NSW Rural Fire Service

Fire. The Australian Experience

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The History of Fire in Australia

Fire on Earth in the form of volcanic activity pre-existed vegetation. It has most Likely affected the environment since the first vegetation appeared. Lightning, volcanic eruptions and maybe even sparks from rock falls would have served as ignition sources from the earliest times. Later, spontaneous ignition could have occurred in peat and coal deposits. What is believed to be ancient charcoal has been found in coals dating from about ten million to two hundred and fifty million years ago.

Most fires today are caused by people, either deliberately or accidentally. However, many of these fires are quite small. The largest fires which burn the widest areas are started by lightning, but the most devastating fires are caused by people.

The influence of both climate and fire on the evolving vegetation can be traced by looking at the palasoecological evidence collected at a range of sites across Australia.

Through much of the tertiary period (65 - 2 million years ago), the Australian continent was dominated by rainforest which existed in a climate where rainfall was high and varied according to the season. In general, any fires would have been started by lightning and would not have burned far or have had much environmental impact. Over the last 45 million years, the Australian continent has been drifting northward at a rate of about 5 degrees of latitude per 5 million years. Forty-five million years ago the climate was warm, humid and the vegetation was predominantly rainforest.

One important feature for survival in extreme conditions is the development of the strengthening tissue sclerenchyma, which produces leaves which are hardened, thickened and resistant to moisture loss.

Plants with leaves of this kind are called sclerophylls. As the continents slowly moved northward over the next 15 million years, drier conditions developed in areas like the Kirnberley region of Western Australia and the first desert and

sclerophyll plants would have begun to develop. In other areas, a mixture of fire sensitive, drier rainforest types and more fire resistant sclerophylls were developing, but there is little information available about the role of tire at this time.

In more recent times, (the last 300,000 years), there have been marked climate variations. With the significant changes in rainfall came changes in vegetation. For example, we know from pollen records found at Lake George near Canberra, that vegetation in that area alternated from herbs and grassland to woodland and forest vegetation over a period of 350,000 years in response to changing rainfall patterns.

Coinciding with evidence of changes from rain forest to sclerophyil vegetation, scientists have discovered a marked increase in charcoal deposits. At Lake George, possibly about 20,000 years ago, the increased charcoal deposits coincide with a change from fire sensitive Casuarina to fire-adapted Eucalyptus. A core of sediment taken from the seabed near the Great Barrier Reef shows that the coniferous forest which used to grow in North Eastern Queensland 150,000 years ago began to be replaced with fire-resistant Eucalyptus trees. At the same time, the amount of charcoal in the sediment increased dramatically, indicating a sharp rise in the number of fires.

Some scientists believe that this dramatic increase in charcoal is due to fires deliberately started by people, and that the changes in vegetation cannot be explained just in terms of climate changes. This is because, at this site, there had been little change in vegetation before this, despite significant fluctuations in climate in North Eastern Australia. In addition to this there was a continuous charcoal record throughout all samples, indicating that there would always have been some naturally occurring fire in the environment and this also had little effect on the environment. Evidence of this kind has been used to support the theory that Aborigines were living in Australia well before the generally accepted figure of 40,000 years ago.

Studies have examined the charcoal and pollen sediments in the Lane Cove River, Brisbane Waters National Park and other sites in NSW.

Some geomorphic evidence, which lends support to the possibility of increased burning due to Aboriginal activity in the history of sediment accumulation around rock shelter archeological sites in the sandstone catchment of Mangrove Creek, north of Sydney, found that the commencement of occupation in the late Holocene coincided with the onset of sediment accumulation.

Scientists also point to evidence of valley fills in Wollombi Brook, Colo River and other locations in central and northern NSW indicating accelerated deposition in the late Holocene period.

In these studies other variables such as climatic change and variation of sea level could not be responsible for the increase of charcoal deposits, but Aboriginal land use could well have been.

The ethnographic evidence for burning practices in the Sydney region is limited because traditional living patterns altered rapidly after January 1788 both due to the disruptive influence of the settlement itself and the disastrous reduction of the population by disease in mid 1789.

There are many references to smoke and fire in the First Fleet Journals including fires directly observed being lit by Aborigines.

“The weather now being very dry, the natives were employed in burning the grass on the north shore opposite Sydney, in order to catch rats and other animals, whilst women were employed fishing- this is their constant practice in dry weather,” Govenor Phillip, September, 1790.

