A Living Archive

An Archaeology of Culturally Modified Trees at Calperum Station in the South Australian Riverland

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Statement of Declaration

I certify that this thesis does not incorporate, without acknowledgement, any material previously submitted for a degree or diploma in any university; and that, to the best of my knowledge and belief, it does not contain material previously published or written by another person except where due reference is made in text.

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Date: 31/01/2019

Abstract

Bark objects likely comprised a fundamental element of Aboriginal material culture across Australia, yet due to their organic origin, rarely survive in the archaeological record. Culturally Modified Trees (CMTs), as the imprint of past bark removal, persist much longer and act as a proxy to study those bark objects. This study uses this unique value of CMTs to assess the local Aboriginal response to European settlement, and how this manifested in changes in bark use and procurement at Calperum Station from the pre- to post-contact period. A substantial body of ethnohistoric literature exists that can inform contemporary scholars of the practices of Aboriginal Australians as they relate to bark procurement and use in the Murray-Darling Basin. This literature, however, tends to privilege past European-dominated concepts, which invoke theories of a 'dying' Aboriginal culture. The attributes of CMTs on the Calperum Station floodplain in the Riverland region of South Australia demonstrate a local narrative of agency and adaptation that challenges the ethnohistoric record.

A desktop study was originally conducted to understand the cultural practices that led to bark use, to assess how European colonisation impacted bark use and to comprehend what the post-contact landscape of bark use looked like in the Riverland. Next, a field survey was designed to locate and record as many CMTs as possible on the station. This was achieved through a systematic survey strategy with a non-random sampling technique. The sampling technique allowed the incorporation of previous knowledge and research on CMTs into the decision-making process. This permitted the exploration of areas where CMTs are most prevalent according to Australian literature, such as near water sources and eucalypt stands, and therefore ensured a sufficient dataset for analysis. Finally, a spatial and attribute analysis of the scars was undertaken to evaluate the local narrative of bark use at Calperum Station and how the trends are the result of the localised environment.

Both *Eucalyptus camaldulensis* (red gum) (n=41) and *Eucalyptus largiflorens* (black box) (n=57) were targeted for bark removal at Calperum Station, despite the overwhelming attribution of bark products to red gum bark in the ethnohistoric literature. Similarly, shields and dishes made up over 71% (n=58) of the recorded typologies, even though canoe scars are by far the most documented typology. This study found that red gum trees were targeted for canoe bark (n=17 of 19) and that the Riverland region supported a diverse and ephemeral use

of bark for canoes, shields, dishes, *mybkoo*, shelter material, shingles, and that the trees themselves were modified to obtain foodstuffs such as wild honey, possums and grubs.

CMTs located in the landscape near the main river channel (n=30) supported most scar typologies which are indicative of basecamp activities. Whereas those discovered near intermittent water sources (n=6) are less diverse and perhaps show seasonality in bark procurement. Many scars contain steel axe marks (n=31) indicating unequivocally that bark procurement continued into the post-contact era. While there are inherent difficulties in attributing a cultural origin to these scars, they can be likely attributed to Aboriginal bark procurement by other scar attributes, such as morphology and location. Those trees without steel axe marks (n=66) could be cut with stone axes and hence the marks concealed by regrowth.

Across Australia, little dedicated research to this cultural resource has been undertaken, despite the non-renewable and limited lifespan inherent to this heritage artefact type. It is clear archaeology has provided a more equitable means of evaluating Aboriginal cultural history and allows a more nuanced narrative of past land use and decision-making to be told.

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This thesis would not have come to fruition without the support and guidance of two very patient individuals. And so, I dedicate my first acknowledgement to my supervisors, Associate Professor Amy Roberts and Dr Mick Morrison. Thank you for the help and advice you have afforded me during the course of the completion of this work. It would not have come together without you.

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Glossary of Terms

Agency—a concept that provides individuals and groups the capacity to actively engage with and make decisions in a given environment.

Anthropogenic Processes—processes that originate from the influences of human activity in nature.

Canoe Tree—name provided to the tree from which a large slab of bark has been removed for the production of a canoe.

Coppice Branch—The name provided to the (usually many) branches that grow from a felled tree stump. They are the result of the activation of dormant buds beneath a trees bark once death tree death has occurred above.

Culturally Modified Tree (CMT)—a tree that has been modified by Indigenous Australians as opposed to those occurring under natural circumstances such as fire, branch tearing or agricultural activities.

Epicormic Stem (in association with CMTs)—the name given to a branch that sometimes sprouts from the base of an anthropogenic scar. Epicormic stems form from dormant buds beneath the bark of a tree that become active shoots when the bark further up the tree is damaged.

Ethnohistoric—the study of past cultures (particularly non-western cultures) through a combination of ethnographic, historical, oral narrative, archaeological and other types of data sources.

Spatial Analysis—a type of geographical analysis that explores patterns of human behaviour and activity as it has manifested within a landscape.

Stand (of trees)—a group of trees sufficiently uniform in composition, structure, age and size to separate them from adjacent groups of trees.

Taphonomy—the study of the processes (such as decay and preservation) involved in affecting how material culture manifests in the current landscape.

1. Introduction

Australia's Murray River extends across three states, and its low-lying catchment area is the largest in the country (Brown and Stephenson 1991:8) (Figure 1). There is both historical and archaeological evidence that, at least at the time of European contact, this region was resource rich and supported dense populations with known territorial boundaries (Bonhomme 1990:16; Clarke 2009:147; Eyre 1845a; Mitchell 1839a). The river itself was fundamental to the successful settlement/invasion of Europeans in this semi-arid landscape as a resource for pastoralists, and a means of transport, trade and access to and from the southern colonies of the country (Cadell 1855; Kenderdine 1993). In South Australia (SA) where the Murray River crosses the Victorian border, lies Calperum Station, in what is known as the Murray Riverland region (Figure 2). This area forms the case study area for this thesis. The Riverland has a history of frontier violence, pastoral pursuits and irrigation achievements (Burke et al. 2016; Foster and Nettelbeck 2012:32–39). As an important region for both Aboriginal Australians and Europeans, there is no doubt that cultural interaction and entanglement was a prominent feature of the early settlement period.

Culturally modified trees[1] (henceforth CMTs) are common in many Aboriginal cultural landscapes. Often they are formed when bark is removed to make vessels such as canoes (Basedow 1914; Edwards 1972), shelter material (Memmot 2007) and utensils such as dishes and shields (Carver 2001). Other CMTs were formed by people trying to collect sugarbag, or wild honey, from the hives of native bees; to hunt possums in tree hollows; and to collect grubs from beneath the bark of Eucalypt trees (Long 2005; Morrison and Shepard 2013). Unfortunately, they are a significant but often understudied cultural feature in the Australian archaeological landscape and one that can provide a means for assessing the entanglement of Aboriginal and European cultures and teasing out local narratives around Aboriginal bark use. Individually, CMTs are visual markers indicating Aboriginal connection to country and custodianship and ownership over the land. When studied on a landscape scale, using distributional information gained through spatial analysis tools, they can tell a much

[1] The term 'culturally modified tree' (CMT) is used in this thesis instead of 'scarred tree', as it relates to the international literature. Scarred tree is an inherently Australian term, yet it does not account for the diversity of tree modifications recorded in this study.

broader story of culture adaptation and continuity in the pre (prior to the 1830s) and post (1830s–1880s) contact period. This thesis sets out to use the advantages of spatial analysis, combined with ethnohistoric data, to investigate questions regarding pre- and post-contact Aboriginal land use in the Riverland region.

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Figure 1: Map of the Murray-Darling Basin with the location of Calperum Station indicated, adapted from Zuo et al. (2014).

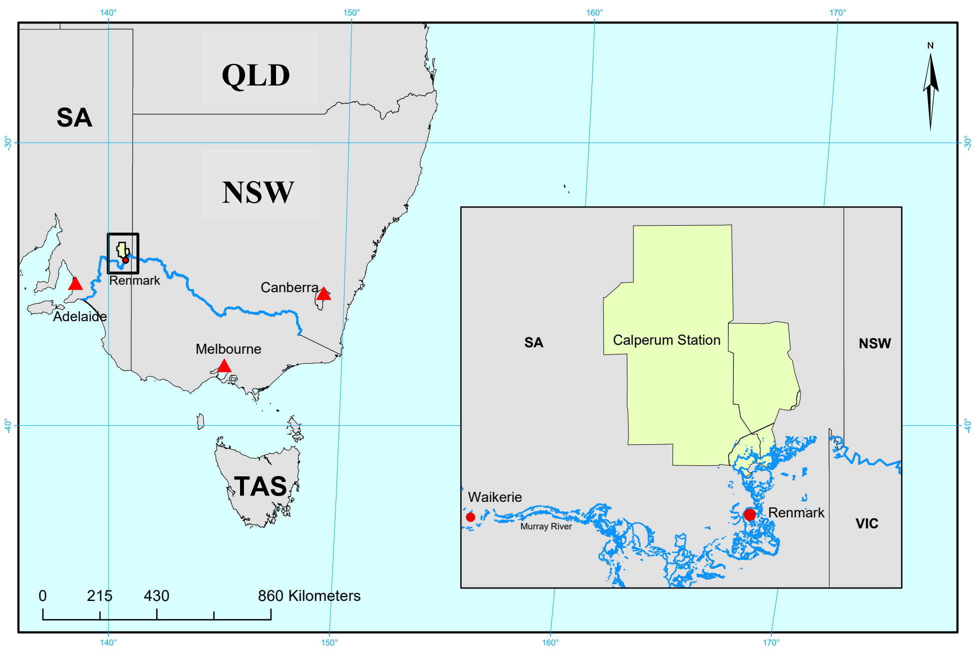

Figure 2: Calperum Station study area in relation to the Murray River.

1.1. Research Question and Aims

This thesis aimed to answer the following question:

What can culturally modified trees reveal about processes of cultural change in Aboriginal bark use and procurement in the South Australian Riverland region from pre- to post-contact?

Following historical research into the Riverland region, and prior assessments of CMTs, the following aims were devised to address research gaps and enhance the knowledge of the region:

- Analyse documented cultural practices that may lead to the creation of CMTs.
- Assess the post-contact culture of bark use in the South Australian Riverland region from ethnohistoric sources.
- Assess how European colonisation impacted the use of bark as a resource.
- Evaluate any indicators of cultural change (in past bark use).
- Establish a typology of CMTs for the South Australian Riverland region.
- Analyse the spatial distribution of CMTs and scars within the landscape.
- Document trends in the attribute data of scars recorded on Calperum Station and consider how they are the product of that localised environment.

By addressing these aims, we can better understand past Indigenous land use with regards to CMTs and begin to understand the local heritage significance of the remaining CMTs of Calperum Station.

1.2. Significance

The significance of this thesis is threefold. Firstly, in terms of its disciplinary significance, it provides a comprehensive archaeological overview of bark use and the resulting CMTs in the South Australian Riverland—an aspect of Australian Aboriginal archaeology that has not received as much attention as other types of Aboriginal material culture, such as rock art and lithics that are well-preserved and fundamental to Pleistocene studies. CMTs in Australia are a non-renewable, organic cultural artefact that are being lost on a significant scale to both natural and anthropogenic processes. They have a limited lifespan before the cultural information they contain is lost forever. Having been almost completely overlooked as meaningful indicators of past activity (e.g. Flood 1989; Hiscock 2008; Mulvaney and Kamminga 1999), any detailed and comprehensive study of CMTs will contribute to the Australian awareness of this cultural resource and its conservation for the future.

Secondly, studies of bark use have tended to preference canoes, as well as the resulting scars, whereas this thesis extends the focus to include a number of other kinds of bark implements and their resulting scars. Bark is a widely documented cultural resource in ethnohistoric and more recent archaeological records (Angus 1847; Attenbrow and Cartwright 2014; Basedow 1914; Benett 2004; Berndt and Berndt 1993; Carver 2001; Edwards 1972; Eyre 1845b; Hawker 1899/1975; Hemming 1991; Kamminga 1988; Massola 1971; Oakden 1838; Taplin 1878; Thomas et al. 2011; Tindale 1974). Yet, comprehensive studies into bark as a resource significantly overemphasise canoe production and canoe scars (Angus 1846; Carver 2001; Edwards 1971; Flood 1989; Oakden 1838). Canoes provide only a single part of a whole array of bark use strategies in the everyday lives of Aboriginal people and as such, this is an important bias to address.

Thirdly, the effects of European colonisation on Aboriginal culture were felt across Australia and the consequences for Aboriginal peoples were diverse and locally specific. In many regions, including South Australia's Riverland, cultural activities were impacted and so this thesis presents research undertaken on a local scale to tell a local story, which can be used by the contemporary Traditional Owners to assess these impacts. The archaeology of CMTs provides a unique means of exploring these consequences at a singular location. This thesis, therefore, explores changes in bark use at one particular place over time. The influences of the environment, culture, contact and colonialism that underpins these local histories, tell a unique story that can provide a different viewpoint to the written record. The final product contributes to a broader body of literature aimed at comparative frameworks of contact experiences on a global scale (Barberena et al. 2017; Lightfoot 1995; Murray 2004a; Roux and Courty 2013; Willey et al. 1955).

1.3. Structure of Thesis

Chapter One introduces the research topic and theme, and in doing so, highlights the research question and significance. Chapter Two presents previous research into the processes of culture contact and entanglement in Australia, and then reviews current literature on CMTs on a global scale. The current literature and ethnohistoric sources regarding bark as a resource on the Murray River are reviewed in Chapter Three, and the study area of this research is discussed in Chapter Four. Chapter Five describes and justifies the methods used in the site surveys and the recording practices employed to collect and manage data, as well as the limitations of the study. The results of the archaeological field surveys and spatial analysis are presented in Chapter Six. Chapter Seven discusses what those results might mean in relation to the research question and aims and reveals how this study can be used to build a local narrative of land use. The conclusion, Chapter Eight, serves to draw together the interpretations of the study to support recommendations for future research.

2. Literature Review

This chapter reviews the relevant literature associated with the archaeological study of Aboriginal Australia around the processes of culture change, as they relate to culture contact. It also explores how CMTs can act as material markers of cultural entanglement and cultural adaptation. Themes that inform this study are explored throughout the chapter. These include broad concepts such as entanglement and cultural continuity, as well as current debates about ethnographies, and the 'prehistoric' versus 'historic' dichotomy in Australian archaeology that treats the pre- and post-contact Aboriginal past as culturally disconnected. This chapter then discusses the global academic trend towards comparative frameworks of contact experiences, and how local narratives of contact experiences—such as those explored in this study—provide significant contributions to these frameworks. The chapter ends with a review of CMT studies, from international and national perspectives, in order to contextualise this study as part of a growing body of literature.

2.1. Themes of Contact Studies

In order to understand what CMTs can reveal about bark use and procurement in the South Australian Riverland, including how those practices might differ pre- and post-contact, we need to develop an understanding of the cultural processes at play. In current literature, the singular connotations of the term 'contact' tends to down-grade the power dynamics inherent in colonial entanglements on a global scale (Silliman 2005, 2009, 2010). The term as used in this thesis however, should be viewed as a holistic process that encompasses continuity and adaptation by both the coloniser and colonised populations.

The archaeological study of contact in Aboriginal Australia has its roots deeply ingrained in a unidirectional and ethnocentric ideal of a 'dying Aboriginal culture', which failed to acknowledge Aboriginal agency (Berry et al. 1989:185; Lightfoot 1995:206). However, since the 1980s, archaeology has shifted its focus to investigate the trajectories of cultural continuity and adaptability that are inherent and well-documented aspects of Aboriginal cultures (cf. Byrne 1996, 2003; Clarke and Paterson 2003; Lydon 2002; Murray 1993, 2000, 2004b; McBryde 2000; Mitchell 2000; Paterson 2003, 2005; Harrison 2004; Lightfoot 1995; Lilley 2000; Ralph and Smith

2014; Smith 2001; Stockhammer 2012; Thomas 1991; Torrence and Clarke 2000; Williamson 2002; Wobst 2000).

2.1.1. Cultural Entanglement

The concept of cultural entanglement is well-established in global contact studies, where entanglement refers to the long-term interaction between two or more cultural groups (often between colonisers and Indigenous peoples) (Silliman 2010:29). Australian studies can continue to contribute to this international discourse, due to the rich and unique nature of its collective archaeological and ethnohistoric record. Using this unique record, we can redress some of the colonial assumptions that have been made about Aboriginal peoples in the past, for example, the idea that Aboriginal Australians played a passive role in the colonial period (cf. Byrne 1996; Harrison 2004; Lydon 2002; McBryde 2000; Mitchell 2000; Thomas 1991; Wobst 2000). Some researchers have countered these previously unchallenged interpretations by highlighting the negotiation of conflicting relationships between Aboriginal Australians and European settlers (Mitchell 2000; Thomas 1991). In this sense, approaching CMT studies with an understanding of cultural entanglement as a two-way process will inform interpretations of change and continuity in bark procurement practices and their material remains (i.e. CMTs).

The effects of cultural entanglement persist in the present. For example, Altman (2009:322) advocated for a greater appreciation of the ‘hybrid economy’ model, a model that appreciates the non-production activities and multi-sectoral production of Indigenous Australians, by modern policy makers. As Altman et al. (2006:141) noted, the diversity between Aboriginal economic strategies and those economic strategies of European settlers was not compatible. The entanglement of European and Aboriginal economies and lifeways in the past, therefore, has had an enduring effect and still manifests in contemporary times. Aboriginal Australians now, as in the past, live within the policies of the European economy and legal system and it is evident even now, that customary activities such as hunting, fishing and art production are still prevalent in local communities (Altman 2009:326). Rather than being consumed by another culture, those Aboriginal cultural practices continued, albeit in new or different ways—ultimately adapting to a changing world in ways that benefitted communities, despite active attempts to exclude them (Altman 2006; Altman et al. 2009; Silliman 2010).

The negotiation of power relations by Indigenous peoples is therefore a fundamental issue in current research, and studies of CMTs have the potential to contribute a nuanced understanding of material culture exchange despite colonialism. This particular potential arises from the broad use of bark by pre- and post-contact Aboriginal Australians and by European settlers after invasion. The harvesting of bark in the pre- and post-contact periods also allows us to make inferences about manufacture traditions and cultural adaptations.

2.1.2. Continuity vs Discontinuity

One of the aims of this thesis is to understand what a study of CMTs can reveal about how bark use practices changed from pre- to post-contact Australia. To identify this change in the material record, we need to understand present scholarly approaches to ideas of cultural continuity, discontinuity and adaptation. In evaluating Aboriginal experiences of colonisation in Australia, many scholars have devoted their efforts to understanding the driving force and mechanisms behind cultural continuity, adaptation, and discontinuity (i.e. where discontinuity refers to a practice that ceases to occur). Understanding the mechanisms and past phenomena associated with discontinuity in the archaeological record is essential for evaluating the cultural continuity present in the same record (see Barberena et al. 2017). Roux and Courty (2013), for example, constructed an introduction to concepts of continuities and discontinuities that, when mapped with evolutionary theory, sees cultural change as continuous until a complete cessation of transmission of social learning occurs (when a population is replaced) (Roux and Courty 2013:189). In terms of post-contact archaeology, this would occur when a population is completely replaced and in the Australian situation, social learning then never ceased and Aboriginal culture as a whole did not participate in a discontinuity event. This is further evidenced by studies such as Murray's (1993) that revealed, even in the face of attempted cultural annihilation in Tasmania, Aboriginal people managed to re-establish their culture in a new landscape albeit with foreign materials. While cultural continuity is an obvious component of the Australian archaeological record, it is one that still requires commentary in contemporary work, and an evaluation of CMTs provides a material means to explore these issues.

2.1.3. Issues with Ethnohistory

This thesis pairs archaeological and ethnohistoric data to investigate the use of bark in order to ensure a more rounded interpretation of cultural continuity. A common critique of Australian archaeology is that it tended to overlook the capacity for Aboriginal cultures to co-exist and persist when European colonialism escalated (Byrne 1996, 2003; Murray 1992; Thomas 1991; Torrence and Clark 2000). Uncritical users of ethnohistoric data tend to idealise this 'stagnant' culture interpretation (see discussion by Byrne 2003; Murray 1992; Wobst 1978). Byrne (2003) highlighted that the past erasure of Aboriginal agency and cultural continuity happened in two ways: through physically marginalising Aboriginal people; and discursively by rendering traces of Aboriginal experience invisible in colonised landscapes. Wobst (1978:304) acknowledged the shortcomings of ethnographic observations based on the motivations of most practitioners—to construct behaviour from short-term observation and to study the disappearing hunter-gatherer through contrast with the agriculturist's society. Torrence and Clarke (2000) published a collection of papers on the topic of cultural negotiation and argued that a broader approach to interpretation, including the use of Indigenous oral histories and archaeological data is necessary, as historical archaeology tends to privilege European-dominated regions and concepts (Torrence and Clarke 2000:2). It is clear then, in modern contact studies, that ethnographic data should be tempered by other data sources for an effective evaluation of past adaptation and continuity of Aboriginal cultures.

2.1.4. 'Prehistoric' vs 'Historic' Dichotomy

This thesis recognises the use of bark as a cultural activity that was practiced long before colonial encounters and hence, when studied in the ethnohistoric record, trends have unobservable origins and trajectories. The prominent disjuncture between so-called 'prehistoric' and 'historic' archaeological theories, methods and frameworks, presently restricts the effective evaluations of Aboriginal agency and impacts of colonisation to this day (Byrne 2002; Torrence and Clarke 2000; Williamson 2004). Lightfoot (1995) identified the discipline-wide distinction between 'prehistoric' and 'historic' archaeology, as serving to detract from the study of long-term cultural change in the record (see also Byrne 2002). To address this issue in the discipline, Murray (2000) advocated the formation of historical trajectories of Indigenous societies.

Similarly, Williamson (2004) argued for researchers to consider Indigenous lifeways prior to contact as well as adaptations after contact to fully comprehend the motivations of cultural change.

2.2. Contact Experiences: Frameworks for Comparison

Since the middle of the twentieth century, archaeologists have engaged in a global discourse on a comparative archaeology of post-contact Indigenous experiences (Barberena et al. 2017; Lightfoot 1995; Murray 2004a; Roux and Courty 2013; Willey et al. 1955). Lightfoot (1995) discussed the study of long-term cultural change and the implementation of pan-regional comparative analyses for understanding the impact of colonialism on culture and lifeways, both temporally and geographically. His ideas are akin to those of Barberena et al. (2017), who focused on building a framework for the comparison of contact experiences, sufficient for evaluating and comparing longer-term phenomena and short-term behavioural mechanisms preceding events of cultural continuity, discontinuity and adaptation. A comparable approach to data and inference, to allow better comparative research on culture contact, is essential for contact archaeology studies in Australia going forward.

2.2.1. Toward a National Framework, Through Local Histories

While comparisons of contact experiences on a global scale are an important part of contact studies today, they are not possible without the categorisation of experiences on local scales. A study of CMTs at Calperum Station in the South Australian Riverland is a local study of contact experiences and can be used to contribute to regional and national understandings of the effects of colonisation. Murray (2004a) aimed to contribute to building a global historical archaeology of contact by highlighting the strengths and weaknesses of 'settler societies' as a category in a framework for global comparisons of contact experiences. He argued that factors such as demographics, intentions of the colonisers and the chronology of contact contributed to diversity in contact situations and that these factors need to be integrated in comparative frameworks to comprehend local experiences. Willey et al. (1955) produced a systematic and detailed classification system of culture contact situations. While the structure does not cover an extensive range of contact situations, and predominantly references American and well-established ancient examples, the categories both classify and clarify the types of contact experienced by cultures. The system itself is based on both the nature of contact experiences and the result of contact, as they are both observable in the archaeological record and allow knowledge sharing and comparison on a global scale. Archaeological research in post-contact Australia should attempt to be integrated where possible into regional and global frameworks, as much can be learned through a comparative perspective in terms of structural similarities in historical processes across regions, times and continents.

2.2.2. Local Experiences, Subversive Heritage

In contributing to a national framework for comparison of contact experiences, we must understand that Indigenous Australia is represented by an array of interconnected cultures, rather than a 'homogeneous', or pan-Australian culture. For this reason, the impacts of colonisation and the resulting experiences of Aboriginal Australians manifested differently across the continent. It follows, then, that we must incorporate a varied assortment of stories and experiences in order to make the framework more robust. One example of colonial entanglement in Aboriginal Australia was explored by Roberts et al. (2017), who demonstrated the local intangible heritage values that are associated with *Crowie,* a wrecked barge, submerged beneath the Murray River in South Australia. The study expressed the multiple layers of attachment that local Indigenous people have with a European barge. The barge, which could be argued is an instrument of colonisation, now forms a part of their perceived cultural landscape (Roberts et al. 2017). The experiences of contact for Indigenous peoples on the Murray River are distinctive of the process of contact at that geographic location.

In Port Jackson and the Kimberley, experiences of contact processes are different still. At these locations, McBryde (2000), highlighted exchange and barter as a significant component of dynamic cross-cultural interactions that saw Aboriginal people as active social agents navigating social and political relationships with the settlers of their land (cf. Harrison 2002a; 2002b). Photographs by Charles Walter, from around 1865, of Coranderrk Aboriginal Station outside Melbourne tell a new local narrative too. According to Lydon (2002) the images permit the assumption of a double cultural meaning. To Aboriginal people they signified land claims, but to European settlers the images equated to the ideals of the rapid civilisation of the residents as measured by the adoption of white goods and customs. European contact did have a significant impact on Aboriginal culture, but it is the archaeologist's task to interpret how Aboriginal people expressed these effects locally. An analysis of pre- and post-contact CMTs provides a new lens through which to consider the local effects of colonisation on the use of bark as a resource.

2.3. Culturally Modified Trees

2.3.1. Culturally Modified Tree Studies, Internationally

On an international scale, trees modified for cultural purposes have been recognised as important sources of information regarding past land use and Indigenous knowledges. Studies focussed on CMTs have been conducted, largely in North America (Kawa et al. 2015; Stryd and Feddema 1998) and the Boreal forested landscapes of Scandinavia (Andersson et al. 2005; Andersson et al. 2008; DeKoninck 2003; Östlund et al. 2003; Östlund et al. 2002), where the use and associated cultural significance of CMTs, by both Indigenous peoples and, in Scandinavia, eighteenth century cattle herders were reviewed. Closer to Australia, the Intellectual Property Issues in Cultural Heritage (IPinCH) research initiative studied *Rākau momori* (a modern Moriori term for 'memorial trees') as a part of a case study of Moriori culture (Hokotehi Moriori Trust 2014).

The functionality of CMTs globally are diverse. For the Indigenous Samì people of Sweden, the bark of Scot's Pine represented an important food source in their daily lives (Östlund et al. 2003:84), while eighteenth century cattle herders in Scandinavia stripped bark from trees to act as markers of socio-political borders and routes through the landscape (Östlund et al 2003; Andersson et al 2005). In North America the literary focus is on the varied use of cedar trees for clothes, food, medicine and dye (Stryd and Feddema 1998:8) and those used as living signs and symbols, including trail trees or CMTs that have been 'bent' and act as 'signposts' indicating tracks through the countryside and as a medium of art (Kawa et al. 2015). In south-western Asia and northern Africa the Boswellia *sacra* tree is 'stripped' to extract frankincense resin as a significant luxury trade good from ancient times to the contemporary world (Sharma et. al. 206). In North America, the significance of studying CMTs has been recognised by governments who have funded research since the 1980s (Andersson et al. 2008:466). The need to raise awareness of this cultural resource has been the subject of significant study by Andersson and Rotherham (2009), in response to a 29% loss of CMTs in 17 years to natural processes. Eldridge (1997) presented an in-depth report on the significance and management of CMTs for the Vancouver Forest region. The report achieved its primary aim of providing guidance on the significance of CMTs and presenting an objective and standardised methodology for dealing with them in the field. The loss of trees due to cultural discontinuity and environmental factors in New Zealand is at the forefront of research. In an effort to preserve this aspect of the heritage of the Moriori culture, researchers have scanned carved trees, undertaken environmental protection through wind breaks and monitoring and even removed 19 trees to preserve them out of context (Hokotehi Moriori Trust 2014). Cultural rejuvenation of carving living trees has been highlighted as a priority project for the future maintenance of this tradition (Hokotehi Moriori Trust 2014:61).

2.3.2. Culturally Modified Tree Studies, Australia

International research into CMTs has demonstrated that Indigenous peoples who use available natural resources have a strong physical and spiritual connection to the land, and a similar scenario is evident in Australia. For example, carved trees which are scarred through the carving of designs, glyphs and motifs are associated with spiritual spaces including burial grounds, bora and initiation sites (Black 1941; Etheridge 1918; Lewis 2014). Another example is Barkley et al. (2008), who discussed the inherent and ongoing relationship between living Traditional Owners and their ancestors or spirits who are associated with the trees. Australian CMTs represent a living archive of the ingenuity, skill and knowledge of past Aboriginal peoples, but as noted above, it has become apparent that anthropogenic processes and natural events across the globe have resulted in the dramatic but often unrecognised loss of CMTs as cultural indicators of peoples and places (cf. Morrison and Shepard 2013:144; Andersson and Rotherham 2009:225). Interrogation of the environment and context within which CMTs are found (Webber and Burns 2004), their spatial distribution in the landscape (Morrison and Shepard 2013) and the attributes of the scars themselves (Bulloch 2014; Carver 2001; Irish 2004; Rhoads 1992) can provide insights into many aspects of past Indigenous lifeways before this resource disappears.

CMT studies are often conducted as part of field surveys for heritage reports or as a component of surveys prior to development, instead of as an area of inherent research potential. For example, as a part of the Bowen Basin Aboriginal Cultural Heritage Project in Central Queensland, Godwin et al. (1999) reported that several CMTs were within 8.6% of land to be affected. These were deemed not to hold outstanding value to the Aboriginal cultural landscape and management was not undertaken. Similarly, Czerwinski (2002) discussed the material culture found along the Onkaparinga River in South Australia, and identified nine scars on living *Eucalyptus camaldulensis* (red gums), elaborating only that three were recognised as being the result of canoe production based on their large dimensions (<2 m). It is clear that CMTs are identified as a product of past Indigenous land use; however, with the exception of carved trees, both prior to contact and well after, they are seldom used to understand more nuanced aspects of past human behaviour, such as activities associated with bark use (Black 1941; Etheridge 1918; Lewis 2014).

There are limited published large-scale studies on CMTs relating to bark procurement in Australia. Rhoads (1992) provided the only published regional and rounded analysis of CMTs to date. This survey in south-western Victoria recorded 299 scar features, which were systematically analysed to illuminate cultural behaviour influencing distribution patterns and environmental factors. Rhoads (1992:215) found that CMTs most likely belong to the same spatial distribution as campsites and that regional water availability does not correlate well with this distribution patterning. Rhoads attributes these conclusions to two fundamental aspects of his study. Firstly, they may reflect a patterning pertaining only to the well-watered region of south western Victoria and secondly, CMTs represent and an embedded rather than directed procurement strategy with an ephemeral nature that would see a random distribution within the landscape.

Another notable study is that by Webber and Burns (2004) who conducted an extensive systematic survey of CMTs in the western Victorian Barrabool Flora and Fauna Reserve, with the key goal of comprehending the pressure on bark as a resource in the region using a controlled sample of all mature trees. Due to the low average number of scars (an average of 1.127 scars/tree) on preferred species (*E. largiflorens* [black box trees] and *E. microcarpa*), it was demonstrated that there was not a high pressure on bark as a resource in this region in the past.

With a focus on understanding Indigenous people's lifeways during colonial times, Morrison and Shepard (2013) highlighted the applicability of spatial analyses of landscape-scale data from CMTs to explore wider patterns in Indigenous landscape use. Their study area comprised two separate regions on the western Cape York Peninsula in north-eastern Australia (Weipa Region and Palm Creek) and the research focussed on CMTs associated with the collection of wild honey ('sugarbag' trees). The results of the study were based on a quantitative analysis of 1502 sugarbag scars on 982 CMTs using statistical tests (Spearman's Rank Order, Mann-Whitney U test and Chi-squared Test) to highlight relationships between and within the categories of scar characteristics, tree attributes and at the two separate locations (Morrison and Shepard 2013:148). The results of this study validated the relevance of CMTs to studies of landscape use and highlighted a strong relationship between nodes of historical activity and collection intensity.

