most of Australia's tropical savannas can grow

as high as 3 metres in the wet season. They then dry out rapidly, and can carry fire from shortly after the last rains. They reach their most flammable state when the next wet season is about to begin.

These and other grasses, supplemented by litter from the woodland trees (mostly *Eucalyptus* and *Corymbia* species which grow to heights of 15–20 metres on the typically sandy or loam soils) provide the fuel for savanna fires. In the absence of fire, fuel loads reach a maximum within about three to five years because of the high decomposition rates in the tropics. This is in marked contrast to the situation in southern Australia's eucalypt forests where fuel can continue building up for several decades, preparing the ground for fierce wildfires.

As a result, even the most intense fires in the savannas are considerably less severe than a raging bushfire in the south. Crown fires, the most dangerous type of bushfire, occur rarely. Nevertheless, late dry season savanna wildfires are dangerous to people and property, and can cause severe damage to plants and animal populations. Preventing them is a key objective of fire management.

Fire and the nutrient cycle

Despite the impression conveyed by lush wet season growth, the soils of Australia's tropical savannas are generally very low in nutrients. So nutrients stored in plant material must be released relatively quickly to support new growth.

Termites and various micro-organisms play significant roles in ensuring that happens. Fire is the other main contributor as new growth can draw on the nutrients left behind in ash. Smoke carries a proportion of the nutrients into the air, but these generally return to ground close to where they originated. Some nutrients are lost as gases.

Research at the Kapalga fire research station in Kakadu National Park in the NT has indicated that any net losses of most nutrients from the soil through fire should be too small to have an impact. Nitrogen is the important exception; the study showed losses during annual fires that completely burn the grass cover might exceed inputs from biological nitrogen fixation, leading to a gradual depletion of soil reserves. Hence, in savannas like those at Kapalga, the best option may be annual early dry-season fires that leave substantial patches unburnt, or more complete burns every two or three years.

The findings make it clear that nitrogen cycling is one of the factors to be considered when deciding how to manage fire in tropical savanna regions.

Fire monitoring

Earth-scanning satellites have made it possible to keep track of dry season fires across the northern Australian savannas. Western Australia's Department of Land Administration (DOLA) uses Advanced Very High Resolution Radiometer (AVHRR) images obtained every day from US National Oceanic and Atmospheric Administration (NOAA) satellites to locate fires in Western Australia and the Northern Territory. Similar fire mapping is planned for Queensland.

The information helps bushfire authorities, Aboriginal communities pastoralists, and other land managers to plan strategies for suppressing wildfires. Equally important, it means the agency can produce broad maps of a season's fires.

A map produced by DOLA showing areas that had been burnt across the north in 1997 up to the end of June, and then to the end of the dry season, prompted considerable concern. It showed that many areas burnt were likely to have had uncontrolled wildfires in the latter part of the season, while substantial areas had remained free of fire.

Current goals of the Tropical Savannas CRC include further development of the use of broad-scale NOAA-AVHRR imagery. In addition, finer-scale images from LANDSAT satellites will be used for more precise mapping in specific regions.

For more information on fire-management issues in northern Australia, go to the Savanna Explorer section of our website at: http://savanna.ntu.edu.au/ and then choose the 'fire' topic, in 'all regions'.
For more information about the Centre's extensive research program go to our research section.