Captain John Hunter commented- “They, (the Aborigines), also, when in considerable numbers, set the country on fire for several miles extent; this, we have generally understood, is for the purpose of disturbing such animals as may be within reach of the conflagration; and thereby they have an opportunity of killing many. We have also had much reason to believe that those fires were intended to clear that part of the country through which they have frequent occasion to travel, of the brush or underwood, from which they, being naked, suffered very great inconvenience. The fires, which we very frequently saw, particularly in the summertime, account also for an appearance, ... that two thirds of the trees in the woods were very much scorched with fire, some were burnt quite black up to the top ... we sometimes, upon our arrival here conjectured that it proceeded from lightning, but upon looking farther, it appeared too general amongst the woods to be occasioned by such an accident,” Journal of Captain John Hunter.

George Worgan, surgeon of the Sirius, describing a trip to North Head, at the entrance to Sydney Harbor, on 28th May,1788 wrote:

“... returning we made a circuit over to part of the hill where we observed a great fire. We found it to be burning of healthy brushwood, which we supposed the natives had set on fire for some purpose, but what we could not conjecture. We observed likewise fires of this nature in several other parts of the country. “

“The wind was blowing very fresh today and perhaps this might favor their designs ... indeed we have remarked that, whenever the wind blows strong, there are a number of these kinds of fires about the country.”

The most likely fire regime which can be postulated at this stage for the shale ridges of the Lane Cove River valley catchment would have been burning of grasses under the tall forest as frequently as once a year. These fires served several purposes- keeping the ridges clear of brush for ease of travel encouraging new grass growth for larger mammals and thereby also, attracting and locating game make the hunting of smaller animals, (lizards, possums, rodents), easier, and, in keeping down shrub invasion in areas of bracken fern, whose roots were an important source of carbohydrate.

Since the arrival of Europeans, changes in vegetation cannot be ascribed to changes in fire frequency alone, as introduced animals and plants radically altered the landscape.

Stephen S. Clarke and Lynene C. McLoughlin have sourced the historical and biological evidence for fire regimes in the Sydney region. They came to the following conclusions:

1. The biological evidence is overwhelming in indicating that fire shaped the structure of the vegetation system and that plants have had to contend with fire for many thousands of years.

2. Fire frequency on the ridge tops would have been greater than the valley bottoms. The intensification of Aboriginal settlement in the Sydney region, 5 - 6,000 years ago, would have increased fire frequencies.

3. Ridge tops appear to have burnt frequently, (1 to 5 years):, by Aborigines.

4. Less frequent fires, 7 to 15 year intervals on the valley sides.

5. A management policy of fire exclusion will continue to lead to the spread of Pittosporum beyond the valley bottoms to the exclusion of other species, however,

6. A palicy of frequent burning, (2 to 5 year intervals), also leads to loss of diversity.

Not all scientists agree, however, that Aboriginal burning had the impact sometimes attributed to it, e.g. a significant role in the replacement of Casuarinas by the more fire-tolerant Eucalyptus and Acacias. They argue that the vegetation was already adapted to fire. The impact of the Aborigines is likely to have been more subtle, and burning much more localized than previously supposed. Climate was likely to have been far more important in bringing about these changes, and Aboriginal burning regimes were likely to have been both variable and subtle, without uniform effects. Aboriginal burning should be regarded as just

one factor in a complex of processes, which also include climatic effects, and naturally occurring lightning fires.

The role of fire in the Australian environment became progressively more important due to a variety of factors: the increasing aridity and variability of climate the activities of Aboriginal people the development and extension of fire-demanding and fire-promoting vegetation the activities of Europeans.

Eucalyptus have been particularly successful in adapting to the Australian environment. Their hard schlerophyll leaves enabled them to survive heat and drought, and the oil in their leaves encourages fire. Their special survival features all ensure their recovery from fire is excellent. Over time, the fire that eucalyptus encourage has ensured their dominance over less fire-tolerant species. Eucalyptus have adapted to a wide range of habitats, from alpine ' snowfields to temperate rainforest to semi-arid deserts.

It is generally accepted that the forest which grows in Australia today is very different to the forest's which existed before European colonization. Writings of a wide selection of early colonists and explorers describe the forests very open, so open as to be frequently likened to parkland. The trees were very often large and well spaced, with native grass and very little undergrowth, there was usually no need for people to clear tracks for their horses and drays. There were also areas, however, that are described as similar to the scrub of today. For example, on 5th April, 1788, John White. a surgeon described the French's Forest area, having passed the swamp which is the source of the creek which empties into the Dee Why lagoon as:

“... an immense wood, the trees of which were very high and large, with little under or brushwood. The ground was not very good, although it produced a luxuriant coat of a kind of sour grass growing in tufts or brushes which, at some distance, has the appearance of a meadow land...”