2.3.3. Culturally Modified Trees, Murray River

Published research on CMTs at Calperum Station (Figure 2) is non-existent and for the western central Murray region in general, is rare. A salvage archaeological project led by Gill (1973) at the Chowilla Dam site on the Murray River found that CMTs did not make up a significant component of the study. Their only reference was in passing and mentioned that canoe scars were present and that confusion with European scars was managed by considering that European scars were deeper. Canoe scars were the focus of an extensive study by Carver (2001) of initially Ngarrindjeri land in South Australia along the River Murray between Mannum and Lake Alexandrina as well as the Finniss River and at Kangaroo Island. The study found that the number of scars per tree was indicative of the pressure on bark as a resource especially along the Finniss River where two groups of Aboriginal peoples (Carver 2001:66) shared the resource and that the young age of river red gums with scars alive today, indicated that Aboriginal people continued to make wood implements from red gums and box trees after contact (Carver 2001:72).

2.4. Chapter Summary

This chapter synthesised the literature that informs the present study. Foundational to contact studies in Australia is an understanding of the processes of contact and how colonisation manifested in the Australian landscape. In addition, this chapter discussed how local Aboriginal Australians adapted to this changing landscape. Determining how these cultural responses were expressed in the archaeological record requires an exploration of the processes of entanglement and adaptation on a local scale. The significance of CMTs to understanding these relations on a local level is profound and the need to effectively manage this heritage resource is much acknowledged in international and Australian literature (Andersson and Rotherham 2009; Barkley et al. 2008; Morrison and Shepard 2013; Stryd and Feddema 1998). CMTs are a non-renewable and finite resource and the information they can contribute to understandings of local adaptations of entanglement for future comparative frameworks should not be overlooked.

3. Bark Use and CMT Distribution in South Australia

This chapter explores the variety of uses of bark by both the Aboriginal peoples of South Australia and by European settlers. It is fundamental to evaluate historical trajectories of Aboriginal culture, and especially material culture comprised of bark, in order to understand cultural adaptation and continuity regarding bark use and procurement (Murray 2000; Paterson 2003, 2005). Insights into pre-contact Aboriginal cultures are crucial for constructing these trajectories and the ethnohistoric sources detailed below provide the commentary required to construct those trajectories.

This chapter identifies and describes the numerous uses of bark in Aboriginal material culture before commenting on how European settlers used bark for their own purposes. This is followed by an evaluation of the impact of European intervention and activities on Aboriginal access and use of this raw material as well as on the taphonomic distribution of CMTs in the Riverland landscape today.

3.1. Indigenous Use of Bark

Bark is a fundamental element of Australian Aboriginal material culture that was deployed for a number of diverse uses (Kamminga 1988:26; Klaver 1998:223). Ethnohistoric sources document the cultural practices of Aboriginal Australians that led to the creation of CMTs and reveal the significance of bark as a raw material for everyday life along the Murray River (cf. Angus 1847; Basedow 1914; Berndt and Berndt 1993; Edwards 1972; Eyre 1845; Hawker 1975; Massola 1971; Oakden 1838; Taplin 1979, 1989; Tindale 1974). Canoes were the most frequently described object made from bark (Basedow 1914; Edwards 1972; Oakden 1838; Roth 1908; Thomas 1905); however, shields, water and food carriers, and shelter material are also mentioned and occasionally described (Angus 1846; Basedow 1914; Edwards 1972). This raw material is organic and does not generally survive long in the archaeological record; therefore, CMTs are the proxy through which we can study those bark objects that have not survived.

3.1.1. Canoes

Canoes were one of the most noted material aspects of Aboriginal culture in ethnohistoric sources. Along the Murray River, ethnohistoric data suggests that canoes were formed from a single sheet of bark harvested from red gums (Mitchell 1839b:223, 1839a:331; Roth 1908:161; Smyth 1878:407, 410; Spencer 1922:138; Sturt 1963:201) and that they were 'poled' for propulsion by spears or long sticks (Eyre 1845a:313, 264; Mitchell 1839a:223; Sturt 1834:201) (Figure 3). Sturt (1963b:201) provided a description of the bark canoes he saw on his travels down the Murray River in early 1830:

> These canoes are of the simplest construction and rudest materials, being formed of an oblong piece of bark, the ends of which are stuffed with clay, so as to render them impervious to the water.

Edwards (1972) extensively described the canoes of Aboriginal Australians and identified large scarred river gums as the sole remnants of this important pre-contact industry (Edwards 1972:71) (Figure 4). The process of removing bark across Australia, occurred 'when the sap is rising' in the tree and the bark could readily be removed (Clarke 2012:241; Davis 1989:42; Hutcherson 1998:62; Levitt 1981; Smith and Kalotas 1985; Spencer 1922). This coincided with spring, when sap flows more freely through the bark, and towards the end of the wet season in tropical climates (Hutcherson 1998:62; Levitt 1981:17; Spencer 1922:126).

Figure 3: Fishing with bark canoes at Chowilla Creek, on the station adjacent to Calperum Station, taken in 1886, Godson Collection, State Library of South Australia.

Aboriginal traditional navigation skills and canoe production were also significant to early European settlers because Aboriginal people actively engaged with and aided colonists (Castella 1987:128; Curr 1883:90; Dunderdale 1870:280; Hardy 1976; Mitchell 1839b:331; Stevens 1969:28; Wardiningsih 2012; Foster 2000). There are numerous historical accounts of Aboriginal people guiding and ferrying Europeans and stock across rivers and flooded creeks (Castella 1987:128; Curr 1883:90-91; Hardy 1976:82; Mitchell 1839b:33; Stevens 1969:28; Wardiningsih 2012) and of saving Europeans from drowning (Dunderdale 1870:280). Bark canoes of Aboriginal origin were at the forefront of colonial activities and their production was driven in the early contact period by European needs as well as ongoing Aboriginal traditional activities.

Figure 4: The imprint of bark removal to create a canoe recorded during this study, NRRI002 (Photo Credit: Frank Boulden).

Bark canoes were identified in the 1860s as a fundamental tool for Aboriginal livelihood and independence through hunting and fishing and by allowing access to other aquatic resources (*Adelaide Observer* 1860:5; Foster 2000; Gara 2013; Renard 2003:pl.5,6; *South Australian Weekly Chronicle* 1860a:1, 1860b:4). It is evident that pastoralists on the Murray, and elsewhere, were objecting to Aboriginal people 'trespassing' on their lands to cut bark from their trees for canoes. In the 1860s, some landowners chopped holes into newly made canoes to deter Aboriginal people from returning (*South Australian Advertiser* 1860:3; GRG 52/1/1884/8; *South Australian Register* 1860:3). The 1860 Protector's Report for the Wellington District (in the lower Murray), as advertised in the *South Australian Weekly Chronicle* (1860:1), suggested that the Government 'could afford no more acceptable aid to the Aborigines of the Wellington District than by supplying two or three canoes to each tribe'. Canoes were supplied to Aboriginal people from the 1860s until the late 1880s, after which, individuals who were capable of working had to pay half the cost (Fowler et al. 2016:6). The State Records of South Australia (SRSA), Government Record Group (GRG) 52 'Aborigines' Office and Successor Agencies' provide the records of correspondence files in (GRG52/1) and out (GRG52/7) of the Department of Aboriginal Affairs from 1866–1968 (Appendix Nine). Hundreds of pieces of correspondence relating to Aboriginal requests for canoes from the government in the Riverland region of the Murray are available in this collection (as exhibited below).

The entanglement of the European and Indigenous cultures forced many Aboriginal people to adapt to the new political landscape and obtain their canoes through the government. Item GRG 52/1/1890/329, for example, shows a request for a canoe for the Aboriginal man 'Tommy Bookmark[2]' from Renmark, at a cost of 10 pounds. Subsequent correspondence states that 'Tommy' will pay four pounds towards the cost. Another example highlights a request for a boat for Aboriginal 'Chowilla Beasley', who was also required to pay four pounds towards the cost (GRG 52/1/1891/335). Sometimes canoes could be allocated to groups of Aboriginal people, for example, an approval from the Protector for a canoe to be provided to an Indigenous group at Renmark (GRG52/7/1890/769b) and then a second canoe was approved for the

[2] 'Bookmark' is an anglicised version of the Erawirung word '*Buikmiko*' meaning 'round hole' (Tindale c.1934-c.1991) and was the original name of the station that was divided to make Calperum and adjacent Chowilla Station.

Renmark group provided four pounds was paid towards the cost of its construction (GRG52/7/1890/786a). It was not just Aboriginal men who had the right to request and contribute towards the funding of a new canoe, Aboriginal women were also afforded the same opportunity. An example is Aboriginal woman Jenny Mason/Xmas. Three records relate to the approval of two canoes to be built for her and an acknowledgement of receipt for three pounds contribution towards the cost of the second canoe in 1891 (GRG 52/7/1887/319b; GRG 52/7/1891/896b; GRG 52/7/1891/900a). The government also expected groups of Aboriginal people to share one canoe for their collective subsistence (GRG 52/7/1901/592). This idea of sharing canoes extended to the re-use of a canoe when its owner had passed away. For example, a request for a canoe for Merly Scott of Renmark, was approved, provided he was given the canoe of Tommy Dodd, of Renmark, who passed away two years earlier (GRG 52/7/1894/145b). Obtaining and maintaining a canoe from the government was an expensive and slow process for Aboriginal people and one without a guaranteed outcome. That Aboriginal people endured the process attests to the importance of canoes in their food procurement strategies and daily life along the river, well after the arrival of European settlers.

3.1.2. Other Aboriginal Uses of Bark

As outlined above, European contact did not stop the bark removal practices of Indigenous Australians (Carver 2001:72). A variety of other uses of bark by Aboriginal Australians are occasionally noted in the ethnohistoric record, but their references are sparser than those related to canoes. Clarke (2012), in an extensive volume that synthesised the use of Australian plants by Aboriginal people, noted the many and wide-reaching uses of bark by Aboriginal people including for clothing, wrapping goods, containers, some food products, shields and shelters, as well as canoes (Clarke 2012:150–162). Clarke noted that bark was used for provisional containers/dishes along the Murray River, which needed to be made quickly and could only be used for a short period of time. Basedow (1914) reported the use of bark food-carriers in south-eastern Australia and distinguished the size of the bark removed as an indicator as to what resource was being utilised (but gives little other information about this inference). In the South Australian Museum, two samples of leaves are held that were collected from around Swan Reach, downstream of Renmark/Riverland on the Murray River (SAM

A42925). The information provided with these items suggests that they were used in the preparation of medical material, by infusing 'leaves in a bark dish over hot ashes'. This supports Clarke's (2012) conclusions about the ephemeral use of bark containers in daily life.

Aboriginal shelters and dwellings across Australia, including the Murray Riverland region, were another notable cultural feature in the ethnohistoric record that extensively utilised bark (Memmot 2007). Clarke (2012:161, 70) noted that red gum bark was the preferred bark used elsewhere in South Australia for windbreaks, roofs and walls of shelters. This conclusion is supported by Worsnop (1987:47) who wrote that the wurleys or huts along the River Murray were covered in bark to provide protection from the weather. Sturt's (1963b:199) expedition journal also noted the use of bark huts along the Murray River when he wrote that during a storm 'we surprised a small tribe in a temporary shelter… they sat shivering in their bark huts'. Bark covered shelters and containers in the Murray Riverland were thus a prominent cultural feature of Aboriginal daily life (Figure 5).

Figure 5: Possible bark wurlies north of Nildottie on the lower Murray River from Tindale, N.B. (1930-1952a). Murray River Notes. South Australian Museum, 338/1/31/1.

Bark, as well as wood, was also used in the construction and practice of Aboriginal shields and organised warfare across the continent (as established by Kamminga 1988) (Figure 7). Angus (1847) (see also Renard 2003:pl.8), in an effort to document the quickly diminishing scenes and landscapes of South Australia, drew and recorded Indigenous bark shields, noting the use of gum bark for their production (Figure 6).

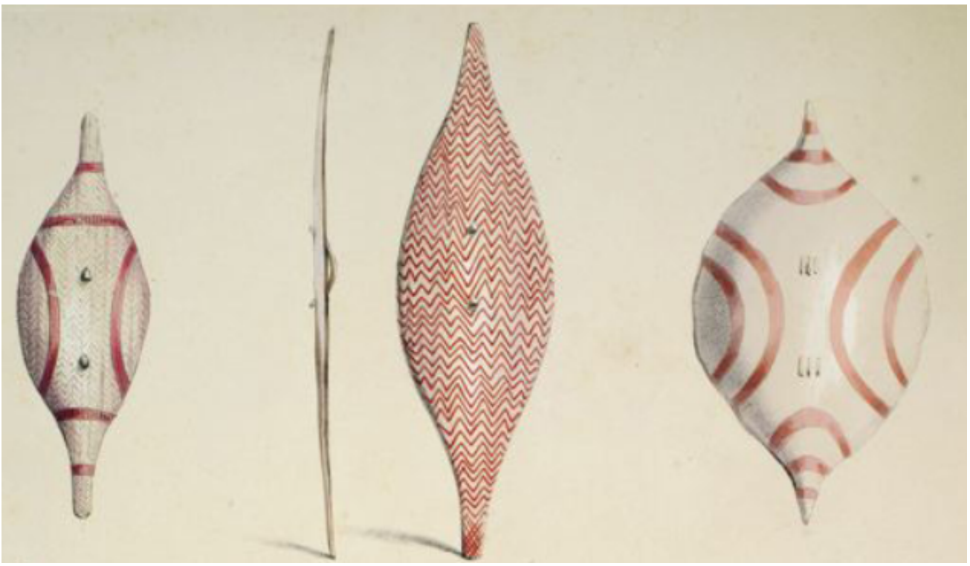

Figure 6: Three examples of bark shields from Mount Barker, the Darling and Encounter bay respectively, drawn by George French Angus in South Australia Illustrated (1847:pl. XI fig. 1, 2, 3 and 4).

The make and form of a shield varied considerably between different parts of Australia (Spencer 1922:13). Bark shields were made for short-term use in South Australia and parts of Victoria (Hemming 1991; Smyth 1878a:332) and were designed mostly for deflecting the lightweight spears thrown in organised battles (Cawthorne 1844/1926:6; Eyre 1845b:165; Jones 2007:58; Smyth 1878:330-334; Worsnop 1987:137-139). Jones (2007:63), provided an account of the use of a bark shield in an organised battle between Indigenous groups at Point McLeay Mission on the Lower Murray River.

Bark shields are of the 'broad' type described by Spencer (1922:13–19), with a wide middle that tapers at both ends to a point and, as opposed to the narrow heavier shield that is made of wood, and were used to parry blows from hand held clubs. Bark shields are rare in Museum collections. The Victorian Museum holds two Ngarrindjeri (Lower Murray) bark broad shields produced in 1840 and 1888 respectively (X95046, X1848) (Figure 8). A bark spear shield from the Lower Murray River, probably made by Ngarrindjeri people, that has lasted well beyond the lifespan of a typical bark object is housed in the South Australian Museum (SAM) (A22270).

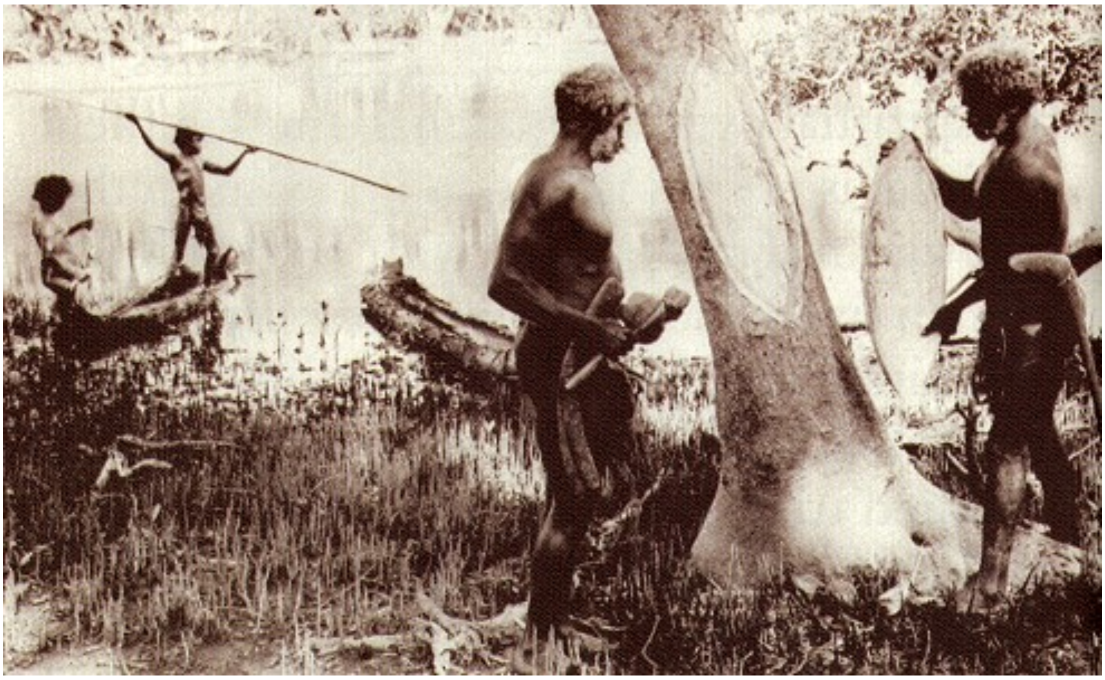

Figure 7: Two men removing bark for the construction of a shield around Port Macquarie, sourced from Muekee and Shoemaker (2004:32).

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Figure 8: Ngarrindjeri bark broad shield produced in 1888 (X1848).

Tree scars in the form of toeholds, still visible on tree trunks today, were the result of Aboriginal access to tree tops in the process of possum hunting (*Adelaide Observer* 1845:2; *Chronicle* 1897:37; Eyre 1845b:280; Renard 2003:pl.1), collecting honey and accessing suitable bark for implements and canoes (Edwards 1972:33,62; Renard 2003:pl. 4). An account by Spencer (1922:138) stated that a man 'ascended the tree by chopping holes with his stone tomahawk for his toes as he proceeded'. The small aperture size of toeholds provides a significant barrier to the contemporary identification of toeholds, as they quickly healed over leaving no visible trace of their existence. As noted in Clarke (2012:160), toeholds are more likely to be found on trees that died soon after the apertures were made. Toeholds, while not a form of bark procurement, were an essential means of access to treetops to procure bark and other resources.

Scars visible in the contemporary landscape may also result from Aboriginal procurement of a resource beneath the bark or within the tree itself. Accessing honey from sugarbag trees (predominantly in Northern Australia) (Barkley et al. 2008; Morrison and Shepard 2013) and catching possums (Eyre 1845a; Kerle et al. 1992; Renard 2003) are two prominent examples in which holes in trees are widened or made to extract a resource. As mentioned above, catching possums was a prominent form of resource procurement noted in the ethnohistoric record (*Adelaide Observer* 1845:2; *Chronicle* 1897:37; Eyre 1845b:280; Renard 2003:pl.1). Another example of food procurement scars is the collection of grubs and insect larvae, which were a principal food for Aboriginal peoples across the continent, including in south-east Australia (Eyre 1845b:251; Miller et al. 1993:226; Parkhouse 1923:6). Ethnohistoric accounts highlight that at the time of colonial contact, grubs acquired from both the ground and gum trees were a prized foodstuff for Aboriginal peoples (Beveridge 1880:20; Eyre 1845a:268; Smyth 1878:207) and in more recent time – see below, as an important component of fishing activities. To collect this resource bark was 'stripped' along grub tracts in trees (Long 2005:77) or a bark dish known as a '*mybkoo*' was manufactured and then used to loosen soil in the search of grubs (Angus 1847:pl.50, fig.32; Philip

Jones pers. comm. 28th September 2018)[3] (Figure 9 and Figure 10). In contemporary times, the practice of removing bark to collect these grubs continues to be undertaken not to collect food, but as bait for fishing (Kyle Payne pers. comm. 10th April 2018). Indigenous bark removal practices, while altered in terms of resource demand and possibly location of procurement after colonisation, thus persisted.

Figure 9: *Mybkoo*, illustrated by Angas 1847 pl.50, fig.32.

Figure 10: A likely '*mybkoo*' scar, used for collecting grubs from the soil and recorded during this study, AC006 (Photo Credit: Frank Boulden).

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[3] While Angus' illustration is not provenanced, the '-ko' suffix seems to be associated with Murray River languages and may be a Ngaiawang term that was learned by Angus at Moorundie near Blanchetown 120 km downstream of Renmark (Philip Jones pers comm. 28th September 2018).

3.1.3. Stone and Steel Tools

Bark constituted a fundamental component of Aboriginal material culture and much energy would have been exerted obtaining and shaping bark implements and canoes (Klaver 1998:223; *Mail* 1932:2) (Figure 11). Across south-eastern Australia, and notably in the Murray Valley, high quality stone harvested from Victoria's Cambrian greenstone belts, was traded in pre-contact times to make ground edge stone tools (McBryde and Watchman 1976:163). Guthridge (1910:5) noted that around Swan Hill, on the Murray, greenstones were traded for reed spears harvested from the extensive reed beds in the region. When early explorers first introduced steel into the Aboriginal landscape, it was quickly integrated into their toolkits. Charles Sturt's desire to keep peace with Aboriginal tribes, during his expedition down the Murray River beginning in 1829, saw him commonly exchanging tomahawks and metal objects with Aboriginal people (Sturt 1963:Vol 2). Sturt wrote:

> I gave, as was my custom, the first who had approached a tomahawk;
> and to the others, some pieces of iron hoop. (Sturt 1963b:96)

Many such occasions are noted in Sturt's journal, also of his exchange of steel tomahawks for sustenance (1963:Vol2 113) and for providing company and safe travels for himself and his men (Sturt 1963b: 41). Steel axes were regularly distributed at ration depots, for similar reasons as the provision of canoes, to reduce the cost of provisions at depots throughout the colony (Foster 2000:21). Steel axe marks in cultural scars represent a continuation of bark procurement strategies altered by the Aboriginal exploitation of this new steel resource that had been introduced.

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Figure 11: Two Aboriginal men on the mid North Coast of NSW, using stone tomahawks and wedges to remove bark from a tree, image sourced from Stewart (1988:75).

3.2. Europeans and Bark

Several factors are identified as having a significant impact on the availability and preservation of trees utilised for Aboriginal cultural scarring, including the riverboat industry in South Australia, European use of bark and timber for other industries and the World War II lumber industry for allied war efforts.

3.2.1. Europeans, Colonisation and the Changes in Bark Use

Bark was an important commodity to European settlers in adapting to the local conditions. In discussing cultural transfer from Aboriginal Australians to Europeans, McIntyre-Tamwoy (2002:176) highlighted that Aboriginal station workers taught European stockman how to make bark humpies and water troughs, when they were away from the homestead. Europeans made use of bark canoes for leisure (*Adelaide Observer* 1853:5), as well as their early use for transport (as noted previously). It is also evident that European settlers used bark as construction material for their houses, for sawn lumber, railway sleepers, piles, poles, fence posts, wood chips, craft work (Bonhomme 1990:21; Mackay and Eastburn 1990:234) and in the manufacture process of tanning (Long 2005:29). From the mid-1800s, Aboriginal people actively engaged with the bark and timber industry to support themselves (Westell and Wood 2016:4). An account of the life and experiences of John Theodore Schell noted that he built a house on Chowilla Station made from 'gum slabs' and with a reed roof that was cut and carried by Aboriginal people (*Murray Pioneer and Australian River Record* 1924:1). On Calperum Station, oral history accounts compiled by Linn (1995:14) reveal that the supply of timber from the station kept many people in work and was used to fire boilers for irrigation pumping stations and household use for the Renmark township. Mr Schmidt, a participant in the recording of oral histories of the area, noted in his interview that 'you could have got a job anywhere as a woodcutter because the pumping stations all operated on wood. It was a big industry'. The oral history account by Hemming and Cook (n.d.:55), of Colin Cook, an Aboriginal man on the Mid Murray River (an antecedent of current community members), further attested to Aboriginal labourers in the 'woodcutting' business for not only riverboats but for European men who supplied wood to local businesses as well. It is thus obvious that the continual use of red gums in the Riverland would have had a significant effect on the number of old scars present in the landscape.

3.2.2. Riverboats

The riverboat industry of South Australia had a major impact on the contemporary distribution of CMTs in the landscape. The River Murray and riverboats played a significant role in the development of South Australia and in colonial conquest, recognised in ethnohistoric sources (Allen 1853/1976; Cadell 1855; Drage and Page 1976; Hawker 1899/1975) and more recent studies (Benett 2004; Christopher 1948/2008; Roberts et al. 2017). Both Allen (1853) and Cadell (1855) wrote journals about the maiden voyage of the *Lady Augusta* paddle steamer on the River Murray, the first custom built paddleboat to navigate the water system (see also Christopher 2004). Both authors noted the extensive use of river red gums in shipbuilding and the abundant 'flooded' gum and box trees (black box) as a major source of fuel for the boilers. Two Aboriginal men are noted to have worked on the steamer for her maiden voyage (Kerr and Kerr 1975:26; Tucker 1985:25) and the *Adelaide Observer* (1853:5) highlighted that Indigenous Australians and crew from the *Lady Augusta* engaged in cutting huge amounts of wood for fuel at Chowilla Station, adjacent to Calperum Station. A photographic tribute to the paddleboats of the Murray-Darling river system by Benett (2004:3) attested to this, as he identified the need for mid-late 1800s steamboats to stop every hour to obtain fuel, a practice that saw a decrease in river gums along the floodplains. The account of the life of Mr Schell, noted that 'Like many people along the Murray, Mr Schell resorted to wood cutting for the steamers at 3/8 a ton, stacked on the riverbank' (*Murray Pioneer and Australian River Record* 1924:1). While bark canoes ceased to be used by the Ngarrindjeri people in the Lower Murray due to European shaping of the social and environmental landscape, they were still in use into the early twentieth century by those Aboriginal groups upstream as far as NSW (Gara 2013:5,9).

3.2.3. World War II Internment Camps

World War II (1939–1945) brought about a significant change in the social and economic landscape of the Riverland region that heavily impacted bark as a resource available to Indigenous Australians, as well as the modern tree distribution. The *National Security Act 1939* endorsed prisoners of war and enemy 'aliens' in Australia to be interned for the duration of the war. The major camp in South Australia was at

Loveday, 12 km south of Renmark, which held Italian and Japanese internees (NAA 2018).

Figure 12: Red gum regrowth from extensive logging at Woolenook Bend, photo taken from Calperum Station.

Importantly, three woodcutting camps; Katarapko, Moorook West and Woolenook, were established, seeing timber lumbered for the allied war effort by Japanese and Italian internees (Piper 2014:246). Woolenook is the most well-known and many images from the camp show the astounding amount of timber lumbered from the floodplains to fuel the Murray River Pumping Stations (see Appendix Ten; Figure 12 and Figure 13). The staggering amount of timber cut out of the floodplains by workers at these camps represents a significant taphonomic factor in the modern CMT distribution in the region and one that would drastically reduce the visibility of cultural scars in the landscape.

Figure 13: Astounding amount of timber cut and stacked on the bank of the Murray River near Woolenook Internment Camp (sourced from https://www.ozatwar.com/pow/woolenook.htm).

3.3. Death of Trees Due to European Changes to the Murray River Level

Modern agricultural activities along the Murray River have adverse effects on the survival and distribution of CMTs. Increased water storage, harvesting and regulatory structures along the Murray have fundamentally changed the hydrology of the river system and its adjacent arid landscapes, resulting in a diminishing river and associated diminishing ecosystem health (Barnet 1989:205; George et al. 2005; Menzies and Gray 1983:36). Dams, locks and irrigation technologies have resulted in a decrease in the flow of water down the Murray, an increase in water recharge rates and a decrease in the frequency, duration and height of natural flooding events (Barnet 1989:205, 208). In the Mallee region, the rising water table has increased the inflow of saline groundwater to the Murray River (Barnet 1989:205,208) and water diversion in the Murray-Darling Basin has removed up to 56% of the mean annual discharge from the river and reduced the natural flood regime of the water system (George et al. 2005).

Widespread clearing of native vegetation along the Murray River is having a similarly drastic effect on local ecosystems (Barnet 1989:205; George et al. 2005). George et al. (2005) determined that clearing for agriculture has seen a reduction of 38–42% of Eucalypt woodlands, dominated by river red gum and black box species, along the Murray River. Vegetation removal in the Murray Basin has resulted in increased recharge rates in the Mallee region of the Murray by two orders of magnitude causing salinity problems in low-lying areas where the water table is closest to the top soil (Barnet 1989:205,208). Changing river dynamics has an adverse effect on local flora and fauna and therefore on the survival and distribution of CMTs in the present landscape. It is important to explore the precursors of the modern taphonomy of CMTs, as this will contribute to a more holistic understanding of the spatial distribution of CMTs at Calperum Station.

3.4. Chapter Summary

This chapter has used a body of ethnohistoric sources to ascertain both cultural practices that resulted in the creation of CMTs as well as the continued impact of colonisation on Aboriginal bark use from the early nineteenth century. As was noted, canoes are the most prominent cultural material made from bark; however, a systematic study of CMTs could reveal if this is an accurate representation of the material record. Shields, containers, shelter material and the imprint of past resource procurement activities represent other prominent types of scars that are noted in the literature. This chapter discussed the adoption of steel into the Indigenous toolkit and argued that this adoption was the result of exploitation of a new resource in the Australian landscape and not an example of European technological dominance. An assessment of European settlement activities, use of bark and timber and hydrological adaptations, exposed those factors such as the development of the riverboat industry and World War II internment camps that both restricted Aboriginal access to and use of bark as well as influenced the contemporary preservation of CMTs in the landscape.

4. Study Area

In undertaking research into the past bark use of Aboriginal Australians, it is important to contextualise the history of the area, as it is vital to the identification of CMTs. In addition to Aboriginal CMTs, scars on trees may be the result of both natural phenomena and activities conducted by non-Aboriginal people in the post-contact era as outlined in Figure 14 below (Long 2005:29–33). Understanding the past land use and history of a region allows for a more informed survey strategy for data collection and field identification of CMTs.

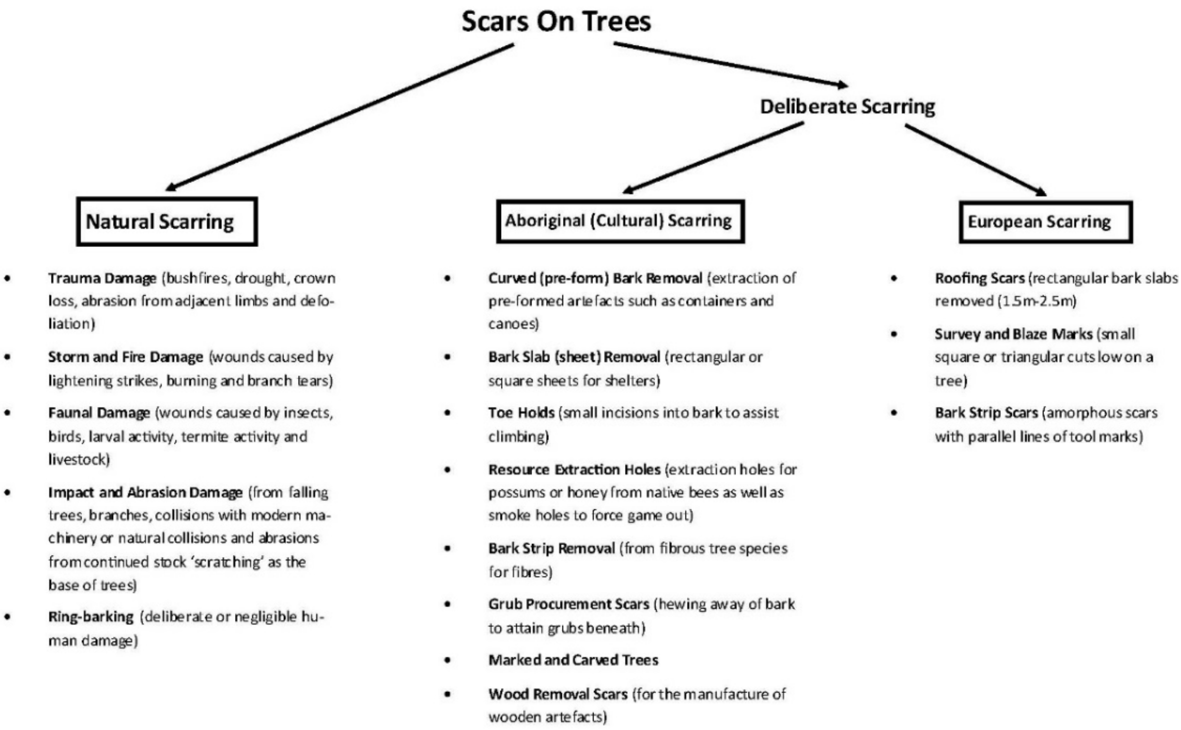

Figure 14: Major known causes of scarring on trees summarised from Long (2005).

