ABORIGINAL scarred trees in New South Wales

A field manual

Department of
Environment and Conservation (NSW)

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Department of
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Cover photograph: A scarred black box *(E. largiflorens)* on a creek in the arid plains of western New South Wales.

Contents

Background

This guide provides information on the identification and recording of Aboriginal scarred trees in New South Wales.

Although scarred trees occur across southern and eastern Australia, including much of New South Wales, they are also one of the least understood elements of Aboriginal heritage. Scarred trees have long been recognised as a product of traditional Aboriginal activities, but little information is available on their age, origin and interpretation.

This guide has been written to aid Department of Environment and Conservation (NSW) (DEC) staff, consultants and NSW Aboriginal communities in identifying scarred trees and to provide a basis upon which to distinguish scars of Aboriginal origin from those of other causes.

The manual consists of five parts:

Section 1: An introduction to scarred trees, including an explanation of how they form, why they are important, what they can tell us about Aboriginal culture and what we can do with the information they provide.

Section 2: An overview of Aboriginal and European scarring practices in New South Wales.

Section 3: A review of non-cultural scarring processes, both natural and incidental in origin, including an explanation of their causes.

Section 4: A guide to the distribution of Aboriginal scarred trees in New South Wales, with comment on the regional types of scarred trees, their likely locations and environment.

Section 5: Suggested techniques for identifying and recording scarred trees, explaining what features to look for, how to assess their significance and preserve them for the future.

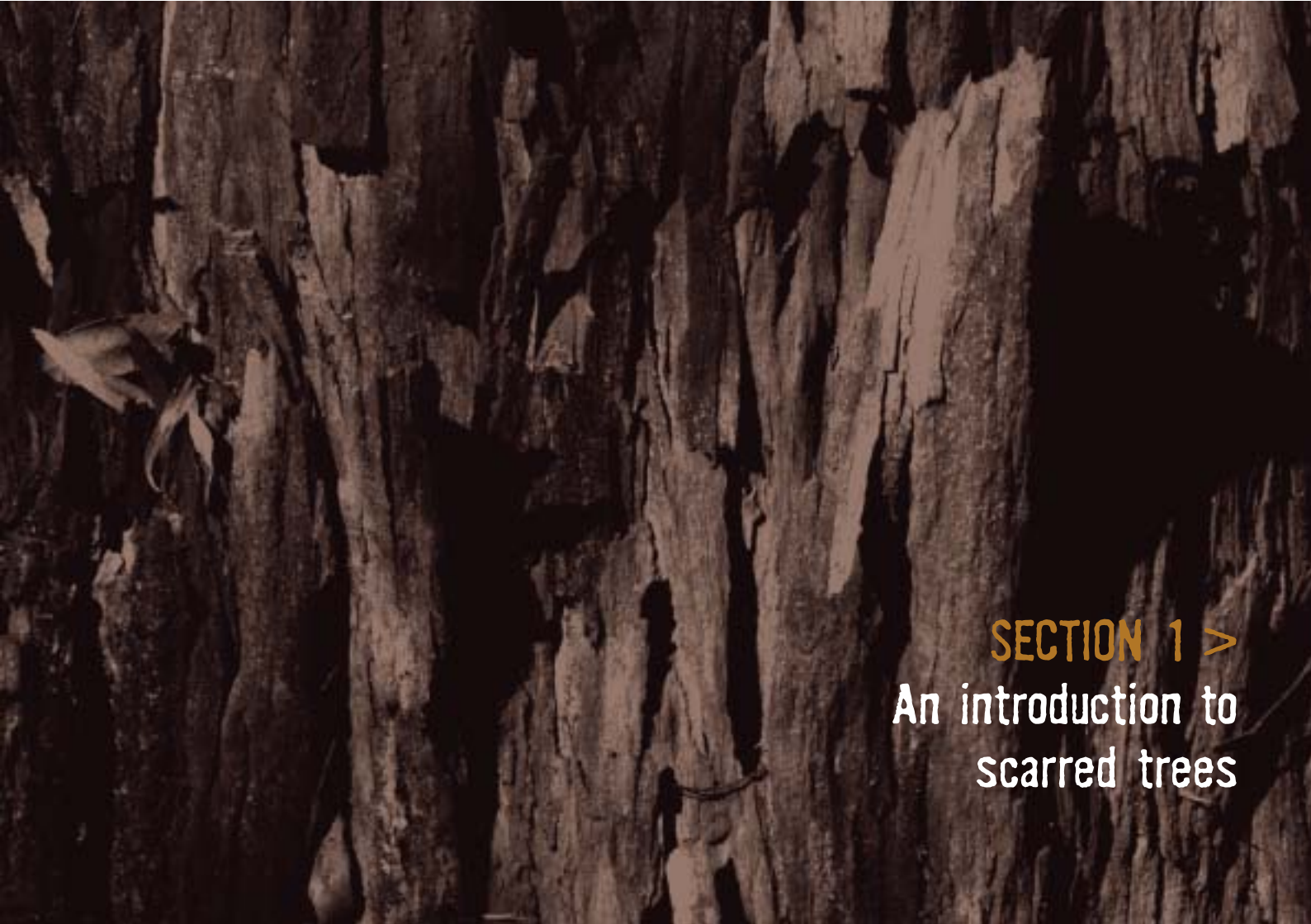
A glossary of terms used in the manual and a list of further reading is located at the back of the document.

LEFT: A scar on a river red gum *(E. camaldulensis)*, with irregular 'creased' overgrowth across the upper part of the dry face. This is unusual as a scar normally overgrows from the sides.

Acknowledgments

This project would not have been possible without the interest and generous support of innumerable people who have contributed their skill, expertise and time to the author in the course of investigating scarred trees in New South Wales, including regional staff of the Department of Environment and Conservation (NSW), AHIMS officers, various colleagues and informants. I am particularly grateful to Peter Peckham (DEC, Dubbo), Tom Peckham, Ricky Powell and Robert Potter (DEC, New England) for their company and interest during the field investigation, and for guiding me to numerous trees in their regions. Special mention should go to Denis Byrne and Sabine Partl (DEC, Hurstville) for guiding this manual through its production stages, and to John Banks and Matthew Brookhouse (Department of Environment, Society and Resources, Australian National University, Canberra) for their valuable knowledge into the scientific field of tree growth processes, and for commenting on drafts of this manual.

Finally, I would like to personally thank Warren Mayers (DEC, Cobar), who originally conceived the notion of a scarred tree manual specifically dedicated to New South Wales, for several rewarding days of scarred tree survey and much stimulating and perceptive debate on their origin and development. This manual has benefited in countless ways from Warren's ceaseless enthusiasm and desire to investigate the truth behind scarred trees, and this project would not have been completed without his unwavering interest, efficient management skills and generous support.



SECTION 1 >
An introduction to scarred trees

What are scarred trees?

Scars are wounds from a range of natural, accidental or deliberate impacts to a tree that cause damage to living plant tissue on a trunk or limb. This damage will stop any further growth in the affected part of the tree and will result in a panel of exposed sapwood (called a 'dry face') which will dry out and 'die' after the bark has been torn or fallen away.

Bark can no longer grow on these 'dead' sections of tree and the exposed sapwood will weather, crack and erode, resulting in the form of scarred trees commonly visible in woodland and forest environments today.

Trees will bear these scars permanently, though given enough time they can often 'seal' the damage by closing over the wound with vigorous new growth extending across the dry face from adjoining sections of living tissue (called 'overgrowth'). Although a scar may not be visible from the exterior of the tree, the damaged area will still be contained within the trunk.

Today 'bark removal scars' may be found on both living and dead trees, though they were invariably formed from impacts to live trees that were covered with a protective bark sheath and had the capacity to at least partly overgrow the damage.

Aboriginal scarred trees

Aboriginal scarred trees are trees that have been scarred by Aboriginal people through the deliberate removal of bark or wood. There are numerous reasons why Aboriginal people took bark from trees, it being versatile and plentiful material that could be used for a wide variety of commonplace tasks, including the construction of shelters, watercraft and containers.

Other forms of tree wounding include deliberate marking (such as tree carving), the

LEFT: Any cultural scar longer than 3 metres is most probably the result of canoe manufacture, as in the case of this scarred narrow-leaved box *(E. microcarpa)* near the Macquarie River, Dubbo. This is almost certainly the result of Aboriginal scarring.

removal of wood for artefact manufacture, and the cutting of the centre of the hollow tree for collecting food or the manufacture of holds for tree climbing.

Bark was one of the natural materials most commonly used by Aboriginal people in forested parts of southern and eastern Australia. Evidence for it is limited to historical accounts, a handful of bark artefacts preserved in museum collections and a few scarred trees that have survived land clearance and natural decay.

Early European settlers adopted the techniques of bark stripping they observed from Aboriginal people, though for a more limited range of uses that included the weather-proofing of buildings and other structures. Sometimes it is difficult to distinguish scarred trees resulting from 'traditional' Aboriginal activities from those made by Europeans.

Today people in New South Wales rarely strip bark for a functional purpose and its use in domestic life has been entirely superseded by widely available manufactured products, though many Aboriginal people maintain the traditions and techniques relating to its removal and use.

As a result, most 'authentic' Aboriginal scarred trees are now well over a hundred years old and are becoming increasingly less commonplace as the host trees age, die or are removed. As these older trees disappear, traditional and historical scars are being replaced in the landscape with a wide range of natural and incidental wounds on both old and young trees which are often mistaken for evidence of Aboriginal activity.

How do trees grow and scars develop?

All trees grow (i.e., increase in girth and height) by adding a sheath of wood over the whole of the existing stem and branches but inside the covering layer of bark. This growth takes place by division and expansion of the cells in the 'cambium' or growth zone that

RIGHT: A bark 'sleeve' scar on a grey box *(E. microcarpa)*, viewed from the front (top right), and the rear (bottom right) (Bogan River, near Nyngan). Note the thin strip of growth on the rear that sustained the life of this tree after the removal of such a large sheet of bark.

occurs at the interface between inner bark ('phloem') and sapwood ('xylem').

When bark is removed from a section of the tree, the cambium is split as the bark is separated from the stem and the cells exposed to the air will dry and die. Only in very rare instances will the tree continue to grow across a scar dry face after bark has been removed (see illustration opposite) when the cambium has been only partially split and exposed.

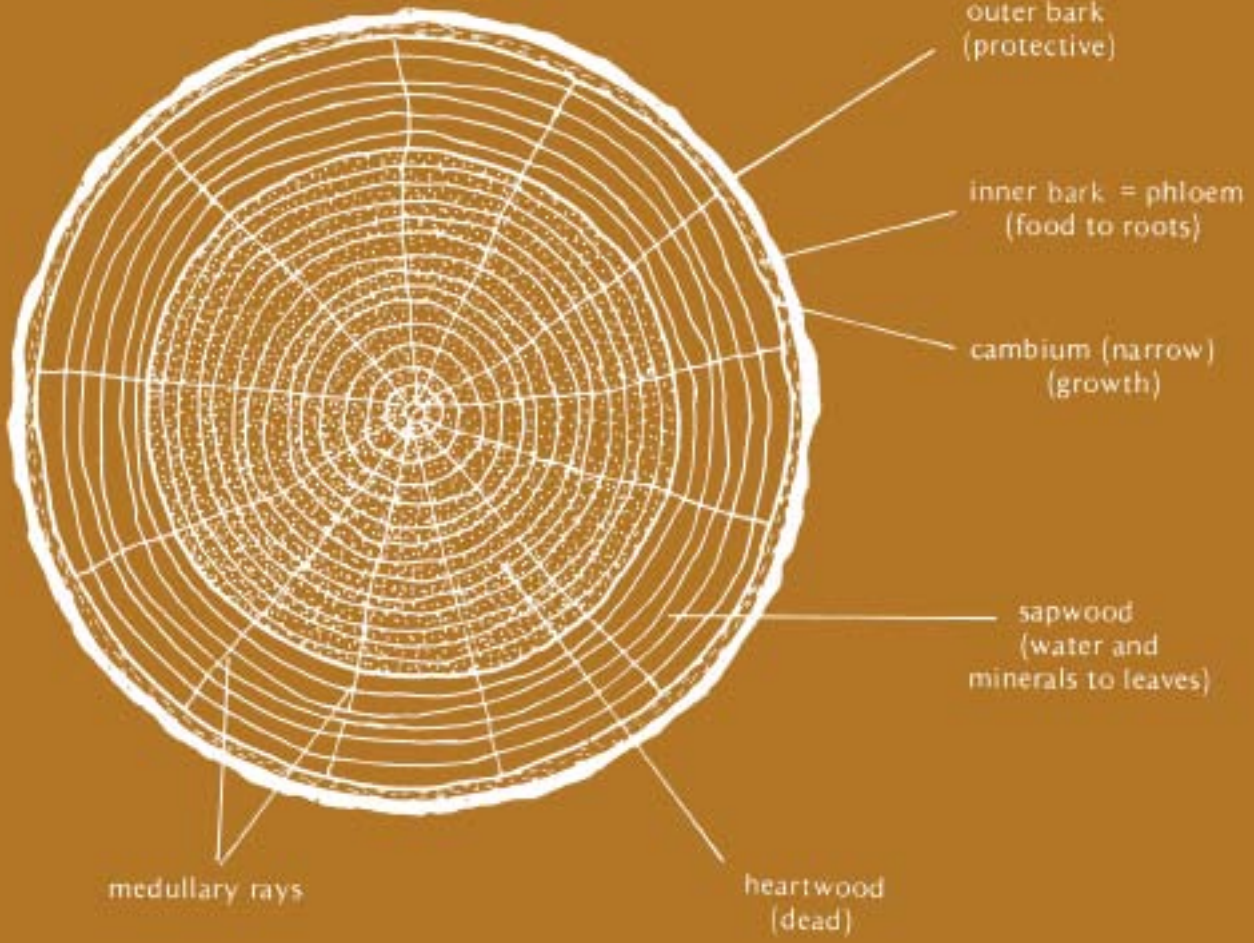
Once the cambium has been killed, growth ceases and the resultant wound (or 'dry face') will be covered by fresh tissue invading from the sides. The fresh tissue is known as 'accelerated growth callus' or 'overgrowth'.