Burning for Bio-Diversity

Wild fires and prescribed fires for management purposes are frequent occurrences in South Eastern Australia, and many of the vegetation communities found throughout this area are burnt periodically.

Some, like rainforest and stream-side vegetation are severely damaged by fire. However, others like heathland, grassland, and the eucalypt dominated forests and woodlands, respond by rapid regeneration of species. In these communities it is the interaction of burning and species' regeneration strategies which maintains high species diversity.

Burning by wild fires and prescribed fires can be detrimental to some species, such as the gum bark eucalypts as well as to some plant communities. The frequency, season and intensity of prescribed fires needs to be compatible with the biological and ecological requirements of species. Provided these requirements are met, burning in the dry sclerophyll forests (Open Forest) does little ecological “damage”.

A patch of remnant dry sclerophyll forest was burned by a prescribed, low intensity fire.

Before burning, the site was dominated by an understorey of native grasses, lilies, herbs and scattered shrubs. In all, over one hundred different species were recorded, but many of them were represented by only a few individuals. The same site has been re-assessed annually for species diversity and species richness following the fire.

For the first few weeks after the fire the area was largely bare, with only a few tussocks which did not burn, a scatter of scorched leaves, and a layer of ash over the ground. Six weeks after the fire, the first of the autumn rains fell, stimulating the seeds in the soil to germinate, and the grass tussocks and rootstocks to resprout. Many of the native orchids, lilies and grasses resprout from underground bulbs and green again.

By the end of the following spring the seedlings have become well enough established that they are almost all able to survive through the dry summer.

Four years after the fire, the site had a thick cover of grasses, small shrubs and herbs, and the wattles and peas were flowering profusely, producing the seed crops that would be stored in the soil waiting for the next fire.

Six years after the fire, all the species which had been recorded before the fire were again present, but many were in far greater numbers than before the fire.

Burning these types of plant communities does not increase species diversity. This is because the species must already be present, even if only as seed in the soil, for the species to respond to fire. However, burning is necessary to maintain species diversity. What the fire does is to stimulate regeneration of large numbers of individuals of each species - it makes the species which are present visible to us. To maintain the species diversity in a patch of dry sclerophyll forest like the one in this example, the optimum fire frequency is about 12 years.

If fire is excluded from these communities, more long term “damage” occurs as the diversity of species will decline, and many species may become locally extinct.

The Impact of Aboriginal Fire Regimes

It is recognized and accepted that knowledge and manipulation of the environment was part of the technology of the Australian Aborigines. It is probable that the Aboriginal relationship with fire is as strong as their relationship with the land. They burned the vegetation regularly in their own management regime and used fire for a number of different purposes.

These included: Signaling, Clearing the ground, Hunting, Regeneration of plant food, Cooking, Ceremonial fires, Enjoyment and fun.

There is conflicting evidence about how Aborigines used fire. Some writers argue that Aborigines used fire wisely and husbanded the land in a fairly planned and judicious way. Others contend that Aboriginal burning was fairly indiscriminate and careless. The truth of the matter probably lies somewhere between. It has been suggested that the way fires were described in accounts of the time may be a function of the way the settlers themselves viewed fire.

There are numerous reports from early explorers and settlers, indicating that Aboriginals were not particularly careful with fire, and fires would often just run their course after being started. They deliberately lit fires to drive out game while hunting, and burned off dry grass to promote fresh green growth to attract game. When European explorers came they lit fires to try to frighten them or as retribution. They also lit campfires, some very large and still others at the base of gum trees. It seems that it was not unusual for the fires to get away and start bushfires or for fires to be left burning when the group had moved on.

Other explorers, however, report careful burning of the undergrowth. A good example of this occurred near Albany, Western Australia, where explorers on the 1837 - 43 voyage of the HMS Beagle noted that Aborigines used large green boughs to beat out the flames which took off in the wrong direction, whilst carefully burning to flush out game. Other reports indicate that burning was carried out in certain seasons, particularly just before the coming of the winter rains.

It has been generally accepted by many people for some time that Aboriginal burning over thousands of years promoted an under-story of native grasses and herbs, relatively free of scrub in many parts of south eastern Australia, and that this encouraged grazing animals like kangaroos and enabled easy passage and hunting. More recently, however, this view has been challenged, as actual documented evidence to substantiate this theory is uncertain. Clear evidence exists for Aboriginal burning regimes occurring in central, northern and other parts of Australia. For south eastern Australia, a more widely accepted explanation is that an open grassy under-story resulted from long, fire free periods where the shrubs died out from old age.