This chapter provides an overview of what is known about Calperum Station, specifically identifying its size and location, as well as summarising previous archaeological research. This is followed by a review of the history of Calperum Station focussing particularly on the Aboriginal Traditional Owners and the relations between Europeans and Aboriginal groups in the Riverland region. Finally, the local landscape and environmental context is described.

4.1. Calperum Station

4.1.1. Size and Location

Calperum[4] Station is a 2,428 km^2 former pastoral lease station, located in the South Australian Riverland, near Renmark, and is managed by the Australian Landscape Trust under a direct contract from the Commonwealth Director of National Parks due to their allocation as a part of the confines of the Riverland Biosphere Reserve (RBR) (Australian Landscape Trust 2016; Fitzsimons and Wescott 2005). The RBR was originally known as the 'Bookmark' Biosphere Reserve[5] and was established as a part of UNESCO's 'Man and the Biosphere' program which aimed to scientifically study a sustainable relationship between people and their environments (UNESCO 2017). The study area for this thesis is in the south east corner of the station, where the Murray River forms part of the station's boundaries and considers the environmental processes associated with all the named locations in Figure 15. The first likely European contact with the study area would have occurred when Charles Sturt travelled down the Murray during his 1830 expedition (Bull 1878:144; Sturt 1834). Appendix One provides a thorough timeline of the Pastoral Lease History of Calperum Station following Grosvenor (1979) and beginning in 1851.

4.2. Aboriginal History of the Riverland

4.2.1. Traditional Owners

A variety of group names and languages have been described in the ethnohistoric record for the Calperum area (e.g. Berndt and Berndt 1993:303; Brown 1931; Clarke 2009:147; Tindale 1974). Tindale's 1974 map (Figure 16) illustrates one version of the cultural geographic boundaries in this thesis—although it is acknowledged that no single rendering is without issues. A full exegesis of this aspect of the ethnohistoric record was beyond the scope of this project. Tindale (1974:211) identifies the study area as being within the territorial boundaries of the Erawirung people. Today, the land falls within the former First Peoples of the River Murray and Mallee Native Title Claim,

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[4] 'Calperum' being likely derived from the Erawirung word *kalparum* meaning 'short cut' or 'branch road' (Tindale c.1934-c.1991).

[5] 'Bookmark' being derived from the Aboriginal word *pukumako* meaning flint stone axe or sandstone grit hole (Manning 2006:62).

determined via consent and managed by the River Murray and Mallee Aboriginal Corporation (RMMAC) (*Turner v South Australia 2011* FCA 1313 (18 November 2011)). The claim incorporated descendants of several narrower Aboriginal groups in the Riverland region.

Calperum Station Study Area

Figure 15: Study area for this thesis on the floodplain of the Murray River in the Southeast corner of Calperum Station.

This image has been removed for copyright compliance

Figure 16: Tindale's 1974 map of the Aboriginal territorial boundaries in the South Australian section of the Murray River with the boundaries of Calperum Station overlain on the image (adapted from Clarke 2009).

4.3. Prior Archaeological Research at Calperum Station

4.3.1. Flinders Theses

Other researchers have studied Aboriginal lifeways on the floodplain at Calperum station and their results are invaluable to the spatial analysis of CMTs in the landscape, as they illuminate places of habitation. Despite the significance of Calperum Station to environmental conversation and given the River Murray has been long recognised as one of the most populated regions of pre-colonial Australia (Pardoe 2003:52; Robinson et al. 2009:206), only a comparatively small amount of published archaeological research has been undertaken. Focussing on Aboriginal daily life on the floodplains of the Murray Riverland, Jones et al. (2017) analysed Indigenous oven mounds at Calperum Station, determining that oven mounds formed a part of a sophisticated management system that contributed to the stable production of food (see also Jones 2016). Similarly, Thredgold et al. (2017) and Incerti (2018) undertook analyses of surface stone artefacts on different landforms on Calperum Station. Based on her analysis Thredgold et al. (2016) suggested that the mounds were particular loci where food and fibre processing occurred. Incerti (2018) found that manufacturing conservation strategies were employed on higher quality materials and the most intensive knapping activities occurred on the lunette and dune forms of Calperum Station.

4.3.2. Conflict

Aboriginal and colonial-settler relations play a significant role in the process of cultural entanglement and therefore impacted bark procurement. Recent regionally-orientated research (Burke et al. 2016; Gill 1973; Jones et al. 2017; Foster et al. 2001:29–43; Foster and Nettelbeck 2012:32–39; Sullivan 2014) indicated that past European and Indigenous use of the landscape was intensive, and that conflict was prominent. Burke et al. (2016) determined that the European attitude towards navigating the landscape was conditioned from previous engagements resulting in amplified frontier violence over time. This contextual view of Calperum is supported by Sullivan (2014), who examined the extent to which conflict on the frontier from 1830–1900, in the central River Murray region of South Australia, was visible in both the historical and archaeological records. Sullivan (2014:84) found that Calperum Station was a zone of high traffic flow and was a significant area of interaction and conflict. Previous research at Calperum Station illustrates a significant degree of cross-cultural entanglement between the Aboriginal people and European settlers, setting an appropriate environment for studies of cultural adaptation, perseverance and change.

4.4. Environment

Understanding the modern environment allows for a more informed interpretation of Aboriginal landscape use and activity that is heavily connected to the use of bark as a resource. The following paragraphs describe the environment of the Murray Riverland, including climate, topography and vegetation. Living CMTs are temporally confined to the last 500 years due to the natural life cycle of the red gum (Rhoads 1992:200), as such, this chapter focuses on the environment and climate of the late Holocene.

4.4.1. The Modern Environment of the River Murray

Modern Climate

The environment of the Riverland region represents a significant factor that impacts the spatial distribution of living, dying and dead CMTs in the landscape. The Riverland is located in the semi-arid region of Australia (Menzies and Gray 1983:9) and exhibits diurnal and seasonal temperature variation (Laut et al. 1977:5). The mean rainfall is approximately 250 mm, and during every month of the year mean evaporation exceeds mean rainfall (Laut et al. 1977:4; Menzies and Gray 1983:1). Under these conditions, the Murray River system was a major ecological resource for survival and therefore a fundamental factor in determining settlement patterns (Gill 1973:11). Using predictive modelling, Wood and Westell (2009:4) found that the distribution of archaeological remains in the Chowilla Anabranch of the Murray River correlated to particular landforms and was determined significantly by the River's flood cycle. This is a pattern that correlates significantly to the Katarapko-Eckert Creek anabranch system, directly downstream from Berri. Occupation and settlement were focussed in areas proximate to the River and more permanent bodies of water and would contract to floodplain margins and higher ground during flooding events (Wood and Westell 2009:4). Proximity to water therefore was a major influence on the survey strategy as both settlement patterns established by Wood and Westell (2009) and prior Australian CMT studies indicate CMT distribution occur close to water sources.

Modern Topography, Landforms and Vegetation

Decreasing aridity since the Last Glacial Maximum, has caused higher sinuosity, smaller channel width, and smaller meander wavelengths of the Murray Land System (Prendergast et al. 2009:70). The River Murray is characterised by a broad floodplain with a low-gradient flow, highly sinuous river system, scroll plains and distributary channels (Westell and Wood 2014:44). Low-gradient river flow equates to relatively calm waters, an environment perfect for single sheet, lightweight and low-lying bark canoes to be an effective means of transport and flotation (Gara 2013:2; Klaver 1998:224). Mallee eucalypt vegetation dominates the flora range (Menzies and Gray 1983:26). In the Riverland, red gum woodlands dominate the floodplain (Laut et al. 1977:6, 139; Smith and Smith 1990:215) and black box woodlands inhabit the highest river terraces, generally marking the maximum height of flood waters (Menzies and

Gray 1983:28; Smith and Smith 1990:215). European impact on the natural vegetation in the Riverland region of the Murray River has changed the basic structure of local flora and the whole region is classified as 'degraded natural' (Menzies and Gray 1983:28). Thus this general degradation also has a severe impact on the survival of those CMTs that may still be extant today and has, no doubt, caused the loss of former CMTs.

Past Land Management Strategies

Past land management at Calperum Station has affected the distribution of CMTs in the landscape today. Predominantly sheep were grazed on the station, but cattle were also run intermittently (Linn 1995:123). The horticultural technique of coppicing, cutting trees at near ground-level to stimulate new shoots from the stump, was very common and was used on eucalypts to stimulate branch growth and therefore harvest more wood for fuel on the station (Peter Cale pers. comm. 2018). Cutting down and removing dead trees from the station was also a common practice and the wood was used for fuel but another likely motivation for removing dead trees was because landowners 'saw dead trees as an indictment of their management' (Peter Cale pers. comm. 2018). Pollarding or removing branches from the tree canopy was also common amongst pastoralists and farmers in the Riverland during the mid-1900s as a means of saving 'stressed' trees (the effectiveness of this approach has been questioned) (Peter Cale pers. comm. 2018).

4.5. Chapter Summary

This chapter thoroughly presents an outline of the history, archaeology, environment and landscape of Calperum Station, which builds the necessary context for this inductive study of the spatial distribution and analysis of CMTs. This chapter has examined both the modern cultural and environmental settings of the study area. The conclusions presented inform the methodology of the study and are vital to the discussion of the results of the study.

5. Methods

This chapter outlines and justifies the methods used for this research. Key methods discussed include methods relating to community engagement; a desktop study of government and archival records relating to bark use and CMTs; a systematic field survey of targeted areas at Calperum Station together with recording methods; and an analysis of the CMT attribute and spatial data. This chapter concludes with an overview of the limitations of the study and data, as well as the steps taken to mitigate these constraints.

5.1. Ethics Approval and Community Engagement

As this project involves working with Indigenous communities and their heritage, it is paramount that the project meets the highest possible ethical standards. This project gained ethics approval as part of the broader 'Calperum Station Research Project' from both RMMAC and the Social and Behavioural Research Ethics Committee of Flinders University, Project Number 6618. Community engagement was ensured through regular updates about the research at RMMAC Director's meetings, including a video presentation. Photogrammetry and 3D reconstruction of a selection of scars were included in the fieldwork for this thesis, to provide tangible visualisation of scar typologies on Calperum Station for RMMAC members (two examples are provided in Appendix Two). During all fieldwork, RMMAC representatives were present and all those involved in the fieldwork followed the cultural protocols required by RMMAC. Detailed coordinates for site locations have not been included in this thesis at the request of RMMAC.

5.2. Background and Archival Research

Determining the extent to which bark was used by the Aboriginal population of the Riverland was fundamental to this study, including how this changed with European settlement and the taphonomic factors that affect the modern distribution of CMTs. Major repositories of data were methodically explored to investigate these issues, including the State Records of South Australia, ethnohistoric accounts, Trove, the South Australian Museum archives, online museum collections across Australia, databases with access permitted through Flinders University and online public access databases. The State Records were particularly useful in determining cultural change and adaptation to colonial endeavours in the Riverland, by providing insights into the effects of colonisation through the supply of government canoes. As this archive has thousands of records, key word searches as identified in Table 1 were used to systematically search the database. The South Australian Museum Accession Register was studied for extra documentation and information regarding their collections of items from the Riverland, in particular a collection of ethnographic items from Calperum Station and donated by the descendants of the Robertson Family who took over the lease by the 1870s. In the South Australian Museum Archives, a collection of notes, correspondence and original photographs by Robert Edwards in preparation for his 1972 book 'Aboriginal Bark Canoes of the Murray Valley' were explored. The diverse and systematic use of databanks available ensured a wide-reaching investigation of how bark was used and how this bark use changed due to the impacts of European settlement in the region, as well as how the modern landscape reflects the past use of bark.

Table 1: Key word searches used to systematically explore the South Australian State Records for publicly available information about Aboriginal bark use in the Riverland region.

Key Words	Types of Data Found	Data Use
Prominent Aboriginal family names known from the Riverland region as listed in Hemming and Cook (n.d.:134 –144)	• Non-specific location • Non-specific individual • Names, dates and number of specific files that are relevant to the thesis • All types of state information, including: - medical ailments - hospital visits - mission activities - land grants - distribution of foodstuffs and blankets and the location - people and geographic associations - daily activities - working status - involvement in crimes and trials - item and repair requests and responses	Allows the identification of individuals within the study location by their family name and even specific correspondence date, name and number ↓ Use this to refine the family name search and gain direct information about the daily lives and activities of the Aboriginal people residing in the Riverland region

'Renmark'	• Names, dates and number of specific files that are relevant to the thesis • Individuals names who are associated with the geographic area	Adds to the list family and individual names that can be searched to provide specific details regarding those people who lived in the Riverland
'Calperum'	• Names, dates and number of specific files that are relevant to the thesis • Individuals names who are associated with Calperum Station specifically	Adds to the list family and individual names that can be searched to provide specific details regarding those people who lived in the Riverland
'Chowilla'	• Names, dates and number of specific files that are relevant to the thesis • Individuals names who are associated with Chowilla Station specifically	Adds to the list family and individual names that can be searched to provide specific details regarding those people who lived in the Riverland
'bark'	• Any use of the word 'bark' in a record - Protectors Reports	Limited data was gained except to identify that bark canoes were fundamental to Aboriginal self-subsistence
'boat' and 'canoe'	• All references to the request for and repair of state provided boats/canoes to Aboriginal individuals and groups	Used in combination of the refined family and individual names to gain the majority of the information included in this thesis regarding the request and payment of individuals for canoes from the government as well as corresponding denials provision and other information that affects certain people obtaining a canoe

5.3. Field Methods

5.3.1. Survey Strategy

In order to identify what CMTs can reveal about processes of cultural change in Aboriginal bark use and procurement in the South Australian Riverland, a targeted archaeological field survey was conducted. The ten locations surveyed for this thesis are outlined in Figure 17. All survey locations are associated with the Holocene Murray Land System as described by Prendergast et al. (2009). Prendergast et al.'s (2009) research was undertaken at Neds Corner, over 100 km upstream of Calperum Station on the Murray, however the landforms are similar at Calperum Station and the results are applicable to all locations in the semi-arid valley of the Murray Basin. As the survival of CMTs is restricted to the last 500 years (Rhoads 1992:200) the Holocene Murray Land System was the focus of survey work.

Foundational to the chosen survey strategy for this study was the nature of CMTs and of environmental determinants in the Riverland region. Literature on Australian CMTs emphasise the association of trees with Aboriginal occupation sites and often water availability, as well as bark procurement with local tree species (Edwards 1972; Goodwin et al. 1991:31; Rhoads 1992:215; Webber and Burns 2004:43). Red gum trees dominate accounts of CMTs in ethnohistoric and more modern literature for the Murray River (Carver 2001; Edwards 1972; Hemming 1991) and together with black box trees are the two principal Eucalypt species (and viable tree species) in the study area (Laut et al. 1977:6, 139; Menzies and Gray 1983:28; Prendergast et al. 2009; Smith and Smith 1990:215). For this reason, locations on the floodplain of the Murray River were chosen for survey that tailored to the distribution of mature red gum and black box stands in the landscape. These locations were determined from a combination of current satellite images of the floodplain sourced from Google Maps, from an assessment of the Surveyor General's 1891 historical map of the Calperum Station (Figure 18) and knowledge passed on by prior Flinders University researchers.

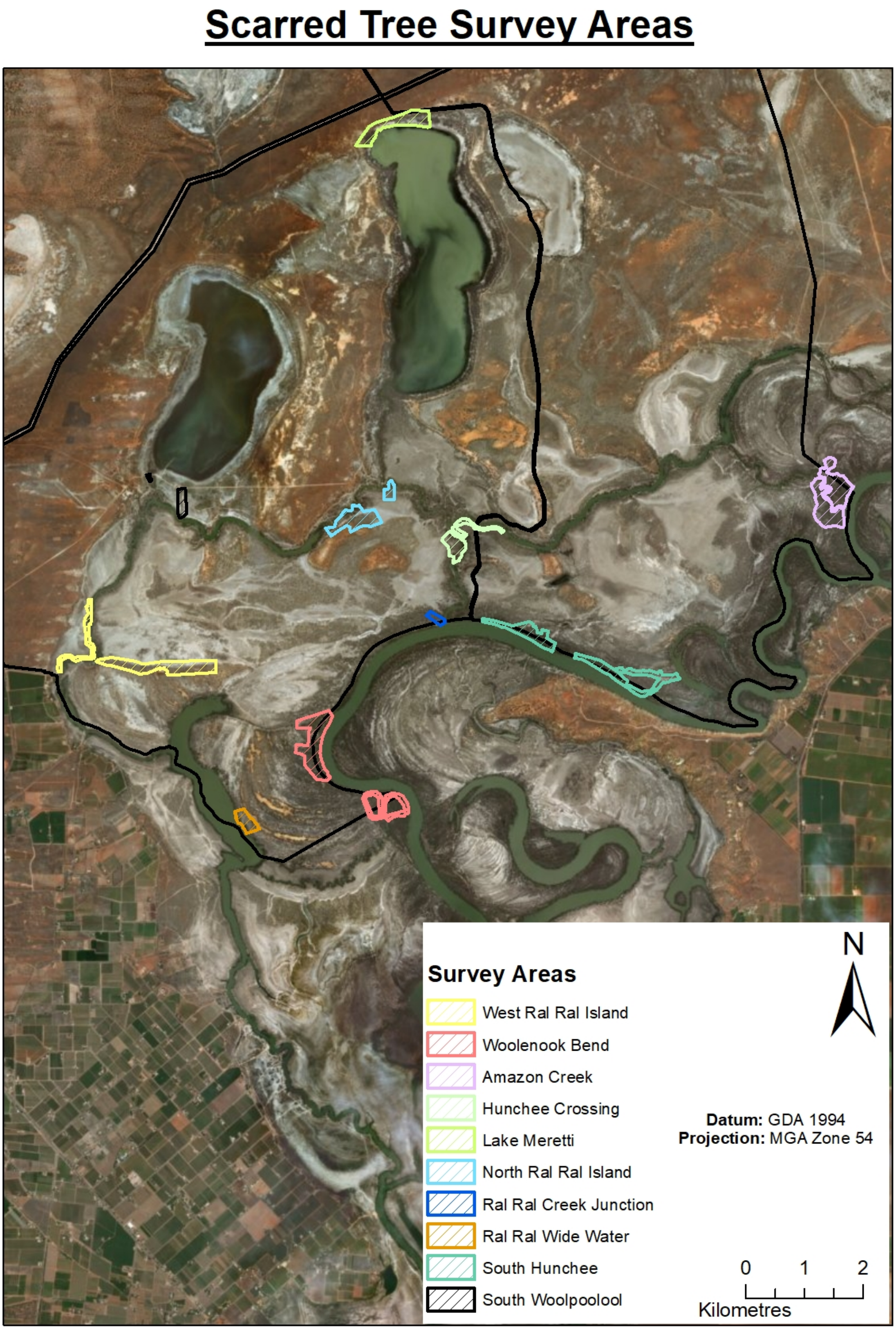


Figure 17: Survey areas for this study.

Figure 18: Surveyor General's 1891 Historical Map of Calperum Station.

The main aim of the fieldtrips was to locate and record as many CMTs as possible to evaluate location and typology. To do this, a systematic and purposive survey strategy with a non-random sampling technique was selected (Burke and Smith 2004:67). This method is probabilistic and therefore allows the acquisition and analysis of a subset of a larger and unobservable population. It was systematic, as evenly spaced transects were walked with the spacing of transects depending heavily on the woodland density. One of the most prominent studies of CMTs in Australia was undertaken by Rhoads (1992), who used a method based on Dunell and Dancey (1983). This study emphasised a regional approach to surveying and utilised three different attributes (terrain, landscape features and water source) as the primary sampling strata, as they change little over time (Rhoads 1992:206). The survey strategy chosen for this study similarly targets three landscape attributes; flora, landscape features and water sources, as they have been identified in the literature as landscapes attributes that can be catered to environments where CMTs are most prevalent. This strategy is inherently different from Rhoads' (1992) approach as it employs a non-random sampling and purposive strategy. A non-random sampling strategy is based on the non-random distribution of CMTs within a landscape. By being 'purposive' this strategy incorporates previous knowledge and research on CMTs into the decision-making process.

5.3.2. Identifying CMTs

Distinguishing CMTs in the field is a subjective task that is based predominantly on scar morphology. Differentiating between natural (including branch tearing and fire damage) and anthropogenic scars is difficult, because both feature similar attributes (i.e. visible heartwood—the inner part of the tree exposed with the removal of bark; bark regrowth around a scar; and occasionally scar shape). Because of the standardised shapes of both Aboriginal and European scars, their negative impressions should be symmetrical. CMTs inform us that people in the past used bark as a resource in their daily lives, but by separating out 'typologies' of scars based on the morphology of the remaining negative, functional bark uses may be distinguished, informing us of 'how' bark was used.

Informed by previous CMT studies, such as those by Burke et al. (2017), Long (2005) and Rhoads (1992), the scar identification typologies used in this thesis are:

- Canoe scars.
- Shield, dish scars.
- *Mybkoo* or shelter scars.
- Shingle scars.
- Resource procurement scars (e.g. toe hold, bark stripping scars, and miscellaneous modification).

Aboriginal bark use typologies include canoes for fishing, transport and hunting (Basedow 1914; Edwards 1972; Oakden 1838; Roth 1908; Thomas 1905); shields for organised battles (Hemming 1991; Renard 2003:pl.8; Smyth 1878a:332; Worsnop 1897:137); dishes for transport of food stuffs and water (Clarke 2012:150–162) (Figure 19); *mybkoo* scars for digging grubs (Angus 1847:pl.50, fig.32); shelter material as windbreaks and roofing on wurleys (Clarke 2012:161, 70; Worsnop 1897:47) and toe holds for accessing tree tops in pursuit of resources (Eyre 1845b:280; Renard 2003:pl.1). European bark use typologies are restricted to the 'shingle' used for shelter material and will generally manifest today on box trees with a morphology with square-like ends (Long 2003:35). Aboriginal people were engaged in cutting bark for European settlers, so it is a difficult task to identify the origin of shingle scars when they are recorded. Apart from the *mybkoo* and Aboriginal shelter materials (which are rectangular, associated with red gum trees and difficult to distinguish due to the overlap in their size) and shingle (generally associated with a variety of trees but seldom red gums (Long 2003:16)), other scar types are ovate in shape when first cut from the tree and will become more lenticular (having pointed ends) as processes of regrowth and healing affect the tree. In reality, regrowth does not occur at even rates and so symmetry of negative bark removal impressions is not always an appropriate indicator of cultural bark removal. Resource procurement scars are not as standardised but are distinguished by the presence of anthropogenic activity such as axe marks indicative of widening holes in trees to access native honey or possums and parallel axe marks that strip bark away from the tree's hardwood along grub tracks to collect grubs (Long 2005:77). Identifying the cultural origin of these scars is difficult because both European and Aboriginal peoples engaged in activities throughout the historical period that would create these indicators of anthropogenic activity, but regrowth around the bark removal for these activities should give an indication of antiquity to allow at least some inferences of origin.

Figure 19: An old pre-formed dish scar recorded at Ral Ral Wide Water (RRWW005).

To circumvent the ambiguity posed by scar symmetry, this study advocates for several other factors to aid in the identification of scars. Firstly, a comprehensive study of the ethnohistoric context of scars, specifically in the SA Riverland was undertaken as well as gathering information regarding the context of the environment in which the study was undertaken. Both these steps were critical to developing an understanding of bark use in the Riverland and identifying this use in the landscape. Other standard information required for a more informed interpretation of scars included the context of the scar on the tree itself and the context of the tree within its environmental context. In the field, a document (Figure 14) outlining the causes of natural scarring and things to look out for as well as indicators of cultural scarring from Long (2005), was consulted when a CMT was located to ensure the most accurate identification and assessment of a scar as possible.

5.3.3. Field Recording

Archaeological recording for this project was conducted in the field on paper forms adapted from Burke et al.'s (2017) recording form for CMTs, as it provided for the identification and documentation of all necessary features for future analysis (see Appendix Three). The fields on the form fulfil the requirements set out in both field manuals developed for CMT recording in Australia (Long 2003; 2005:72–75). The major fields included:

- GPS location.
- Name of the recorder.
- Date of recording.
- Tree identification number (TIN).
- Scar identification number (SIN).
- Number of scars.
- Perceived origin of the scar (i.e. Aboriginal or European activity; or natural).
- Scar attributes:
    - Dimensions (length; width; regrowth depth and width; height from ground; tree circumference at middle of scar).
    - Location on tree (trunk, branch etc.).
    - Presence of an epicormic stem
    - Scar orientation.
    - Axe marks (number and type).
    - Scar shape and heartwood texture.
- Assessment of scar age and typology.
- Assessment of the tree species.
- Tree context and health.

In addition to the above, a personal assessment of a tree and scar's condition was included on the form, which allowed for the recorder to assess the current condition of both the tree and scar at the time of recording. Tree health was determined by the foliage and canopy, green, full canopies indicated a healthy tree, thinning canopies with wilting and off-coloured leaves indicated a stressed tree and no foliage and dried bark indicated the tree was dead. Scar condition was assessed based on its shape, heartwood condition, and overall appearance. Only the author recorded the scars to ensure consistency in the personal assessment of scar condition and allow for a more reliable comparison of results in the discussion. An assessment of heartwood condition as either 'smooth' or 'rough' provided an additional means of assessing scar origins, as natural scars tend to have rougher heartwoods. The amount and location of regrowth was noted to assess scar age and axe marks, derivation and pattern allow for information into scar origin as well as provide important attribute information for heritage management purposes.

Additional fields were incorporated that are specific to the analysis undertaken in this research. These include axe mark lengths, for the determination of possible axe type and size, orientation, to explore correlations with scar orientation, the landscape and a Scar Identification Number (SIN) and Tree Identification Number (TIN), to ensure consistency between recording forms and photograph numbers while recording. The SIN was later reclassified from consecutive numbers to an ID which identified the survey area (by initials) and scar numbers within that survey area (for example: LM0001 = Lake Meretti survey area, scar no. 1). A field, which allowed for a personal assessment of the maturity of the CMT within its immediate stand, was also included to provide a relative evaluation of the trees age. This last point is essential because variable rainfall and seasonal temperature constrain the development of annual growth rings in red gums living in semi-arid regions of Australia (George et al. 2005; see also Argent et al. 2004). Tree circumference at 1 m, as well as a personal assessment of the tree's maturity within its stand, was selected as an appropriate means for assessing tree age. A tick box was included for the presence of an epicormic stem to provide an indication of scar age, as well as several new 'Scar Location' options (coppice stem and bilobate trunk) that became pertinent to include after initial fieldwork commenced.

A second recording form for felled trees and axe marks was created using the 'Tree Context' and 'Axe Marks' fields from Burke et al.'s (2017) recording form for CMTs to record felled trees and stumps that were clearly formed with axes and not more modern power machinery (see Appendix Four). This form included coordinates and was essential for the identification and comparison of axe types and sizes across the study region.

A third recording form was constructed for 'other' types of archaeological sites that were encountered during the surveys including, artefact scatters, isolated artefacts, earth mounds and burials (see Appendix Five). This form was designed to be generic and to allow the basic information, including coordinates and a mud map of sites, features and artefacts providing details for the spatial analysis of the dataset. Both a GPS and photography proforma were used to keep a systematic record of SIN and TIN locations and their associated photographs to minimise error and ensure consistency in data management (see Appendix Six).

A Garmin GPSMAP 64s was used to collect the coordinates for individual trees, as the 3 m margin of error is negligible for the purposes of this thesis. A Nikon DSLR camera with a fixed focus lens was used for the photogrammetry of all scars as this aids the process of stitching together images for 3D reconstruction as variable focus images portray an aspect of the scar as different relative sizes in the Agisoft Photoscan Program. A Nikon DSLR camera with a manual focus lens was used to take all other photographs, including close-ups of axe marks, broad landscape photos for context and photos of community members and the team undertaking the survey. Agisoft PhotoScan software was used to undertake the photogrammetric process to create spatial data from the images collected in the field and Adobe Lightroom Classic CC was used to manipulate the lighting of some images with shadows prior to their photogrammetric processing.

5.4. Data Management and Analysis

All data was manually imported into two simple Microsoft Excel spreadsheets: one for the CMTs and trees with axe marks and one for the '-other sites-' that were recorded (Appendix Seven). The former spreadsheets were combined into one, as many trees had both a cultural scar(s) and marks derived from steel axes. These corresponding TIN numbers were put together so that every TIN had its corresponding scar and axe mark information organised in the same spreadsheet. The data was then 'cleaned', by a thorough examination of records using the Microsoft Excel 'pivot table' function to ensure spelling and fields were correct and consistent. The scar orientation was recorded during the field work and the degrees recorded were standardised into direction through Figure 20. Appendix Eight provides a simplified table used to re-evaluate scars and classify scar origin from the spreadsheet, based on the criteria set out in the New South Wales field manual for the effective identification of Aboriginal CMTs (consistent with Rhoads 1992:202; Westell and Wood 2016:10–11; see also Long 2005). Those scars deemed to have a natural or unknown origin maintained their TIN number and were left in the spreadsheet but were removed from those records being analysed.

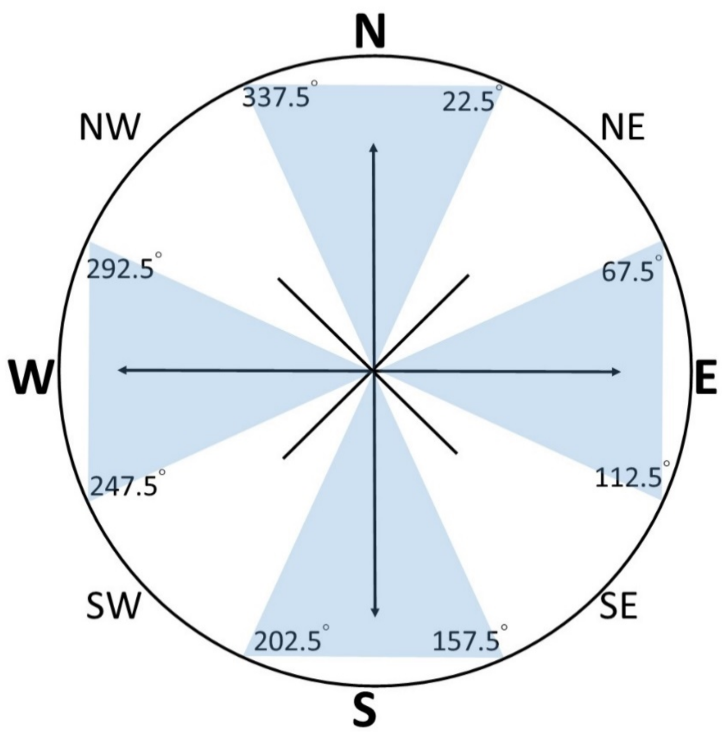


Figure 20: Figure used to standardise the 'Scar Orientation' field of the database, created by dividing a compass into evenly spaced sectors of 22.5° with each sector corresponding to a compass direction.

Simple data analysis queries, including basic nominal and non-spatial queries were performed using Microsoft Excel's pivot table function to complete the analysis, as well as appraise the more comprehensive exploration of the data to be completed in ESRI ArcGIS. This function was also used to create the frequency distribution graph of scar lengths at 20 cm intervals in order to both appraise the functionality of different scars based on their length attribute as well as compare the functional typologies of scars identified in this study with those of Simmons (1980) and Klaver (1998:238–243). ESRI ArcGIS, provided the means to spatially analyse the dataset accurately and assess the data within the landscape. This was achieved by creating data layers from recorded sites as well as analysing these layers against layers of previously recorded sites sourced from other researchers of the broader 'Investigation of Past and Contemporary Indigenous Connections to Country' Project at Calperum Station. Layers from other researchers were shared through Open Science Framework (OSF) a free, open-source web application for data sharing which is password protected to ensure confidentiality of the data. Results of the analysis were visualised in ESRI ArcMap for this report and for the communication of results to RMMAC. The base layer chosen for the presentation of results was a satellite image sourced from Google Maps. This base layer was chosen over a topographical image as the satellite image provides the greatest information regarding the density or sparseness of local vegetation.