This new wood may be pressed onto the 'scarred' surface but will never bond with it. As the scar is 'healed' from both sides, the 'callus tissue' will eventually meet and with continuing overgrowth the cambial cells from the two sides will join and ultimately hide the scar beneath new wood and bark.

Dry faces provide access for fungi, insects and fire to the heartwood of a tree and it is for this reason that many scars on non-durable species of eucalypt are hollow. By contrast, wounds on durable timber (such as red gums or boxes) will retain an intact dry face for a considerable time.

Damage to the cambium, by removal of bark, normally stimulates cambial growth around the margins of the wound with minimal response at the upper and lower ends and enhanced growth along the sides. Frequently a dry face will become elongated through dieback, as the sections of trunk at the top and bottom of a scar are starved of nutrients, water and photosynthates that are transported through the inner bark (phloem) and

LEFT: An impressive canoe scar on this river red gum *(E. camaldulensis)* in the Moira-Millewa State Forest, Murray Valley, illustrates how a sheaf of wood is added to the outside of a tree as it grows. In this case the tree has responded with a massive 'accelerated growth callus' around the wounded area, which is far greater in girth than the unscarred section of trunk above.
RIGHT: The cross-section of a tree, showing the outer and inner (phloem) bark, the position of the cambium where growth takes place, the sapwood and the 'dead' heartwood at the centre of the trunk. Australian Trees, Hadlington and Johnston (Courtesy NSW University Press).


outer bark
(protective)
inner bark = phloem
(food to roots)
cambium (narrow)
(growth)
sapwood
(water and
minerals to leaves)
medullary rays
heartwood
(dead)

sapwood (xylem), effectively extending the length of the wounded area, while overgrowth along the sides will narrow the apparent scar width.

Because the healing of a wound takes place in this manner, the visible or apparent dimensions of a partially healed or occluded wound may bear little relationship to the original dimensions of the wound. If left to develop naturally most scars will assume a round-ended 'canoe' shape regardless of the original cause or shape of the scarring event.

Overgrowth processes can be highly irregular, depending on a number of factors. Some of these are illustrated in this guide.

Bark removal or other damage may also cause 'epicormic sprouting' which can result in a new limb growing from the base of a scar. The development of this subsidiary limb is stimulated by an interruption of the downward flow of growth, inhibiting hormones synthesised in the crown. Any injury that reduces this downward flow (including the loss of the crown due to insect defoliation or scorching in the event of fire) will result in the rapid growth of epicormic shoots. Without epicormic development the root system below a large scar may die, seriously weakening the tree.

Principal features of scarred trees

The common features of tree scars are:

Dry Face – this is the dead, exposed timber that forms the scar surface. As the scar ages the dry face becomes increasingly cracked and weathered. Tool marks where the bark was cut and prised away are often preserved towards the top, bottom and occasionally across the centre of the scar. Tool marks will only be preserved on the sapwood (xylem)

TOP LEFT: The scar dry face on this river red gum *(E. camalduensis)* has been completely covered with overgrowth. Only a vertical join and distinctive radial 'crease lines' along the margins show where the scar is hidden (Seven River, Glen Innes).
BELOW LEFT: An epicormic stem has developed at the base of this scarred grey box *(E. microcarpa)* near Narromine. In this case the removal of the bark killed the central bole and the life of the tree has continued on through its secondary branches only.

which can be eroded away quickly due to a high content of sugars (photosynthates), leaving the relatively inert underlying heartwood layer exposed.

Overgrowth – the scar tissue or 'accelerated growth callus' that forms along the sides of a dry face. This is a natural response from the tree to rapidly 'seal' the damaged area and protect the wound from decay and infestation. Overgrowth generally develops at a much faster rate than the tree's normal growth and is often distinctive from the surrounding bark. Eventually the wound may be completely absorbed into the trunk and hidden from view by overgrowth.

Epicormic stem – a subsidiary limb can develop at the base of a scar which is sufficiently broad to prevent the downward flow of growth inhibiting hormones. As epicormic stems can occur directly as a result of a scarring event they may be used to date a scar through growth ring counting, without damaging the dry face or overgrowth.

Dieback – an area of secondary damage above or below a scar, linked to, but occurring after the original scarring process. Typically this could happen where a large bark removal scar has interrupted the downward flow of photosynthates from the crown, which are forced to divert widely around the damaged area, thus killing off a larger part of the tree than originally affected by the scarring. Dieback can also be caused by insects which access adjacent parts of the tree soon after scarring.

Tool marks may only be seen on cultural scars where overgrowth has been inhibited by dieback at the top and bottom of a scar. These give us the opportunity to measure the original dimensions of a scar, and thus the shape and size of the sheet of bark removed.

TOP RIGHT: A recent scar on a vigorously growing river red gum *(E. camaldulensis)*, clearly showing the original outline and irregular accelerated overgrowth callus on its left side. This species is renowned for its ability to entirely 'occlude' or heal scars.
BELOW RIGHT: A good illustration of dieback on a scarred white box *(E. albinos)* near Tumut. This large rectangular shelter scar has been elongated through insect activity at the upper margin. The original size and shape of the bark removal scar can be seen through the position of tool marks near the top and bottom.

Why we look for and record scarred trees

1 The main reason is to ensure their future protection and preservation in the landscapes of New South Wales. Realistically, this can only be achieved if their location, conservation and management requirements are known. Scarred tree protection may involve recognising the existence of a scarred tree so that it is left unharmed by a development or other form of human land use, such as logging, firewood removal or pasture clearance, or it may involve taking steps against a natural or incidental process such as bush fire, stock damage, vandalism, timber rotting or tree collapse.

2 A second reason is that scarred trees are significant evidence of Aboriginal occupation in what is now a highly modified agricultural landscape. There are few developed agricultural regions in the world where signs of pre-modern Indigenous activities are preserved in the fabric of living plants. This makes scarred trees of south eastern Australia a record of human activity of potential world importance.

3 Thirdly, scarred trees can tell us much about past Aboriginal activities in the area that they are located, which can help us understand and preserve information about Aboriginal culture and the way in which it interacted with the environment. Scarred trees are evidence for the use of perishable materials which rarely survive in archaeological sites. Very few bark artefacts have been preserved in museum collections.

What can we learn from scarred trees?

There is an enormous amount of information that can be gathered from scarred trees, though so far this potential has not been widely explored. Generally, the more scars are recorded, the more we can learn from them. When several hundred scarred trees have

TOP & BOTTOM LEFT: This small Aboriginal scar was entirely hidden from view until the collapse of the tree split the trunk open (Walgett, Central West). Mature river red gums *(E. camaldulensis)* in particular may have numerous scars hidden behind their apparently seamless outer sheath of wood (below).

been recorded in one place we begin to get a clear picture of the diversity of scar-forming activities within a particular area.

Here are just a few of the ways in which scarred tree information can be used:

> They are an important record about traditional places and events in Aboriginal history and can help us visualise how the landscape would have looked before clearance.

> Scarred trees represent places where an event took place. This may have involved the manufacture of an artefact, such as a canoe, the erection of a shelter, or food collection. This allows us to study where these activities generally occurred and identify aspects of culture distinctive to a particular region or tribal group.

> The characteristics of a scar can tell us much about the nature of an activity and the role that bark performed in the activity. For instance, by looking at the shape, size and position of a group of scars we can tell whether bark sheets were commonly used for building shelters, or whether other materials were used.

> The natural characteristics of the tree, the scar and its overgrowth can tell us much about the age of a scar and the age of a tree when it was scarred.

> The number of times a tree has been scarred can tell us much about the local availability of suitable bark, which gives us information about the intensity of scarring activities and the number of Aboriginal people living in that area.

RIGHT: Small scars like this on a dead tree near Lake Macquarie are an invaluable record of Aboriginal activity. Generally only larger scar types are visible on living trees, and smaller scar types, such as containers, are generally only to be seen on trees that died shortly after their removal.

SECTION 2 >
Aboriginal and European scarring in New South Wales

Scarred trees are a highly significant expression of Aboriginal culture in New South Wales and this is recognised through their protection as Aboriginal heritage sites by the provisions of the National Parks and Wildlife Act 1974 (NSW). It is important therefore to ensure their future protection through recording and appropriate management, but it is equally important to ensure that scars are only registered if there are compelling grounds for believing they are of Aboriginal origin and not a result of a natural or incidental impact.

Scarred trees of historical European origin are also protected by state legislation for non-Indigenous heritage sites and places. However, it can be very difficult to make a clear distinction between scars of Aboriginal and European origin except where there is compelling documentary or physical evidence.

Typically scarred trees of European origin will consist of trees with very recent scarring produced by relatively modern tools and techniques, where there is a very clear European association, such as early explorer's blazes, or where the scars occur in an area of intensive documented European activity, such as a historical gold mining settlement where it is known that bark was consumed in large quantities.

However, in the absence of definitive evidence, the majority of deliberate cultural scarred trees in New South Wales can for practical purposes be considered as Aboriginal heritage sites, regardless of their ethnic origin, and be protected as such.

Much of what we know about scarred trees and scarring practice is common across New South Wales and its neighbouring States. There are also distinctive local variations depending on environmental, historical and cultural factors, which need to be taken into consideration when making a determination.

LEFT: Aboriginal men constructing a bark shelter for an early travelling party in New South Wales ('Party preparing to bivouac', Atkinson, James 1826. Courtesy National Library of Australia).

Aboriginal scarred trees

Before European settlement, Aboriginal cultural activities resulted in large numbers of scarred trees throughout the landscape and explorers, early settlers and ethnologists have left an extensive record of the types of artefacts, cultural purposes, removal techniques and the locations in which bark removal and use occurred.

Although bark was also used in other traditional cultures around the world, such as in Canada or Tierra del Fuego, it appears to have been of highest importance to Aboriginal people living in the forested parts of south eastern Australia. Early explorers like Hume and Hovell tell us that trees bearing Aboriginal 'marks' were located even in the remotest places, telling us that Aboriginal people travelled widely to collect and use bark.

Scarred trees were a very common feature of the landscape during the 19th century, though land clearance and natural tree healing processes have removed or obscured much of this evidence today.

After European settlement, Aboriginal people continued to collect bark for their own purposes as well as being employed to strip bark for European purposes, such as building huts. Many of the scarred trees visible today are thought to date to this historical period, given the age of the host trees and the use of steel tools. Many Aboriginal people have continued the tradition to the present day and some scars used to make canoes or shelters are only a few decades old.

TOP LEFT: Multiple scarring displaying evidence for the removal of bark pieces of different sizes, shapes and ages is typical of Aboriginal bark use. This dead river red gum *(E. camaldulensis)* tree has a total of eight small scars on both sides of the trunk, indicating that bark was locally in high demand and was purposely managed and conserved as a resource (Boort, Victoria).
BOTTOM LEFT: This magnificent canoe scar (over 6 metres in length) is in the Moira-Millewa State Forest, Murray Valley. Although Europeans occasionally used them, there is no evidence that they ever made them, relying instead on the skill of local Aboriginal men.
RIGHT: Thomas Dick (1877-1927) composed several photographic vignettes of Aboriginal life in the Hastings River District, which provide us with some of the best evidence for the 'stages of production' in traditional Aboriginal artefact manufacture, in this case the stripping of bark for a shelter. (Courtesy The Australian Museum, Sydney).

Because of this long association with bark use, scarred trees have special significance to Aboriginal people today and a large number of scars can be directly connected to Aboriginal activities. There is, however, much overlap between scars of Aboriginal and European origin and scars made by Aboriginal origin for a European purpose.

Fortunately there are a number of common characteristics that can distinguish some exclusively Aboriginal forms of scarring from European types.

> Aboriginal scars reflect a wide range of bark removal, wood removal and toe hold scar forms.

> Aboriginal scars may occur on a wide range of tree species, including various gum, box, pine, fig, paperbark and stringybark species.

> Aboriginal bark removal scars have a wide range of sizes and shapes, reflecting the numerous purposes for which bark was used.

