Believing the Balga

The Nyungar people of south-western Australia say that frequent fire was traditionally an important tool for their ancestors. Recent scientific research on balga grasstrees confirms it. Can our understanding of traditional Nyungar burning provide a sound basis for fire management?

by David Ward & Rick Sneeuwjagt

Nyungar people have occupied south-western Australia for many thousands of years—some of them say forever. Fire was essential to their traditional way of life (see 'Karla Wongi: Fire Talk' in *LANDSCOPE*, Summer 1998-99). They used fire for many reasons: to cook, stay warm, hunt, clear tracks, and promote fresh green shoots for game. Their fires added to those caused by lightning strikes, and extended the fire season.

The arrival of Europeans led to changes in land use and fire patterns, but some early settlers were well aware of the importance of frequent fire to Nyungars, and the effect that fire had on plants and animals. For example, Edith Hassell, who lived amongst Nyungars in mallee country at Jerramungup in the 1880s, wrote:

> '. . . the natives burn large tracts of country every year, to ensure the grass and herbage coming up green and sweet at the first rains, also to drive out the game for hunting purposes. All the young of the birds that nest on the ground were hatched and able to fly, also all the young ground rats were running about, so it was quite time for the man carls [bushfires] . . . in a few days the whole country was on fire and the smoke driving down on the station made life intolerable.'

Recent research on balga grasstrees has helped us clarify the pre-European fire regime of the south-west of Western Australia. Much remains to be done, but we can now be confident that we know the fire frequency at many places before, and just after, European settlement.

GRASSTREES AND FIRE

The subject of this research is a well-known and distinctive plant that occurs throughout south-western Australia. Grasstrees of the *Xanthorrhoea* genus grow up to six metres high, with a thick black stem and a green, grassy top. Called *balga* by the Nyungar people, the grasstree had many uses. They knew that fire provoked it to flower, and caused useful gum to ooze from the stem. The long flower stalks were used for making fire, and for fish spears. The gum was used for fixing tools and weapons, such as the spear (*gidji*) and axe (*kodj*). Nyungars also prized the *bardi* grubs that are found in dead balga. The young shoots at the centre were a refreshing snack, and the older needles were used for thatch and bedding.

Balga have a long life; 200-year-old specimens are common. They grow slowly, typically one or two centimetres a year, perhaps up to four centimetres

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The thatch of Balga ignites from the mildest of fires.

Above: Balga's resilence to fire makes it a useful tool in fire-dating.

Left: Balgas usually flower profusely within a year of fire.
Photos – Dennis Sarson/Lochman Transparencies

on a good site. A balga one metre tall is usually 50-100 years old. Although balga do grow slightly in diameter, most of their growth is vertical.

As the needle-like leaves die, they are laid down as a highly flammable thatch around the stem. When fire occurs, a thick mantle of charred leaf remnants, set in a strong matrix of gum, protects the living stem. This mantle allows balga to survive most fires, although, if left unburnt for long periods, the heavy thatch may cause a fire intense enough to kill them.

Recent research has shown that balga can be used to reconstruct fire history. Under the charcoal on balga stems, the old leaf remnants lie in repetitive coloured rings. Light and dark brown rings represent annual growth, and the growth rates they yield match closely those derived in the 1970s by Professor Byron Lamont (of Curtin University of Technology) using a different method. There are also black rings, which are the result of fire events: deliberate burning of balga produces a black ring where green needles are killed by the fire, whereas nearby unburnt balga do not produce a black ring. The positions of the black rings also match perfectly with the times of known recent fires. The pigmentation is the subject of chemical and anatomical research under the direction of Professor Lamont.

Despite worthwhile attempts, it is difficult to reconstruct reliable fire history from fire scars and growth rings on jarrah or marri trees. Due to the trees' thick bark, a mild fire does not cause a fire scar; therefore, no fire scars might mean no fires, or any number of mild fires that caused no damage.

The balga offers a more sensitive record because its thatch ignites from the mildest of fires. An exception to this is when the balga is too tall for the fire to reach the thatch, leading to an underestimate of past fire frequency on the upper part of tall stems. Nearby short balga will, however, record recent fires, and the lower part of the taller stems is also a valid record. In some situations, such as rock outcrops, isolated balga may avoid fire for long periods.