5.5. Research Limitations

There are a number of limitations to this study. Firstly, the process of distinguishing an artificial versus natural scar is highly subjective. Similarity in scar morphology and the numerous agents responsible for the production of scars in the landscape is a limitation that needs to be considered when scars are identified and recorded in the field (Klaver 1998:228). Heritage manuals exist for the field identification of Indigenous CMTs (Long 2005:72–75; Long 2003:35–39), but they are not exhaustive and misidentification of trees in the field can occur, which may skew the results of the research. Re-evaluation of trees via photographs post-data collection, against the criteria advocated by Westell and Wood (2016:10–11), served to minimise the risk of incorrectly identified scars from entering the dataset (see Appendix Eight).

Secondly, the landscape on Calperum Station is heavily altered by anthropogenic activities on-site and in the Riverland more broadly. For this reason, it is likely that the distribution of scars observed in the landscape today is a small proportion of what once existed. While the current landscape may not accurately reflect the extent of past bark use by Aboriginal people, it does recognise that bark procurement took place and allows some fundamental analyses for this study.

Thirdly, absolute dating of recorded CMTs is both expensive and beyond the scope of this thesis. Methods such as dendrochronology and radiocarbon age determinations are a potentially useful means of understanding cultural continuity and for evaluating precise landscape use, but it is expensive and destructive process and often unsuccessful (Argent et al. 2004; Long 2003:33). For this project, criteria advocated for by Long (2003:32–33), including but not limited to tree size and girth, scar depth and regrowth are non-destructive methods used to estimate the relative age and chronology of CMTs. Tree size (height and width) increases as a tree ages. While there are inherent issues with using this measure to scientifically date eucalypts (see Beesley 1989), in general the larger the tree the older it is. As scars age the amount of regrowth increases and the depth of the scar increases. These measures, as well as other scar attributes that will be discussed in Chapter 7, make it possible to relatively estimate the maturity of CMTs recorded on Calperum Station.

Fourthly, no means exist to fully comprehend the pre-contact bark use practices of Aboriginal Australians in the Murray Riverland. Inherent issues exist when using ethnographies and ethnohistoric records to build these narratives, as discussed in Chapter Two (see those by Byrne 2003; Murray 1992; Wobst 1978) and so, to ensure this study remains relevant, a number of steps were taken to effectively evaluate pre-contact bark use. These included a critical evaluation of the ethnohistoric record of bark use in the Riverland and nearby regions presented in Chapter Three and the inclusion of a number of scar attributes to assess bark availability in the pre-contact period, such as regrowth width and depth, presence of an epicormic stem and tree circumference. These measures allow a thorough understanding of pre-contact bark use, a fundamental step in this study which aims to assess changes in bark use brought about by colonisation.

5.6. Chapter Summary

This chapter presents the methods employed during this study in order to address the research question and aims before highlighting the limitations of the methods used. As can be noted, the recording form was tailored specifically to the research question of this thesis, but also providing more than the required information of standard CMT recording in Australia. The field methods targeted water bodies as well as red gum woodlands as a means to record as many CMTs as possible to ensure a broad range of trees and survey locations for spatial analysis and analysis of cultural entanglement. The limitations inherent in this study are manageable and steps to mitigate the consequences of these limitations have been outlined.

6. Results

This chapter outlines the results of the fieldwork. The full dataset recorded for this thesis is included in Appendix Seven and is discussed in detail in this chapter. A general overview of the archaeological context of the survey area is presented here, including an indication of taphonomic processes observed in each survey area, followed by more specific descriptions of the data set. Measurements and identified trends in the data are presented in a systematic way, evaluating overall trends, before identifying trends specific to both black box and red gum trees. These results are discussed in relation to the research question and aims in the following chapter, Chapter Seven.

6.1. Overall Trends in the Collected Data

This section presents a broad overview of the data collected during nine days of survey over two field trips (in April and September 2018), where CMTs were recorded in ten survey areas, as shown in Figure 17. Analysis of the survey areas identified that large stands of mature trees were not present (except for a stand of dead mature black box trees surveyed next to Ral Ral Wide Water) and the great majority of mature trees were dispersed amongst younger stands of the same species. Most trees were found within 200 m of the Murray River, its perennial and intermittent tributaries, backwaters, lakes and billabongs. All were within a landscape that has been heavily altered by woodcutting and agriculture and significant amorphous scarring was present in all survey areas.

Table 2 identifies the total number of CMTs at each survey area and the associated anthropogenic modification of the environment (for examples of these humanly induced characteristics, see Figure 21, Figure 22 and Figure 23). Across all survey locations 117 CMTs were identified and 132 individual scars were recorded. Re-evaluation of scars from photographs eliminated 28 CMTs and 34 individual scars from the dataset as being either the result of natural scarring or as too ambiguous to determine origin. Therefore, 89 CMTs and 98 (n=98) scars have been identified as being anthropogenic and likely of Aboriginal origin (see Appendix Seven for the full dataset). Eight black box trees exhibited two scars and one tree had three scars. Fifty-four percent (n=58) of the recorded CMTs were black box and 46% (n=41) of the trees were identified as river red gums.

Table 2: Characteristics of individual survey areas.

Survey Area	No. of Scars Recorded	Scar ID No.	Dominant Tree Species	Associated Archaeology	Anthropogenic Modification of the Environment
Lake Meretti (LM)	4	LM001-004	Black Box	lithics; grinding material	felling; coppicing
West Ral Ral Island (WRRI)	8	WRRI001-008	Red Gum and Black Box	N/A	coppicing
South Hunchee (SH)	4	SH001-004	Red Gum	Billabong with identified earth mounds associated	felling; coppicing
Woolenook Bend (WB)	21	WB001-019; non-associated axe marks (WBA-G)	Red Gum and Black Box	brush yards; historical footbridge remains	pollarding; modern toe holds; dense undergrowth
Ral Ral Wide Water (RRWW)	15	RRWW001-012	Black Box	two silcrete cores	mature coppiced trees
Ral Ral Creek Junction (RRCJ)	9	RRCJ001-006	Black Box	houseboat mooring (rubbish, firepits)	felling; coppicing
Amazon Creek (AC)	12	AC001-AC010; non-associated axe marks (ACA&ACB)	Red Gum	N/A	felling; pollarding
Hunchee Crossing (HC)	16	HC001-016; two non-associated axe marks (HCA&B)	Red Gum	N/A	felling; coppicing
North Ral Ral Island (NRRI)	3	NRR1001-003	Red Gum	N/A	felling; pollarding
South Woolpoolool (SW)	2	SW001-SW002	Red Gum	lithic material; baked clay	soils scraped into manufactured levee
Outliers (OUT)	4	OUT001-004	Red Gum	N/A	N/A

Figure 21: Coppiced red gum and felled black box trees in the SH survey area.

Figure 22: Mature red gum trees dispersed in a stand of juvenile red gums at AC and pollarding at WB.

Figure 23: OUT004 recorded at the cross roads in the middle of Reny Island and logging at WB.

A staggering 67.5% of trees (n=61) were identified as either stressed or dead, a trend with significant implications for heritage management. Figure 24 illustrates the overall health of the CMTs recorded during the study as well as whether they are still standing or have fallen. The condition of scars follows a similar trend to that identified for tree health (Figure 25). Poor and Fair conditions dominate the records with 85% (n=83) of 98 scars identified as falling in either category. Figure 26 shows an example of scars deemed in 'Good', 'Fair' and 'Poor' conditions.

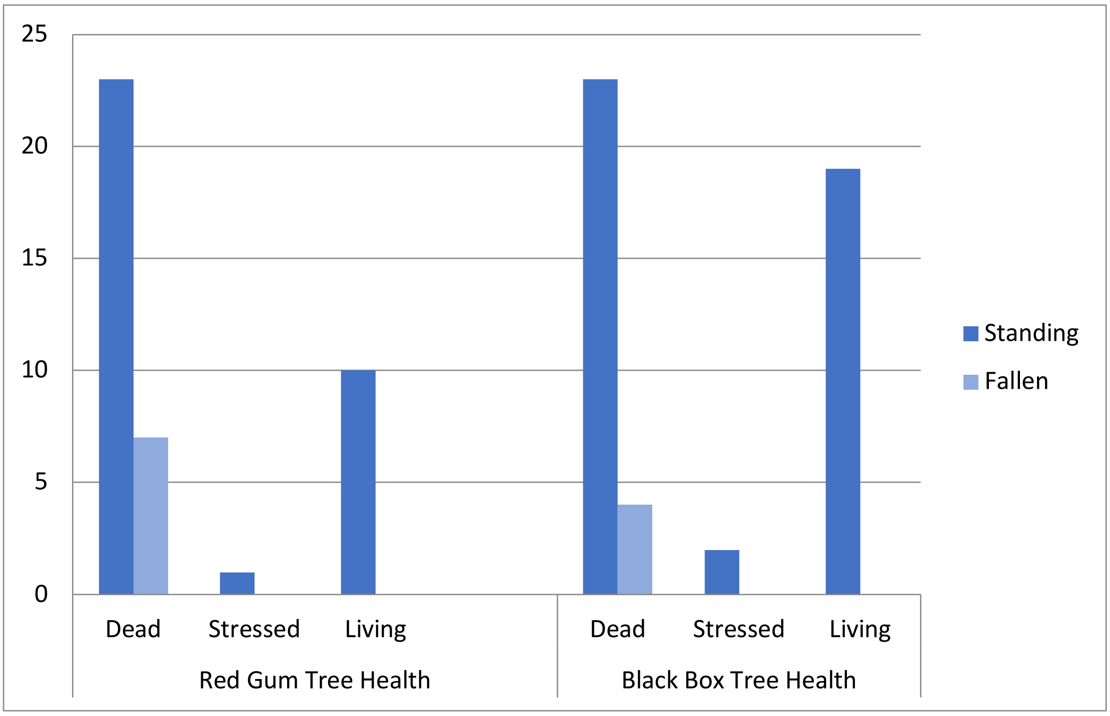
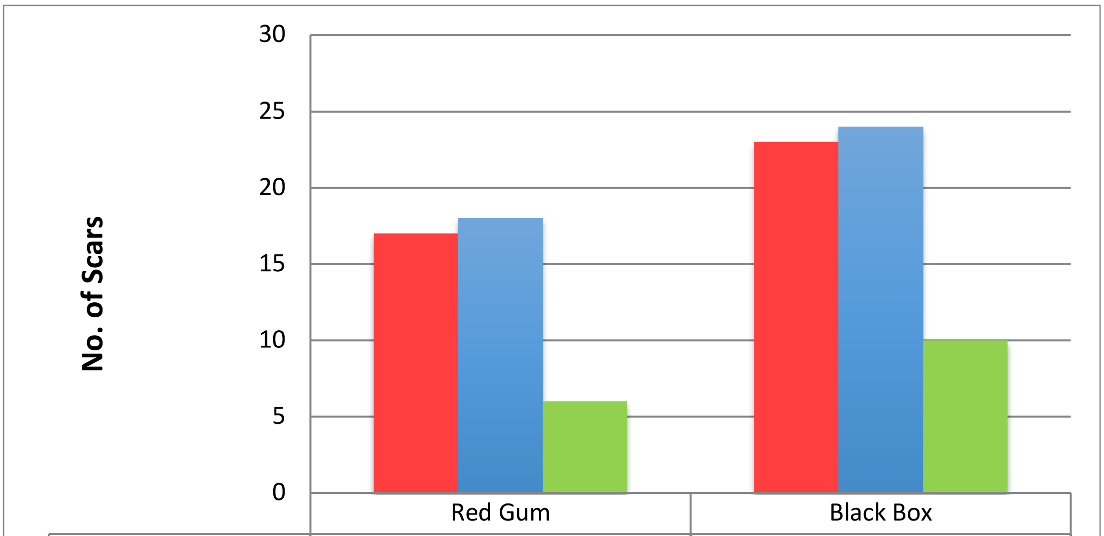


Figure 24: Summary of the overall health of recorded CMTs on Calperum Station per tree species.



	Red Gum	Black Box
Poor (<20% intact)	17	23
Fair (20 - 80% intact)	18	24
Good (>80% intact)	6	10

Figure 25: Overall scar condition per tree species.

Figure 26, a, b and c: Examples of scars in ‘Good’(a), ‘Fair’(b) and ‘Poor’(c) condition (Photo Credit: Frank Boulden).

The circumference of a tree at chest height (1 m) was recorded to make comments on tree age and maturity (Figure 27). Generally speaking, the greater the tree circumference, the older a tree is, and red gum trees are more often than not larger than black box CMTs on Calperum Station. Defining the relative age of a tree is necessary to understand the chronology of bark use in the Riverland and make an assessment of cultural adaptation and entanglement. It was found that of the recorded trees 5% (n= 3) had a circumference over 500 cm and 32% (n=22) less than 200 cm. The circumference of 21 trees were not recorded due to the nature of the tree’s structure, such as coppice branches and bilobate trunks (

Table 3), which hindered the ability to measure an accurate trunk circumference.

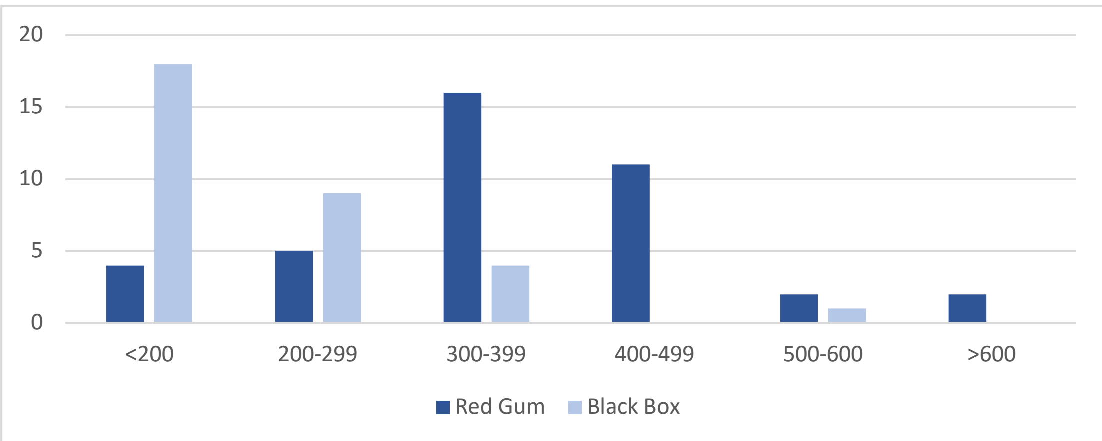


Figure 27: Tree circumference range per species.

Table 3: Location of scars on different tree species.

Scar Location	Red Gum	Black Box
Trunk	40	32
Bilobate Trunk	1	15
Branch	0	4
Coppice branch	0	6
Total	**41**	**57**

The regrowth exhibited on a scar also provides clues into the chronology of scars in the landscape, as mature trees with available bark to be used in the pre-contact period may not have been scarred until recently. The process of morphing and regrowth that occurs in living trees hinders evaluating original scar sizes. Due to this difficulty, scar dimensions recorded are only of the visible scar. Rates of regrowth are vastly different between tree species and individual trees (Figure 28). The presence of regrowth indicates, non-specifically, that an amount time has passed since the scar was created. Due to the nature of tree growth, it is likely to only be found on the two vertical sides of a younger scar and at the top and/or bottom (as well as sides) of older scars. It is important to note that the presence of regrowth on all sides was not a factor used to discriminate scarring in the field, as once bark is cut from tree, it may not have had a chance to produce regrowth before it died. All the scars, however, did exhibit observable regrowth between 4.5 and 50 cm, and regrowth was documented on all intact sides (including top and bottom) indicating that no recent or contemporary bark has been cut at the station.

Figure 28: Cultural scar on a red gum tree showing visible regrowth all sides (Photo Credit: Frank Boulden).

A feature of the landscape—noted in almost all survey locations—was single steel axe marks and wedge cut/s adorning felled and living trees. Ethnohistoric research identified that steel tomahawks were quickly integrated into Aboriginal toolkits due to their lightness and flexibility, and so these marks were measured to determine whether they had the potential to be the result of Aboriginal activity in the landscape (Long 2005:20). Long (2005:20) suggests that the full-sized axes (with a diameter greater than 100 mm) were not commonly used by Aboriginal people in the contact/post-contact period, other than for cutting timber. It is not clear if this point is widely applicable given little other evidence discussing Aboriginal use of large wood axes but if this is a correct inference then marks of greater than 100 mm would indicate a likely European or more contemporary origin. Eighteen trees and stumps with axe marks not directly associated with cultural scars, and located on mature or dead trees, were recorded during the first field trip and were only noted in the subsequent fieldtrip, but not formally recorded due to their abundance in the landscape. All of the recorded marks and those measured in the field but not recorded, were below 100 mm (10 cm) in length indicating they are within the acceptable range of the length of a steel tomahawk (Figure 29). Many of these marks exhibit regrowth indicating that they could be the result of either Aboriginal or European activity in the early contact era.

Figure 29: Axe marks not associated with Aboriginal cultural bark procurement (Photo Credit: Frank Boulden).

This thesis aims to assess cultural change in bark use. The types of activities associated with bark use was impacted by the process of colonisation and these changes can only be assessed through an understanding of the bark typologies in the Riverland. Maximum scar length is discussed in Simmons (1980) and Klaver (1998:238–243) who recorded CMTs in the floodplains between the Wakool and Murray River and along the Murrumbidgee River respectively. Length classes exist in their work indicating distinctive functional use of bark and therefore indications of typological categories. The categories identified in Klaver's dataset varied slightly from that of Simmons (Table 4), a trend that may represent the different environments, larger dataset and tree species from which the CMTs were recorded. A similar analysis of frequency distribution of the 81 viable scars from both tree species with categorical ranges of 20 cm was conducted in this research to distinguish functional typologies for the Calperum Station dataset (Figure 30). Considerable variation exists between the types of scars recorded on the two trees species. As can be noted, there is a definite distinction between the small/medium category range for both tree species at 20–260 cm that would correlate to the 'small' scar length category advocated first by Simmons (1980) but with a length range more similar to the larger data set of Klaver (1998). From Figure 30 we can distinguish a 'Large' category with a range of 280–460 cm, which is more representative of Simmons (1980) dataset.

Table 4: Scar length categories identified for CMTs by Simmons (1980) and Klaver (1998).

Scar Length Category	Length (cm) Simmons (1980)	Length (cm) Klaver (1998)
Small	50 - 80	40 - 100
Medium	120 - 190	140 - 240
Large	270 - 500	300 - 350

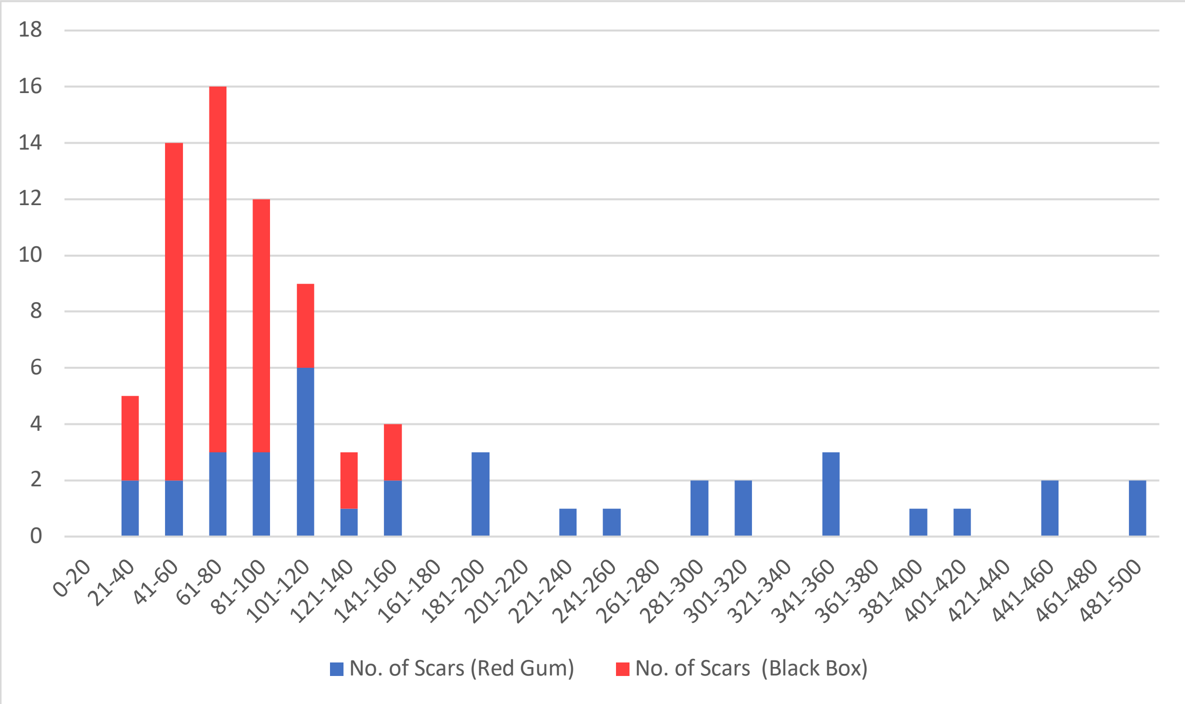


Figure 30: Scar length frequency distribution of both red gums and black box trees.

6.2. Red Gum

Two tree species were selectively harvested for bark in the Riverland; red gum and black box trees. Both species have been significantly affected by modern anthropogenic processes as well as past practices of settlers and land owners. By splitting the attributes of scars on red gum trees from those of black box trees, trends specific to the species become visible and will inform the study of both taphonomic factors that have affected the species and provide insights into selectivity in choosing bark for different resources. Of the 41 culturally scarred red gum trees, four had circumferences that could not be determined because they had either fallen to the ground (scar ID AC001 and AC002) or were inaccessible (SH003; HC016). The average circumference of the 37 measured trees was 358.4 cm but ranged from 121 cm to 615 cm. Regrowth depth ranged between 2–25 cm and regrowth width between 4.5–45 cm. Irregular regrowth that deforms the symmetrical shape of cultural scars was present on both living and recently dead trees.

Figure 31 depicts a potential canoe scar (AC012) on a living tree which exhibits bulb growth, distorting the traditional elongated, symmetrical shape.

Figure 31: A canoe tree (AC012) that exhibits non-symmetrical regrowth (Photo Credit: Frank Boulden).

Forty red gum scars were used in the analysis of scar shape. WB003 was excluded as it was the result of bark death due to cultural activity and its shape not defined by the procurement of bark as a resource. Of the remaining 40 scars, 87.5% (n=35) were elongated in shape and the remaining 12.5% (n=5) were interpreted as having a shape that resembled square ends. Due to the faster closure of the vertical sides of scars, elongated shapes should be common in a data set of older scars. Figure 32 further breaks the number of scars down into their recorded shape category as a means for further interpretation in the discussion. The maximum interior length of 37 scars (HC016 was excluded because the tree was inaccessible and scar dimensions could not be recorded and WB003; HC003; HC005 were wedge cuts or toe holds, typologies irrelevant to this particular analysis) ranged between 38 cm and 500 cm and averaged 194 cm.

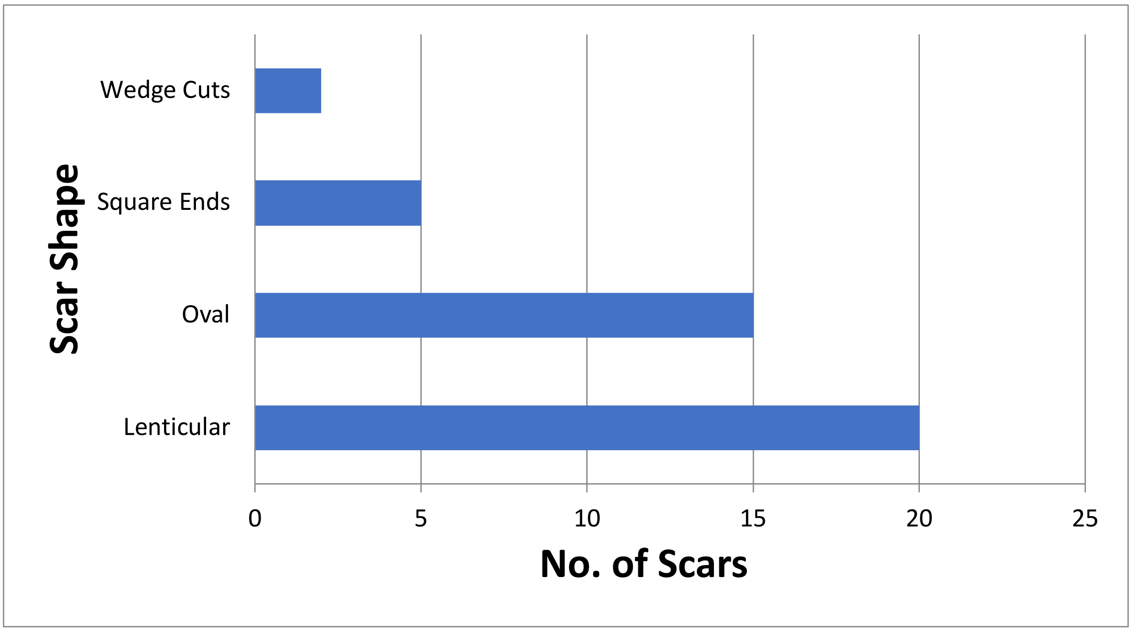


Figure 32: The identified shape of scars recorded on red gum trees.

Table 5 shows all red gum scar lengths and their identified typologies. It is obvious that canoe scars dominate the larger scar length categories and consistency exists between *mybkoo*/shelter material scars which all exhibit similar lengths. Shields and dishes are present in 13 of 29 scar length categories, a trend that probably reflects the diversity of the typology. The interior width of the 37 scars viable for inclusion ranged from 4–70 cm but averaged at 32.3 cm. HC016; SH003; NRRI002; HC006 were excluded from this analysis because no accurate measurement of their interior width could be obtained. Only 38 scars were used in the analysis of scar length and width ratios. The average length to width ratio was 6:1 in which the length was approximately six times the measured width of the scar. The range, however, was vast ranging from 1:1 for square shaped scars and 17:1 for some large canoe scars. Regrowth is bound to exaggerate this pattern in ratio as time passes for scars on living trees. Four scars exhibit a ratio between 1:1–1:1.5 (AC005; AC006; WB011; WB017) and they correlated to all but one of those scars identified with a square-like shape. These scars have been identified as either shingles, used by Europeans as a backing for housing, shelter material used by Aboriginal people, or what George Angus French (Angus 1847:pl.50, fig.32) describes as '*mybkoo*', used to obtain grubs from the ground.

Table 5: All red gum scar lengths and their identified typologies.

Scar Length	Scar Typology		
	Canoe	*Mybkoo*/Shelter Material	Shield/Dish
38			2
46			1
51			1
61			1
71			1
72		1	
92		1	
93			1
94			1
104		1	
110			2
112		1	
120			2
140			1
157	1		
160			1
190			1
200	2		
226			1
258	1		
300	2		
310	1		
315	1		
350	3		
400	1		
410	1		
450	2		
500	1		
503	1		
Total	**17**	**4**	**16**

Thirty-four scars were used in the evaluation of scar area. The average red gum scar was 0.7 m^2 but ranged between 0.045 m^2 and 2.8 m^2. Shield and dish scars, and canoe scars both made up an equal 41.5% (n=17) of the scars. The remaining 17% (n=7) were scars described as wedge cuts, toe holds and *mybkoo* scoops/shelter material. Table 6 shows the exact breakdown of the number of different scar typologies as identified in the data set and the percentage of whole that they represent.

Table 6: Typology of scars recorded on red gum trees.

Typology	No. of Scars	Percentage (%)
Canoe	17	41.5
Mybkoo/Shelter	4	9.5
Shield/Dish	17	41.5
Toe Hold	1	2.5
Wedge Cut/s	2	5
Grand Total	**41**	**100%**

Five scars were not included in analysis of orientation as they were either wedge cuts, toe holds, or the trees had fallen and were therefore not viable for this analysis. Figure 33 records the orientation of all red gum scars recorded during the fieldwork categorised by typology. Canoe scars have a fairly diverse spread but a majority face north or south. *Mybkoo*/Shelter material are similar but with double the number of north facing scars to any other orientation. Shield and dish scars cover every direction except west but have a south and southeast predominance in orientation.

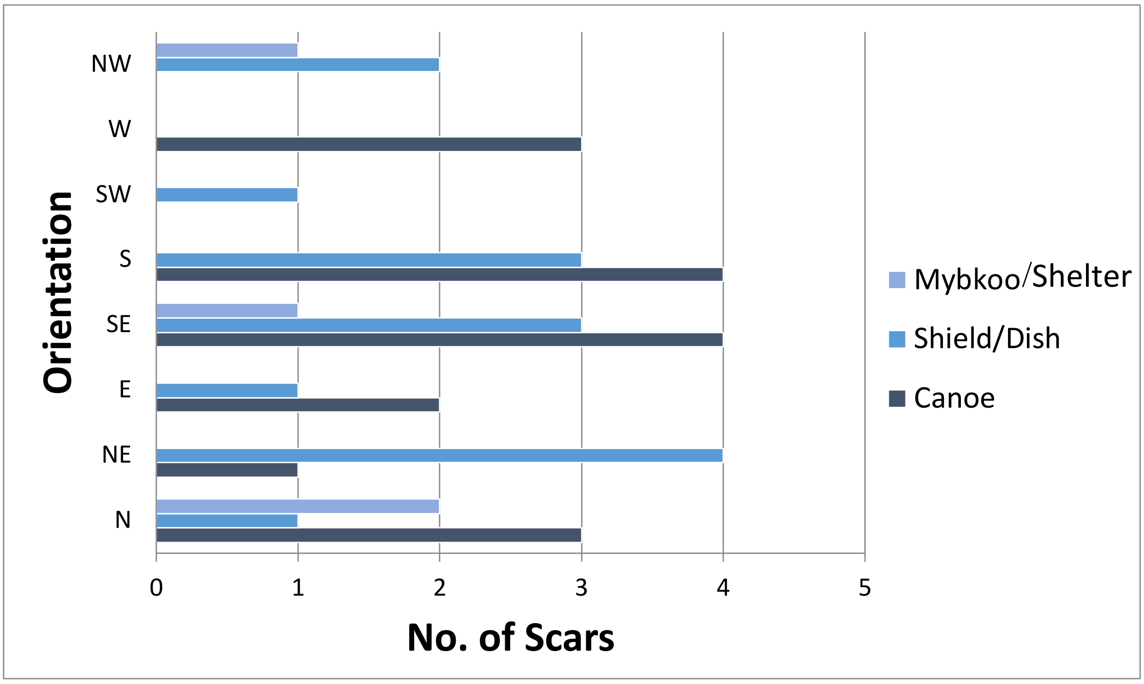


Figure 33: Orientation of red gum scar typologies.

Of the total number of red gum scars, 73% (n=30) had no visible axe marks. A further 24.5% (n =10) of the scars had steel axe marks and 2.5% (n = 1) had a possible stone axe mark (SW001) (Figure 34). Two of the *mybkoo*/shelter typology had steel axe marks visible on their heartwood (20%; n=2), 5 shield/dish typology were also recorded with axe marks (50%; n=5) and 1 steel mark was recorded on each a modern toe hold and a wedge cut (10% each). Of the axe marks visible in scars, 82% (n=9) exhibited parallel lines around the top and/or bottom, 9% (n=1) had a single axe mark visible and the remaining 9% (n=1) was marks resulting from wedge cuts. As can be seen in Table 7, 82% (n=9) of axe marks were visible on CMTs that were dead, probably because overtime regrowth would conceal axe marks which generally adorn the edges of the scar where bark was removed.

Table 7: Type of axe marks compared with tree health.

Type of Axe Marks	No. of marks	Tree Health		
		Living	Stressed	Dead
Parallel	9	2	0	7
Wedge Cut/s	1	0	0	1
Random	0	N/A	N/A	N/A
Single	1	0	0	1
Total	**11**	**2**	**0**	**9**

Figure 34: Possible stone axe mark on SW0001 (Photo Credit: Frank Boulden).