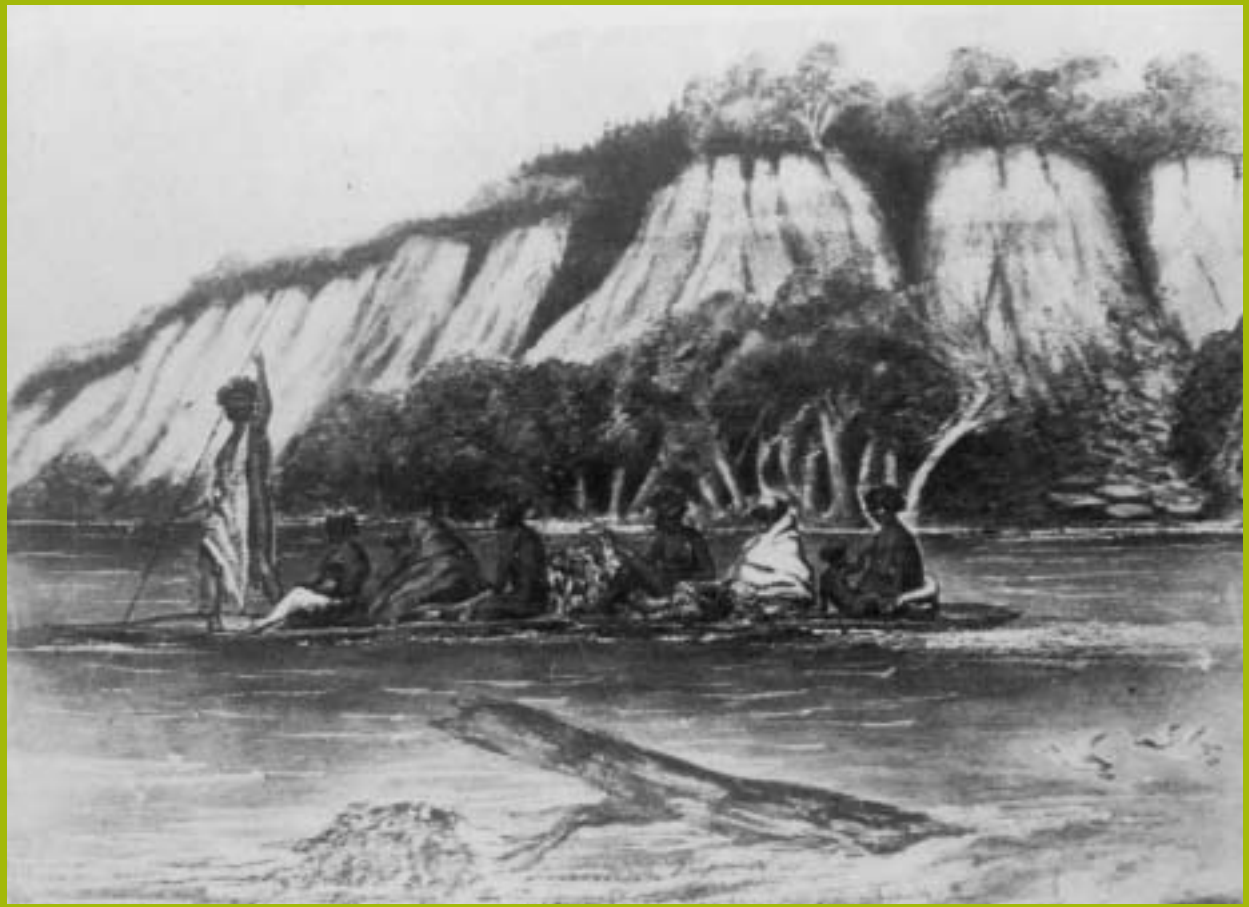
> Scars deliberately positioned on a bend in the tree are invariably Aboriginal in origin. These are termed 'curved pre-forms' and were used as canoes or containers, depending on their size, as they were capable of displacing or containing water and other liquids.

> Deliberate scars greater than 3 metres in length are invariably Aboriginal in origin. They represent bark removal for making canoes.

> Aboriginal scars can occur in a wide range of positions around the trunk and limbs of a tree.

> Traditional Aboriginal scars will not display marks made by a full size woodsman's axe (blade length 10-15 cm). While small steel axes or 'hatchets' (blade length 5-10 cm)

TOP LEFT: A container scar on a curved trunk section on a dead grey box *(E. microcarpa)*, Bogan River.
BOTTOM LEFT: A curved pre-form scar resulting from canoe production (12 feet [3m] long) near the Murray Valley in 1840. Drawn by George Augustus Robinson. Courtesy Mitchell Library, State Library of New South Wales Sydney.
RIGHT: A large bark canoe on the River Murray, carrying seven adults, two children and three dogs. Gerard Krefft (Natives crossing the Murray; Gerard Krefft. Courtesy Mitchell Library, State Library of New South Wales Sydney).



were rapidly adopted into the Aboriginal toolkit for a range of purposes given their lightness and flexibility, larger types of axe were not commonly used other than for cutting timber.

> Scarred trees with three or more scars are generally Aboriginal in origin.

> Scars with stone tool marks will have an Aboriginal origin.

> All scars in NSW scientifically dated to 217 years or more will be Aboriginal in origin, though some Aboriginal scars will be as recent as 50 years old.

Aboriginal scar forms

1 > Curved (pre-form) bark removal scars

Scars in this category consist of circular, oval or elongated shapes resulting from the removal of a pre-formed artefact, such as a canoe or container, that took their form from a curved section of either the tree bole, a major limb or a large burl. The original curvature is frequently disguised by subsequent growth in the tree, but is invariably preserved in the scar dry face.

Curved pre-forms can greatly vary in size and position on a tree. They range from containers made from thin bark on smaller limbs and burls, to large canoes up to six metres in length that take up the whole side of a massive red gum.

Simple bark canoes with a naturally curved profile were used extensively on inland waterways, sometimes with bark accessories such as seats, torch holders, paddles and fire platforms.

Containers had a variety of uses in everyday life, from storing water and other liquids to carrying grains and seeds or sorting honey ants. Many different types were used including hollowed burls, troughs (shaped & tied) and sewn buckets.

Bark spear shields (or 'helimans') using curved-preforms were also made along the central and northern coastline of New South Wales, though wood naturally formed a more

durable material for this use across the State. Only a few bark shields have survived to attest to this practice.

There was little European use for bark containers or canoes, since durable manufactured items such as pans and water bags were widely available to explorers and settlers alike, and rafts could be improvised from available materials for river crossings.

Curved pre-form scarred trees are demonstrably of Aboriginal origin and should be considered as such in every instance where the age of both scar and tree are consistent with wounding in the historical period or earlier.

They are most commonly found in inland riverine districts where their manufacture was a common part of traditional culture, and can be distinguished either by an obvious curvature preserved in the scar dry face, or occasionally by a curved line of tool marks at either end.

2 > Bark slab (sheet) removal scars

Sheet and slab artefacts are produced from rectangular or square sheets of bark. Usually these slabs did not actually require a specific form; the resultant square-ended shape was often a matter of convenience in the removal process. Historical photographs of stripped trees and shelters suggest that sheets of various sizes and shapes were often utilised as part of a single shelter.

TOP LEFT: A rare example of a curved line of tool marks at the base of a container scar on the Murray River.
BOTTOM LEFT: A curved pre-form on a dead tree on the arid plains of western New South Wales.
Water containers were very important in dry areas, where the need to store or carry water was great.
TOP RIGHT: A square-ended bark slab scar, defined by tool marks at the top of the scar (Yarrangobilly, Tumut).
BOTTOM RIGHT: There are numerous instances where smaller slabs of rectangular bark were used, though it is often difficult to interpret their purpose as there are few references in the historical literature for the use of such pieces (Gulgong).

> The process by which the bark is stripped from the tree is very simple. It is first cut all round the tree into the timber, with the tomahawk, about a foot or so from the ground, and, a similar ring being cut about sixteen or eighteen feet above, the bark is then split down in a straight line from one ring to the other; and after it has been beaten sufficiently with the blunt part of the tomahawk, the whole of the bark between the circular cuts will shell off without further trouble.
>
> The sheet thus stripped off is placed over a strong fire, in order that the heat may cause it to expand and flatten; it is then bent double, and fixed on the ground, something in the form of a dog–house, and with the addition of a small sheet at the back their winter gunya is formed. WILLIAM GOVETT c1977s[1]

Sometimes these bark pieces required further shaping, such as flattening or trimming, and it is possible that large sheets were divided to create smaller items.

In contrast to curve-formed artefacts, the larger pieces were probably manufactured from mature trees with a larger circumference; this would produce larger, flatter sheets requiring less manipulation. The main trunk characteristics required were a straight stem with no surface defects.

Measurements from surviving scarred trees indicate that bark was commonly removed from 50–75 per cent of the bole circumference, though sometimes the bark was removed as a sleeve around the entire trunk, killing all parts of the tree above the wound. In these cases

TOP LEFT: Close-up of toe holds on a dead tree at Baryugil, near Grafton. In this case the toe holds show no indication of overgrowth, and may have been made when the tree was already dead.
BOTTOM LEFT: A staggered line of partially overgrown toe holds on a dead tree near the Murray River, Euston.
RIGHT: An Aboriginal encampment in the Blue Mountains, using conveniently stripped sheets of bark, presumably from stringybark trees (Night Scene – The Gunyas, or Huts, of the Natives; Govett, William Romaine, c. 1830s from Sketches of New South Wales, Renard 1977. Courtesy National Library of Australia.)

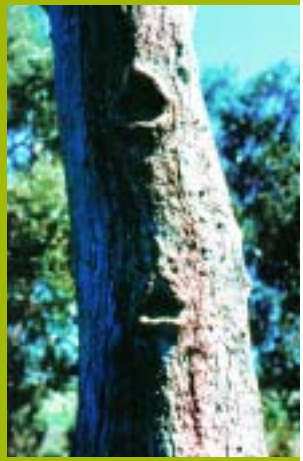
[1] See also papers by Mann (1883:31), Roth (1904:9) and Edwards & Guerin (1969).

it would be possible for a tree to continue living through epicormic sprouting around the base of the sleeve, and the scarred trunk would become a dead standing bole enveloped by new subsidiary limbs.

In coastal regions large rectangular sheets were used to make canoes with ends tied with twine and stopped with clay, while smaller pieces were used to make tied or sewn containers and buckets. Tied canoes were used extensively along the coast on rivers, lakes, sheltered inlets and occasionally on open water between the mainland and offshore islands.

Bark sheets of various sizes were also used for hunting decoys (circular or triangular), spear targets (circular), possum skin stretching boards (rectangular), burial structures, such as huts, grave markers, burial chambers or coffins (generally rectangular), musical 'beaters' (rectangular), panels for painting (rectangular) or carved figures for ceremonial use.

3 > Toe holds



Toe holds are small incisions into the bark and sapwood that allow tree climbing. Although they are commonly known as 'toe holds' the shallow cuts could be equally used with the hands. Normally they occur in staggered lines on near vertical trees, which represent the route of a single climb. In order to scar the tree, each hold would need to either cut into the sapwood or be partially overgrown.

Close-up of toe holds on a dead tree at Baryulgil, near Grafton. In this case the toe holds show no indication of overgrowth, and may have been made when the tree was already dead.

TOP LEFT: In the forested parts of eastern New South Wales, naturally occurring vines and creepers were used to manufacture ropes for tree climbing, as in this illustration by William Govett (c. 1830s).
BOTTOM LEFT: A close-up of partially overgrown toe holds, suggesting that this tree died shortly after the cuts were made.

4 > Resource extraction holes ('Possum holes')

These features consist of small holes cut into hollow trunks or limbs in order to catch game (e.g. possums and birds) or collect honey. Two types are currently documented:

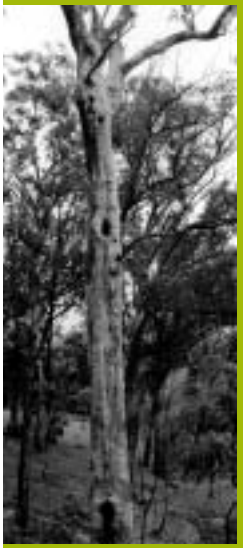
> Smoke holes – usually located at the base of a hollow tree. A hole will be cut and a fire lit to smoke the game out of the hollow pipe onto a limb or other accessible part of a tree. Frequently these will be cut through an existing weakness, such as an earlier scar dry face where the timber has already decayed. Occasionally additional holes will be cut further up the trunk as a flue for smoke to escape or to remove a trapped animal. There will often be associated indications of burning.

> Access holes – usually located higher up in the tree. These will be cut to get direct access to animals sheltering in a cavity within the tree or a bee's nest.

The age of these features is open to question and all such holes observed by the author have been cut by steel axes (or occasionally by chainsaw). It is probable that many of these scars were created during the 1930s Depression by Aboriginal and European people alike attempting to live off the land.