A great advantage of balga dating is that the historical record is on the outside of the stem, so it is not necessary

to cut the tree down. We can obtain large, statistically reliable samples without destroying a single balga.

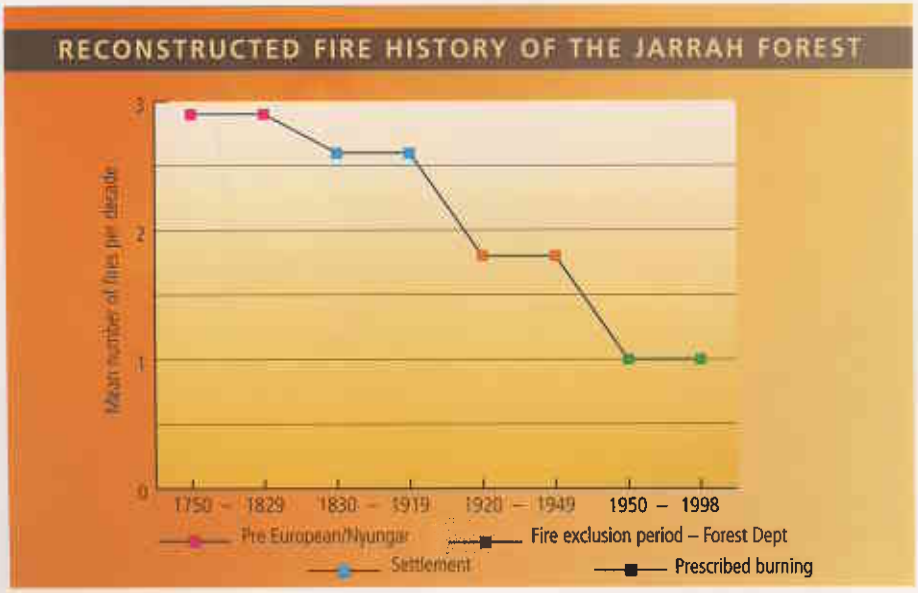
EVIDENCE FROM THE FORESTS

Fire histories reconstructed from balga for forest sites of south-west Australia have been compared with Nyungar traditional knowledge, the comments of early European settlers, and those of their present descendants.

Amphion Forest Block, near Dwellingup is a good example. Fire has been excluded from part of this block since 1931. The balga record plainly shows three fires per decade prior to 1880, a fall in fire frequency in the early 1880s, a slight rise in fire frequency when logging started in the 1890s, and no fires for the past six decades (see chart).

Mr Charles Fawcett of Marradong is a direct descendant of Captain Theodore Fawcett, who, with Michael Pollard, was one of the first Europeans to ride up the Murray River in the 1850s. They rode from Pinjarra, past Dwellingup, and on to Marradong. According to Mr Fawcett, they were able to ride up the valley because it was much more open then, due to Nyungar burning every three to four years.

After a tragic massacre by mounted troops at Pinjarra in 1834, the remainder of the Murray Nyungar group was almost obliterated by measles in the early 1880s. The reduced fire frequency of that decade seems to date from this event.



For comparison, the chart shows the fire history of the tuart forest at Yalgorup National Park. The balga stems there show two or three fires per decade right up to the early 1960s, when fire frequency dropped suddenly.

This national park was formerly grazing leases, and these were burnt every three or four years up to the early 1960s, to encourage new grass. The grazier families learnt their fire skills, in the early days, from Nyungars. They lit up on March mornings, running the fire towards the coast. They then went home, confident that the fire would go out when the sea breeze came in and humidity rose. When the grazing leases expired, Yalgorup became a national park, with attempted fire exclusion, resulting in the occasional severe, destructive fire in heavy fuel.