6.3. Black Box

Specific trends in the black box data relate heavily to cultural entanglement between Aboriginal Australians and settlers. By differentiating between scar attributes on black box trees, cultural adaptation and change in bark use may be examined in association not just with CMTs as a whole, but between species. Of the 48 recorded black box trees, 57 scars were identified and documented. Eleven scars (HC008; HC013; HC009; RRCJ001; RRCJ002; LM001; AC009; WB010; WB012; WB013) are resource procurement scars and will be omitted from the following evaluations of scar shape, interior width, ratio, area and orientation. They will be treated separately when discussing axe marks and make their own category for evaluations of typologies. In evaluating the circumference of the tree at 1 m as a surrogate for tree age, sixteen trees were not included as their trunks were bilobate or coppiced (RRWW005; RRWW006; RRWW011; OUT002; RRCJ004; RRCJ006; OUT001; OUT004; WRRI001; WRRI002; WB013; WB019; LM002; NRRI001; HC013; HC015). The average circumference of the remaining 41 trees was 211.5 cm but ranged between 90 and 507 cm. Bark thickness or depth of regrowth ranged between 2.2 cm and 15 cm but averaged at 5.2 cm and regrowth lengths were documented between 5.5 cm and 50 cm. Irregular regrowth was also noticeable. RRWW004 for example is a shield or dish scar from a black box tree in which a part of the right side of the scar has grown faster than the left side creating an almost 'C' shape (Figure 35).

Figure 35: A shield/dish scar that has non-symmetrical regrowth (Photo Credit: Frank Boulden).

Figure 36 shows the recorded shape of the 46 black box scars. From Figure 36 it is clear that the vast majority, 93.5% (n=43), can be considered elongated. The range of the maximum interior length of the 44 viable scars was 23–214 cm and the average was considerably smaller than the red gum scars at 73 cm. Table 8 shows all scar lengths on black box trees and their identified typologies. Wedge cuts and resource procurement scars were removed from this analysis. Obvious trends exist in the grouping of shingle and canoe scar typologies, with the single canoe scar representing the longest scar length. Similar to the trends in scar length of red gum scars, shield and dish scars represent a variety of scar lengths dominating the entirety of scar range for the data set. The average interior width of scars was measured in the field. Aside from resource scars, four scars (RRCJ001; RRCJ002; HC009; HC013) were not included in this analysis because their inaccessibility made accurate measurement of this dimension impossible. A further two were omitted because they appeared to be the result of bark removal for shingles (HC011 and WB019(1)). Due to the documented Aboriginal involvement in European bark and wood harvesting activities, the origin of these shingle scars is difficult to infer. The width of the remaining 40 scars ranged from 7–35 cm but averaged at 20.3 cm. Scar length for these 40 scars was on average 4.2 times greater than the scar width but ranged between 1:1 and 12:1. The analysis of scar area omitted HC007 also as this is a recorded wedge cut and bark death. The range of scar area is between 0.0161–1.6 m^2 but the average area was 0.12 m^2, indicating the scar area was more often towards the smaller end of the range.

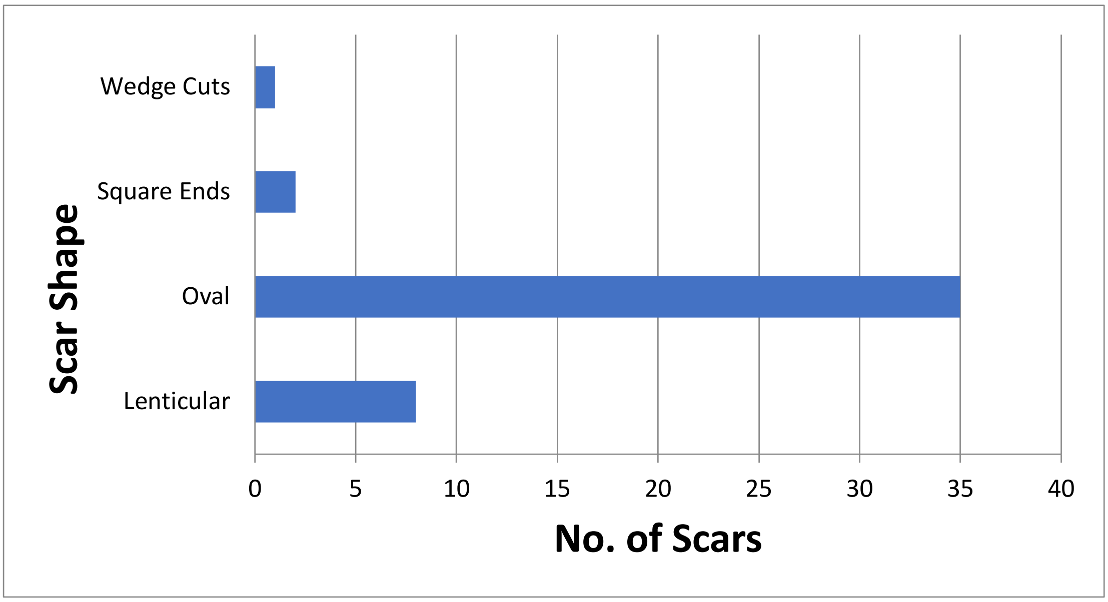


Figure 36: The identified shape of scars recorded on black box trees.

Table 8: Scar lengths on black box trees and their identified typologies.

Scar Length		Typology	
	Canoe	Shield/Dish	Shingle
23		1	
31		1	
35		1	
41		1	
44		1	
44.5		1	
45		1	
46		1	
47		2	
48		1	
53		1	
55		1	
58		1	
60		1	
61		1	
64		2	
66		2	
69		1	
70		1	
71		1	
73		1	
74		1	
75		1	
76		1	
79		1	
85		2	
86		3	
87			1
88		1	
90		1	
93		1	
109		2	
116		1	
125		1	
140			1
145		1	
214	1		
Total	**1**	**41**	**2**

Unlike the scars on red gum trees, shield and dish scars made up 72% (n=41) of the recorded scars on black box trees, while resource procurement scars were the next most represented typology at 19.2% (n=11). Possible small canoe scars, European shingles and a single wedge cut together made up the remaining 8.8% (n=3) of the recorded scars (Table 9). Figure 37 shows scar orientation organised by typology. Like the scars on red gum trees, scars with a southerly orientation were the most represented category at 33% (n=15) while 15.5% faced north (n=7), 13% faced northeast (n=6) and 17 % faced west (n=8) facing scars were the next most represented category. The single canoe scar was facing north, shingles are randomly distributed and shield/dish scars favoured a southerly orientation but also represented every direction possible.

Table 9: Typology of scars recorded on black box trees.

Typology	No. of Scars	Percentage (%)
Canoe	2	3.5
Resource Procurement	11	19
Shield/Dish	41	72
Shingle	2	3.5
Wedge Cut/s	1	2
Grand Total	**41**	**100%**

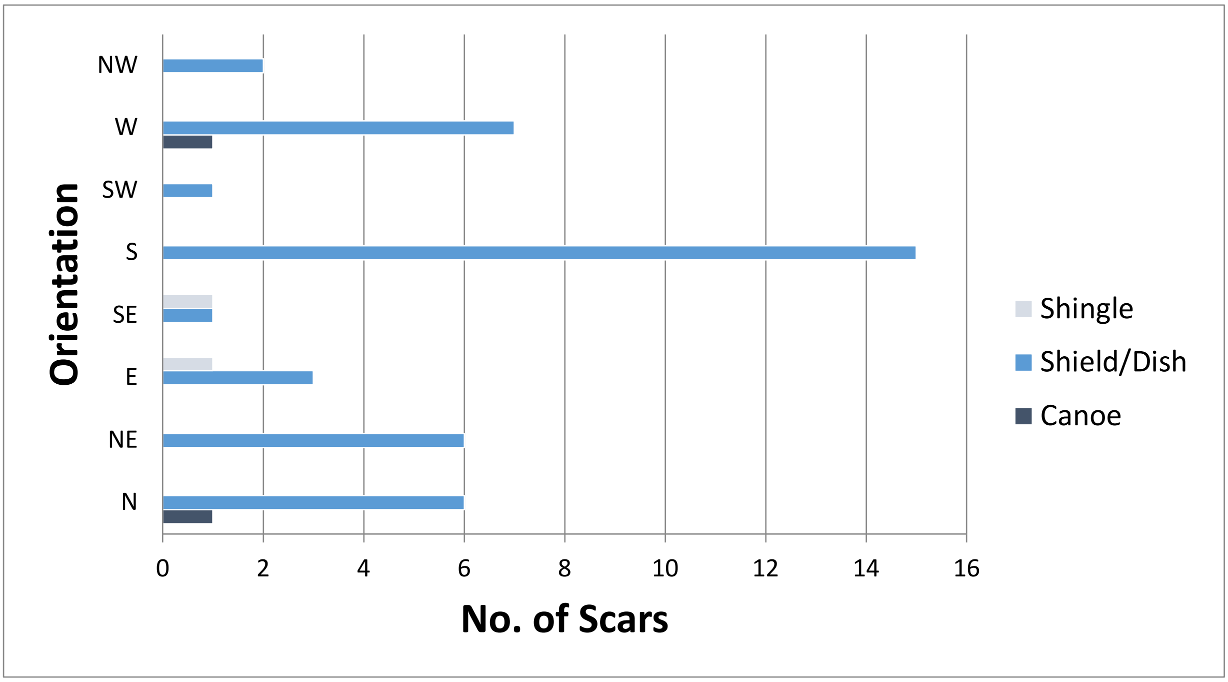


Figure 37: Orientation of black box scars categorised by their identified typology.

Bark 'stripping' scars are evident in all survey areas except NRRI, SW and RRWW. Only 11 examples of this type of resource procurement scar were recorded as their similarity with parallel axe marks running along grub tracks, made recording them a superfluous task (Figure 38). These scars were noted at each survey location and the axe mark lengths of each one found were measured to indicate the type of axe being used in the process. This type of bark procurement scar provides a profound form of cultural entanglement in which Aboriginal practices were adopted by Europeans, and has subsequently persisted for nearly 200 years. Larvae and grubs from eucalypt trees was a prized foodstuff for Aboriginal people in the pre- and post-contact period (Beveridge 1880:18) and the traditional method of whittling bark away down the infested section of wood was adopted by Europeans to collect the grubs as bait, a popular method for bait collection to this day (Kyle Payne pers. comm. 10th April 2018). For this reason it is difficult to prescribe origin to bark 'stripping' scars.

Figure 38: Resource procurement scars showing the typical 'skinning of the bark' along grub tracks (Photo Credit: Frank Boulden).

Steel axe marks are more prevalent on black box trees and may indicate a greater reliance on black box bark in the post-contact period as opposed to bark from the red gum tree. Forty-six percent of the scars (n=21) exhibited axe marks derived from steel, and only 2% (n=1) with a possible single stone axe mark (Figure 39). Eleven of these were resource procurement scars with parallel steel marks running horizontally down the tree (42%; n=11). A further 12 shield/dish scar types were recorded with steel axe marks (46%; n=12) and both shingle scars had steel axe marks (8%; n=2). The remaining mark was recorded in a wedge cut with significant regrowth (4%; n=1). Of the 15 scars with axe marks that were not the result of resource procurement, 60% (n=9) exhibited parallel lines along the top or bottom of the scar, 27% (n=4) were wedge cuts, 6.5% (n=1) had lines that seemed to have marks with a random distribution and one (6.5%; n=1) bore a single axe mark. As can be seen in Table 10, a relatively even spread between living and dead black box trees with axe marks is exhibited. Compared to the domination of axe marks on dead trees seen in the red gum sample, it is evident that black box was targeted for bark procurement more in the post-contact era.

Figure 39: Possible stone axe mark on WB005 (Photo Credit: Frank Boulden).

Table 10: Axe marks visible and scar tree health.

Type of Axe Marks	No. of marks	Tree Health		
		Living	Stressed	Dead
Parallel	20	0	1	8
Wedge Cut/s	4	4	0	0
Random	1	1 (possible stone)	0	0
Single	1	1	0	0
Total	**26**	**6**	**1**	**8**

6.4. Spatial Analysis Results

6.4.1. Scar Association with Water Systems

The location of CMTs in the landscape contributes to a local history of land use. The distribution of CMTs is broadly established by the habitat of the appropriate trees for bark procurement that are mature enough to have been available for bark use prior to and post-contact. Red gum trees also reside typically on the floodplain below the high-water mark of annual flooding events, whereas black box trees inhabit the floodplain above the high-water mark. The majority of CMTs on Calperum Station were found in woodland areas immediately adjacent (within a 60m buffer) to water bodies as opposed to further inland in woody forests. Most scars are associated with perennial tributaries and creeks (n=46) followed by the main river channel (n=30; Table 11).

Table 11: CMT association with water sources on the Calperum Station landscape.

Water Source	No. of CMTs
Main River Channel	30
Perennial Lake Systems	4
Intermittent Lake Systems	2
Perennial Tributaries/Creeks	46
Intermittent Tributaries/Creeks	4
Backwaters and Billabongs	5

6.4.2. Typological Distribution

Functional diversity of scar types at a single location likely indicates that a greater range of activities took place there. This was explored to consider how bark procurement took place throughout the landscape. When combined with an assessment of relative tree ages and assessed against other archaeological data in the landscape or regions of dense historical activity, this aspect of the analysis allows insights into cultural entanglement within the landscape. Table 12 highlights the number of scars recorded in each survey region and their respective typologies while Figure 40 presents this data visually. As can be noted, WB has the greatest size diversity followed by HC and AC. From Table 12 it is obvious that RRWW and WB had the greatest number of CMTs, but RRWW had the least scar size diversity of all survey areas. Another notable trend is that scar diversity increases when both targeted tree species occur within the same survey area. While this may be the result of targeted bark procurement for different resources, in this study it is more likely to reflect locations of greater European activity as both WB and HC survey areas contains the shingle typology. As all but the shingle and *mybkoo*/shelter typology occur on both tree species to some degree, scar diversity seems to be more a reflection of the activity that took place in an area as opposed to the tree species available for bark procurement.

Table 12: The number of scars recorded in each survey region and their respective typologies.

Survey Area	Distribution of Scar Typology				
	Canoe	**Shield/Dish**	***Mybkoo*/Shelter**	**Shingle**	**Total**
Lake Merreti	0	3	0	0	**3**
South Woolpoolool	1	1	0	0	**2**
North Ral Ral Island	2	1	0	0	**3**
Hunchee Crossing	2	7	0	1	**10**
Amazon Creek	5	4	2	0	**11**
Ral Ral Junction	0	6	0	0	**6**
Ral Ral Wide Water	0	16	0	0	**16**
South Hunchee	4	0	0	0	**4**
Woolenook Bend	3	11	1	1	**16**
West Ral Ral Island	2	6	0	0	**8**

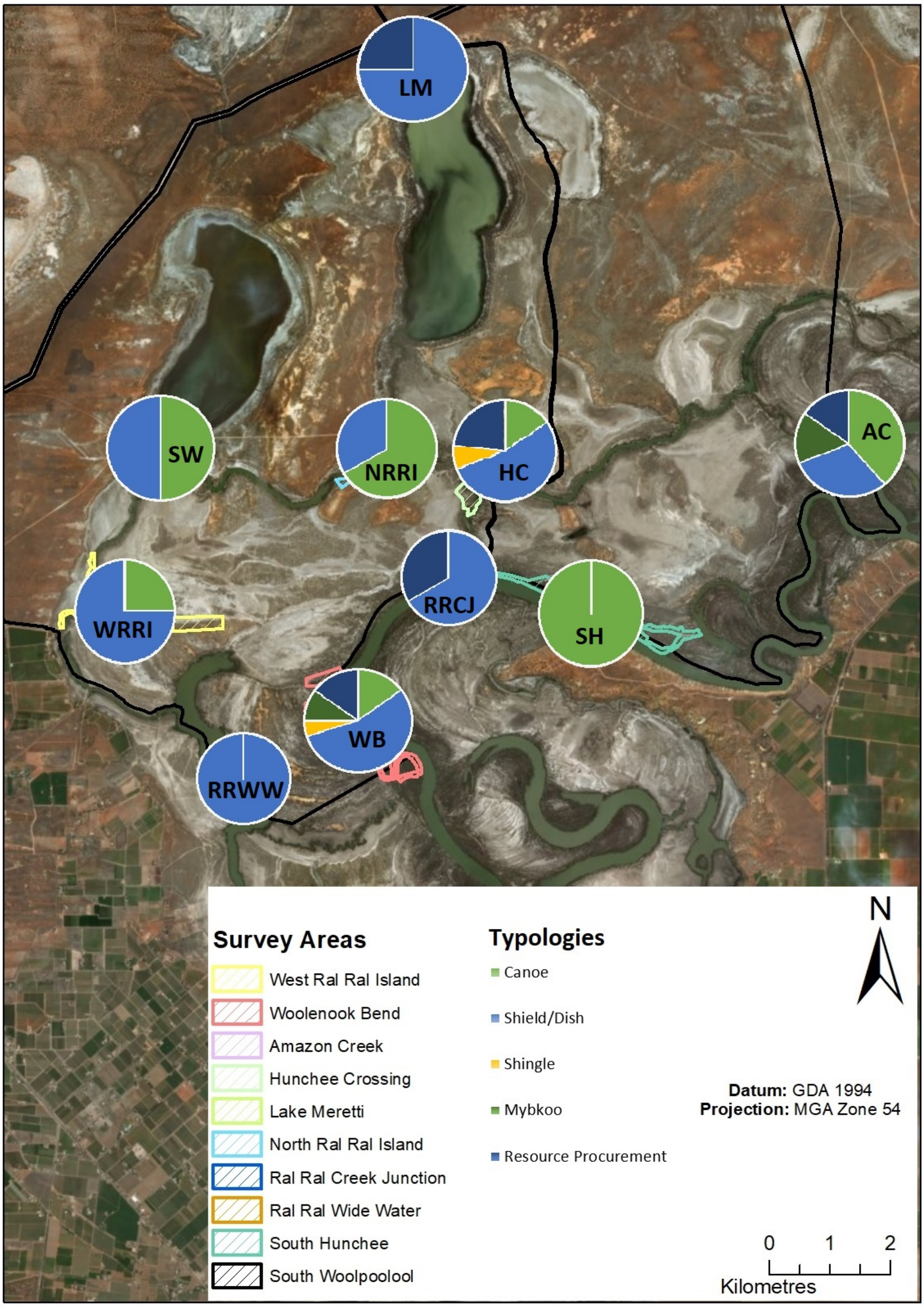


Figure 40: Scar distribution by typology and association with different water sources.

6.4.3. Archaeological Sites and CMTs

The spatial analysis of CMTs in relation to other archaeological sites within a landscape, can provide an indication of Aboriginal occupation and land use, although more research would be required to consider the chronological ordering of various activities. The results of a spatial analysis between CMTs and archaeological sites recorded during the fieldwork for this thesis and archaeological sites recorded by other researchers on Calperum Station are presented in Table 13 and Table 14, and Figure 41. Only the HC survey area for this study overlapped with the mound survey areas of Jones (2016). Here six mound sites were located and a diverse array of scar typologies were recorded. A single shield/dish 'Outlier' Scar (OUT003) was located in the Reny Island Billabong area in which six mounds were recorded for his study (Jones 2016). The archaeology recorded during the survey for this thesis is identified in Table 13. Previous Flinders University field schools have recorded archaeological sites as part of their course. This data has been cleaned and tabulated by site type—surface deposits, shell matrixes, stone artefacts, historical features, hearths and flakes. Flinders University field school surveys overlapped with four of the survey areas from this study and the distribution of artefacts within each are presented in Table 14. The HC survey area extensively overlapped with the work of Flinders University students and so comparative data was abundant.

Table 13: 'Other Sites' Data distribution on the Calperum Station floodplain.

	'Other' Sites Distribution	
Survey Area	Site Type/s Recorded	Count
Lake Merreti	Lithic Scatter	1
South Woolpoolool	Lithic Scatter	1
Hunchee Crossing	Hearth Complex; Shell Midden	2
Amazon Creek	Lithic Scatter	1
Ral Ral Wide Water	Hearth Complex	1
Woolenook Bend	Shell Scatter (x2); Hearth Complex	3
West Ral Ral Island	Mound Site	1

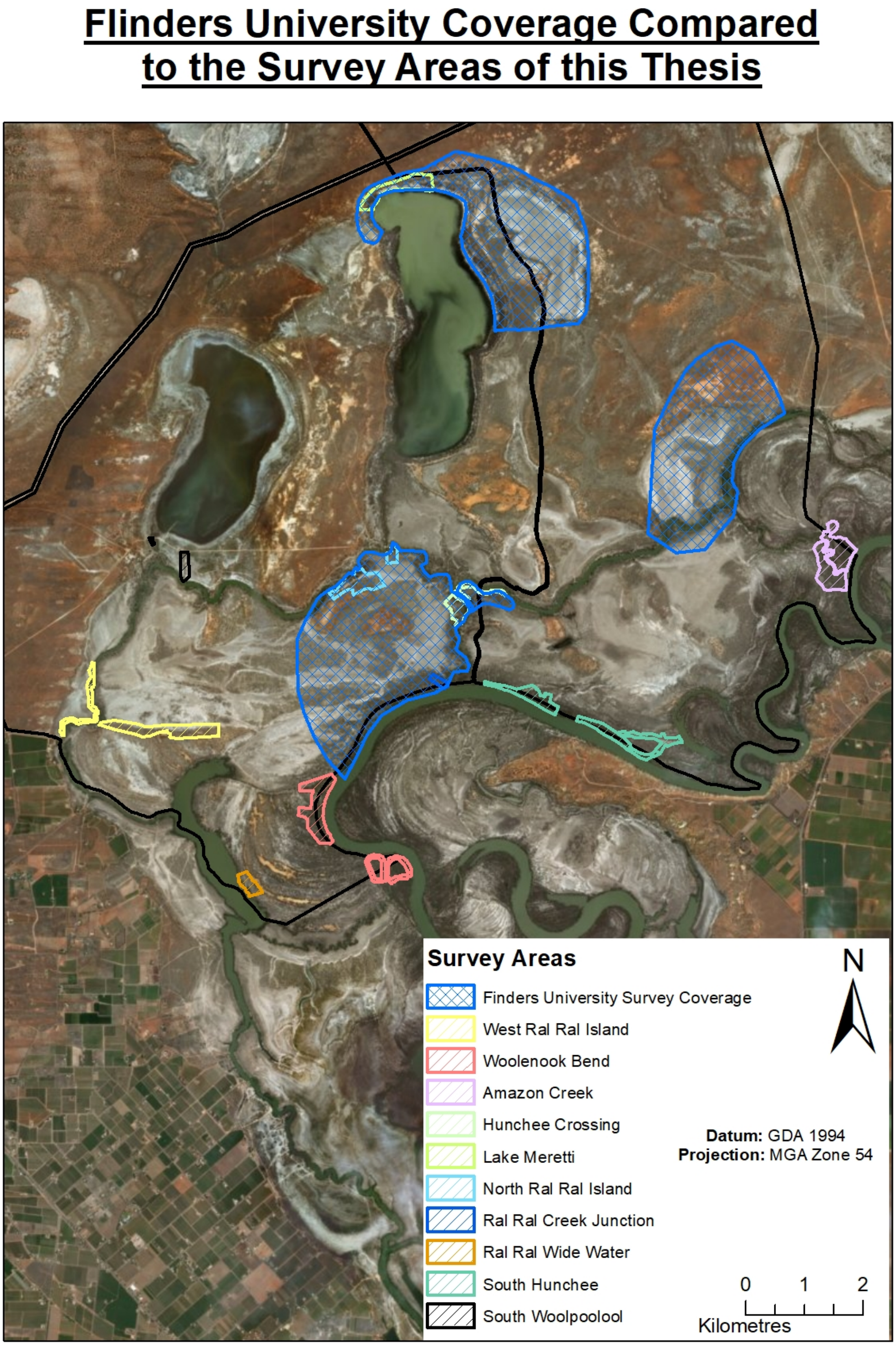


Figure 41: General areas of survey coverage for the Flinders University Archaeological Site Data and the relationship with the survey areas of this study.

Table 14: Flinders University Data distribution on the Calperum Station floodplain.

Flinders University Site Data		
Survey Area	**Site Type**	**Count**
Lake Merreti	Midden; Historical Glass	2
Hunchee Crossing	Stone Artefact; Flakes; Shell Matrix (x6); Earth Mound (x2)	29
North Ral Ral Island	Hearth and Midden Complex (x2); Stone Artefacts; Flakes	8
Ral Ral Creek Junction	Shell Matrix (x3); Flakes; Stone Artefacts	10

6.4.4. CMTs and Historical Places

By overlaying the spatial data on CMT locations with an 1891 historical map of Calperum Station, distinct trends become visible between scar location and places of historical European land use. Where Aboriginal and European activity overlap, is probably a reflection of available water in the arid landscape but no doubt cultural entanglement would have occurred here. While the spatial data cannot be visually represented at the request of RMMAC, Figure 42 and Figure 43 shows the survey areas and how they correlate to the landscape 200 years ago. As can be noted from Figure 43, the northern section of the WB survey area overlaps European brush yards as an area of more intense historical activity and is where one of the recorded shingle scars was located. The SW survey area resides adjacent to the Ral Ral Accommodation House of 1891, the western section of the WRRI survey area is less than 150 m north of an old historical hut and the LM survey area is parallel to an Old Coach Road from historical times. One of the two shingles recorded for this study was found in the WB survey area in the immediate woodland around the brush yards, the other shingles recorded were not associated with historical activity identified on this map in the HC survey area.

Survey Areas Overlayed on the 1891 Historic Map of Calperum Station

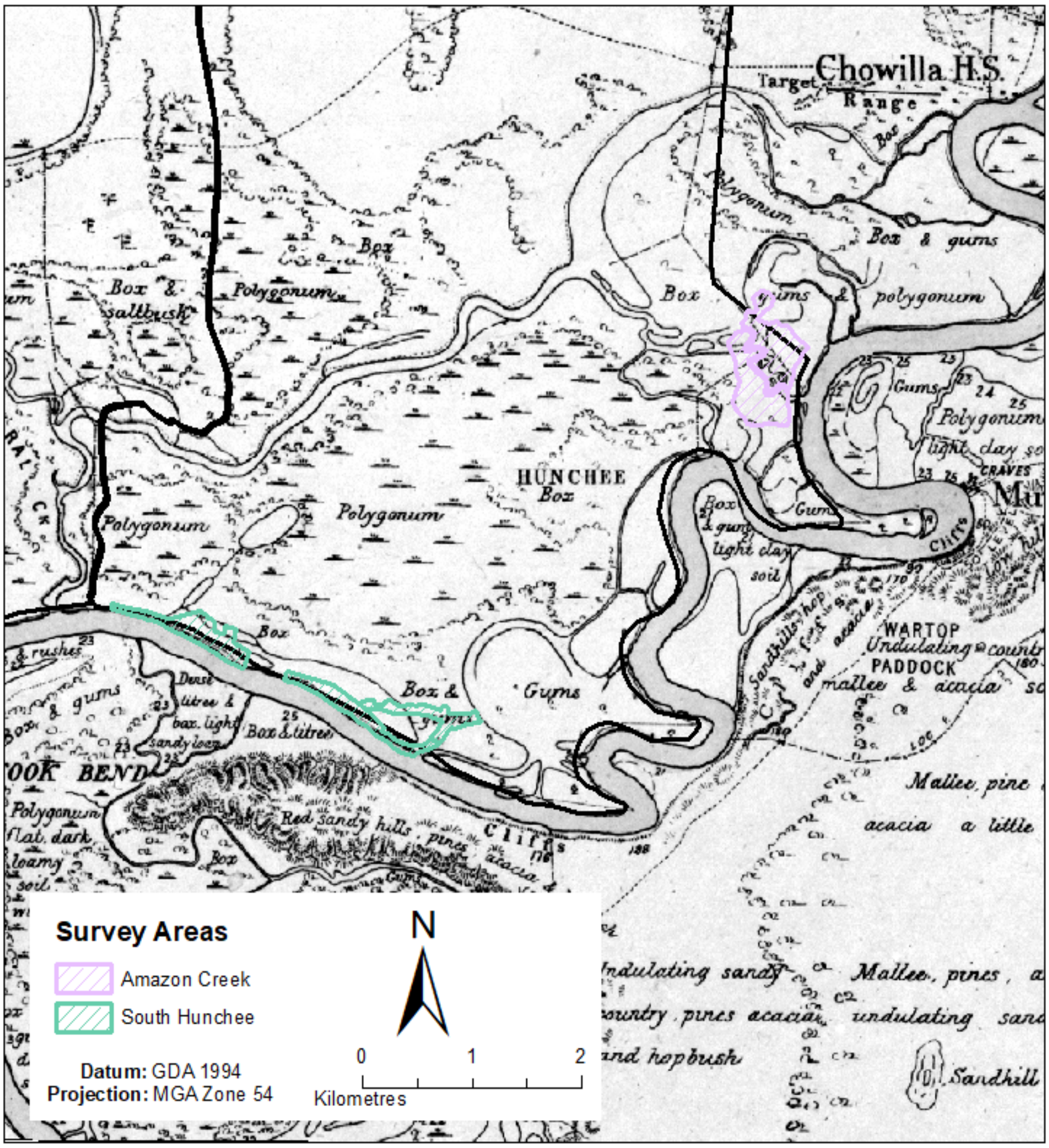


Figure 42: The 2018 survey areas for this thesis overlayed on the 1891 Surveyor General's map of Calperum Station.

Survey Areas Overlayed on the 1891 Historic Map of Calperum Station

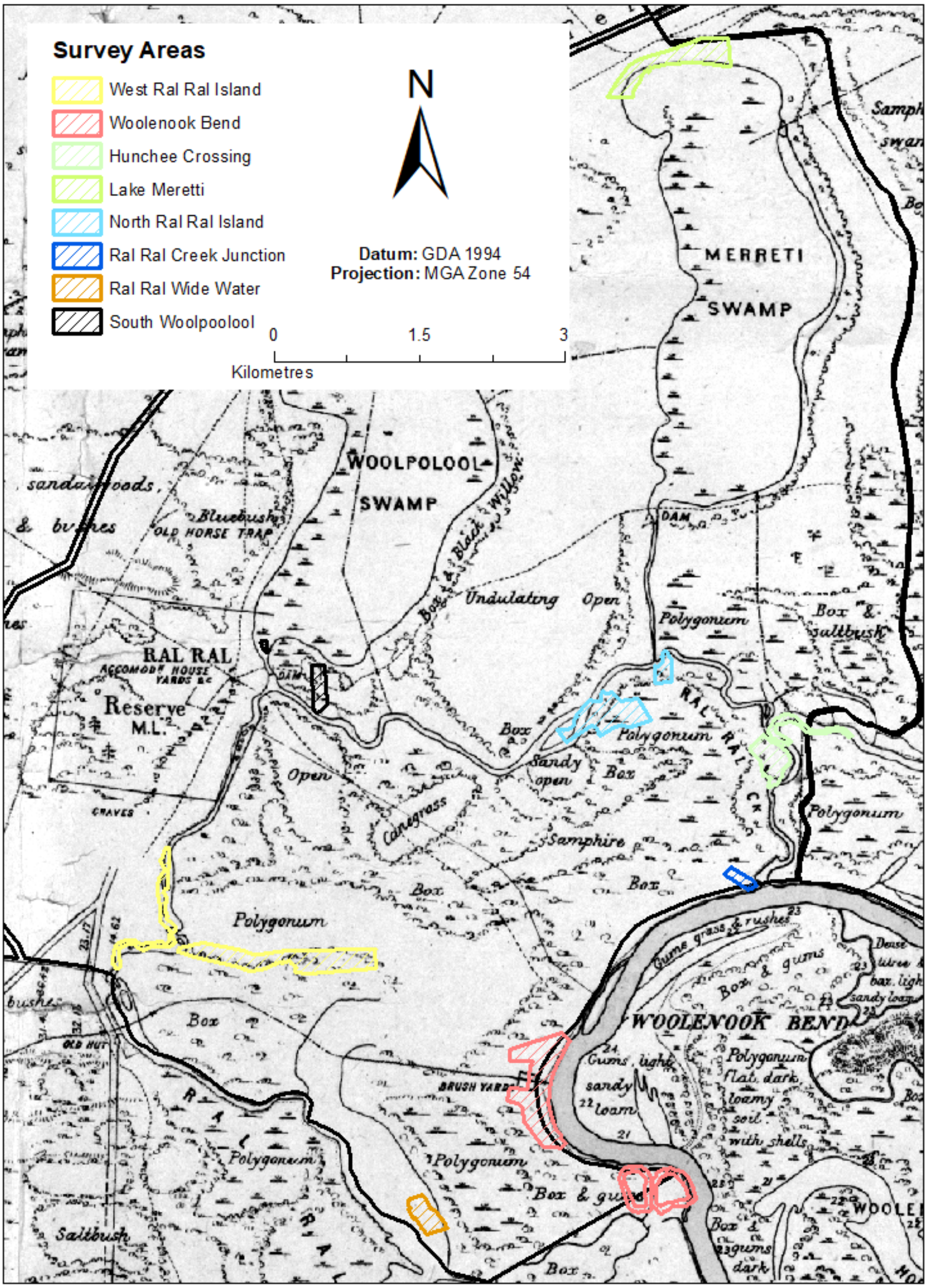


Figure 43: The 2018 survey areas for this thesis overlayed on the 1891 Surveyor General's map of Calperum Station.