5 > Bark strip removal scars

Bark strip and fibre components were used in the manufacture of a wide range of artefacts and consumable commodities, such as sewing thread, fishing line/nets, binding twine, climbing ropes, torches, tinder, blankets, disposable utensils, wrappers, packaging and clothing accessories. Wattlebark chips were also used as a poison for stunning fish or eels, as well as a tanning agent in curing skins.



TOP RIGHT: Resource extraction holes in a tree near Armidale, New England. An access hole (upper) and axe-hewn smoke hole (lower & inset) are visible. Significantly, this tree was recorded through oral knowledge held within the community.
BOTTOM RIGHT: The hunting of possums or other game was an important Aboriginal subsistence strategy, as depicted in this watercolour by Joseph Lycett (c. early 1820s), probably in the Hunter River District. National Library of Australia, Canberra.

The raw material was generally collected in small pieces, such as strips removed from fibrous tree species. In most cases the final product did not resemble the size and shape of the original piece of bark removed, or the artefact was formed using only the outer bark, making it difficult to identify its use from surviving scarred tree evidence. Furthermore, this evidence is less likely to survive in the archaeological record as damage to the trees was generally slight and tended to affect species with a limited longevity, such as shrubs. It is unclear in the literature whether bark fibre was pulled directly from the trees, or whether bark panels were removed first, with fibre subsequently extracted after the soaking phase.

6 > Grub procurement scars

The ethno-historical literature suggests that grubs found beneath the bark of many species of tree formed an important part of traditional Aboriginal diet. Descriptions of the process of obtaining these grubs involve cutting away patches of bark to expose individual grub holes and larger sections of grub-infested trunk.

It is likely that these types of scar will only survive on trees of durable timber that have been dead for over 100 years.

7 > Marked and carved trees

The practice of tree marking and carving has been widely documented in New South Wales for the 19th century, and several examples survive into the present day. Tree carving (and the less durable forms of bark engraving, painting and burning) was undertaken for a range of ceremonial purposes, including marking burials, bora grounds, initiation rites and avenging expeditions.

There is an extensive literature on carved trees which documents the ceremonial and

TOP & BOTTOM LEFT: A tree with a possum extraction hole at Hungry Head, Urunga, with (inset) a close up of the access hole and a toe hold.

artistic use of trees, and deals with a range of issues relating to interpretation, management and conservation (see bibliography).

8 > Wood removal scars

Various wooden artefacts, such as shield, boomerangs and waddies were manufactured from different parts of trees by Aboriginal people. There is little direct physical evidence for this activity, as in many cases an entire limb was removed to produce the artefact, leaving few identifiable traces. Given the rapidity with which these deep but relatively narrow incisions will be covered by overgrowth, this activity will only be evident through oral information or on trees that died soon after the scarring event.

The exception are a handful of dead trees from which wooden shields have been split from the timber, including the famous 'Moruya Shield Tree' which is now in the Australian Museum in Sydney.

European scarred trees

European settlers rapidly adopted bark as a construction material and a raw material for various manufacturing processes (e.g. tanning) during the earliest days of settlement (post–1780s).

During this period a large number of trees were debarked for purposes unrelated to the Aboriginal use of bark, however much of this activity resulted in the widespread felling or destruction of trees which will not survive in the landscape today.

Exclusively European uses of bark were limited, resulting in a restricted range of scar type and scar position. There were also a number of modifications to the method of stripping

TOP & BOTTOM RIGHT: 'Carved trees are a striking Aboriginal scar type of high significance to local Aboriginal communities. Although they occur widely throughout eastern New South Wales, surviving trees are located mainly in the central parts of the State. Given their rarity and the fragility of the carved timber surface, any newly identified carved trees should be reported to Department of Environment and Conservation immediately to ensure their future protection and conservation.'

bark that help distinguish scars of likely European origin from Aboriginal scars. These include the types of tool used, the methods of cutting and excising the bark slab and the quantity of bark removed from each tree. In general, the historical European use of bark was highly destructive to the environment whereas deliberate care appears to have been taken by Aboriginal people to manage and preserve the resource for future use. Many aspects of European bark removal are well documented in early accounts and 19th century instruction manuals for settlers.

> At night a spot is selected for an encampment, or rather bivouac, where there is water and food for their horses, with plenty of dead wood for firing; the horses are then tethered out, or tied to a piece of wood which they can draw about after them; the black Natives strip some bark off the nearest trees that will suit the purpose, and construct a hut sufficiently large to shelter the whole party, with their baggage, arms, and saddles, from the weather; this they will execute in half an hour with ease; in the meantime others of the party kindle a fire, put on the kettle to boil some tea, and commence preparing supper; care is taken to collect sufficient wood to keep the fire up through the night, and if the ground is damp, some strips of bark are dried and laid upon sticks, to raise them a few inches off the ground, to sleep upon; in this way journies [sic.] into the unoccupied parts of the country may be performed with safety and comfort, while the weather is fine. I have performed many long journies [sic.] in this manner myself, without any attendants than two black Natives, on whose fidelity I could rely. The sheet thus stripped off is placed over a strong fire, in order that the heat may cause it to expand and flatten; it is

TOP LEFT: A dead tree with evidence for the removal of two shields.
CENTRE LEFT: An instructional illustration, teaching settlers the most effective ways to strip bark. Note the careful cross-diagonal cuts along the bark sheets and the stripping of a felled trunk using wedges. The New South Wales Agricultural Gazette, c 1900. Courtesy Department of Agriculture.
BOTTOM LEFT: The construction of European huts in New England during the 1850s, showing the widespread ring-barking of trees around the encampment. Sketches of New South Wales, Renard 1977. Courtesy National Library of Australia.
RIGHT: Devices carved on the trees at Wellington. Henderson, John; 1954. (Courtesy National Library of Australia).


Devices carved on the trees at Wellington.

then bent double, and fixed on the ground, something in the form of a dog–house, and with the addition of a small sheet at the back their winter gunya is formed.

ATKINSON 1826

The following features can be used to distinguish European scarred trees.

> Historical European scars are generally limited to bark removal scars and resource extraction holes.

> European scars occur on a selected range of tree species, mostly stringybark, messmate and box species. River red gum appears to have been seldom used.

> European bark removal scars are limited to rectangular panels, approximately 1-3 m in length, which reflect their primary use for weatherproofing buildings and other structures.

> Large scars may be divided up into two or more panels separated by a line of tool marks where the sheets have been split.

> European scars are invariably located at the base of a tree, generally ending within 0.5 m of the ground surface.

> Europeans made frequent use of a full size woodsman's axe (10-15 cm L), especially when severing the bark slab near ground level. Steel hatchets were often used at the top of the scar, but never stone tools.

> Cross-diagonal ('zigzag') tool marks are a common feature of European scars, especially at the top of the scar.

> European scars will be less than 170 years in age.

Typical European scar forms

There are three types of European scar which occur frequently in New South Wales.

> Roofing scars – These rectangular bark slab removal scars generally conformed to a standardised length (1.5–2.5 m), though the width of panels varied according to the girth of the tree. They can only be readily distinguished from Aboriginal shelter scars by their relatively recent age, the presence of zigzag tool marks and the use of full size axes (10–15 cm blade length) when cutting the bark.

> Survey and blaze marks – These comprise a range of small square or triangular cuts on the lower bole of a tree, representing survey markers. They are frequently found in road reserves and on riverbanks. Notable European blazes in NSW include the 'Explorers Tree' at Katoomba, marked by Blaxland, Lawson and Wentworth in 1813.

> Bark strip scars – Amorphous scars with parallel lines of tool marks have been identified near Balranald (Murray-Darling), indicating where long strips of bark have been removed. Their precise purpose is unclear, though they are all relatively recent in date.

TOP LEFT: A European shelter slab scar on a blackbutt *(E. pilularis)*, comprising two separate panels defined by rows of cross-diagonal tool marks. The effects of vigorous lateral overgrowth and terminal dieback have almost completely obscured its original rectangular shape (Tenterfield, New England).
BOTTOM LEFT: A recent triangular blaze on a black box *(E. largiflorens)*, near Moama.
TOP RIGHT: An older, overgrown blaze on a blakely's red gum *(E. blakelyi)* near Narrabri.
BOTTOM RIGHT: A large scar made by the removal of thin bark strips, as seen by the lines diagonal of tool marks on this scar.

SECTION 3 >
Other causes of scarring

It is important to realise that the majority of visible scar types in New South Wales today relate to more recent natural and incidental impacts that have left partially healed wounds on both old and young trees in forest and woodland environments.

Natural and incidental scars can cause considerable confusion in scarred tree recording as their characteristics may mimic the expected attributes of Aboriginal scars, such as their shape, size, position, age and tool marks. However, there are diagnostic features that may distinguish them from deliberate scars which are discussed in this section according to five categories:

1 **Trauma Damage**, including the general effects of bushfire, drought, crown loss and defoliation
2 **Storm and Fire Damage**, including wounds directly caused by lightning strikes, burning and branch tears
3 **Faunal Damage**, including the wounds caused by insects, birds and livestock
4 **Impact and Abrasion Damage**, including the effects of falling trees, branches and accidental collisions
5 **Ring-barking**, and other deliberate or negligent human damage

1 > Trauma damage

This category consists of scars that are caused by general damage or stress to the tree that indirectly result in the localised loss of bark. These can sometimes be hard to distinguish from scars of cultural origin as they lack obvious signs of their cause and may be consistent in size, shape, position and age with typical bark removal scars.

These scars are very common and occur widely in open woodland environments.

TOP & BOTTOM LEFT: A trauma scar on a forest red gum *(E. tereticornis)*, displaying an amorphous shape and evidence of major crown loss on the trunk above (Gippsland, Victoria).

Trauma damage: **causes**

The scars are caused when the host tree experiences a traumatic event, such as defoliation from fire or insects, the loss of a major limb or crown section, a prolonged drought, root exposure (e.g. riverbank undercutting), termite infestation or other change in environmental circumstances (e.g. if all sheltering trees are felled, leaving the host tree exposed to excessive wind and sun).

Such impacts can stress localised sections of tree trunk through interrupting the flow of nutrient rich water and photosynthates. This 'starvation' can cause the death of cambium in the affected parts of the trunk, with the bark splitting and falling away shortly after. This may result in scars that have no signs of local impact or apparent cause.

When the tree recovers from the trauma, the 'wound' will begin to overgrow normally like any other type of scar.

Trauma damage: **what to look for**

As there may be no other indications of the natural origin of a trauma scar, there could be a tendency to record these features as cultural scarring.

There are three points to check in making a clear determination:

A > Are there general signs of trauma, in particular dead limbs or crown loss that may indicate that the tree has experienced severe stress in the past?

B > Are there other scars of a similar nature and/or age on the trunk, some of which may have more apparent causes, such as branch tears?

C > Are there attributes of the scar dry face that would make it unsuitable for deliberate bark removal (e.g. the presence of branch stubs, burls, or irregular growth callus)?

2 > Storm and fire damage

This category consists of a range of external processes that impact on a localised section of tree trunk, directly causing the loss of bark.

Lightning strikes
Lightning is discharged to earth through sap in the cambial layer between the bark and sapwood of a tree. The bark is seared in the process and either splits on impact or subsequently peels away.

Lightning strikes: **what to look for**

A > These scars are very common in forested areas, particularly on river red gums which, as a species, tend to survive these traumatic events more effectively. Due to the damage inflicted, the tree may be reduced in vigour and overgrowth can be comparatively limited following the strike.

B > The process invariably forms thin, elongated scars extending down the length of the tree, usually widening towards the base and often curving around the trunk.

C > Dead branches and/or stubs generally protrude from the scarred surface.

D > Branch tears (see below) and splintering to the upper limbs of the tree are often associated with the lightning strike.

E > The scar may develop into an extensive hollowed area, particularly when also affected by fire. The exposure of extensive areas of sapwood will ultimately result in the premature death of the tree.

These scars can be confused with irregular, elongated ('canoe') scars with obscured or damaged bases, particularly if they have rounded margins. Check to ensure that the shape

TOP LEFT: A recent lightning strike on a river red gum *(E. camaldulensis)* near Yass, showing the point where lightning was discharged to the ground. Much of the damage above this point is below the bark and cannot easily be seen (photo courtesy of Petra Schell).
BOTTOM LEFT: A series of scars resulting from lightning winding around a tree trunk (Moree).

of the extant scar accurately reflects the area of the original scarred area. This can be achieved through an inspection to detect overgrowth patterns, variations in surface weathering and the presence of axe marks.

Fire damage

The action of intense heat generated by a bush fire or lightning strike can frequently kill the cambium of a tree without necessarily burning or scorching the underlying sapwood. Fire damage is the most common type of scarring in forest environments.

Fire damage: **what to look for**

A > Two distinctive types of scar are formed by fire:

1 A distinctive triangular scar with a wide base descending to ground level

2 A continuous elongated or discontinuous series of small curvilinear scars extending up the length of the trunk.

B > The scars invariably form on the leeward (downwind) side of the tree where the heat is most intense, particularly in locations where there is sufficient build up of fuel (e.g. log jams resulting from floods).

C > The dry face may initially be burnt, but eventually weathering processes will act to reveal a surface of unburnt heartwood. In other cases the bark will peel away after the fire, revealing an unburnt surface.