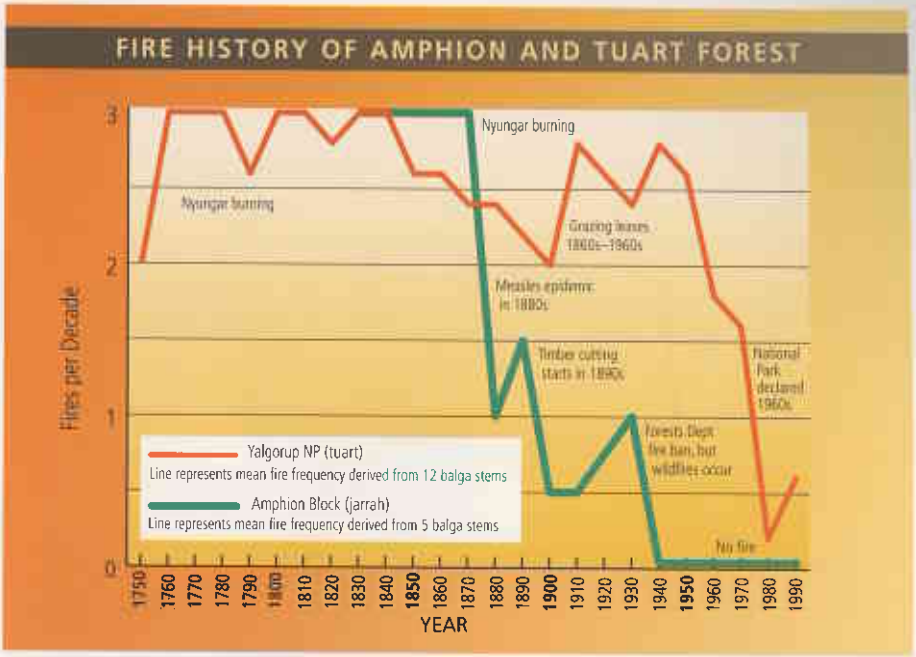
THE JARRAH FOREST

On a much broader scale, evidence is also available for the jarrah forest. In 1997 a broad-scale survey of balga in the jarrah forest gave a mean pre-European fire frequency of about three fires per decade, i.e. an interval of three to four years between fires. This agrees with the traditional knowledge of today's Nyungar community, and with the views of old settler families, expressed by senior living members such as Jim Muir, Mal Hester, Charlie Fawcett and Arthur Batt. It also broadly agrees with comments by early observers such as James Drummond (three to four years for the parts of the south-west that he knew), Francis Singleton (every two years on sandy country near Dandalup), Lieutenant Bunbury (every two to three years in the south-west generally), and John Gilbert (every three years for thickets near York).

This time span also agrees remarkably well with biological indicators. CALM scientists have determined that all understorey plant species throughout

Above: (*left*) Balga stem showing high frequency of fire in the early-European era. (*right*) Fire frequency is significantly less in recent years as revealed by this balga stem.
Photos – David Ward/CALM

Facing page right: Balga grows profusely in Jarrah forest.
Photo – Dennis Sarson/Lochman Transparencies



the upland jarrah forests reach flowering age three to four years after fire, and that most native fauna that have been studied, including birds, mammals and invertebrates, have recovered to pre-fire levels within three or four years after low-intensity fires. Post-fire recovery of some plants and animals that inhabit wet riparian zones can take longer (see 'After the Burn' in *LANDSCOPE*, Spring 1995). After four years, many of the larger macropods (kangaroos, brush wallabies) begin to move elsewhere as their food plants decline.

Nevertheless, it should not be assumed that every square metre of the jarrah forest was burnt every three or four years. Although within the jarrah forest no significant difference in mean fire frequency due to landscape position was statistically apparent, knowledge of fire behaviour suggests that fire refuges such as moist creek banks, or high rocky places, do exist. Early European explorers, such as John Septimus Roe, described unburnt strips or patches along creeks, surrounded by burnt country. Present-day Nyungar elders confirm that such patches were left. These refuges, and rocky areas, are where fire-sensitive plants (such as *Banksia seminuda* near creeks and *Banksia solandri* in rocky places) are mostly found today.

FURTHER RESEARCH

The balga technique can be extended to other vegetation types, including wetlands, peat swamps and heath. For example, a preliminary look at balga in the wandoo forest within Dryandra Woodland shows clear differences in fire frequency between different landforms.