6.5. Chapter Summary

This chapter presents the archaeological data recorded for this study. The overall trends were identified for the recorded CMTs, before illuminating the specific attributes of scars and modifications recorded on red gum and black box trees in the survey areas. The location of each CMT was analysed in relation to its proximity to geological areas and water sources, broadly, then in terms of scar typologies specifically. The results highlight that red gum and black box trees are subject to a process of cultural selection that differentiates the bark objects types that are harvested from them. This trend provides insights into past decision-making processes, and combined with relative tree age analysis, provides details regarding changes in land use as a result of colonisation. Red gum tree circumferences are larger and indicative of older scars. This trend that may inform cultural adaptation by providing a potential chronology to the dataset and comparisons of CMT locations in relation to centres of European activity provides niches of entangled activity by both Aboriginal Australians and settlers. These issues are explored further in the following chapter.

7. Discussion

This chapter discusses the results presented in the previous chapter. Particular attention is paid to discussing congruity (where it exists) and diversity of the results compared to the previously discussed literature regarding bark use. This assessment provides the opportunity for conclusions regarding processes of cultural change to be analysed on a local scale. Supplementing the archaeology with the ethnohistoric and recent literature provides a nuanced interpretation of Aboriginal uses of bark in the Riverland.

7.1. The Landscape of CMTs at Calperum Station

7.1.1. Floodplain Taphonomy and Heritage

CMTs represent the material remains of past Aboriginal land use and connection to country. Their distribution throughout the Riverland is a material indicator of the abundance of past Aboriginal activity in the area but are highly susceptible to changing environmental dynamics and anthropogenic activities. As Chapter Five highlighted, the highly degraded landscape of the South Australian Riverland is a result of the substantial timber and logging trade as well as the riverboat industry on the Murray, combined with anthropogenic alterations of the Murray River's natural flow and flooding regime. Survey locations on Hunchee Island (HC, AC and SH) had relatively more mature trees than the survey locations on Ral Ral Island. It seems Hunchee Island is much less affected by agricultural land clearance than neighbouring Ral Ral Island and the larger quantity of mature trees here may explain the higher frequency of the 'canoe' typology found on the island. Larger trees were targeted initially for removal from the woodlands by timber cutters and this would have a serious effect on canoe tree distribution in particular. There is no way to gauge the numbers of CMTs that were present in the landscape at the time of colonisation nor give an estimate. It is obvious, however, that what is extant today is just a small remnant of what once existed.

One of the most poignant indications of the failing floodplain health is the number of dead and dying trees recorded for this thesis. A total of 67.5% (n=60) of the recorded trees were either stressed or already dead. These numbers are slightly less than those reported in Wood and Westell (2016:14) for the Chowilla Floodplain, where 83% of the recorded trees were classified in this way. A higher relative portion of red gum trees are identified as 'dead' according to Figure 24, perhaps indicating that greater stress has befallen river red gum trees over the years. An even greater number of scars than trees are in a poor condition. As Figure 25 reveals, both living and dead trees have scars identified in 'poor' condition. Black box trees had the greatest relative number of scars identified in each category. The relative number of black box and red gum scars identified as being in a 'poor' condition are very similar with 41% (n=23) and 42% (n=17) respectively. Figure 44 shows SH003 an old canoe scar that has died from being permanently submerged due to locks and water management strategies. This figure highlights how little time is left before the entire class of heritage known as CMTs for this area are lost.

Figure 44: SH003, a canoe scar that will soon be lost forever.

7.2. Identifying Cultural Trajectories, Change and Adaptation through Scar Age

To comprehend change in past bark use from the pre-contact period, it is first necessary to construct the bark procurement and use strategies of Aboriginal people prior to contact with European settlers. To do this, an assessment of scar age is needed to provide an understanding of the availability of bark—particularly at the time of contact—and establish a relative chronology of scars to determine the trajectory of bark use with which archaeological data can be compared. The antiquity of CMTs is restricted by the age and preservation potential of the subject tree as well as the environment in which it is located. Rhoads (1992:202) postulated that river red gums could live up to 500 years and as contact occurred less than 300 years ago for the people in the South Australian Riverland, it is theoretically possible to evidence use of bark before the 1830s in the archaeological record. Dating cultural scars is difficult without the destruction of the resource that accompanies scientific analysis. Instead, this thesis used four relative measures to assess CMT age and identify if trees would have been a useful size for bark procurement in the pre-contact or contact period.

7.2.1. Tree Circumference

The most practical way of estimating the age of CMTs for this study was by measuring tree circumference at 100 cm from ground level. This field on the recording form was the main tree age proxy for this fieldwork, along with a personal assessment of a tree's maturity in its immediate context. One ambiguity associated with assessing tree age is the time that has elapsed since a tree has died. Dead red gums can remain standing for up to 100 years before rotting, according to some estimates by Beesley (1989:12).

Of the tree circumference ranges presented in Figure 27, all those circumferences identified at less than 200 cm are located on dead trees. Increases in circumference of tree trunks cease with death and so it is difficult to assess whether these trees would have been available for bark procurement around 300 years ago. No comparative data for red gum trees was found in the literature but 12 black box trees of known ages from the Overland Corner on the Murray River were analysed by Klaver (1998:234) to provide insights into black box tree age relative to circumference. By plotting the amount of radial growth per year the data suggested an inverse exponential relationship between growth rate and age, consistent with Beesley's postulation that once Eucalypts in Australia have matured, their growth rates decline (1989:12) and that growth rates decline more rapidly after 100 years. From this data, Klaver recommends that healthy black box trees in Riverine environments, with circumferences of less than 150 cm would not be old enough to be related to Aboriginal land use in the early nineteenth century.

Figure 45: A dish scar on a logged black box tree with circumference of just 90 cm.

For the dataset from Calperum Station, a more conservative approach was taken, in which healthy trees with a circumference less than 200 cm were recorded only if other attributes such as scar shape, symmetry and amount of regrowth suggested they were the result of past Aboriginal land use. Figure 45 reveals a stunning scar found on a logged black box stump (HC012) whose circumference was only 90 cm and is indicative that eliminating trees based on circumference alone, especially on dead trees may result in the exclusion of legitimate cultural trees from the data. HC012 highlights a number of facets of entanglement. Firstly, the scar evidences a post-contact, entangled landscape which to this day bears evidence of shared use by both Aboriginal peoples and European settlers. The scarring and subsequent logging of such a juvenile tree highlights potential competition for resources in the landscape as well as confirming that colonial historical activities did affect the distribution of CMTs in the landscape, much like the modern impact of poor water management in the Murray-Darling basin. As the large trees were being felled for European economic endeavours, Indigenous Australians used smaller and smaller trees to harvest suitable bark for their lifeways. Figure 27 shows the frequency distribution of tree circumferences for both tree species. As can be noted, the distribution shows a decreasing number of trees as tree circumference increases. This distribution is expected given the sustained woodcutting industry that the Riverland has supported and the preference of woodcutters for larger, more mature trees (Klaver 1998:238).

7.2.2. Regrowth Depth and Width

Mature trees can be adorned with young scars indicative of much later bark use. Larger amounts of regrowth around scar margins would indicate a likely greater antiquity, as would deeper scars with larger measured scar depths, but again inherent issues arise when using these rates to date scars. As Beesley (1989:12) postulated, once Eucalypts in Australia have matured, their growth rates decline, and so regrowth amounts are dependent on a tree's age and vitality. On red gum trees, the depth of scars ranged from 2–25 cm with most dead trees falling at the lower end of this range. A similar situation existed for black box trees, where the lower threshold of regrowth width occurred on dead trees whose growth ceased soon after the scarring event. Figure 46 shows two scars (HC001 and AC011), one on a dead tree with only a small amount of regrowth and one on a still living tree with extensive regrowth. Regrowth on all sides of scars, and the ranges and depth of all scars in this data set, are sufficient to indicate likely antiquity. Both black box and red gum trees exhibited similar ranges for both scar depth and regrowth and so it is reasonable to conclude that bark was procured from both species during the same time period in this location.

Figure 46: Juxtaposition of two scars showing vastly different regrowth (Photo Credit: Frank Boulden).

7.2.3. Steel Axe Marks

The most evident example of cultural entanglement in the Riverland is the use of European introduced steel axes to cut traditional bark objects. The final means of determining scar age is by evaluating the implement used to cut the bark from the tree. Both stone and steel axe marks have been identified on Australian CMTs, however, stone axe marks are now very rare and are not easily distinguishable on old heartwoods (Newland 1899:39). Figure 47 shows the definite sharp edge of steel axe mark which, when compared to the possible stone axe marks of the previous chapter, highlights the ease of distinction between the two. Axe marks also tend to be covered with regrowth early in a scar's lifecycle, as they generally exist on the perimeter of a scar. For this reason, scars with no axe marks could be the result of the removal of bark with stone axes or be dated to the pre-contact or early years of contact for the marks to have been completely hidden by regrowth.

Figure 47: Overgrown steel axe marks recorded on Reny Island at Hunchee Crossing (Photo Credit: Frank Boulden).

Steel axe marks definitively date bark procurement to the post-contact period. All axe marks in scars were well below the 10 cm threshold of a steel tomahawk, a tool introduced by Europeans to the material culture of the Riverland. While steel tomahawks were introduced by European colonists there is much literature highlighting the abundant Aboriginal use of this tool (Sturt 1849b:61, 1849:127–128). Cultural entanglement evidenced by the Aboriginal use of steel tomahawks, makes assigning a cultural origin to these scars difficult. Despite most of the scars being implemented with steel axes, their general morphology and perceived age provides some evidence of an Aboriginal origin, being cut in the early historical period. European bark use tends to be limited to the standardised shingle typology for the weatherproofing of buildings and other structures (Long 2005:7). It is plausible that 53% (n=19) of steel axe marks recorded on scar types associated exclusively with Aboriginal bark procurement activities such as *mybkoo*/shelter and shield/dish types can be attributed to Aboriginal procurement strategies. The 6% (n=2) of the 36 steel axe marks recorded on scars indicative of the shingle typology, 31% (n=11) of steel marks recorded on resource procurement scars and 11% (n=4) associated with modern toe holds and regrown wedge cuts have a much more uncertain origin. However, the use of a steel tomahawk as opposed to a full wood axe provides some evidence of Aboriginal bark procurement, this conclusion however is not irrefutable as both Aboriginal peoples and Europeans had access to the smaller steel tomahawk. Significant regrowth on all but the modern toe hold does indicate that they are the likely result of bark procurement in the early historical period.

The higher percentage of steel axes used on black box trees is probably due to the prevalence of black box trees in the Riverland landscape in the post-contact period, given the early timber-cutting for the riverboat industry and the preference for the fine hardwood of red gums. The variation of axe mark numbers between the tree species is defined by tree health. A total of 82% of axe marks were located on dead red gum trees and seem to reflect the cessation of regrowth before the mark was covered, whereas on black box trees, the spread of marks is consistent between living and dead trees. The spread of marks on living and dead trees on black box suggests that perhaps bark was procured from this resource at a slightly later date given the depletion of mature red gum trees in the post-contact landscape. These results indicate that bark use by Aboriginal peoples in the Riverland continued through the contact period, but the species targeted for procurement of this resource changed to emphasise the use of black box bark as opposed to bark procured from red gum trees.

7.3. Typology of CMTs and Cultural Change in the South Australian Riverland

7.3.1. Assessing Typology

Establishing a typology of CMTs in the Riverland was a key objective of this study for both heritage management reasons and to allow for an effective evaluation of the changed activities associated with bark use due to colonial pressures. Scars represent the removal of an object for a functional use associated with past activity. To establish a typology of scars found in the South Australian Riverland, it is necessary to define the functional use of bark based on the negative impression of the bark's removal that remains today. It is also essential to have a sound understanding of the context of a scar, its ethnohistoric and environmental contexts, before interpretations of scar typology can commence. As has been outlined, European scars are restricted in their morphology (Klaver 1998:230; Long 2003:35; Long 2005:72), but scars of Aboriginal origin are generally differentiated, and functions can be inferred based on scar lengths (Klaver 1998:229; Simmons 1980). The length of a scar is the dimension least affected by regrowth and therefore gives the best indication of the original scar's size. Higher frequencies of certain length classes are likely the result of a functional cause and relate to the artefact type.

7.3.2. Scar Length Analysis

The functional categories gained from the frequency distribution of scar lengths in the previous chapter provided a means of distinguishing scar typology for the Riverland region. Figure 30 reveals that red gum trees represent nearly the whole range of length classes. This result complements Klaver's (1988) analysis, with a bimodal distribution distinguishing predominantly between the smallest and largest length classes. Unlike Klaver (1998), however, black box trees exhibit a unimodal distribution, clustered around the shortest length class only.

Table 15 shows the results of the frequency distribution of this dataset compared to those of Simmons (1980) and Klaver (1998). Similar to the large dataset of Klaver (1998), the functional categories evident in Table 15 are not as distinct. This is likely due to the differential processes of growth and healing that alter scar shape over time. Small to medium (20–260 cm) and large (280–460 cm) scar length ranges were evident. The greatest distinction in the Calperum dataset is between the 'small/medium' scar length category and the rest of the data. The range for this category is significantly bigger than that of Simmons (1980) and correlated more to the larger dataset of Klaver (1998). The larger dataset, and the overlap in typological bark use sizes, likely resulted in the lack of distinction between the 'small' and 'medium' class lengths. The largest scars are more indicative of the red gum dominated dataset curated by Simmons (1980) and is almost certainly the result of the preference for large sheets of bark for making canoes.

Table 15: Comparison of scar length categories after Simmons (1980).

	Length (cm)		
Scar Length Category	**Simmons (1980)**	**Klaver (1998)**	**This Study**
Small	50 - 80	40 - 100	20 - 160
Medium	120 - 190	140 - 240	180 - 260
Large	270 - 500	300 - 350	280 - 460

Functional typologies assigned to scars in this dataset were based on the above established criteria associated with scar lengths as well as scar shape articulated in the heritage manuals of both NSW and Victoria (Long 2003:12–15; Long 2005:22–29). Several new categories were included that varied from these length-based typology criteria in order to account for the range of anthropogenic scars found in the South Australian Riverland that could be attributed to past Aboriginal land use. These included, 'wedge cut/s', more modern 'toe holds', '*mybkoo*' and 'resource procurement' scars.

7.3.3. Large: Canoes

The largest scar length category advocated for by Simmons (1980) was identified as a canoe type. For this dataset, scar lengths that are greater than 280 cm are considered the product of bark procurement for canoe construction. However, small lengths, down to 160 cm, with the appropriate shape have been included as probable canoes, as Edwards (1972:30) suggests canoes of 150 cm are appropriate for one person. Records also indicate that smaller canoes, called '*yookoo*', may have been used by children (Black 1947:356). Forty-six percent of red gum scars were identified as canoe scars, three of these scars fell below and two above the functional types advocated by scar length. Red gum scars exclusively represent the 'large' scar range, indicating that red gum bark was selectively targeted for canoe production (Wood et al. 2005:55; Wood and Westell 2009:69). One black box scar measured 214 cm and had an elongated shape indicative of a canoe scar. As cited by Klaver (1998:238), the properties of bark influence how it can be used, and the less durable nature of black box wood indicates that the black box canoe scar was most likely employed for short term use (Beveridge 1880:40). Given the importance of canoes to Aboriginal lifeways (*Adelaide Observer* 1860:5; Foster 2000:18), smaller canoes, and canoes manufactured from black box trees, likely represent changed Aboriginal bark use brought about by the loss of access to traditional territories and species due to European invasion and environmental destruction. With the provision of canoes and many supplies by the government, smaller and less durable canoes likely represent the solution to individual and immediate needs, as opposed to the production of a vessel that will support a population for a greater period of time.

7.3.4. Small/Medium: Shields, Dishes, *Mybkoo*/Shelter Material and Shingles

Figure 48: Two shingles cut side by side (WB019).

Similar to the findings of Klaver (1998:238), a bimodal length distribution is evident in this study's dataset, which distinguishes between two functional categories—the small and medium ranges and the large scar length range. The two shelter materials (shingles) recorded in this study fell into the 'small' length category as opposed to the 'medium' scar length category for which Simmons (1980) advocated (Figure 48). Shingles are documented on black box trees, as opposed to red gums, and have more standardised dimensions, measuring 150–250 cm in length before regrowth (Long 2003:35). Also falling into this hybrid scar length range are bark slab removals used as windbreaks and roofing in wurleys and/or *mybkoo* (Figure 49), a large, square in-section scoop that was described by George French Angus as being used for 'loosening the ground in search for grubs' (Angus 1847:pl.50, fig.32). The provenance of this description, and its accompanying illustration by Angus, is not known, but, as noted previously, the language term *mybkoo* indicates it is probably from the Murray River and is likely associated with Angus' visit to Moorundie near Blanchetown where he drew his landscape image of the river on plate 3 in *South Australia Illustrated* (Philip Jones pers. comm. 2018).

Figure 49: A *mybkoo* or bark slab removal scar, AC005 (Photo Credit: Frank Boulden).

According to the scar length categories first advocated by Simmons (1980), dishes were the functional type associated with the smallest scar length range. This dataset however, identified only a 'small/medium' category due to the significant overlap of the sizes of diverse functional scar types. The overlap in the size of shields and dishes also means distinguishing these two types is impossible through measurements alone. Shields and dishes exhibit similar elongated shapes to canoe scars but with scar lengths shorter than those of the largest canoes. Ninety-three percent of the scars on black box trees belong in this category, compared to only 42% of red gum scars. This indicates that black box trees were targeted for the smaller bark objects such as the creation of shields and dishes. The high percentage of probable dish scars can also provide insights into past land use and resource collection strategies. While it is impossible to determine if any of the dish scars were cut prior to the 1830s it is reasonable to infer that bark dishes were prominent in Aboriginal lifeways prior to European contact and certainly were in use after European settlement. As has been noted, bark dishes had an ephemeral use and their abundance in the landscape attests to continuity in container use for resource collection strategies in the post-contact period as well as evidencing the continued need for containers in this period. Despite colonial settlement, this form of traditional land use continued to feature prominently in Aboriginal lifeways in the Riverland region.

7.3.5. Resource Procurement Scar Typologies

Resource procurement scars are not identifiable by their scar length as the location, size and shape of resource procurement scars are all the direct product of factors relating to the resource in the tree. Grubs formed an important component of the traditional Aboriginal diet and may also have been used traditionally as bait. There is some contention over the southerly extent of hook distribution prior to European invasion, that arises from a disjuncture between evidence from historical ethnography, which promotes the uniformitarian assumption of early Europeana, and archaeology (see Arthur and Morphy 2005:54; Berndt and Berndt 1993:96; Gerritsen 2001). However, there is a body of ethnohistoric evidence pertaining to areas of the Murray Darling Basin that confirm the use of hooks as part of a diverse collection of resource procurement strategies (outlined in Gerritsen 2001:21–23). As far as the use of grubs as bait, Berndt and Berndt (1993: 96) outlined that the Yaraldi peoples of the lower Murray River used bird flesh and grubs as on their hooks to catch fish. The tool marks and scars left from this process of grub collection are visible in the modern landscape as 'stripping scars' (Beveridge 1880:18). Beesley (1989) notes that insect attacks occur only between the bark and active cambium, therefore grub tracks on the heartwood indicate that the grubs existed in the tree before the bark was stripped. As can be seen in Figure 50 the initial cut into the bark is over the concentration of grub holes and then the bark is whittled away along the tracks to obtain the resource. These scars are abundant on black box trees in the Calperum landscape. The method of obtaining and using larvae and grubs as bait was likely adopted by European colonists and contemporary Australians. This whittling of bark to obtain larvae and grubs for fishing bait would certainly explain the abundance of these scars at RRCJ, adjacent to a popular houseboat mooring area. The entanglement of culture and the expression of cultural activities in the landscape means these bark 'stripping' scars cannot be easily or solely associated with Aboriginal procurement strategies. However, many of these scars (such as Figure 50) have significant regrowth and attest to a much earlier removal of bark than within the last 100 years.

Figure 50: A 'bark stripping' scar (HC008) showing the initial cut into a grub hole and then horizontal axe marks down the trunk as bark has been 'skinned' from the tree (Photo Credit: Frank Boulden).

Wedge cut/s and modern toe holds are also problematic types that cannot be associated as solely originating from traditional Aboriginal land use, but are prevalent in the landscape. The modern toeholds recorded during this data set must be more recent, perhaps the early-mid-twentieth century, as they are visible on living red gum trees. A single example was fully recorded (Figure 51) but many more were noted. They are always associated with red gum trees that have been pollarded and therefore probably provided a means for accessing the top branches of these trees (Peter Cale pers. comm. 2018). Wedge cut/s of all sizes were recorded. Little information can be gained from this data, but it is believed that they are possibly the result of attempt to fell trees.

Figure 51: A modern toe hold (WB[D]) for accessing tree tops for the practice of pollarding. The 'scar' around the tree is caused by bark death (Photo Credit: Frank Boulden).

7.4. Local Narratives of Continuity and Change

7.4.1. Adaptation

The analysis of scar width provides an interesting example of the cultural adaptation to the changed landscape, brought about by European colonisation, specific to Calperum Station. As has been stated, regrowth tends to mean the width dimension of a scar will close at a proportionately greater rate than the length. Scar width, however, is useful for providing relative measures of scar size, and in the evaluation of scar area. Red gum trees exhibited both the widest and most narrow scars, a range that attests to the likely earlier period in which red gum trees were exploited. The reduced diversity in black box scar widths supports the previous conclusion inferred from axe mark diversity compared to tree health, that bark harvesting targeted black box trees more in the post-contact landscape as opposed to red gum trees which seem to have been more frequently targeted before contact.

7.4.2. Continuity

While cultural adaptation has featured heavily in the current discussion, cultural continuity is also evident. As continuity can only terminate with the complete cessation of cultural transmission (Roux and Courty 2013:189), bark use, adapted to the changing landscape, persisted in the daily practices of Aboriginal people. Scar area provides a clear example of the decision-making process in the selectivity of tree species for canoe scars and how this process was unchanged despite colonisation. Scar area is recorded through the width and length measurements of recorded scars. The average red gum scar was 0.7 m^2, 7 x greater than the average area of black box scars (0.12 m^2). Table 16 shows the average scar area for each tree species compared to the results of Klaver (1998) on the floodplain of the Murrumbidgee River, and Wood and Westell (2014) on the Pike River Floodplain. This indicates, as both Wood and Westell (2014:60) and Klaver (1980:243) have noted, that red gum trees were targeted for canoe production, while the smaller ranges of bark sizes were more random. Despite the reduced numbers of red gum trees available for bark procurement and the reduced access to the land where bark could be harvested from, the selective use of red gum bark for canoe manufacture persisted.

Table 16: Scar area of the species studied in this thesis compared to the results of Klaver (1998) and Wood and Westell (2014).

	Average Scar Area (m^2)		
Tree Species	**Klaver (1998)**	**Wood and Westell (2014)**	**This Study**
River Red Gum	0.65	1.29	0.7
Black Box	0.4	0.24	0.12

Very limited information exists that may give insight into scar orientation except that bark was more easily removed when the 'sap was rising' (Clarke 2012:241; Davis 1989:42; Hutcherson 1998:62; Levitt 1981:17; Smith and Kalotas 1985:349; Spencer 1922:126). It is also noted that—especially for large typologies such as canoes—the bark was required to be large enough and unblemished to be an effective resource. By these lines of thinking, the orientation of a scar is a conscious decision of the bark cutter and is the result of functionality and ease of labour, rather than determined by environmental constraints.

The scar orientation recorded during this thesis found a predominance in the south and south-eastern orientation for both red gum (42%) and black box scars (38%). These results are very similar to those presented by Bonhomme (1990:69) who cited that 49% of CMTs in the Barmah Forest had an east to south orientation. North to north-east facing scars were the second most recorded orientation with 29% of the black box and 31% of the red gum scars exhibiting this orientation.

As can be ascertained, the orientation of many scars is likely primarily decided by functionality and ease of procurement. However, a definite trend exists that favours human agency in knowledge of the best practice for bark removal over environmental constraints. Two hypotheses were considered, neither are mutually exclusive and neither can be proved but both provide insight into the more human factors that influence decision-making and past cultural strategies. Firstly, by cutting bark from the south and north side of a tree the dry face is not as exposed to the harsh sunlight and the tree has a better chance of survival. The second hypothesis is simply a matter of comfort in a task that took several hours to complete (Sturt 1849a:127). By not cutting a scar on the eastern and western sides the creator did not have to have the sun in their face or directly on their back while working. The fact that this trend in orientation is exhibited on all scars, despite implement or relative age, indicates that whatever cultural choices were being made regarding the side of the tree from which bark was to be procured, persisted after the settlement of Europeans.

7.5. Spatial Analysis

7.5.1. CMT Density and Maturity on Calperum Station

The current health of the Calperum floodplain and the present distribution of CMTs within the landscape inform the local narrative of land management practices at Calperum Station and provide insights into the site specific taphonomy affecting tree distribution. The 89 CMTs located are undoubtedly an under-representation of the original density on Calperum Station as both natural and anthropogenic processes could have potentially eliminated scars in the landscape. A similar number of scars were recorded at Chowilla Station immediately adjacent to Calperum Station (n=65) and it is evident that a similar situation exists in terms of taphonomic processes and CMT destruction (Wood et al. 2005:55). The highest density of CMTs was found at RRWW, which featured one of the smallest survey areas for this study. This area lies adjacent to a perennial tributary of the Murray River and is a stand of mature dead trees. The area has been heavily exploited by Europeans including the removal of wooden fence posts and coppicing for timber and fuel (Figure 52). The area is also located due west of a source-bordering dune with Aboriginal burials. The reason for this high density of CMTs at RRWW is likely associated with the location and indicative of Holocene campsite activity in the area.

Figure 52: Examples of removed wooden beams (a) and coppiced trees (b) at RRWW Survey Area (Photo Credit: Frank Boulden).

7.5.2. Scar Type Distribution and Implications for local Aboriginal Land Use

The association of scars with each other, the landscape, and other archaeological remains, provides the opportunity to tell a local history specific to the experiences of Aboriginal people at Calperum Station. The pattern of the current distribution of CMTs is affected by both habitat and their removal through land clearance activities (Wood and Westell 2014:60). Their spatial distribution in association with other occupational sites, such as middens, ovens, mounds and other artefacts, provides a noteworthy indication of past activity patterns throughout the landscape (Klaver 1998:243). Rhoads (1992:215) suggests, from his surveys of 10,000 km^2 in Victoria, that when the preservation of the landscape is good, CMTs follow a similar spatial patterning as occupation sites. Despite the significant variation in study areas and environmental conditions between this study and that of Rhoads, it is reasonable to speculate that CMTs at Calperum Station would reflect a distribution similar to campsites. Distribution may vary, however, in that the habitat of red gums on the floodplain alone may be more distant but still proximate to other evidence of occupation.

As has been highlighted, there are inherent issues when building a narrative of past bark use from ethnohistoric records. While these records can provide a broad, regional narrative of bark use, they are rarely capable of defining local histories. This analysis of tree species selection and bark types identifies a local trend in the data that differs from the larger narrative of the ethnohistoric record. Over three quarters of the survey locations were adjacent to the waterline of the main river channel or water bodies in locations that favour the growing environment of river red gums. These survey locations were targeted because river red gum trees are overwhelmingly represented in ethnohistoric accounts of tree species targeted for bark on the Murray River (Mitchell 1839a:223; Mitchell 1839b:331; Roth 1908:161; Smyth 1878a:407,410; Spencer 1922:138; Sturt 1963b:201). Despite the deliberate targeting of environments favoured by red gums, a relatively equal number of scars were recorded in each species, at 41 (46%) recorded on red gum and 57 (54%) on black box trees. There may be several explanations for the discrepancy between the historical and archaeological record.

Firstly, the hardwood of the river red gums was targeted for the construction, and river boat industries, and were widely accessible as they grew adjacent to the waterline along much of the Murray River and its tributaries. Red gums are also more susceptible to the fundamental changes to the river's hydrology system brought about by modern agriculture, native vegetation clearing and construction of water regulatory structures (Barnet 1989:205, 208). As was noted in Chapter 4, changing river health and water height has seen a reduction of 38–42% of Eucalypt woodlands, dominated by red gum and black box species, along the Murray River (George et al. 2005). Finally, red gum trees were the targeted species for the 'canoe' typology of CMTs, a typology that dominated early records but may not have been the predominant scar typology evident in the early colonial period (Basedow 1914; Edwards 1972; Oakden 1838; Roth 1908; Thomas 1905) despite being the one that is highlighted in historical accounts. It is clear that CMTs on Calperum Station tell a distinct narrative of bark use in the SA Riverland that varies from the ethnohistoric narrative of the area.

Scar size was used as the proxy for inferred function and, therefore, the greater the variety of typologies at a site, the more diverse the land use that occurred at that location. WB had the greatest typological diversity in the recorded scars followed by HC and AC. WB is associated with both dense historical materials, as well as areas of little recorded historical influence. Similar to WB, what seems to be components of an old brush yard fence were noted at HC (Figure 53), again indicating more dense European activity. In this way, the theory regarding typological diversity and more intense land use is supported, as different types of activity were undertaken in this location for both Aboriginal and European needs. Both HC and WB exhibited great scar diversity attributed to European activity in their locations, but AC was and is still not subjected to intense European land use. The diversity at AC, therefore, can be explained only by variety in Aboriginal land use from the procurement of foodstuffs evidenced by the presence of *mybkoo*, dishes and 'stripping scars' for grubs, water access for foodways with canoes, camping activities evidenced by possible shelter material scars and shields for cultural protocols and traditions. SH exhibited only canoe scars on red gum trees. Because the four trees recorded were mostly living and mature, the dominance of canoes may reflect regrowth and scar closure overtime. Where both tree species coincide, greater diversity is evident, and this is increased if European activity is present in that landscape.

Figure 53: Components of a likely old brush yard fence at Hunchee Crossing.

On the Murrumbidgee River, Klaver (1998:243) indicates a spatial relationship between earth mounds and CMTs, consistent with Rhoad's (1992) conclusions regarding CMT distribution. Earth mounds indicate occupation and are generally associated with basecamp activity (Brockwell 2006:47). For this study, data collected during the fieldwork for this thesis, as well as mounds recorded by Jones' (2016) and by Flinders University between 2015 to present, provided comparative data for spatial analysis. The HC survey area overlapped with the collated data for analysis at HC where six mounds were recorded by Jones and four in the Flinders University dataset. Also, present was one 'outlier' scar, which was identified close to six recorded mounds at what Jones (2016) terms the Reny Island Billabong. Scar diversity at HC and its association with earth mounds further attests to basecamp occupation in that area.

As noted in Table 11, most trees were recorded in the woodland areas bordering water sources rather than further afield where appropriate bark was still available. While, Rhoads (1992:215) concluded that CMT locations do not correlate spatially with water availability, the tree species targeted for this thesis occupy the floodplain and so a spatial correlation was inevitable. Intermittent water sources and backwaters provide suitable environments for the growth of red gum and black box woodlands and the lesser total recorded trees at these types of water sources may indicate seasonal land use when water and resources were intermittently available.