D > Dead Branches and/or stubs may protrude from the scarred surface.

E > Often associated with lightning damage and burnt hollows. If the tree is repeatedly burnt the scar may develop into a large hollow at the butt.

TOP RIGHT: A classic triangular fire scar (Type 1) (Macquarie River, Dubbo).
BOTTOM RIGHT: A recent fire scar (Type 1) on a bloodwood tree *(E. intermedia)*, showing scorching to both the dry face and surrounding bark.

Scars from fire damage can potentially be miss-identified as cultural scars, particularly where there is no evidence of burning. Check to ensure that the shape of the extant scar accurately reflects the shape of the original scarred area through an inspection of overgrowth patterns, variations in surface weathering and the presence of axe marks. Check adjacent trees for similar scarring with the same aspect. Check historical records of bush fires and the direction of the prevailing wind for comparative evidence of fire damage.

Branch tears

The loss of a branch during or after high winds may cause associated scarring. If the branch falls from the point where it connects with the trunk it will rip a section of bark, and possibly wood, away from the trunk below the limb.

Branch tears: **what to look for**

A > Very common in river red gums which are naturally susceptible to branch loss.

B > This process leaves a characteristic keyhole or 'tear' shaped socket at any height on a tree.

C > A prominent branch socket or cavity will be present at the top of the scar.

D > The internal structure of the timber is sometimes exposed due to the loss of the limb, but not necessarily in every case.

E > The fallen branch may be located on the ground below the tear mark.

F > The bole above the scar will frequently jut out, indicating the position of the 'crook' between the limb and the parent bole.

G > The ultimate form of the scar will depend on the size of the branch lost. In the case of small limbs, the socket will frequently be occluded; larger cavities, however, will allow internal decay, resulting in irregular hollows. The resultant feature will continue to display a 'keyhole' shape and the pre-existing shape of the surrounding trunk area – for example, the pronounced jutting upper edge of the scar.

Branch tears are normally easy to spot due to the distinctive 'keyhole' shape, the jutting upper edge and the socket left by the branch; however, if this rots away it becomes more difficult to distinguish between this scar type and hollowed cultural scars.

3 > Faunal damage

Insect activity

Insect or fungal activity of various types is frequently associated with scars of both natural and cultural origin, but also has to be considered as a group of separate scar formation processes. The initiation of scars by insects is thought to be relatively uncommon since insects or fungus generally require an existing wound in order to gain access to underlying timber. However, given sufficient time, these sub-bark activities will significantly weaken a tree, resulting in limb loss or cambial decay which can cause scarring and potentially death.

Larvae

The boring larvae of various insects, notably moths and beetles (termed 'borers') can create galleries between the bark and sapwood and within the timber as well as exit holes through the bark. This localised damage weakens the cambium and can result in bark loss and eventually the death of the trunk section. This is a gradual, degenerative process that can take several years to result in a definable 'scar'.

With few exceptions (e.g. longicorn beetles), most borer species access the sapwood through existing wounds or tiny entry holes which do not contribute significantly to the creation of scars. Exit holes, however, are a common feature of natural scars. They do not occur with frequency on pre-existing scars of cultural origin.

TOP LEFT: This branch tear closely resembles a shelter slab scar.
BOTTOM LEFT: Composite Type 2 fire scars on a red mahogany *(E. resinifera)*.
TOP RIGHT: This branch tear closely resembles a shelter slab scar.
BOTTOM RIGHT: A classic insect-related scar on a spotted gum *(E. maculata)* near Singleton, it resembles a recent canoe scar.

Insect activity: **what to look for**

A > The presence of numerous borer holes and galleries located across the scar surface. Galleries will take the form of shallow 'tracks' running across the dry face. An individual hole or gallery is unlikely to be the sole cause of a scar, and other processes may be present.

B > The resulting scars tend to be triangular or irregular in shape, though with time lateral overgrowth and dieback may elongate the dry face. These scars usually occur near the base of the tree and often extend down to ground level.

C > If the tree has been affected for an extended period of time, compound scars can occur, resulting in additional lines of overgrowth across the scar surface as the borers successively infest adjacent sections of living tissue.

D > Grub activity can kill large parts of a tree relatively quickly and extensive parts of the trunk may dieback, resulting in large, amorphous scarred surfaces.

Field observations suggest that grub holes are not a common feature of cultural scars, though they may occur as individual examples. In general, it appears that most borer species do not infest dead tissue and are unlikely to cause extensive damage to existing scars. On this basis, scars relating to borer activity can be easily distinguished from cultural bark removal scars, although surrounding areas of timber can be intensively affected by later infestation (see also grub procurement scars).

Termites

Although termites ('white ants') are often believed to be a cause of scarring, this, in fact, is rarely the case. Termites restrict their feeding to heartwood and without an existing injury cannot access this resource. As they are particularly susceptible to desiccation,

TOP LEFT: A scar caused by larval activity. Note the exit holes and gallery at the top of the dry face, with no trace of insect activity elsewhere on the tree (Armidale, New England).
BOTTOM LEFT: A classic larvae scar near Merriwa.
RIGHT: Small scars on a grey box *(E. microcarpa)* caused by recent bird activity. (Murray Valley).

they undertake most of their activities in subterranean tunnels within the heartwood. Furthermore, they are dependent on fungi to breakdown lignin between the wood fibres, which also favour these conditions.

However, the combined action of termites and fungi will structurally weaken a tree, potentially causing limb loss or trauma related scarring.

Termites: **what to look for**

A > As most damage to the tree caused by termites is contained within the heartwood, the scarred area will rapidly decay internally, eventually leaving large hollow cavities. These are frequently associated with extensive, accelerated-growth callus around the margins.

B > The process is progressive and a scar could be the cumulative result of a number of smaller scarring events defined by small ridges of re-growth. The bark can take several years to completely detach and can often be left hanging off the tree, revealing a scar with only minor overgrowth.

Bird damage

A number of species of flocking birds (e.g. galahs and cockatoos) strip bark from various species of trees (e.g. grey box) to leave distinctive scars on the trunk and limbs of a tree.

The irregular shape of this type of scarring is highly distinctive. The irregularity of the 'original' scar will be retained in the 'extant' outline, but as the scar heals it will be increasingly hard to distinguish from cultural scars of the same age. Only recent bird damage scars have been identified to date, but it is important to consider the role this process may have played in creating scars in the past.

Bird damage: **what to look for**

A > This type of scar normally occurs in the central and upper parts of the tree and is rarely present at the base.

B > This process is progressive and a scar could be the cumulative result of a number of smaller scarring events defined by small ridges of re-growth.

C > Scars in this category are generally small to medium in size, with a maximum dimension of less than 1.5 metres; they are often wider than they are tall.

D > The resulting scars are highly irregular in shape and frequently 'curve' around the trunk.

E > All documented examples appear to be very recent in origin.

Stock damage

The prolonged use of a thinned woodland paddock for grazing, particularly by horses and cattle, may result in scarring near the base of the tree. Trees and other hard, upstanding features such as fence posts are invariably used for 'scratching' to reduce discomfort from parasites and other irritants, and there is evidence to suggest that bark can be stripped and chewed as a result.

Stock damage: **what to look for**

A > The area of land will have a history of stock grazing.

B > The result is a highly polished scarred area, frequently around the circumference of the bole. Associated dieback may extend the damaged area higher up the tree trunk.

C > The scarring may effectively 'ring-bark' the tree (see next section). This damage is likely to kill the tree and so will probably appear to be relatively recent with little indication of surface weathering; frequently bark will still be adhering. If not dead, the tree will probably be in poor condition.

These scars can be potentially miss-identified as square or rectangular cultural scars, as they are frequently similar in size, shape and position. The minimal weathering and stock surface-polish should distinguish between these types.

4 > Impact and abrasion damage

This category consists of scars that result from contact with falling or moving objects.

Impact damage
There are several situations in which a tree will scar through accidental or incidental collision with moving objects:

1 The collapse of an adjacent trunk or branch onto the tree during a storm, especially in dense forest
2 The deliberate felling of an adjacent tree, especially in logged forests
3 Collision with a substantial floating log (or other form of debris) during a flood, in floodplain environments
4 Collision with logging and earthmoving machinery in logged or managed forests
5 Accidental collision by domestic vehicles or trucks, especially adjacent to roads.

Impact damage: **what to look for**

A > These scars may be readily identified if they have an 'impact' mark or point of collision such as crushing, splintering, tearing or other deep damage to the heartwood, torn branch stubs. The impact may also tear long strips of bark and result in extensive dieback to surrounding areas.
(continued overpage >)

TOP LEFT: Stock damage has ring-barked this tree.
TOP & BOTTOM RIGHT: An impact scar caused by vehicle collision, Wisemans Ferry. Note the position of the scar in relation to the road, the position of the impact mark (arrows) and dieback.

Impact damage: **what to look for** (< cont'd from previous page)

B > Many machinery or vehicle collision scars will occur adjacent to tracks or roads and will generally be at a height and orientation consistent with the direction and type of traffic. Scars associated with logging machinery may occur at any point in a past or present logging coupe and could occur up to 3-4 m above ground level.

C > These scars will invariably be recent in date, though falling limb scars may be of any age.

D > Falling limbs may graze the bark obliquely and not result in an impact mark.

E > It is common for limbs and trunks to fall into tree forks, leaving opposing scars on either fork.

F > The active, 'impacting' trunk or limb is frequently located in alignment with or adjacent to the resultant scar. The location of tree stumps may also provide evidence when the fallen limb is no longer present.

G > As these scars weather they are likely to develop similar characteristics to cultural scars, though they may incorporate a number of non-cultural features such as branch tears or stubs.

These scars can be potentially miss-identified as a range of cultural scar types. Check to ensure that the shape of the extant scar accurately reflects the area of the original scarred area through an inspection of overgrowth patterns, variations in surface weathering and the presence of axe marks. An examination of the immediate environment of the tree can provide contextual evidence, such as the orientation of the scar in relation to watercourses and fallen trees/stumps.

Abrasion

The repeated action of rubbing will eventually erode the outer bark, kill the underlying cambium and eventually create a definable scar. These scars may typically be caused by the long term rubbing of adjacent limbs or by the rubbing of stock in paddocks. In extreme

TOP LEFT: An elongated scar formed by a limb falling from an adjacent tree, which can still be seen in the brush below (Hastings River, Manning).
BOTTOM LEFT: A V-cut has succeeded in killing this red gum.

cases, cables looped around a tree trunk have effectively ring-barked trees, causing very large scars by triggering dieback.

Abrasion: **what to look for**

A > The scar may be partially hidden by an associated limb or trunk. This limb may have been removed or have fallen subsequent to the formation of the scar. This is a gradual process that can result in the continual modification of the scar shape and size.

B > The exposed surface may have a clean, polished surface.

C > As the host bole and adjacent limb continue to grow the morphology of the scar may show surface irregularities such as subsidiary lines of re-growth; smaller adjacent scars and the shape of the scar surface may conform to the shape of the 'active' limb.

D > As these scars weather they are likely to develop very similar characteristics to cultural scars, though they may have a number of atypical features such as polishing, surface irregularities and subsidiary scarring.

These scars can potentially be miss-identified as cultural scars largely occluded by epicormic stems. Check the position and surface of the scar carefully to determine whether the secondary limb resulted from the creation of the scar, or vice versa.

5 > Ring-barking

The cutting of a concentric groove or the removal of a concentric strip around the base of a tree trunk generally kills the central bole and any higher limbs. However, under certain circumstances the tree can recover, sometimes resulting in scars displaying a prominent horizontal line of axe cuts. Ring-barking aims to kill the tree with a minimum of effort, thus

TOP RIGHT: A recent collar cut on a black box *(E. largiflorens)* Murray River, near Moama, with associated dieback. Note that the bark is still attached.
BOTTOM RIGHT: 'Frilling' at the base of this scar.

increasing the carrying capacity of the land for pasture grasses. Various techniques were used to ring-bark different tree species, depending on their relative vigour:

> **Collar cut** – the removal of a broad strip of bark around the butt of the tree without pronounced incision.

> **V-cut** – an unbroken circular axe cut deep into the sapwood.

> **Frilling** – a series of downward, overlapping axe cuts resulting in the bark hanging off the lower bole in ribbons.

Ring-barking: **what to look for**

These scars can be potentially miss-identified as either:

> Large sleeve scars, resulting from the removal of a large sheet of bark from the entire tree bole and effectively ring-barking the tree. Generally these will be defined at the top and base by tool marks rather than 'axe scarfs' or cuts, though in some cases panel sub-division and /or dieback can result in a line of tool marks across the apparent centre of a dry face.

> Small square or circular scars located near the base of the tree.

These can be identified by examining the tree and environs for other obvious ring-bark events and assessing the length of exposure on the scar surface. Regenerated ring-bark scars will tend to be relatively unweathered and occur at a consistent level – about 1 metre above the base of the trunk.

TOP LEFT: Three ring-barked epicormic stems on a black box *(E. largiflorens)*. The one on the right has regenerated, leaving an oval aperture which now resembles a small scar (Moulamein, Edward River).
BOTTOM LEFT: A composite scar near Singleton, Hunter Valley, showing a collar cut defined by tool marks, and adjacent areas of dieback caused by larval activity.

