



KEYWORDS: *Woronora Plateau – Wildfire – Fire intensity – Exfoliation*

THE EFFECTS OF FIRE ON THE ROCK ART OF THE WORONORA PLATEAU

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Abstract. Sandstone shelters and open sandstone platforms with Aboriginal rock art were observed by the Illawarra Prehistory Group after wildfires on the Woronora Plateau in the adjacent areas of the Metropolitan Catchment and Royal National Park. These areas had different fire regimes. Where fires were infrequent and intense in the Metropolitan Catchment, fire-induced exfoliation was noted in a small number of shelters, whereas in the Royal National Park, where fires were frequent, it was absent in shelters but common on open pavements.

Introduction

As a member of the Illawarra Prehistory Group I have been surveying for archaeological sites on the Woronora Plateau for over forty years (Sefton 1988, 1993). This paper records the fire history of the plateau and some casual observations.

The Woronora Plateau is located mainly on the Hawkesbury sandstone of the Sydney Basin, immediately south of Sydney. The area we have surveyed includes the Metropolitan Water Catchment Areas (the Woronora, Cataract, Cordeaux, Avon and Nepean Catchments); the Dharawal and Garrawarra State Conservation Areas (SCA); and the Heathcote and Royal National Parks (NP) (Fig. 1).

Rock art sites are numerous, with 1387 having been recorded within the surveyed area. The art sites are in shelters, both small and large, with charcoal drawings; drawings, stencils and paintings in red ochre and white pipeclay; and petroglyphs. By far the most frequent art technique is charcoal drawing. Open sandstone outcrops also have petroglyphs, although these are more common in the northern survey areas.

The average shelter size in the Woronora is length 13 metres, width 3 metres and height 2 metres. Aspect can be any direction but is most commonly N-NW.

The Hawkesbury sandstone supports upland swamps in dells at plateau level and open woodlands on ridge tops. The valley slopes contain eucalypt woodlands. The understorey is generally a dense shrub layer. The species in the shrub layer vary but in areas with moisture, in particular the shrub swamps, *Banksia ericifolia* is frequent. On ridge-tops in shallow rocky soils *Allocasuarina* species and *Petrophile pulchella* are common. These are all very flammable species.

Fire frequency

In the Royal National Park there have been three wildfires in the last twenty years (Table 1). Where the fires have been frequent the understorey is open and shrub growth is minimised, making it easy to survey.

In the neighbouring Woronora Catchment Area, where public access is restricted, wildfires have been more severe (Table 1). When the 2001 fire burnt the Woronora, including houses in the township of Helensburgh, there had not been a wildfire for thirty-

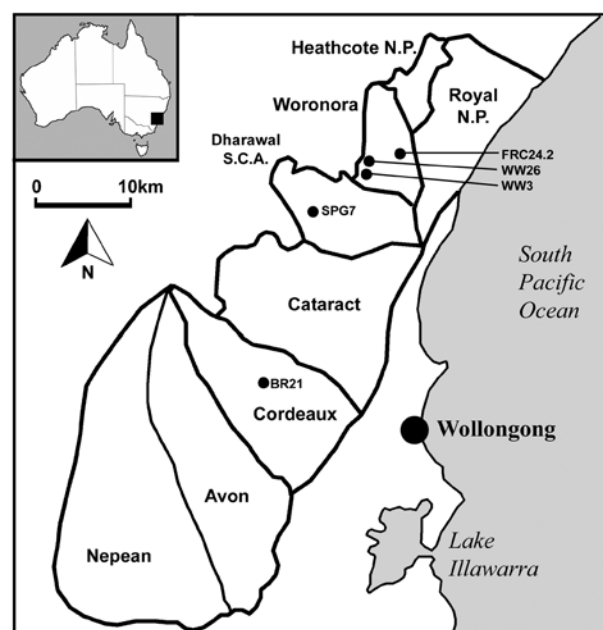


Figure 1. Map of catchment study areas.

Year	Woronora (% burnt)	Royal N.P. (% burnt)
1964	50	na
1968	100	na
1988		50
1994		95
2001	100	50

Table 1. Wildfire occurrence and impact in the Woronora and Royal National Parks.

three years. When we began surveying in 1969 the Woronora catchment was easy to survey and had an open understorey. Today that is not the case.

The thirty-three years between burns had allowed the fire-sensitive banksias, allocasuarinas and *Petrophlie pulchella* to mature into large trees. These were killed during fires and now dead trees interlace across the ground surface, which, along with the regrowth from the seed released during the fire, add to the fuel build-up and make it now impossible to walk on the ground surface in some areas. It is expected that the next wildfire in the Woronora Catchment will be very intense.

The Woronora catchment has the highest density of art sites on the Woronora plateau. It also includes some of the largest and best-preserved shelter art sites. Despite current dense vegetation, there was obviously high Aboriginal exploitation of the area suggesting that the vegetation was more open in pre-contact times.

Metropolitan Catchment Area

Three shelters within the Woronora catchment and one shelter in the Dharawal catchment (SPG7) were found to have been fire damaged. Damage was also observed in another (BR26) in the Cordeaux catchment to the south (Melanie Thompson, BIOSIS Pty Ltd, pers. comm. 2009).

These shelters exhibited recent exfoliation and have a number of parameters in common (Table 2). In particular, they are mainly shallow compared to their height. Wildfires on the Woronora Plateau are generally driven by westerly winds; however the damaged shelters showed no consistency in their

Catchment	Site	Location	Depth at Location (m)
Cordeaux	BR21	Rear wall	6.0
Dharawal	SPG7	Rear wall	0.8
Woronora	FRC24B	Front wall	1.5
Woronora	WW03	Front wall	2.0
Woronora	WW26	Rear wall	1.5

The depth refers to the depth of the shelter at the location affected.