Spatial analysis of scar types also provides a means for determining aspects of the selection process of trees for bark removal. The distribution of canoe trees is problematic in a number of ways. Their survival in the landscape is largely the result of anthropogenic processes and environmentally driven taphonomic processes (Bonhomme 1990:668), which are exaggerated by tree death, a common occurrence when a large sheet of bark is removed. Their distribution is also very much a product of the availability of adequate unblemished bark, and so their distribution cannot be immediately associated with a particular landscape. Fifty-eight percent (n=11) of canoe trees were recorded at Hunchee Island in just three survey areas (HC, SH, AC). Canoe trees also made up 44% (n=11) of all scar typologies recorded on Hunchee Island as opposed to just 15% (n=8) of 54 recorded scars on Reny Island, indicating that Reny Island has been more intensely logged. Canoes are a valuable and versatile tool in past lifeways and therefore travelling away from campsites to find appropriate trees for canoe manufacture is evident. Smaller bark objects, such as shields and dishes, have a more localised distribution around areas of higher pre- and post-contact activity, including campsites. This reflects a more opportunistic selection of trees for these smaller and more ephemeral items than the bark canoes. This trend seems to represent a continuity in bark procurement tradition, in that despite European colonisation, the spatial data where European activity was more intense does not reflect a change in tree selection for bark procurement.

Ethnohistoric literature suggests that European colonists prevented the procurement of red gum bark for canoes from the mid-1800s onwards (*Adelaide Observer* 1860:5; Foster 2000:18; Gara 2013:5; Renard 2003:pl.5,6). However, the three survey areas associated with historical European activity in Figure 43 have canoe scars recorded (SW001, WB015 and WRRI004). There is the possibility that these were cut prior to contact with Europeans and the attributes of SW001 certainly indicate this kind of longevity (Figure 54), however, it is more likely that these 'historical' places had value to both Aboriginal and European people during the early contact period, particularly as places with access to water sources. The landscape at these places is riddled with cultural markers of both Aboriginal and European peoples. This entanglement of cultures makes it difficult to assess the Aboriginal land use but does tell a more nuanced narrative of the past than that which is portrayed in the ethnohistoric record.

Figure 54: Canoe scar from the South Woolpoolool survey area that exhibits a large epicormic stem and very old heartwood (Photo Credit: Frank Boulden).

7.6. Chapter Summary

It has been cited in the literature that European settlement did not immediately impact the traditional lifestyle of Aboriginal people on the Murray River (Bonhomme 1990:25; Penny 1979*)*. This is certainly true for the area that became the predecessor of Calperum Station in 1851. Despite serious taphonomic disturbances, it is clear that bark continued to be used into the nineteenth century albeit with changed bark procurement strategies. Smaller and smaller trees were used to harvest bark as mature trees disappeared from the landscape, the less sturdy bark from black box trees began to be harvested more as the availability of mature red gum trees decreased and the shingle typology was introduced into the landscape as European pastoralists adopted Aboriginal methods of obtaining bark for backing in their houses. Bark used to manufacture large canoes remained restricted to red gum trees and those areas where the most largest variety of scar typologies occur indicate probable Holocene campsite activities as well as locations where European and Aboriginal interaction occurred. The archaeology of Calperum Station tells a distinctive local narrative of cultural adaptation that differs from the broad account of culture loss and dependence, which is perpetuated in ethnohistoric literature.

8. Conclusions

This thesis addressed the following research question:

What can CMTs reveal about processes of cultural change in Aboriginal bark use and procurement in the South Australian Riverland region from pre- to post-contact?

This was achieved through the assessment of the ethnohistoric record for the Murray Riverland and adjacent regions, as well as conducting an archaeology of CMTs at Calperum Station, to ascertain the cultural trajectory of bark use. The conclusions drawn from the archaeological data highlight Aboriginal cultural adaptation and continuity of bark procurement practices, but with changed procurement strategies associated with changed needs in the post-contact landscape.

The cultural adaptation explored in this study is a direct result of the entanglement of Aboriginal Australian and European cultures through the processes of contact and settlement in the SA Riverland. The imprint of past bark procurement and use in the form of CMTs in the landscape provides a unique means of exploring this adaptation on a local scale and will result in a distinct and site specific record of contact experiences that can provide depth to Australian understandings and frameworks of contact experiences.

This study has uncovered six key findings through an analysis of both the ethnohistoric record and an archaeological survey of CMTs. Firstly, an assessment of the ethnohistoric record synthesised past observations of bark use and tree-scarring practices, as well as the impact of Europeans on these practices, which ultimately helped to shape a local narrative. The examination of the ethnohistoric record presented in this study provided a means to assess cultural practices in the past that lead to the creation of CMTs. These included the production of canoes, shields, dishes and shelter material, and the collection of honey, possums and grubs (see. Angus 1846, 1847; Basedow 1914; Eyre 1845; Hawker 1975; Massola 1971; Oakden 1838; Taplin 1979, 1989; Tindale 1963, 1974, 1978). European records of their colonial endeavours within the ethnohistoric literature also allowed an evaluation of the noticeable European impact on Aboriginal bark use. These impacts included taphonomic disturbances such as wood cutting and changes to the river hydrology, the introduction of the shingle typology, the supply of government boats and the introduction of steel axes to Aboriginal toolkits.

Secondly, the adaptation to European settlement was well recorded in the archaeological data of CMTs at Calperum Station. Steel axe marks, for example, unequivocally date cultural scars to the post-contact period and have been determined to have an Aboriginal origin because their morphology reflects traditional typological shapes in Australian archaeology. Steel marks were recorded on the heartwood of 24.5% of red gum scars and 44% of black box scars, numbers that attest to the ready adoption of steel tools into Aboriginal toolkits and use in cutting traditional bark implements from trees (Sharp 1952:18; Sturt 1849a:127, 1849b:61). The higher number of axe marks associated with black box trees indicates the increased use of bark from this species in the post-contact period. Similarly, the preference for red gum bark, prior to contact and in the early contact period, is visible in the archaeological record by the larger range of regrowth exhibited on the species. There is no doubt that bark material culture played a significant role in the daily lives of Aboriginal people in the pre-contact period, and scars removed from coppiced stems attests to its significance long after contact.

Thirdly, European industries impacted the tree species Aboriginal people targeted for bark procurement. Red gum trees are overwhelmingly represented in the literature as the tree species selected for bark procurement in the early years of contact. The high percentage of steel axe marks in black box trees reflects a change in tree species selectivity towards black box trees. This is likely a local adaptation to the Aboriginal restrictions on access to red gums on the floodplain by European settlers, and the impact of the riverboat and woodcutting industries on the numbers of red gums available. Aboriginal selection of tree species to procure bark was explored through the spatial distribution of scar types in the landscape. Cultural continuity could be evidenced in the selection of tree species, as even in areas of more dense European settlement, red gums were targeted for canoe bark and the more ephemeral implements made of bark were haphazardly cut around areas of activity.

Fourthly, cultural activities undertaken by Aboriginal people that relate to bark use was also impacted by colonisation. Bark use declined with the introduction of distribution depots throughout the landscape and the provision of a small number of canoes for each

Aboriginal group, but the culture of bark use from the past did not cease. Continuity in many aspects of cultural foodways associated with bark use persisted into the nineteenth century when boats ceased to be supplied to Aboriginal people for their own aquatic hunting and transport needs. While the production of bark canoes would have lessened significantly with government provided boats, the traditional cultural activity associated with the bark canoe remained constant.

Fifthly, the spatial distribution of CMTs in the landscape and typological diversity of scars at different locations highlights further cultural entanglement in the archaeological landscape. Shingle scar types were introduced into the Australian landscape by Europeans, and they were found only in areas of dense European activity. The areas where shingles are found also represent locations in the landscape where the greatest scar diversity exists, including post-contact Aboriginal scars, and indicating that Aboriginal people and Europeans may have coincided at these locations. These locations may provide sites where toleration of cultural differences was practiced and perhaps cultural transfer (both ways) may be evidenced or they can represent a palimpsest of activity that overlaps spatially but not temporally. While it is difficult to assess if this temporal overlap of cultures occurred, the presence of both post-contact Aboriginal and European material evidence in the landscape highlights that entanglement to some degree was a significant aspect of post-contact life on Calperum Station.

Finally, changes in bark use are locally specific. What is recorded in the ethnohistoric record is a product of the culture and traditions of the European dominated records of the past, and archaeology is in the perfect position to enrich these accounts. It is abundantly evident that past and modern European activities such as logging for riverboats, timber and fuel, and the degrading floodplain health, have significantly reduced the survival rates of this cultural resource. Despite the taphonomy, archaeological evidence suggests that the past culture of Aboriginal bark use changed with European contact as Aboriginal people adapted to the new social and economic environment that they found themselves in.

8.1. Future Directions

Due to the current environmental threats to CMTs along the Murray-Darling River (and elsewhere in Australia through increased infrastructure, mining and global climate change), CMTs, as living archives of past Aboriginal land use and ingenuity, are threatened. It is vital that this cultural resource be recorded and meaningfully studied across the continent before this inevitable loss occurs. CMT attributes alone can provide information into bark procurement strategies and local adaptation to the changing landscape brought on by the European invasion. They have the unique potential to tell a local narrative of post-contact experience that is invaluable to understanding the nuanced experiences of Aboriginal people in this country.

The spatial distribution of scars can provide significant insights into land use, activity patterns, and seasonality in a landscape. With increasing landscape data on sites and isolated artefacts at Calperum Station, as well as insights into the taphonomic processes that have affected them, a more complete picture of distribution associations of CMTs and other sites can be built. Increased understanding of scar distribution on a landscape as degraded as Calperum Station will add to a small corpus of spatial data already present in Australia (Bonhomme 1990; Klaver 1998; Kamminga and Grist 2000:98; Rhoads 1992; Webber and Burns 2004) and will contribute to a national appreciation of CMTs as meaningful indicators of past Aboriginal lifeways.

Scientific, as opposed to relative dating methods would provide a more objective means of assessing some of the conclusions of this study. While dendrochronology is not always reliable in Eucalyptus species, it would provide a new way of assessing tree age and bark availability in the early contact period. Dendrochronology would also allow a more informed age-circumference method for assessing tree stands in the local environment and provide a fundamental method of ascertaining the impact of taphonomy on the local tree populations. Another means of further assessing the conclusions of this study (or even providing new conclusions) is the use of more sophisticated metric analysis of CMTs through their 3D models. Volume and area for example would allow a more informed interpretation of scar typologies and could even provide a means of distinguishing bark objects whose length and width dimensions are similar (such as shields and dishes).

Further research into local narratives of the Riverland, and across the continent, will help to tease out local experiences of the process of contact and allow more nuanced comparative frameworks of experiences to be developed. While it is clear the ethnohistoric record for the region tells a general narrative of bark use, changes along cultural trajectories of bark use cannot be explored without archaeology as they begin long before contact with Europeans. Archaeology has provided a more equitable means of evaluating Aboriginal cultural history and allows a more nuanced narrative of past land use and decision-making. While historical narratives are excellent at portraying those stable trends that underlie daily life and social interactions across Australia, archaeology is needed to show variation, diversity and agency. Any research committed to telling a local narrative will contribute to an enhanced understanding of the past.

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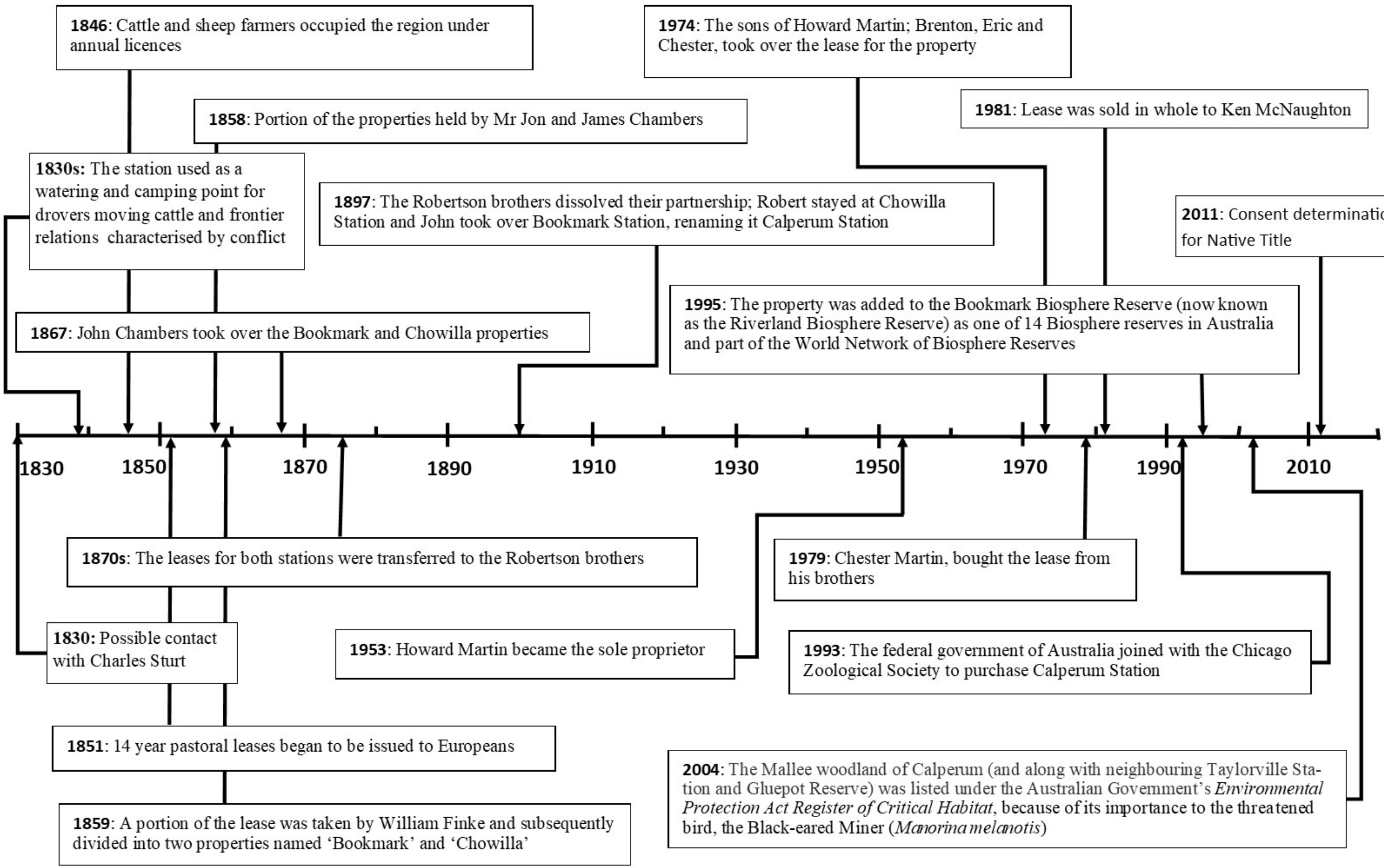
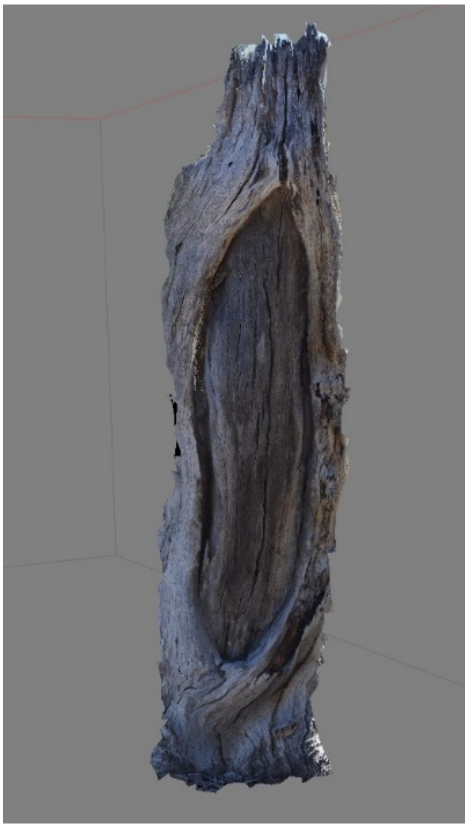
Appendices

Appendix One: Pastoral Lease History of Calperum Station.



Appendix Two: Two 3D Reconstructions of Scars Recorded at Calperum Station



A shield/dish scar recorded on a logged black box tree at Hunchee Crossing (HC012).

A shield/dish scar recorded on a mature, dead red gum tree at Hunchee Crossing (HC001).

Appendix Three: Scar Tree Recording Form (after Burke et al. 2017)

Scarred Tree Recording Form

Site Location: Calperum Station, SA

Recorder/s: [ ]

Date: / / **TIN:** [ ]

Location Details – GPS

Datum: MGA 94 **Easting:**

EPE: _____ **Northing:**

Number of Scars: [ ]

Origin of Scar(s):

- ☐ Definitely Indigenous
- ☐ Possibly Indigenous
- ☐ Probably Indigenous
- ☐ European
- ☐ Other (Please Specify): --

Tree Health:

- ☐ Living
- ☐ Stressed
- ☐ Dead

Tree Species:

- ☐ Red Gum
- ☐ Grey Box
- ☐ Other (Please Specify): --

Status:

- ☐ Standing
- ☐ Fallen
- ☐ In Danger of Falling
- ☐ Relocated

Dimensions: Circumference 1m above ground: [ ]

- ☐ Mature
- ☐ Young

Context

- ☐ Isolated Tree
- ☐ With other/potentially scarred trees
- ☐ Hillcrest/Ridge
- ☐ Creekline/Bank
- ☐ Billabong/Lagoon
- ☐ River Terrace
- ☐ Swamp
- ☐ Lake Edge
- ☐ Flat/Plain
- ☐ Dune
- ☐ Other: --

Land Use:

- ☐ Forested
- ☐ Felling Nearby
- ☐ Cleared
- ☐ Grazed
- ☐ Other: --

Other Comments/Observations:

Related Archaeology in the area:

DESCRIPTION OF SCAR(S): **Epicormic Stem:** ☐ **SIN:** ☐

Scar No: ☐

Location: ☐ Trunk ☐ Branch

Max. Length: ☐ cm

Max. Width: ☐ cm

Depth (Bark Thickness): ☐ cm

Circumference of Tree at middle of scar: ☐ cm

Height of base of scar above ground: ☐ cm

Degree of Scarring: ☐ Bark only removed ☐ Heartwood removed

Shape/Texture: ☐ Oval (round ends) ☐ Square ends ☐ Smooth Heartwood ☐ Lenticular (tapered ends) ☐ Indeterminate ☐ Rough Heartwood

Type of Scar: ☐ Canoe ☐ Shield/Dish ☐ Toe Holds ☐ Carved ☐ Other:________________

Axe Marks: ☐ Yes → Number: ☐ ☐ No

Derivation of Marks: ☐ Steel Axe ☐ Stone Axe ☐ Length:____________

Type of Marks: ☐ Parallel Lines ☐ Random Lines ☐ Criss-Cross Lines ☐ Surveyors Mark ☐ Other:________________

Regrowth: ☐ None ☐ Middle of Scar ☐ Top of Scar ☐ Bottom of Scar ☐ All Sides

Width of Regrowth: ☐ cm

Condition:
☐ Good (>80% intact)
☐ Fair (20-80% intact)
☐ Poor (<20% intact)

Orientation: ☐
Compass Reading: ☐ o

Photographs:
DSLR Photo Numbers/Range: ☐

Epicormic Stem: ☐ **SIN:** ☐

Scar No: ☐

Location: ☐ Trunk ☐ Branch

Max. Length: ☐ cm

Max. Width: ☐ cm

Depth (Bark Thickness): ☐ cm

Circumference of Tree at middle of scar: ☐ cm

Height of base of scar above ground: ☐ cm

Degree of Scarring: ☐ Bark only removed ☐ Heartwood removed

Shape/Texture: ☐ Oval (round ends) ☐ Square ends ☐ Smooth Heartwood ☐ Lenticular (tapered ends) ☐ Indeterminate ☐ Rough Heartwood

Type of Scar: ☐ Canoe ☐ Shield/Dish ☐ Toe Holds ☐ Carved ☐ Length:________________

Axe Marks: ☐ Yes → Number: ☐ ☐ No

Derivation of Marks: ☐ Steel Axe ☐ Stone Axe ☐ Length:____________

Type of Marks: ☐ Parallel Lines ☐ Random Lines ☐ Criss-Cross Lines ☐ Surveyors Mark ☐ Other:________________

Regrowth: ☐ None ☐ Middle of Scar ☐ Top of Scar ☐ Bottom of Scar ☐ All Sides

Width of Regrowth: ☐ cm

Condition:
☐ Good (>80% intact)
☐ Fair (20-80% intact)
☐ Poor (<20% intact)

Orientation: ☐
Compass Reading: ☐ o

Photographs:
DSLR Photo Numbers/Range: ☐

Epicormic Stem: ☐ **SIN:** ☐

Scar No: ☐

Location: ☐ Trunk ☐ Branch

Max. Length: ☐ cm

Max. Width: ☐ cm

Depth (Bark Thickness): ☐ cm

Circumference of Tree at middle of scar: ☐ cm

Height of base of scar above ground: ☐ cm

Degree of Scarring: ☐ Bark only removed ☐ Heartwood removed

Shape/Texture: ☐ Oval (round ends) ☐ Square ends ☐ Smooth Heartwood ☐ Lenticular (tapered ends) ☐ Indeterminate ☐ Rough Heartwood

Type of Scar: ☐ Canoe ☐ Shield/Dish ☐ Toe Holds ☐ Carved ☐ Other:________________

Axe Marks: ☐ Yes → Number: ☐ ☐ No

Derivation of Marks: ☐ Steel Axe ☐ Stone Axe ☐ Length:____________

Type of Marks: ☐ Parallel Lines ☐ Random Lines ☐ Criss-Cross Lines ☐ Surveyors Mark ☐ Other:________________

Regrowth: ☐ None ☐ Middle of Scar ☐ Top of Scar ☐ Bottom of Scar ☐ All Sides

Width of Regrowth: ☐ cm

Condition:
☐ Good (>80% intact)
☐ Fair (20-80% intact)
☐ Poor (<20% intact)

Orientation: ☐
Compass Reading: ☐ o

Photographs:
DSLR Photo Numbers/Range: ☐

Appendix Four: Felled Trees/Stumps with Axe Marks Recording Form

Recording Form – Felled Trees/Stumps with Axe marks ect.

Site Location: Calperum Station, SA

Recorder/s:

Date: **TIN:**

Coordinates

Datum: MGA 94 **Eastings:**

EPE: **RTK:** ☐ **Northings:**

Tree Context

- ☐ Isolated Tree
- ☐ With other/potentially scarred trees
- ☐ With other felled trees
- ☐ With other culturally marked stumps

- ☐ Hillcrest/Ridge
- ☐ Upper Slope
- ☐ Mid Slope
- ☐ Lower Slope
- ☐ Flat/Plain
- ☐ Other:

- ☐ Creekline/Bank
- ☐ River Terrace
- ☐ Swamp
- ☐ Lake Edge
- ☐ Dune

Land Use:

- ☐ Forested
- ☐ Road Verge
- ☐ Cleared
- ☐ Grazed
- ☐ Other:

Dimensions

Circumference: **Width:**

Height: **Other:**

Tree Species:

- ☐ Red Gum
- ☐ Grey Box
- ☐ Other (Please Specify):

Axe Marks

Number:

Type: Stone Axe Steel Axe Indistinguishable

Orientation:

Type of Marks:

- ☐ Parallel Lines
- ☐ Random Lines
- ☐ Criss-Cross Lines
- ☐ Surveyors Mark
- ☐ Other:

Other Comments/Observation:

DSLR Photo Numbers/Range:

Appendix Five: 'Other Archaeological Sites' Recording Form

<u>**'Other Sites' Recording Form**</u>

Site: Calperum Station **ID No.** ______

Day:

Date:

Coordinates

Datum: MGA 94

EPE:

RTK: Yes No

Eastings:

Northings:

Site Type (Earth Mound, lithic Scatter etc.)**:**

Site Description:

Photography

DSLR Photo Range:

Appendix Six: GPS and Photography Proformas

GPS Proforma (8/4/18 – 12/4/18)

Project: Scarred Tree Recording

Site: Calperum Station, SA

Datum: GDA94

*Estimated Position Error (meters)

Pt.	Easting (E)	Northing (N)	EPE*	TIN + No. of Scars	Initials	Day
1						
2						
3						
4						
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10						
11						
12						
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42						
43						

Photography Proforma

Project: CMTs at Calperum Station **Page No.** _____ **of** __

Camera ID	Description/Context/Subject/Direction	Initials	Date/Day

Appendix Seven: Attribute Data. Table 1

Survey Area	Artefact No.	Cultural Scar	No. of Scars	Tree Species	Tree Health	Tree Status	Circumference (cm)	Typology	Scar Location
Woolenook Bend	A	No	0	E. camaldulensis	Dead	Fallen	226	axe marks	trunk
Woolenook Bend	001	Yes	1	E. camaldulensis	Dead	Fallen	188	shield/dish	trunk
Woolenook Bend	002	Yes	1	E. camaldulensis	Dead	Standing	400	shield/dish	trunk
Woolenook Bend	003	Yes	1	E. camaldulensis	Dead	Standing	380	wedge cut/s	trunk
Woolenook Bend	B	No	0	E. camaldulensis	Dead	Standing	252	wedge cut/s	trunk
Woolenook Bend	004	Yes	1	E. largiflorens	Living	Standing	185	shield/dish	trunk
Woolenook Bend	005	Yes	2	E. largiflorens	Living	Standing	179	shield/dish	trunk
Woolenook Bend	005	Yes	2	E. largiflorens	Living	Standing	179	shield/dish	trunk
Woolenook Bend	C	No	1	E. largiflorens	Dead	Standing	138	wedge cut/s	trunk
Woolenook Bend	D	No	0	E. camaldulensis	Dead	Standing	203	modern toe hole	trunk
Woolenook Bend	E	No	0	E. camaldulensis	Dead	Standing	202	wedge cut/s	trunk
Woolenook Bend	006	Yes	1	E. camaldulensis	Dead	Standing	475	canoe	trunk
Woolenook Bend	F	No	0	E. camaldulensis	Dead	Standing	202	axe marks	trunk
Woolenook Bend	007	Yes	1	E. largiflorens	Stressed	Standing	215	shield/dish	branch
Ral Ral Wide Water	A	No	2	E. largiflorens	Dead	Standing	367	removed beam	branch
Ral Ral Wide Water	001	Yes	2	E. largiflorens	Dead	Standing	367	shield/dish	coppice branch
Ral Ral Wide Water	001	Yes	2	E. largiflorens	Dead	Standing	367	shield/dish	trunk
Ral Ral Wide Water	B	No	0	E. largiflorens	Dead	Fallen	Indeterminate	wedge cut/s	coppice branch
Ral Ral Wide Water	002	Yes	1	E. largiflorens	Dead	Fallen	140	shield/dish	bilobate trunk
Ral Ral Wide Water	C	No	1	E. largiflorens	Dead	Standing	Indeterminate	removed beam	trunk
Ral Ral Wide Water	D	No	0	E. largiflorens	Dead	Standing	152	wedge cut/s	trunk
Ral Ral Wide Water	003	Yes	1	E. largiflorens	Dead	Standing	219	shield/dish	branch
Ral Ral Wide Water	E	No	0	E. largiflorens	Dead	Standing	Indeterminate	wedge cut/s	bilobate trunk
Ral Ral Wide Water	004	Yes	2	E. largiflorens	Dead	Standing	214	shield/dish	trunk
Ral Ral Wide Water	004	Yes	2	E. largiflorens	Dead	Standing	214	shield/dish	trunk
Ral Ral Wide Water	005	Yes	1	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	bilobate trunk
Ral Ral Wide Water	006	Yes	2	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	bilobate trunk
Ral Ral Wide Water	006	Yes	2	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	bilobate trunk
Ral Ral Wide Water	F	No	0	E. largiflorens	Dead	Standing	Indeterminate	wedge cut/s	trunk
Ral Ral Wide Water	007	Yes	1	E. largiflorens	Dead	Standing	266	shield/dish	trunk
Ral Ral Wide Water	008	Yes	1	E. largiflorens	Dead	Stump	182	shield/dish	trunk
Ral Ral Wide Water	009	Yes	2	E. largiflorens	Dead	Standing	243	shield/dish	trunk
Ral Ral Wide Water	009	Yes	2	E. largiflorens	Dead	Standing	243	shield/dish	trunk
Ral Ral Wide Water	010	Yes	1	E. largiflorens	Dead	Standing	187	shield/dish	trunk
Ral Ral Wide Water	G	No	0	E. largiflorens	Dead	Fallen	Indeterminate	removed beam	trunk
Ral Ral Wide Water	011	Yes	1	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	bilobate trunk
Ral Ral Wide Water	012	Yes	1	E. largiflorens	Dead	Standing	507	shield/dish	trunk
Woolenook Bend	008	Yes	1	E. largiflorens	Living	Standing	330	canoe	trunk
Woolenook Bend	G	No	0	E. camaldulensis	Dead	Fallen	Indeterminate	wedge cut/s	trunk
Outlier	002	Yes	1	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	bilobate trunk

Table 1 continued

Scar Shape	Orientation	Max. Length (cm)	Max. Width (cm)	Max. Depth (cm)	Scar Height (cm)	Regrowth (cm)	Scar Condition	No. of Axe Marks	Mark Type
N/A	N/A	1. 9; 2. 9; 3. 6	N/A	N/A	N/A	N/A	N/A	3	steel
oval	NE	46	22	16	321	11	Poor (<20% intact)	N/A	N/A
oval	S	61	37	8	146	11	Poor (<20% intact)	N/A	N/A
N/A	S	113	41	7	15	27	Fair (20-80% intact)	5	steel
N/A	N/A	1. 7; 2.6	N/A	N/A	N/A	N/A	N/A	4	steel
oval	W	41	12	13	75	N/A	Good (>80% intact)	6	steel
oval	W	46	12	approx. 15	49	18	Poor (<20% intact)	N/A	N/A
lenticular	NE	116	31	13	AGL	N/A	Poor (<20% intact)	1	Stone
N/A	N/A	18	N/A	Wedge 5.5	N/A	N/A	N/A	3 + wedge cut/s	steel
toe hole	N/A	14	N/A	3	222	N/A	N/A	N/A	steel
toe hole	N/A	1. 16; 2. 20	N/A	1. 4; 2. 5	1. 205; 2. 260	N/A	N/A	N/A	steel
lenticular	SE	> 300	approx. 17.5	22	175	45	Fair (20-80% intact)	N/a	N/A
N/A	N/A	15	N/A	N/A	1. 133; 2. 141	N/A	N/A	6	steel
oval	NE	45	25	N/A	330	N/A	Good (>80% intact)	N/A	N/A
N/A	N/A	182	27	N/A	N/A	N/A	N/A	N/A	steel
oval	E	31	12.5	3.5	64	10	Fair (20-80% intact)	6	steel
lenticular	S	79	21	4	26	15	Fair (20-80% intact)	13	steel
N/A	N/A	1. 49; 2. 16	1. 22; 2. 9	1. 11.5; 2. 6.5	N/A	N/A	N/A	2x wedge cut/s	steel
oval	N/A	> 74*	24*	7.5*	N/A	8	Poor (<20% intact)	N/A	N/A
N/A	N/A	1. 18; 2. 230	1. 19; 2. 29	N/A	N/A	N/A	N/A	N/A	steel
toe hole	N/A	1. 10.5; 2. 9	1. 11; 2. 9	1. 9	N/A	N/A	N/A	N/A	steel
oval	W	53	20	3.5	272	8	Good (>80% intact)	N/A	N/A
N/A	N/A	1. 17; 2. 9	1. 13; 2. 9	1. 6.5	N/A	N/A	N/A	N/A	steel
oval	NE	64	15.5	5	143	14	Poor (<20% intact)	N/A	N/A
oval	S	88	16	5.5	8	12	Fair (20-80% intact)	N/A	N/A
oval	S	86	22	12.5	87	N/A	Fair (20-80% intact)	N/A	N/A
oval	S	76	18	9	60	N/A	Poor (<20% intact)	N/A	N/A
oval	S	60	21	8	105	N/A	Poor (<20% intact)	N/A	N/A
N/A	N/A	5	7	5.5	N/A	N/A	N/A	N/A	steel
oval	W	44.5	13	2.5	44	9	Good (>80% intact)	N/A	N/A
oval	S	35	25	2.5	10	9	Fair (20-80% intact)	N/A	N/A
oval	S	86	13	N/A	31	N/A	Poor (<20% intact)	N/A	N/A
oval	S	93	10	N/A	210	N/A	Poor (<20% intact)	N/A	N/A
oval	S	47	16	10	86	N/A	Good (>80% intact)	N/A	N/A
N/A	N/A	91	35	N/A	N/A	N/A	N/A	N/A	steel
oval	S	66	13	8	93	N/A	Poor (<20% intact)	N/A	N/A
oval	S	85	22	15	55	50	Poor (<20% intact)	N/A	N/A
lenticular	N	> 400	approx. 40	N/A	150	N/A	Poor (<20% intact)	N/A	N/A
N/A	N/A	15 - 37	9 - 20	6 - 16	122 - 638	N/A	N/A	N/A	steel
oval	N	69	20.5	9	49	N/A	Fair (20-80% intact)	N/A	N/A