Miscellaneous damage

There are numerous other types of incidental process which can leave un-natural forms of scarring on trees. These are not necessarily clearly identifiable in the field, but could result from various farmland or woodland management activities:

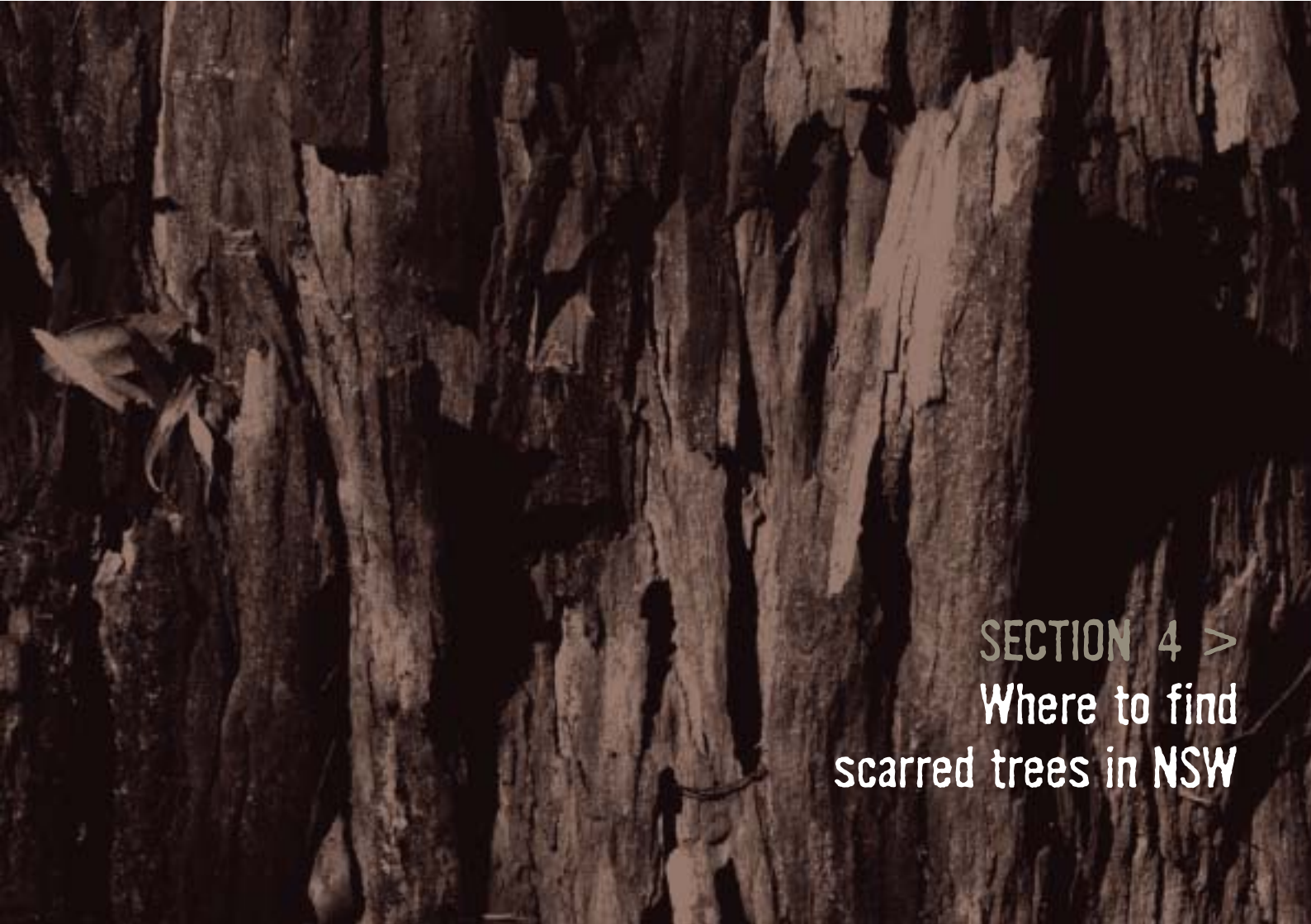
A > The resulting scars are generally small (< 0.5 metres long), though in the case of rope or cable abrasion marks, wide sections of a tree can be ring-barked.

B > Tool marks, cuts and other surface abrasions are invariably located across the surface of the scar panel. These often take the form of 'cuts' into the sapwood rather than 'marks' across its surface.

Miss-identification:

The cuts and abrasion marks can be miss-identified as steel tool marks on authentic bark removal scars. However, they are invariably the result of activities unrelated to bark removal. It is important to note that even two or three axe cuts can damage the cambium sufficiently to result in a definable scar which frequently becomes wider than the area of original damage through the effects of dieback. Similar marks can also be found on the surface of authentic cultural scars, representing later damage to the scarred surface.

TOP RIGHT: Fencing wire wrapped around this scarred tree near Tamworth has caused subsidiary scarring to the overgrowth.
BOTTOM RIGHT: Miscellaneous axe cuts to this forked tree near Bungendore, have resulted in this unusual saddle shaped scar.



SECTION 4 >

Where to find scarred trees in NSW

New South Wales encompasses a large environmentally diverse region with significant differences in climate, geomorphology and natural resources that have strongly influenced the type and distribution of social and economic activities over time. These factors also influence the type, distribution and preservation of scarred trees in the landscape, providing a rich and diverse record of cultural activity.

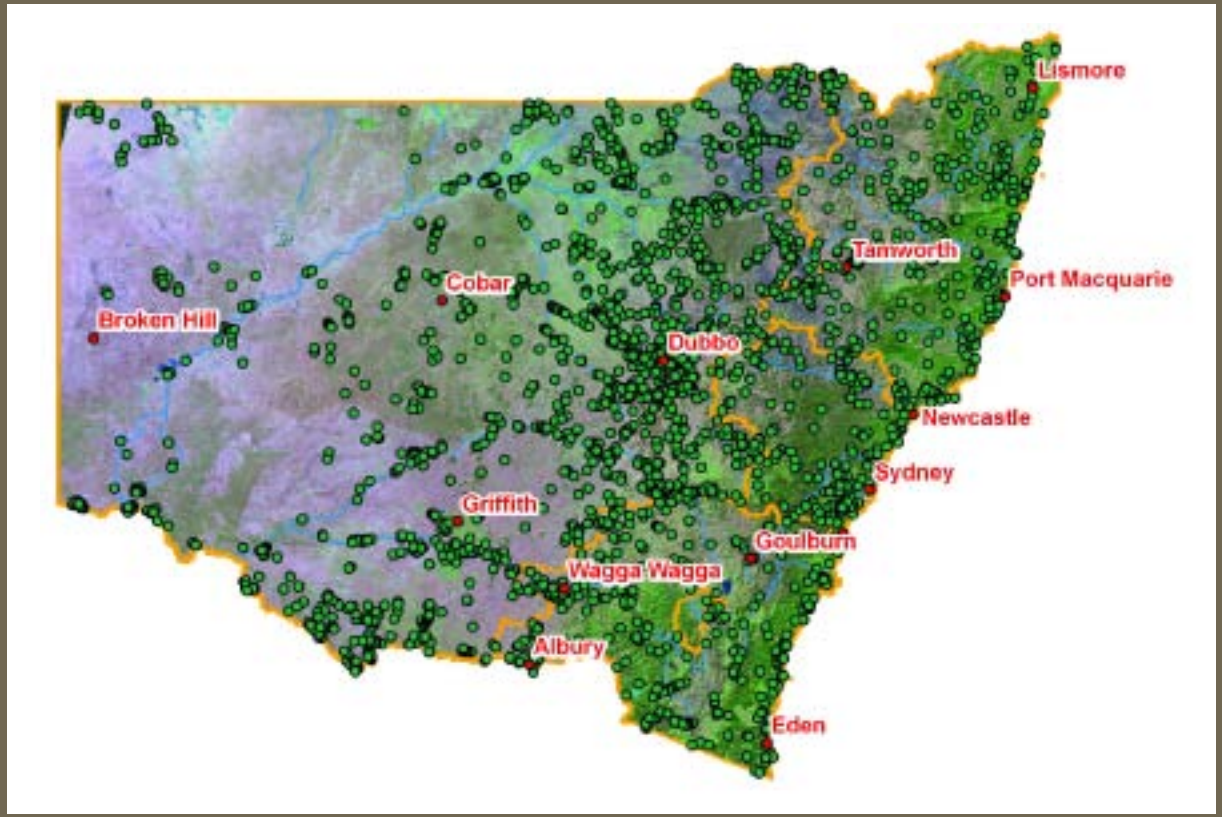
In order to assist the Department of Environment and Conservation (NSW) and Aboriginal communities in the identification and recording of scarred trees, it is helpful to outline the types of tree species, cultural activities and landscape preservation conditions that apply in specific areas of the State. Bark was valued as an important natural resource throughout the pre-contact and historical period throughout the state, though the types and quantity of bark available, the range and intensity of uses and more recent impacts to woodland, forest, heath and mallee environments can vary significantly from region to region.

The State broadly comprises four biogeographical regions which offer different cultural/ historical factors, vegetation zones and preservation conditions which influence the distribution and type of scarred trees found today.

Coastal Hinterland

The coastal plains and valleys of New South Wales are some of the oldest settled parts of Australia, with European occupation dating to the 1780s around Sydney and outlying coastal settlements established at Newcastle (1800s) and the Illawarra (1810s). Rural occupation fanned out onto rich coastal plains and major river valleys in the 1820s and 1830s (such as, the Manning , Hastings, Clarence, Macleay, Moruya and Bega Rivers). Some of the earliest activities recorded were highly destructive to the environment,

TOP LEFT: A paddock containing several remnant old trees near Merriwa offers good possibilities for scarred tree preservation. Despite the use of land for grazing, this paddock has not been cleared and contains many original trees, including both living and dead standing specimens.
BOTTOM LEFT: Partially cleared paddocks, such as this one near Lismore, provide some of the best opportunities for identifying scarred trees in the coastal hinterland.
RIGHT: Map of New South Wales showing locations of scarred trees that are recorded in AHIMS (Aboriginal Heritage Information Management System).


Lismore
Tamworth
Port Macquarie
Cobar
Broken Hill
Dubbo
Newcastle
Sydney
Griffith
Goulburn
Wagga Wagga
Albury
Eden

including land clearance and timber getting.

Today much of the more marginal land around these densely settled areas is still reserved as Crown forest, used historically for timber getting or forest grazing.

Most of the earliest accounts of Aboriginal bark use are derived from observations in the Sydney, Newcastle and Illawarra region, and the historical literature is rich with observations of bark stripping for canoes, shelters and numerous other purposes. Scars relating to these early activities would now be extremely old (age 200+ years) and may not have survived either natural decay or land clearance.

Many of the Aboriginal groups in this region suffered early displacement and disruption to their tradional way of life. It is also in this region that Aboriginal techniques for bark removal were first adopted by European settlers and it may be hard to clearly distinguish an Aboriginal scar from European ones.

The region consists of three types of landscape:

A > highly urbanised areas surrounding Sydney, Newcastle, Wollongong and other coastal and hinterland towns.

B > localised pastoral districts on coastal plains and in broad river valleys.

C > managed forest and heath environments that occupy coastal ranges and extend into the Great Dividing Range.

Scarred tree types reflect both Aboriginal and European uses of bark, dating from the pre-contact and historical periods up to the mid 20th century in areas adjacent to early townships, missions and reserves. Scar types more commonly reflect domestic usage, especially shelter construction, from the historical period or later. In coastal and estuarine

LEFT: Melaleuca scars are unique to the coastal belt, as in the case of this relatively recent shelter scar at Lake Macquarie. Similar sheets would have been collected to make shelters like those depicted by Joseph Lycett (p55)
RIGHT: 'Aborigines Resting by a Camp Fire near the Mouth of the Hunter River, Newcastle, NSW' (Joseph Lycett, c. 1820s). This scene may have been typical of Aboriginal life on the coastal belt during the early settlement of New South Wales (Courtesy National Library of Australia: R5684).

areas large 'sheet' scars associated with tied canoe manufacture may be found.

This region also contains the only conclusive evidence for bark and wooden shield scars known in the State. Thomas Dick documented some examples on fig trees along the Hastings River around 1915, while the Moruya and Narooma shield trees were removed to the Australian Museum in the 1930s. Given the advanced age of these trees it is uncertain whether any further examples of this traditional activity will still survive in the landscape.

However, this region is also one of the most intensely settled and modified environments in New South Wales and the opportunities for Aboriginal scarred tree survival are lower than more remote, pastoral districts of the State. It is likely that most surviving scarred trees in this region relate to historical, and potentially quite recent, European activities.

There are two main reasons for this:

Firstly, the impacts of European settlement occurred approximately 50–100 years earlier than in the remainder of the State and it is unlikely that many scars dating to these early years have survived on living trees. Agricultural clearance has also had a major impact, though scars do survive on paddock trees across most pastoral districts.