Table 3. Location of exfoliated surfaces within each shelter.

orientation. Similarly there was no consistency in their location, as they occur from the valley bottom to ridge top. Exfoliation, to either a major or minor extent, was noted on either the rear or front wall, and in areas where the majority of rock art is located (Table 3).

In all, recent exfoliation was observed in five shelters subjected to the 2001 fires (Figs 2–7). Exfoliation was also noted in other narrow overhangs, but none of these were archaeological sites.

At BR21 exfoliation was widespread across the rear wall (Figs 2–3). The shelter is significantly deeper than the others with damage, but has an open configuration. It also has vegetation growing along the base of the shelter wall. Both the BR21 and WW26 shelters have large rock outcrops at floor level beneath the rear wall that may have increased radiant heat. Such rock floors are an uncommon feature on the Woronora Plateau, as the vast majority of shelters have floors with soil deposits.

Royal National Park

A review of recent photographs of 104 shelters in Royal National Park with older photos has shown no evidence of recent exfoliation that could be associated with the 2001 fires.

The only evidence of smoke blackening (soot on surfaces) observed has been in shelters where

Catchment	Site	Length (m)	Depth (m)	Height (m)	Faces	Environment
Cordeaux	BR21	20	6	4	S	UVS
Dharawal	SPG7	3	3	2	W	VB
Woronora	FRC24B	12	2	3	W	UVS
Woronora	WW3	8	2	2	E	RT
Woronora	WW26	7	1.5	2	NE	RT

Key to environments: RT Ridge top; UVS Upper valley slope; VB Valley bottom

Table 2. Attributes of shelters affected by fire-induced exfoliation.

contemporary bushwalkers regularly camp.

Royal National Park has many open petroglyph sites. After the 2001 fire many open sandstone platforms exhibited major exfoliation. The exfoliation occurred on both small and large platforms. It is likely that many petroglyph sites would already have been lost due to prior exfoliation events and the partial damage of some existing petroglyphs is attributable to fire-induced exfoliation. Generally, however, sandstone platforms with exfoliation evidence do not (or no longer) contain petroglyphs.

Conclusion

The effects of wildfires on shelter sites are different for the two areas of the Woronora Plateau discussed. It appears that where there is a long period without wildfires, the potential for damage from exfoliation is increased.

While it appears that most exfoliation is caused by erosional processes in the sandstone, I suggest that fire hastens exfoliation and can be a primary cause in a limited number of cases.

I also argue that it is possible to predict which art sites may be affected by fire and that there is a remedy. Shelters which will be susceptible will exhibit frequent exfoliation scars and be narrow (shallow) with respect to height, or open shelters with vegetation within their driplines. One remedy is to pursue a management practice of low intensity burns to reduce the fuel level around susceptible sites.

Prior to European occupation it is believed that these art sites would have been located in a far different environment to that in which they are today. The art sites would have been located in open woodlands, with a less dense understorey which was frequently fired, and would not have been subjected to the high heat intensity of the wildfires which occur in today's infrequently fired bush on the Woronora Plateau.

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Figure 2. BR21 prior to fire. Note vegetation.



Figure 3. BR21 after fire. Note sandstone blocks on floor. Image courtesy of Melanie Thompson, BIOSIS Pty Ltd.



Figure 4. Detail of fire damage to the rear wall of BR21. Image courtesy of Melanie Thompson, BIOSIS Pty Ltd.

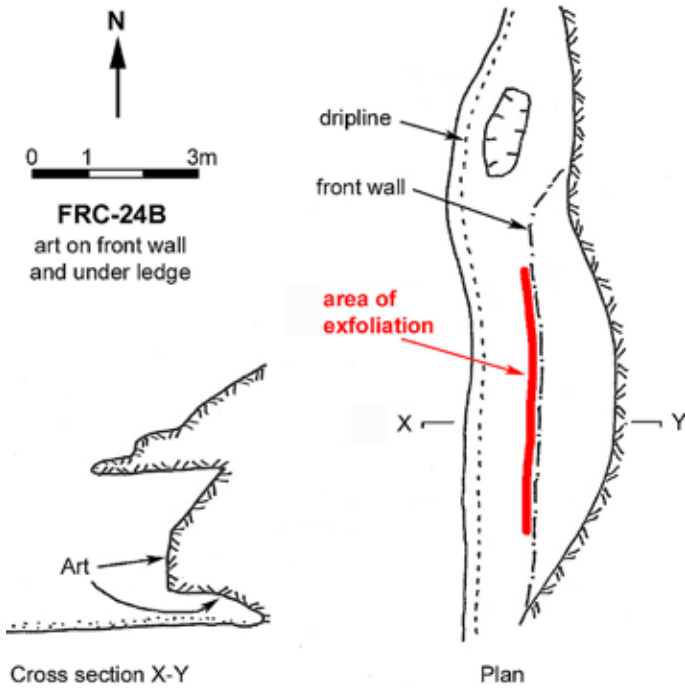


Figure 5. Plan of the FRC24B shelter showing areas of exfoliation.



Figure 6. FRC24B shelter showing the front wall profile.



Figure 7. WW03 Small open shelter with two areas of fire-induced flaking.



Figure 8. WW03 Recently exfoliated piece located on floor of shelter.

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