At Dryandra, before the measles epidemic that spread up the Albany Highway in 1860, fire seems to have occurred regularly every two or three years along the creeks. The regularity suggests that grass was the fuel. Captain Bannister rode overland to Albany in 1831, and described large areas of grass, including the prized kangaroo grass, in the valleys. Roadside patches of this grass still exist at Wandering and Boddington.

On the bare, rocky ridges at

LIGHTNING STRIKES

Summer lightning storms have always been a source of bushfire ignition. Long-term weather records for the jarrah forest show that fires can burn on almost half of the days in any year. Lightning fires alone accounted for 194 fires in south-west forests between 1987 and 1992. If these had not been suppressed, they could have burnt most of the jarrah forest at least once within this six-year period. In the summer of 1960-61, 19 lightning strikes in the northern jarrah forest led to catastrophic fires that burnt about 145,000 hectares, including the Dwellingup township. The Royal Commission into these fires recommended that prescribed fuel-reduction burning be applied throughout the south-west forests.

Photo – Rick Sneeuwjagt/CALM

Dryandra, however, the balga record for that period shows irregular fires at intervals of 10-25 years. These ridge fires were probably accidental, due either to lightning or to sparks from a fire near the creek below. The fire-sensitive rock sheoak probably got its name from being found originally only in these rocky fire refuges. It is now much more widely spread.

Co-operative research by CALM and Curtin University into fire history and grasstrees continues, with Professor Byron Lamont supervising a team of technologists and post-graduate students.

Left: A 400-year-old balga on a rocky ridge at Dryandra shows infrequent pre-European fires.
Photo – David Ward/CALM

Results so far suggest a significant effect of fire on nutrient cycling. More detailed research into the effect of landform on fire frequency is being pursued. The Nyungar community will be further consulted on traditional fire regimes, and historical research will continue at the Battye Library in Perth.

FIRE HISTORY AND MANAGEMENT

In view of the social and landscape changes since 1829, it would be naive to think that we can, or should, restore traditional fire regimes everywhere. Forests now have a variety of uses, such as recreation, water catchment, and production of wood and honey, so frequent summer burns are not appropriate in all areas. Furthermore, many of the former native grasses have been replaced by shrubs, which will not burn so frequently. Also, Nyungars burnt mainly in summer (*peeruck*), but since 1847 the Bush Fires Act has prohibited summer burning except in special situations.

Today, in the south-west, forests are fragmented by farms and towns. Tens of thousands of hectares of jarrah forest have not been burned for more than 10 years, and are carrying heavy fuel loads. This means summer fires are often very difficult to control and pose serious threats to life and property.

Public concern has been expressed that regular burning may endanger native plants and animals and favour exotic weeds and predators. CALM is aware of these concerns, and research must continue into the effects of fire on ecosystems; but the overwhelming historical evidence of fire in the dry forests and woodlands of the south-west suggests that these ecosystems are highly resilient to frequent fire, and that our wildlife is adapted to regular, patchy, low-intensity burns. Furthermore, the precautionary approach to fire management means that, wherever practical, we should take our lead from the traditional Nyungar fire regime, setting fires frequently rather than excluding them. Based on the many years of fire ecology research undertaken in south-western Australia, CALM is trying to apply varied fire regimes (see 'Fire for All Reasons' in *LANDSCOPE*, Autumn 1998) that will conserve natural systems as well as protect life and property. This will involve the use of fire in a variety of seasons, scales and intervals.

We may not be able to mimic the traditional use of fire exactly, but we can certainly try to restore the spirit, and the benefits, of the Nyungar fire regime.

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Western Everlasting, see page 22, follows the same successful approach to protecting threatened plants as Western Shield did for mammals.

Beneath its black and burnt exterior, the common balga is giving up its secrets. See 'Believing the Balga' on page 10.

For 25 years, CALM's Wildlife Research Centre in Woodvale has been 'A Centre of Diversity'. See page 36.

The spectacular coastline of Torndirrup National Park has been years in the making. See page 28.

Read how locals, CALM and other agencies are working together to save the Lake Muir-Unicup wetlands. See page 49.

FEATURES

REGULARS

COVER

'Moving Mala' (page 17) tells the story of the translocation of these endangered mammals from Australia's Central Desert Region to a small island off WA's north coast.

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