Secondly, extensive timber getting and logging will have removed most traces of scarring in modern forest environments, though isolated groups or individual examples may still survive. It is probable that natural and incidental impacts (e.g. bushfire) rather than cultural activity will have created most of the tree scarring visible in coastal forests today.

It is especially important to check for natural and incidental causes when identifying scars in this region, as the number of genuine Aboriginal and European cultural scars is relatively low. Particularly common causes to be mindful of include fire and impact damage in forested areas and incidental human impacts in farmland or semi-urban environments.

TOP LEFT: A recent square scar on a Melaleuca sp. tree on the Liverpool Plains.
BOTTOM LEFT: A remnant scarred tree in regenerated forest near Grafton.

The best opportunities for identifying Aboriginal scarred trees occur in pastoral districts where old remnant trees have been preserved either as living or dead specimens. Pockets of remnant scarred trees may also survive in forested areas.

Areas around Aboriginal missions and fringe camps also contain well documented scars, often relating to more recent historical Aboriginal activities (e.g. Corrindi Camp, Urunga). Several scarred trees in these environments have oral associations which allow for clear interpretations of these sites.

Common scarred tree species include river red gum *(E. camaldulensis)*, swamp box *(Tristania suaveolens)*, yellow box *(E. melliodora)*, grey box *(E. moluccana)*, white box *(E. albens)*, white mahogany *(E. acmenoides)*, red box *(E. polyanthemos)*, blackbutt *(E. pilularis)*, stringybark *(E. eugenioides)* and brown barrell *(E. fastigata)*. Other species known to have been scarred for more specialised purposes in localised areas include paperbark *(Melaleuca sp.)*, Moreton Bay Fig *(Ficus macrophylla)*, black bean *(Castnospermum australe)* and ironbark *(Eucalyptus sp.)*. Ironbarks do not appear to have been used extensively.

Great Dividing Range

The Great Dividing Range between Bombala and Tenterfield contains some of the most contrasting landscape in New South Wales, including broad river valleys, upland plains, tablelands and alpine ranges.

This rugged country formed both the backdrop to the coastal plains and a barrier to inland plains and early European occupation concentrated on the major river corridors and lines of communication, such as the upper Hunter, Macquarie and Murrumbidgee Rivers, and pastoral tablelands, such as the Southern Highlands, Monaro Plains and New England, which were first settled in the 1820s and 1830s.

TOP RIGHT: A large shelter scar preserved on a dead ring-barked paddock tree near Bega.
BOTTOM RIGHT: Canoe scars rarely occur in the Great Dividing Range, except in the major river valleys (Murrumbidgee, near Jugiong)

Much of the surrounding remote high country was not extensively used or occupied until later, and then largely for timber getting or mining rather than agricultural settlement. As a result, many Aboriginal groups in the region maintained a traditional mode of life late into the early 20th century, and the potential exists for scars relating to this period to survive in the landscape.

The region consists of four types of landscape:

A > rural agricultural districts in major river systems
B > pastoral districts on upland tablelands
C > managed forest environments across the foothills and middle ranges
D > alpine forest and heath in the highest parts of the range

Knowledge of specific bark removal practices or bark use is limited in this region, though ethnologists, such as R.H. Mathews, recorded much information about the material culture, social and ceremonial life of these groups around 1900.

Scarred tree types reflect both Aboriginal and European uses of bark, dating from the pre-contact and historical periods up to the mid 20th century in areas adjacent to early townships, missions and reserves. Scar types more commonly reflect domestic usage, especially for shelter construction, from the historical period or later.

This region formed the boundary between the use of simple bark canoes on inland waterways to the west, and tied bark canoes on the coast. Canoes of both types were used in navigable waters, though to a lesser extent than in the adjoining regions.

Much of the forested country has been subject to extensive timber harvesting and other widespread impacts such as bushfire and it is unlikely that many scarred trees pre-dating 1900 will survive in these environments.

TOP LEFT: Past forest management practices may have removed all trees of mature age, and scarred trees may only survive on occasional dead or fallen trees (Armidale, New England).
BOTTOM LEFT: Typical pastoral country in New England, near Glen Innes. Scars may survive on old or dead paddock trees in otherwise cleared land.

Alpine, highland and heath environments are not generally associated with historical or pre-contact bark usage, though scars do occur across pastoral tablelands (such as New England and the Monaro) and close to inland waterways.

The best opportunities for identifying Aboriginal scarred trees occur in pastoral districts where old remnant trees have been preserved in paddocks, either as living or dead specimens. Pockets of remnant scarred trees may also survive in forested areas. Many of the shelter trees may be of European origin, though sometimes there is oral or other physical evidence to suggest Aboriginal involvement.

Common scarred tree species include river red gum *(E. camaldulensis)*, grey box [or narrow-leaf box] *(E.microcarpa)*, yellow box *(E. melliodora)*, white box *(E. albens)*, blackbutt *(E. pilularis)* and various stringybark species *(cf. E. eugenioides)*. Snow gums *(E. pauciflora)* and other high alpine species are not known to have been used.

Western Slopes

The plains and foothills on the western fringe of the Great Dividing Range have some of the best preserved scarred tree landscapes in the State. This belt, starting from the Murray River near Albury in the south, extends along the low western slopes of the Great Dividing Range around Wagga Wagga, Dubbo and Moree.

European settlement dates to a pastoral occupation of the land in the 1830s and 1840s and extensive agricultural occupation has broadly continued to the present day. Apart from a number of regional townships the lack of urban development has allowed Aboriginal groups to continue a traditional mode of existence around reserves and settlements in the 19th century and much scarring activity occurred well into the historical period.

TOP RIGHT: Scarred trees can occur in any context, such as this example of a shelter scar on a forested hilltop near Tenterfield. This scar occurs in a mining settlement and is of probable European origin.
BOTTOM RIGHT: Mixed gum and pine forests near Narrabri where the natural vegetation has been preserved offer good conditions for scarred tree occurrence.

The main landscape characteristic is the natural occurrence of lowland woodland species, particularly grey, or narrow-leafed box *(E. microcarpa)*, the bark of which has a wide range of uses. Despite clearance by agriculture and forestry, scarred trees occur extensively wherever the natural vegetation has been preserved. Although the density of scarred trees will generally be lower at any one location than in the riverine floodplains to the west, scars are distributed widely across the landscape. In contrast, scarred trees in the eastern parts of the State are few and far between. The study of large numbers of trees across extensive areas can tell us much about how the landscape was used.

Common places to find scarred trees include river, creek and wetland reserves, road reserves and any areas where significant remnant woodland cover has been preserved and where timber getting impacts have been absent or less intensive.

Scars in this region are typically dominated by large shelter slab scars, with a range of smaller and more specialised types, such as containers, also found. Simple bark canoes were also in use and larger scars (3m+) close to waterways are evidence for their manufacture. More recent scars around Aboriginal settlements tend to be resource extraction holes.

Common scarred tree species include river red gum *(E. camaldulensis)*, grey box [or narrow-leaf box] *(E.microcarpa)*, bimble box *(E. populnea)*, white box *(E. albens)*, and occasional pine *(Callitris glauca)*.

Western Plains

This region includes the major lowland river systems of the Murray and Darling Rivers, their tributaries and intervening plains, low ranges and the deserts as far as the South Australian and Queensland borders.

TOP LEFT: A diversity of scar types in grey box woodland close to an Aboriginal settlement near Narromine reflect of a range of continued bark uses into the historical period.
BOTTOM LEFT: Much of the Western Plain district is either naturally treeless or cleared, offering limited opportunity for scarred tree identification.

The riverine plains, mallee and desert landscapes of western New South Wales contain some of the least disturbed vegetation structures in the State, though much of this region is treeless. Large trees suitable for bark removal have fairly limited distribution in riverine floodplains and wetlands, though these areas can contain very dense groups of Aboriginal scarred trees.

The inland rivers are thought to have supported some of the highest Aboriginal populations in Australia prior to European contact and this is reflected in the large number of scarred trees, particularly close to missions, reserves and townships where Aboriginal people have lived in the historical period.

The intensity of scarring in these riverine forests is suggested by John Stanley James, who travelled the Murray River in 1884. He pointed out 'how the bark has been cut away from the many large gums we pass to make canoes, and smaller pieces for coolimins [water carriers], the number of trees marked showing how numerous the blacks must have been at one time'.[2]

Scarred trees are most commonly found along the banks of waterways, around lakes and swamps and on low lying floodplains, though some older mallee species may also preseve scars. Given their ability to heal damage, mature river red gums in these environments can preserve entirely healed scars without clear external indications.

Scarred tree types reflect both Aboriginal and European uses of bark. Large canoe and shelter scars are highly characteristic of the major waterways, such as the Murray and Darling Rivers, while floodplains close to historical centres can contain some of the densest

TOP RIGHT: By contrast, well preserved coolibah and box forest on riverine floodplains contains some of the densest groups of scarred trees in the State (Walgett).
BOTTOM RIGHT: A canoe scar at Moira c. 1900. Compare this fresh looking scar with the recent photograph on p.121. Photo: W.H. Dudley Le Souëf; Wildlife in Australia. Pg. 121. (Courtesy National Library of Australia: NL 591.994 LES).

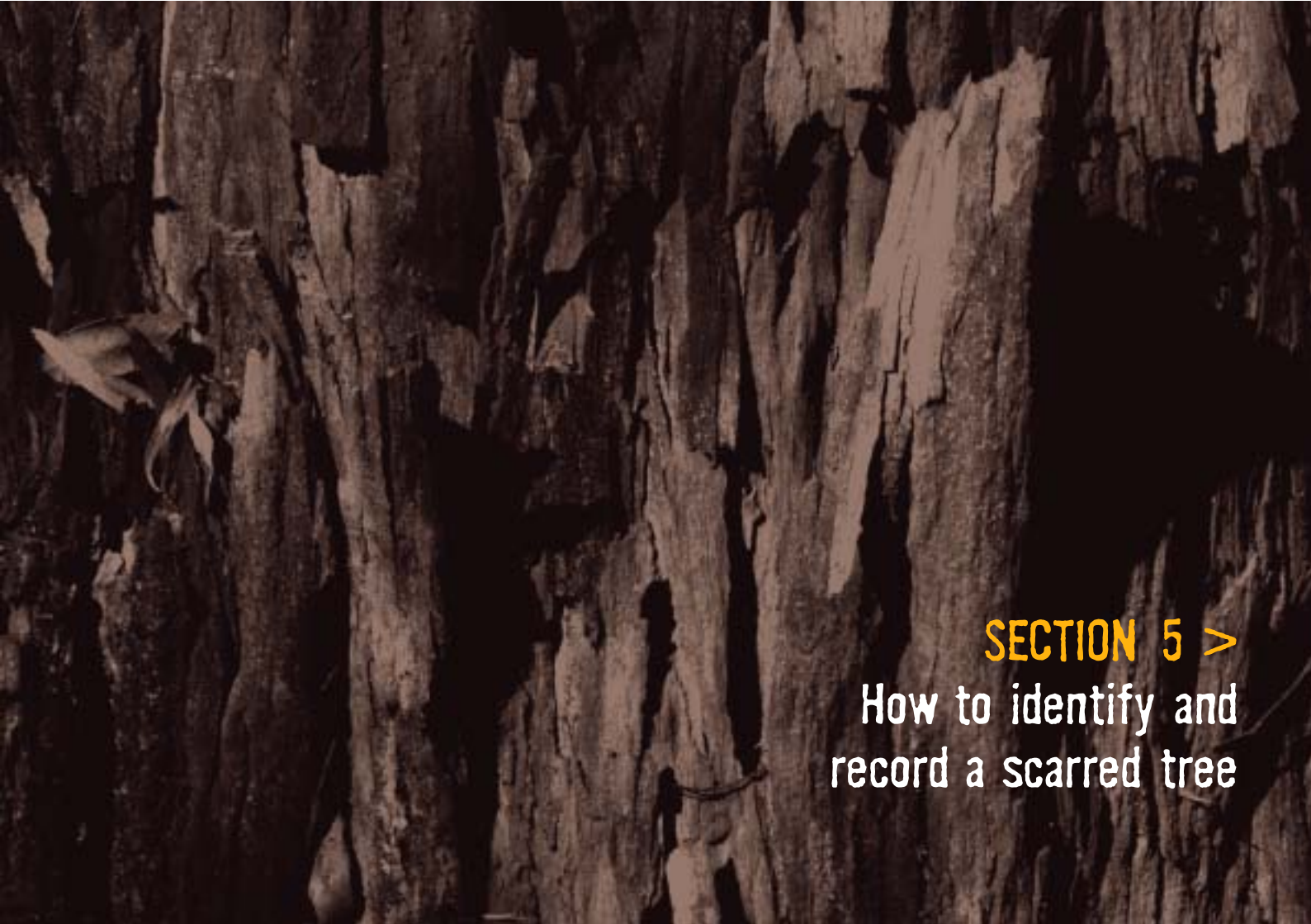
[2] Cannon, Michael (ed.). 1981. *Vagabond Country. Australian Bush and Town Life in the Victorian Age.* Hyland House, Melbourne. p. 40.

groups of scarred trees in the State, reflecting a myriad of domestic uses (e.g. shelters and containers). This diversity is reflected in the range of sizes, shapes and positions of scars on the tree, indicating a broader use than the predominantly shelter-type scars that are found in the eastern parts of the State.