Table 2

Survey Area	Artefact No.	Cultural Scar	No. of Scars	Tree Species	Tree Health	Tree Status	Circumference (cm)	Typology	Scar Location
Hunchee Crossing	001	Yes	1	E. camaldulensis	Dead	Standing	324	shield/dish	trunk
Hunchee Crossing	002	Yes	1	E. camaldulensis	Living	Standing	350	canoe	trunk
Hunchee Crossing	003	Yes	1	E. camaldulensis	Dead	Standing	302	wedge cut/s	trunk
Hunchee Crossing	004A	Yes	2	E. camaldulensis	Living	Standing	262	shield/dish	trunk
Hunchee Crossing	004B	Yes	0	E. camaldulensis	Dead	Fallen	> 600	wedge cut/s	trunk
Hunchee Crossing	005	Yes	1	E. camaldulensis	Dead	Standing	121	toe hold	trunk
Hunchee Crossing	006	Yes	1	E. camaldulensis	Living	Standing	600	canoe	trunk
Hunchee Crossing	007	Yes	1	E. largiflorens	Living	Standing	131	wedge cut/s	trunk
Hunchee Crossing	008	Yes	1	E. largiflorens	Living	Standing	164	resource procurment	trunk
Hunchee Crossing	009	Yes	1	E. largiflorens	Living	Standing	147	resource procurment	bilobate trunk
Outlier	003	Yes	1	E. largiflorens	Dead	Standing	181	shield/dish	trunk
Ral Ral Creek Junction	001	Yes	2	E. largiflorens	Dead	Standing	210	resource procurment	coppice branch
Ral Ral Creek Junction	001	Yes	2	E. largiflorens	Dead	Standing	210	resource procurment	bilobate trunk
Ral Ral Creek Junction	002	Yes	1	E. largiflorens	Dead	Standing	140	resource procurment	trunk
Ral Ral Creek Junction	003	Yes	3	E. largiflorens	Dead	Stump	122	shield/dish	trunk
Ral Ral Creek Junction	003	Yes	3	E. largiflorens	Dead	Stump	122	shield/dish	trunk
Ral Ral Creek Junction	003	Yes	3	E. largiflorens	Dead	Stump	122	shield/dish	trunk
Ral Ral Creek Junction	004	Yes	1	E. largiflorens	Living	Standing	Indeterminate	shield/dish	coppice branch
Ral Ral Creek Junction	005	Yes	1	E. largiflorens	Dead	Standing	148	shield/dish	branch
Ral Ral Creek Junction	006	Yes	1	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	bilobate trunk
Outlier	001	Yes	1	E. largiflorens	Living	Standing	Indeterminate	shield/dish	bilobate trunk
North Ral Ral Island	001	Yes	1	E. largiflorens	Living	Standing	Indeterminate	shield/dish	bilobate trunk
North Ral Ral Island	002	Yes	1	E. camaldulensis	Dead	Standing	515	canoe	trunk
South Woolpoolool	001	Yes	1	E. camaldulensis	Dead	Standing	390	canoe	trunk
North Ral Ral Island	003	Yes	1	E. camaldulensis	Dead	Fallen	335	canoe	trunk
Amazon Creek	001	Yes	1	E. camaldulensis	Dead	Fallen	Indeterminate	shield/dish	trunk
Amazon Creek	002	Yes	1	E. camaldulensis	Dead	Fallen	Indeterminate	canoe	trunk
Amazon Creek	003	Yes	1	E. camaldulensis	Dead	Standing	395	shield/dish	trunk
Amazon Creek	004	Yes	1	E. camaldulensis	Dead	Standing	430	shield/dish	trunk
Amazon Creek	005	Yes	1	E. camaldulensis	Dead	Standing	200	mybkoo/shelter	trunk
Amazon Creek	006	Yes	1	E. camaldulensis	Dead	Standing	360	mybkoo/shelter	trunk
Amazon Creek	007	Yes	1	E. camaldulensis	Dead	Standing	305	canoe	trunk
Amazon Creek	008	Yes	1	E. camaldulensis	Living	Standing	390	canoe	trunk
Amazon Creek	A	No	0	E. camaldulensis	Living	Standing	Indeterminate	wedge cut/s	trunk
Amazon Creek	B	No	0	E. camaldulensis	Living	Standing	Indeterminate	resource procurment	trunk
Amazon Creek	009	Yes	1	E. largiflorens	Living	Standing	200	resource procurment	trunk
Amazon Creek	010	Yes	1	E. largiflorens	Living	Standing	165	shield/dish	trunk
Amazon Creek	011	Yes	1	E. camaldulensis	Living	Standing	395	canoe	trunk
Amazon Creek	012	Yes	1	E. camaldulensis	Living	Standing	500	canoe	trunk

Table 2 continued

Scar Shape	Orientation	Max. Length (cm)	Max. Width (cm)	Max. Depth (cm)	Scar Height (cm)	Regrowth (cm)	Scar Condition	No. of Axe Marks	Mark Type
oval	SE	94	26	4.5	46	9	Fair (20-80% intact)	N/A	N/A
oval	NE	approx. 315	approx. 35	deep	183	N/A	Fair (20-80% intact)	N/A	N/A
lenticular	NW	50	24	6	152	11	Good (>80% intact)	minimum 5	steel
lenticular	S	190	20	23	40	N/A	Poor (<20% intact)	N/A	N/A
N/A	N/A	1. 31; 2. 31	1. 14; 2. N/A	1. 17; 2. 12	N/A	N/A	N/A	N/A	steel
oval	S	10	4	3.5	129	4.5	Fair (20-80% intact)	6	steel
oval	E	approx.200	N/A	N/A	405	N/A	Good (>80% intact)	N/A	N/A
wedge cut	S	29	9	7	60	12	Fair (20-80% intact)	2	steel
Bark 'Peeling'	W	135	35	5	48	12	Poor (<20% intact)	minumum 15	steel
Bark 'Peeling'	All	N/A	N/A	N/A	N/A	N/A	Poor (<20% intact)	many	steel
lenticular	N	109	12.5	6	108	9	Poor (<20% intact)	N/A	N/A
Bark 'Peeling'	All	193	N/A	N/A	N/A	N/A	Fair (20-80% intact)	many	steel
lenticular	E	104	12	5	116	N/A	Fair (20-80% intact)	3	steel
Bark 'Peeling'	All	164	N/A	N/A	N/A	N/A	Poor (<20% intact)	minumum 11	steel
oval	N	23	7	7	37	N/A	Poor (<20% intact)	N/A	N/A
oval	NW	44	14	N/A	9	N/A	Poor (<20% intact)	N/A	N/A
oval	S	71	13	N/A	10	N/A	Poor (<20% intact)	N/A	N/A
oval	W	61	11	5	161	N/A	Good (>80% intact)	N/A	N/A
oval	NE	58	17	4.5	97	5.5	Fair (20-80% intact)	N/A	N/A
oval	W	90	21	4.5	244	7	Poor (<20% intact)	N/A	N/A
oval	N	66	31	4	76	N/A	Good (>80% intact)	10	steel
oval	SW	70	17	9	58	N/A	Fair (20-80% intact)	3	stone
oval	N	> 500	N/A	N/A	140	26	Fair (20-80% intact)	N/A	N/A
oval	N	> 400	70	7	55	N/A	Fair (20-80% intact)	1	stone
oval	S	503	39	N/A	approx. 190	N/A	Poor (<20% intact)	N/A	N/A
lenticular	NE	226	26	16	98	N/A	Fair (20-80% intact)	N/A	N/A
lenticular	E	350	29	N/A	410	N/A	Poor (<20% intact)	N/A	N/A
oval	NW	120	38	5	96	N/A	Good (>80% intact)	N/A	N/A
oval	E	38	12	4	38	N/A	Good (>80% intact)	2	steel
square ends	NW	72	56	N/A	47	N/A	Poor (<20% intact)	N/A	N/A
square ends	SE	112	47	4	41	N/A	Poor (<20% intact)	N/A	N/A
lenticular	SE	300	22	9	37	N/A	Fair (20-80% intact)	N/A	N/A
lenticular	SE	410	38	N/A	30	N/A	Poor (<20% intact)	N/A	N/A
wedge cut	N/A	N/A	N/A	N/A	N/A	N/A	Good (>80% intact)	N/A	steel
wedge cut	N/A	N/A	N/A	N/A	N/A	N/A	Good (>80% intact)	N/A	steel
Bark 'Peeling'	N/A	146	53	N/A	62	N/A	Good (>80% intact)	3	steel
lenticular	NE	125	22	6	10	N/A	Good (>80% intact)	N/A	N/A
lenticular	SE	310	30	25	160	Approx. 30	Poor (<20% intact)	N/A	N/A
lenticular	W	450	50	N/A	185	N/A	Poor (<20% intact)	N/A	N/A

Table 3

Survey Area	Artefact No.	Cultural Scar	No. of Scars	Tree Species	Tree Health	Tree Status	Circumference (cm)	Typology	Scar Location
Woolenook Bend	009	Yes	1	E. camaldulensis	Living	Standing	355	shield/dish	trunk
Woolenook Bend	010	Yes	1	E. largiflorens	Living	Standing	185	resource procurment	trunk
Woolenook Bend	011	Yes	1	E. camaldulensis	Dead	Standing	300	mybkoo/shelter	trunk
Woolenook Bend	012	Yes	1	E. largiflorens	Living	Standing	162	resource procurment	trunk
Woolenook Bend	013	Yes	1	E. largiflorens	Living	Standing	Indeterminate	resource procurment	coppice branch
Woolenook Bend	014	Yes	1	E. camaldulensis	Living	Standing	310	shield/dish	trunk
Woolenook Bend	015	Yes	1	E. camaldulensis	Living	Standing	400	canoe	trunk
Woolenook Bend	016	Yes	1	E. camaldulensis	Dead	Standing	330	shield/dish	trunk
Woolenook Bend	017	Yes	1	E. camaldulensis	Dead	Standing	370	mybkoo/shelter	trunk
Woolenook Bend	018	Yes	1	E. camaldulensis	Dead	Standing	180	shield/dish	trunk
Woolenook Bend	019	Yes	2	E. largiflorens	Living	Standing	Indeterminate	shingle/s	bilobate trunk
Woolenook Bend	019	Yes	2	E. largiflorens	Living	Standing	Indeterminate	shield/dish	bilobate trunk
Lake Meretti	001	Yes	1	E. largiflorens	Dead	Standing	305	resource procurment	trunk
Lake Meretti	002	Yes	1	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	branch
Lake Meretti	003	Yes	1	E. largiflorens	Living	Standing	201	shield/dish	trunk
Lake Meretti	004	Yes	1	E. largiflorens	Living	Standing	266	shield/dish	trunk
Outlier	004	Yes	1	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	coppice branch
West Ral Ral Island	001	Yes	1	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	coppice branch
West Ral Ral Island	002	Yes	1	E. largiflorens	Dead	Standing	Indeterminate	shield/dish	bilobate trunk
West Ral Ral Island	003	Yes	1	E. largiflorens	Dead	Standing	185	shield/dish	trunk
South Hunchee	001	Yes	1	E. camaldulensis	Living	Standing	615	canoe	trunk
South Hunchee	002	Yes	1	E. camaldulensis	Dead	Fallen	410	canoe	trunk
South Hunchee	003	Yes	1	E. camaldulensis	Dead	Standing	Indeterminate	canoe	trunk
South Hunchee	004	Yes	1	E. camaldulensis	Dead	Standing	495	canoe	trunk
West Ral Ral Island	004	Yes	1	E. largiflorens	Dead	Standing	187	canoe	bilobate trunk
West Ral Ral Island	005	Yes	1	E. camaldulensis	Dead	Fallen	173	shield/dish	trunk
West Ral Ral Island	006	Yes	1	E. camaldulensis	Dead	Standing	214	shield/dish	trunk
West Ral Ral Island	007	Yes	1	E. largiflorens	Living	Standing	301	shield/dish	trunk
West Ral Ral Island	008	Yes	1	E. camaldulensis	Dead	Standing	460	canoe	trunk
Hunchee Crossing	010	Yes	1	E. camaldulensis	Stressed	Standing	475	shield/dish	bilobate trunk
Hunchee Crossing	011	Yes	1	E. largiflorens	Living	Standing	183	shingle/s	trunk
Hunchee Crossing	012	Yes	1	E. largiflorens	Dead	Stump	90	shield/dish	trunk
Hunchee Crossing	013	Yes	1	E. largiflorens	Dead	Stump	Indeterminate	resource procurment	bilobate trunk
Hunchee Crossing	014	Yes	1	E. camaldulensis	Dead	Fallen	260	shield/dish	trunk
Hunchee Crossing	015A	Yes	2	E. largiflorens	Stressed	Standing	Indeterminate	shield/dish	trunk
Hunchee Crossing	015B	Yes	2	E. largiflorens	Stressed	Standing	Indeterminate	bark death	trunk
Hunchee Crossing	016	Yes	1	E. camaldulensis	Dead	Standing	Indeterminate	shield/dish	trunk
South Woolpoolool	002	Yes	1	E. camaldulensis	Dead	Standing	295	shield/dish	trunk

Table 3 continued

Scar Shape	Orientation	Max. Length (cm)	Max. Width (cm)	Max. Depth (cm)	Scar Height (cm)	Regrowth (cm)	Scar Condition	No. of Axe Marks	Mark Type
lenticular	NW	120	25	N/A	30	N/A	Poor (<20% intact)	7	steel
Bark 'Peeling'	SW	75	26	N/A	89	N/A	Fair (20-80% intact)	many	steel
square ends	N	104	42	9	74	N/A	Poor (<20% intact)	2	steel
Bark 'Peeling'	S	65	21	N/A	16	N/A	Fair (20-80% intact)	many	steel
Bark 'Peeling'	E	98	>60	N/A	AGL	N/A	Fair (20-80% intact)	many	steel
oval	SE	51	19	5	76	N/A	Fair (20-80% intact)	2	steel
oval	W	>350	Approx. 50	N/A	270	N/A	Poor (<20% intact)	N/A	N/A
lenticular	NE	160	33	4.5	75	N/A	Fair (20-80% intact)	N/A	N/A
square ends	N	92	44	8	28	N/A	Fair (20-80% intact)	2	steel
lenticular	SE	93	24	5.5	90	N/A	Fair (20-80% intact)	1	steel
square ends	E	87	70	9	25	N/A	Fair (20-80% intact)	many	steel
oval	W	47	19	8	71	N/A	Fair (20-80% intact)	2	steel
oval	S	15	11	9	140	N/A	Fair (20-80% intact)	2	steel
oval	SE	48	20	5	118	16	Poor (<20% intact)	3	steel
oval	N	75	22	9	18	N/A	Poor (<20% intact)	2	steel
oval	N	109	26	6	19	N/A	Fair (20-80% intact)	3	steel
oval	E	55	13	N/A	34	11	Poor (<20% intact)	N/A	N/A
lenticular	S	86	17	7	112	N/A	Fair (20-80% intact)	N/A	N/A
oval	NW	73	22	N/A	67	N/A	Fair (20-80% intact)	2	steel
oval	NE	64	22	10	37	N/A	Good (>80% intact)	N/A	N/A
lenticular	S	157	35	25	130	N/A	Fair (20-80% intact)	N/A	N/A
lenticular	S	450	45	N/A	330	N/A	Poor (<20% intact)	N/A	N/A
oval	N	min. 350	N/A	N/A	N/A	N/A	Poor (<20% intact)	N/A	N/A
lenticular	S	258	28	11	196	N/A	Fair (20-80% intact)	N/A	N/A
oval	W	214	35	N/A	4	N/A	Fair (20-80% intact)	N/A	N/A
lenticular	N/A	110	19	N/A	152	N/A	Poor (<20% intact)	N/A	N/A
square ends	NE	38	33	2	110	7	Good (>80% intact)	8	steel
lenticular	S	145	12	N/A	30	N/A	Fair (20-80% intact)	2x wedge cut/s	steel
lenticular	W	200	40	14	220	N/A	Fair (20-80% intact)	N/A	N/A
lenticular	S	140	35	10	N/A	>6	Fair (20-80% intact)	N/A	N/A
square ends	SE	140	45	13	AGL	N/A	Fair (20-80% intact)	2	steel
oval	E	74	19	4	21	7	Poor (<20% intact)	N/A	N/A
Bark 'Peeling'	N/A	92	circumference	2	AGL	N/A	Poor (<20% intact)	many	steel
lenticular	N/A	110	19	7	170	8	Poor (<20% intact)	N/A	N/A
lenticular	S	85	14	4	90	N/A	Fair (20-80% intact)	2	steel
lenticular	NW	39	11	5.5	90	N/A	Fair (20-80% intact)	3	steel
lenticular	SW	N/A	N/A	N/A	N/A	N/A	Good (>80% intact)	N/A	N/A
oval	N	71	20	13	38	25	Fair (20-80% intact)	N/A	N/A

Appendix Eight: Table Used to Identify and Re-evaluate Scars

	Trauma/Stress	Fire/Lightning	Branch Tears	Insect	Bird	Impact
Tree Species	– Any	– Any	– Any	– Any	– Any	– Any – Common in red gums
Scar Age	– Any – Note Similar Age scars repeated on tree	– Any – Note similar age scars repeated on tree and surrounding trees	– Any	– Any	– Any	– Any
Scar Size	– Any	– Any	– Any – Often long >3m	– Any	– Small to medium <1.5m	– Any
Scar Shape	– Note similar form scars repeated on tree	– Triangular with wide base at ground level – Can get series of curvilinear scars up trunk	– Irregular though often elongated	– Irregular	– Irregular – Often Wide	– Often Elongated
Location on Tree	– Anywhere	– Most at base – Series of curvilinear scars may continue up the trunk – Downstream side where furl collected from flooding	– Begins at Branch Stub	– Anywhere – Often at ground level	– Central and upper	– Common at limb forks leaving opposing scars
Other Attributes & Context	– Branch stubs and burls on dry face – Irregular regrowth – Signs of Trauma, including dead limbs and crown loss	– Note higher frequency where high fuel loads are seen	– Branch socket at top of tear	– Borer holes and galleries	– Progressive scarring results in regrowth ridges	– Impact mark – Tree context/close to track – Is there a potential impacting trunk located adjacent to tree

Attribute	Aboriginal	Non-Aboriginal
What scars might relate to	– Bark Implements – Shelter and Other Structures – Canoes – Place Marking – Toe Holes – Resource Extraction	– Roofing Shingles – Structural timber – Fencing and other infrastructure – Logging Activities – Ring Barking
Tree Species	– Native to Area	– Select range – Plantation Species
Scar Age	– >120 years	– <160 years
Scar Size	– Various – Occasionally up to 6m	– Typically standard lengths 1.5 – 2.5m, e.g. roofing shingles
Scar Shape	– Various	– Standardised Shapes – Invariably squared though older scarring may become rounded with regrowth
Location on Tree	– Anywhere – Often on bend in trunk	– Near base of tree – Occasionally extends the whole circumference
Tool Marks	– Stone – Small Blade Tomahawkt (5-10cm)	– Bow, crosscut and circular saws – Broad Axe – Cross-diagonal marks at top
Number of Scars	– One or more	– Often only one – Look for additional scars in the surrounding area

Appendix Nine: Records of South Australia, Government Record Group 52 'Aborigines Office and Successor Agencies'—Records of Canoes Near Renmark and Mannum

GRG 52/1: *The Correspondence Files of the Aborigines Department and Successor Agencies (letters received 1866-1968)*

Records from Mannum and Renmark regarding Aboriginal Canoes

GRG 52/1/1905/41

- Lists the names of 28 Aboriginal people at Murray Bridge, Wellington and Mannum who received boats during the 10 years ending 30/6/1905.

Besley of Chowilla Station (Renmark):

- *GRG 52/1/1891/335* – requesting a boat for Aboriginal 'Chowilla Beasley': Native will contribute 4 pounds towards the cost
- *GRG 52/1/1892/57* – Teale (Renmark) Recommends boat for ' Tommy Dodd' in lieu of Aboriginal 'Besley'

Georgy Chowilla (Renmark):

- *GRG 52/1/1890/264* – Teale (Renmark) Applied for a boat for Aborigines at Renmark. Natives 'Chowilla Georgy' and 'Scrubber' will contribute 2 pounds each towards the cost of 10 pounds

Tommy Dodd (Renmark/Chowilla):

- *GRG 52/1/1888/236* – M.C Stewart (Overland Corner) Applies for stores required and acknowledges receipt of boat for 'Tommy Dodd' of Chowilla
- *GRG 52/1/1892/57* – Teale (Renmark) Recommends boat for 'Tommy Dodd' in lieu of Aboriginal 'Besley'

Tommy Bookmark (Renmark/Mannum):

- *GRG 52/1/1890/329* – requesting boat for Aboriginal 'Tommy Bookmark' at the cost of 10 pounds. Native will pay 4 pounds and the balance for Department
- *GRG 52/1/1891/330* – Report concerning the result of the trial 'Queen versus Tommy' at circuit court, Port Augusta on the 18th Instance
- *GRG 52/1/1892/57* – Teale (Renmark) Recommends boat for 'Tommy Dodd' in lieu of Aboriginal 'Besley'

George Lindsay (Mannum/Murray Bridge):

- *GRG 52/1/1888/242* – Phillips (Murray Bridge) recommends canoe for Aboriginal 'George Lindsay' who offers to pay one half of cost
- *GRG 52/1/1889/73* – Phillips (Murray Bridge) Reports receipt of 2 pounds and 10 shillings from Aboriginal 'George Lindsay' as part cost of 5 pounds for a boat for him. Encloses account also of 2 pounds and 10 shillings for the balance
- *GRG 52/1/1891/287* – Applies and encloses cheque for 4 pounds on account of boat for Aboriginal 'George Lindsay'

Paddy Richardson (Renmark):

- *GRG 52/1/1893/47* – Teale (Renmark) Applies for a boat for Aboriginal 'Paddy Richardson' of which the Native will pay 4 pounds of 10 pound cost

Merrily (Merly) Scott (Renmark):

- *GRG 52/1/1894/334* – Teale (Renmark) Applies for canoe for Aboriginal 'merrily Scott' who will pay 4 pounds towards costs

GRG 52/7 = *Letter Book of the Protector (and Chief Protector) of Aborigines (outgoing correspondences)*

Jerry Mason (Mannum) and Joe Cook (Mannum/Upper Murray)

- *GRG 52/7/1880/175* – Response from the Protector that Canoes will be provided for some Aboriginal individuals at Mannum, once a tender for a general supply of boats is called for. Jerry Mason will be one of these individuals.
- *GRG 52/7/1880/258* – Three canoes from Goolwa will be forwarded to Mannum for:
  Jerry Mason

  Joe Cook

  Queen Monarto
- *GRG 52/7/1885/84a* – Response from the protector to a letter requesting repairs to the canoes of Jerry Mason and Joe Cook. They are advised to take their boats to Swanport to be examined.
- *GRG 52/7/1885/94b* – Confirmation to for the boat builder in Swanport to undertake repairs on Jerry Mason's boat, but Joe Cooks boat is not worth being repaired
- *GRG 52/7/1885/114b, GRG 52/7/1885/221b, GRG 52/7/1885/691a and GRG 52/7/1885/724a* – show the out correspondences of the Protector for the repair of Jerry Mason's boat and the construction of three new canoes for the Aborigine people of the Mannum area.

Jenny Mason (Renmark/Mannum)

- *GRG 52/7/1887/319b* – Approval for a boat to be built for Jenny Xmas
- *GRG 52/7/1891/896b* – Approval for a new boat to be built for Mrs Jerry Mason in which she will contribute £ 3 towards the cost.
- *GRG 52/7/1891/900a* – Acknowledgment of a receipt of £ 3 for the cost of a new boat for Mrs Jerry Mason.

Tommy Bookmark (Upper Murray)

- *GRG 52/7/1886/221b* – Protectors response to Mr E. Newman of Swanport who was commissioned to build several canoes for the Mannum area (including for Joe Cook) and for the repair of canoe of an Aboriginal called Bookmark. Asks the boat-builder to discuss the worthiness of repairing Bookmark's boat with Corporal Montagu, who will have the final say.
- *GRG 52/7/1886/222a* – message to Corporal Montagu, to discuss the cost of repairing Aboriginal Bookmark's canoe at Swanport.
- *GRG 52/7/1890/716b* – Approval for the repairs to be undertaken on Tom Bookmark's canoe.
- *GRG 52/7/1890/807* – Approval for a canoe to be built for Tommy Bookmark at Renmark provided he contributes £ 4 towards the cost.
- *GRG 52/7/1895/177b* – Protectors asks for more information regarding the price and types of repairs needed for the canoes of Tommy Bookmark and Lindsay.
- *GRG 52/7/1895/180a* – Approval for repairs to Tommy Bookmark and Lindsay's canoes.
- *GRG 52/7/1899/472b* – Denial of a £ 6 canoe to be purchased by Tommy Bookmark of Renmark who was willing to contribute £ 1. Specified that if he paid £ 2 or £ 3 than his request would again be considered.
- *GRG 52/7/1905/921b* – Request for more information regarding Tommy Bookmarks request for a boat offered to him for £ 2.
- *GRG 52/7/1906/975a* – Approval to secure the boat for Tommy Bookmark at a cost of no more than £ 2.

Mrs Beck (Renmark)

- *GRG 52/7/1901/592* – Protectors denial of a request for boats for Aborigines in the Upper Murray. Mrs Beck was identified to have been given a boat 4 years ago that should still be of use if it has been properly taken care of.

George Lindsay (Upper Murray)

- *GRG 52/7/1888/535b* – Approval for a boat for Geo. Lindsay, provided it is worth the £ 5 and he must contribute half the cost.
- *GRG 52/7/1891/884b* – Acknowledgment of receipt £ 4 for a boat constructed at Renmark for George Lindsay.

- *GRG 52/7/1891/898a* – Acknowledgment of receipt £ 4 for a boat constructed at Renmark for George Lindsay.
- *GRG 52/7/1900/495a* – denial of a boat for Geo. Lindsay.
- *GRG 52/7/1901/569b* – Protector requesting information regarding Geo. Lindsay and his family, whether they have obtained a boat and why they are not on their land provided by the department.

Tommy Dodd (Chowilla/Renmark)

- *GRG 52/7/1888/537a* – Response from the Protector requesting more information about Aboriginal Tommy Dodd, who has applied for a Canoe.
- *GRG 52/7/1888/547b* – Response from Protector stating that he does not think a canoe would be of service to Tommy Dodd, from the information provided regarding his ailments.
- *GRG 52/7/1888/556a* – Approval given for a canoe to be provided to Aboriginal Tommy Dodd

Paddy Richardson (Renmark)

- *GRG 52/7/1893/*15a – Approval for a boat to be built for Paddy Richardson who will pay £ 4 towards the cost.

Chowilla Beales (Chowilla/Upper Murray)

- *GRG 52/7/1891/903b* – Approval response by the Commissioner of Crown Lands that the department will pay for a boat for Chowilla Beales, who has already paid £ 4 to the cost.

Chowilla George (Upper Murray/Chowilla)

- *GRG 52/7/1889/653b* – Protector's response to a previous request of a canoe for Chowilla George. Reply is that he will have to pay £ 6 towards the cost, which he should be able to accumulate in a few months.

Merly Scott (Renmark)

- *GRG 52/7/1894/145b* - applying for a Canoe for Aboriginal Merly Scott who is willing to contribute £ 4: towards the cost of £ 10. Protector asks if a canoe given to Tommy Dodd in January 1892, who has recently passed away, may be given to Merly Scott.

Appendix Ten: Woolenook Internment Camp

The following images, sourced from https://www.ozatwar.com/pow/woolenook.htm, depict Woolenook Internment camp, a wood cutting camp in South Australia. They show the astounding amount of timber lumbered from the floodplains of the Murray Riverland Region and highlight a preference of logging Red gum (*Eucalyptus camaldulensis)*. These activities represent a taphonomic factor in the contemporary CMT distribution in the region, and directly result in the reduction of the visibility of cultural scars in the landscape.

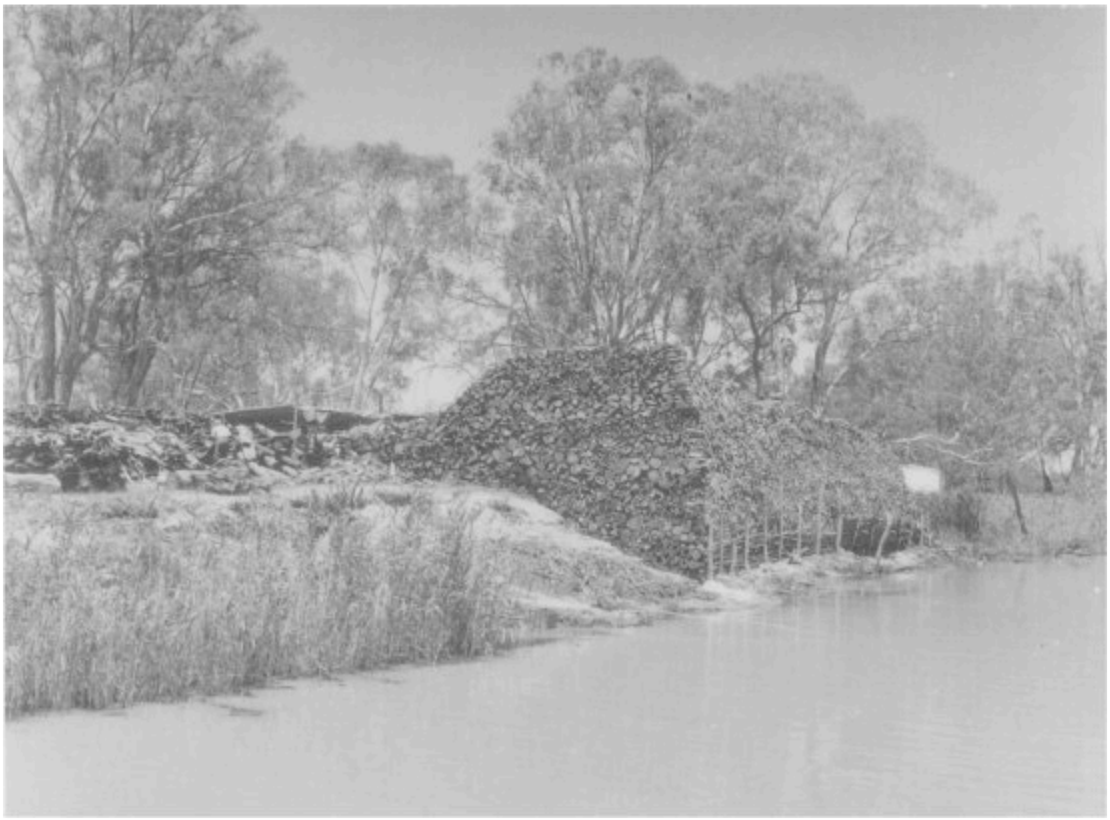
1. Sawing Logs, 1934–44

This Red gum tree that is being sawn, may even have the remnants of a cultural scar visible on its trunk (as indicated by the red circle).

2. Sawing Red gum Timber, 1934–44

3. Riverboat '*Pyapp*?' loading firewood, 1934–44

4. Firewood ready for shipment, 1943–44



5. Red gum tree falling, 1934–44

6. Firewood ready for shipment to Adelaide, South Australia, 1943

7. Firewood ready for shipment to Adelaide, South Australia, 1934–44