Major impacts that may affect the distribution of preserved scars include extensive clearance and ring-barking of floodplain forests for agriculture, logging of red gum for timber and fuel along waterways and timber getting around townships.

Common scarred tree species include river red gum *(E. camaldulensis)*, black box *(E.largiflorens)*, bimble box *(E. populnea)*, and gum-barked coolibah *(E. intertexta)*. Other species that occasionally display scars include various pine *(cf. Callitris glauca; Callitris murrayensis)* and mallee species.

RIGHT: A typical Riverine scene at Moira on the Murray River in the 19th century, showing four bark canoes in use. The river red gum tree in foreground has two smaller square scars on each bole at mid height, which indicates the widespread use of bark by Aboriginal people in this area. Today only the larger red gum scars, such as the one inset, are generally visible on the outside of these trees. Photo: Nicholas Caire (1837-1918), (Courtesy National Library of Australia: PIC/8465/3 LOC Album 397).



SECTION 5 >
How to identify and record a scarred tree

Before outlining the features to look for when identifying scars, it must be realised that the majority of scars that exist in the Australian landscape today are the result of natural and incidental causes. The cumulative effects of natural tree growth and decay, land clearance and forest management have removed most of the mature trees which held cultural scars in the pre-contact and even historical periods of Australia's past. These have largely been replaced with younger trees bearing the impacts associated with the agricultural and forestry use of the landscape which followed the earlier subsistence use of the landscape after about1850.

The number of surviving cultural scarred trees, both Aboriginal and European, within the vast array of existing scars is low and the environmental circumstances in which they occur are limited. There is no hard and fast procedure for identifying scarred trees, though some general principles apply. There are, however, far more exceptions than there are rules to follow, and in the end the accuracy of a scarred tree identification will depend on the experience and understanding of the recorder, and the opportunity provided by the tree to reveal any evidence of cultural intervention.

Some scars display all the hallmarks of an authentic cultural scar: age, form and the telltale signs of bark removal in the form of tool marks where the bark has been cut and prised off. But these are generally all large scars of a particular type on trees which have been halted in their overgrowth development at an ideal stage to visibly preserve such features.

Others are much less clear, where later impacts and peculiarities in the healing patterns have distorted or hidden the original form and features of the scar. In other cases it is easy to recognise the common features of Aboriginal scars on trees which could not possibly be old enough to have been scarred through traditional or even historical Aboriginal activity.

LEFT: A scarred grey box *(E. microcarpa)* in a road reserve near Wellington. Uncleared road reserves can have preserve 'corridors' of the original vegetation when adjacent paddocks have been entirely cleared.

It has to be expected that some trees of non-cultural origin will be mistakenly registered as Aboriginal heritage sites, while others of a cultural origin will elude discovery. It is through the proper documentation of both the trees and the environment they inhabit that these inconsistencies may be resolved, and this guide can provide the starting point.

How to tell a scarred tree from natural or incidental types of scarring

If you find a tree which you suspect may have an Aboriginal scar it is important to ask yourself the following questions and find satisfactory answers before recording it as a heritage site.

What has happened in the local environment?
Understanding the local environment is a crucial first step in determining the origin of a scar. At the most basic level it is important to recognise whether the environment is natural and whether the scarred tree is part of this environment. Authentic Aboriginal scars are invariably on native trees that have grown naturally in that environment – most typically these will be red gum, box, stringybark or messmate trees, though numerous local variations exist. Aboriginal scars will not occur on exotic trees, plantation trees or trees which have been regrown in logged forests.

The most promising locations for the survival of both Aboriginal and European scarred trees are those where elements of the original, pre-clearance forest or woodland have been preserved. These include road, river, creek and other water reserves, where logging or tree removal has been limited. Scarred trees can also survive as isolated specimens or small groups in paddocks, parkland or forest, but generally these areas will be highly modified and often contain mostly introduced or regenerated trees.

TOP RIGHT: This forest consists mainly of regenerated saplings, and the potential for scarred trees is limited.
BOTTOM RIGHT: There are numerous scars on dead trees in this thinned black box woodland on Bumbang Island, Euston.

Forests in particular do not offer high potential for preserving scarred trees given the high impact of logging and firewood collection, though isolated pockets of original trees may survive. Riverine forests, however, have not generally sustained clear felling, and scarred trees often survive around water margins, or on dead trees ring-barked during forest pasture thinning operations 50–120 years ago, as can be seen in Riverine forests in the Murray Valley.

Bumbang Island, a cut off bend in the Murray River near Euston, is perhaps the best known example of a logged forest where scarred trees survive in large numbers. This is because they occur mainly on dead trees which have not been cleared away for firewood given the island's isolation in mid stream with no ready access during the past 100 years.

What impacts have occurred in the vicinity of the scar?
The impacts which create a scar on one tree will probably have caused scarring of a similar nature on other trees in the same place. If in doubt about the cultural origin of a scar it is very important to check other trees in the vicinity to see whether the same features occur elsewhere, and the form that they take. This can help eliminate from enquiry any natural or incidental scars that may mimic the features of cultural scars through the regular shape of their apertures or other distinguishing features.

How old is the tree on which the scar occurs, and how long has the scar been there?
With some exceptions, Aboriginal and other historical scars in New South Wales will only exist on trees older than 65 years. This assumes that in most areas the last widespread bark removal activity occurred before c. 1950 on trees that were 10–15 years old at the time of scarring. Although in some specific localities, bark was removed for building shelters, often by Aboriginal people, beyond the 1950s, these instances are generally associated with well documented settlements and reserves. Across most of the State the extensive use of bark ceased soon after the end of the 19th century.

TOP LEFT: Tool marks are visible along the edge of a recent scar near Wellington. This is what historical bark removal scars would have looked like before occlusion by overgrowth.
BOTTOM LEFT: Cuts on a scar near Grafton made with a wood cutting axe. These indicate that either the scar origin was incidental or that this is later damage to a scar dry face.

It is difficult to estimate the correct age of a tree given that after 100 years most trees have acquired the uniform attributes of maturity. Tree aging is a technical skill which involves assessing the girth of the tree, the state of the crown, the extent of any damage and the position of the tree in its local environment.

In general, the larger the tree the older it is; but there are numerous exceptions to this. Some small, stunted trees could be very old, while other much larger trees could be only 40 or 50 years old. There simply has not been enough scientific study on the age of commonly scarred tree species to develop an effective visual dating system beyond the first 50–80 years of their life.

An accurate tree age may only be gained through a scientific process involving both C14 (radio carbon dating) and growth ring counting. This may involve destroying part of the tree, though epicormic stems and other major limbs can sometimes be used instead of the main trunk.

One simple way that could be used to assess the age of a scar (and very roughly the age of the tree) is to examine the degree of weathering on a scar dry face. As dead timber is exposed to the elements, through bark removal for instance, it dries and cracks. The more cracked and weathered the dry face, the older the scar is likely to be. Scars that have little cracking are unlikely to be very old and would not normally count as heritage sites even if they are cultural in origin.

The age and extent of overgrowth can also be used to assess a scar's age, as this indicates the length of time a tree has had to repair the damage. Some species, notably red gum, have a remarkable ability in some cases to completely heal over even large areas of damage, while others, such as grey box, cease overgrowth relatively early. One of the best indicators of scar age is whether the overgrowth is covered with old or young bark. It is easy to identify young bark since it is quite different in appearance and texture from bark on the trunk surrounding the scar. The presence of young bark proves that the scar can be no more 10–50 years old.

What impacts have occurred to the tree, and can you work out the order in which they have occurred?

Many scars are the result of several processes, rather than simply the act of removing a sheet of bark. One of the most basic is the process of dieback which can extend the damaged area up and down the tree, dramatically altering the shape and size of the scarred area. This can easily be spotted where tool marks or an early line of overgrowth are preserved, but often there is very little to interpret. In other cases more recent fire or lightning damage or distortion caused by the crushing of the dead scar 'dry face' by the surrounding living wood accompanies the original scarring.

Can you identify the form and size of the original scar on the tree?

One of the most important considerations is to view the scar as it originally occurred, rather than as it appears today. In this way the changes that have occurred to the scar over the years can be identified and discounted as part of the original cultural event. One common mistake is to assess a scar in relation to its current shape without reference to the age of the tree, the age of the scar or the involvement of other impacts in creating what we view today. In some cases healing of the scar can completely obscure the evidence of a cultural scar with overgrowth callus tissue, or decay may totally destroy a scar dry face and it will not be possible to determine the original form of the scar (at least without cutting into the tree).

Is the tree providing enough opportunity to determine the origin of the scar from a surface inspection only?

In some cases it may be possible to make an instant determination, in others the process may take a long time to complete and involve comparing a wide range of factors. A determination in the field may not be possible. If there is any doubt about the Aboriginal

TOP LEFT, BOTTOM LEFT and TOP RIGHT: Mid term overgrowth on a vigorously growing grey box *(E. microcarpa)* in the Murray Valley showing front (top left), side (bottom left) and rear (top right) views. When looking for scarred trees in dense woodland it is often possible to identify a likely scarred tree without actually seeing the dry face, as the bulbous thickening caused by accelerated growth callus may be visible from other angles.
BOTTOM RIGHT: A dead tree near the Bogan River, Nyngan with superimposed scars defined by tool marks. The lower scar is clearly older than the upper scar. Such reuse and management of the bark as a resource is an Aboriginal scarring trait.

origin of a scar, specialist advice should be sought. This may involve technical information on the age of the tree, the use of the land or advice on how to read the evidence displayed by the scar and its overgrowth.

How to tell an Aboriginal scarred tree from a European scarred tree

Caution should always be used when attempting to differentiate between an Aboriginal and a European origin for a cultural scar. While there are several characteristics that are uniquely Aboriginal, there are comparatively few uniquely European attributes, making it hard to demonstrate beyond doubt that an Aboriginal person was not involved in the bark removal process.

The main criteria that are thought to distinguish between a (traditional) Aboriginal scar and a (historic) European scar are the age and type of scar, the types of tools employed and the way in which they were used. The following section briefly discusses each criterion and assesses their usefulness in making a distinction between an Indigenous and a non-Indigenous scar.

Scar Age

The European use of the landscape post-dates the exclusively Aboriginal use of the landscape. Logically, then, European scarring evidence will be more recent. While scientific dating using C14 or growth ring counting can demonstrate that a scar was made during a particular time bracket, this is hard to demonstrate through a subjective appraisal of weathering and overgrowth, except in very recent examples.

Type of Scar

The European collection of bark for construction purposes was extensive, but involved only a narrow range of slab sizes and shapes. These were exclusively rectangular sheets, measuring about 1.5–2.5 m in length, taken from the base of trees and sometimes from around the entire girth. This largely excludes European involvement in scars of different shapes, sizes and positions on the tree to those just described, but does not discount Aboriginal people from using similar rectangular sheets for shelters in the same timeframe.

Tool Types and Patterns

Given the availability of manufactured steel tools in colonial society, stone hatchets were never widely adopted by Europeans. While it appears that the use of the full-size, steel bladed wood cutting axe (blade measuring 10–15 cm in length) was not integrated into Aboriginal culture, steel hatchets were rapidly adopted as soon as they became available on the eastern seaboard during the late 18th century. On scars where a full size axe has been used, particularly in a cross-diagonal or zigzag pattern (an innovation apparently originating in the historical period), a European purpose is more likely, but it does not absolutely preclude the use of the same tools and techniques by Aboriginal people.

Any claims for an exclusive European origin of a scarred tree must carefully consider all the scar attributes and contextual data (e.g. environmental & historical) before drawing this conclusion.

How to record a scarred tree

This section is intended to help explain to those unfamiliar with the scar recording process how to undertake the effective documentation of scarred trees. Such documentation will provide a consistent and accurate database of information on scarred trees on the Department of Environment and Conservation AHIMS register and a better understanding of scarred trees in general.

> **Tree Location** – an accurate grid reference using a GPS is ideal, though manually computed grid references using the best available scale of topographic map or even a sketch plan may be sufficient.

> **Tree Species** – a range of field guides to trees in New South Wales are available. These should be consulted for general background information about tree species

TOP LEFT: Two parallel lines of sharp incisions made by steel hatchet (Blade 5-10 cm L) along the top of a shelter scar (compare with the photo below).
BOTTOM LEFT: A line of potential stone axe marks along the base of this shelter scar. Note the deep indentations that have survived on this weathered surface.

and their attributes. If in doubt, a generic name (e.g. gum, box or stringybark) will suffice as these broadly describe the type of bark that was available.

> **Tree Condition** – in general most living trees can be described as being in good health unless they have lost most of their foliage due to stress (e.g. fire, insect infestation, lack/surplus of water). Even in these cases, a tree may recover and continue living for decades longer, so poor health should only be noted where it is clear that the life of a tree is threatened.

> **Girth of the tree at 1.5m high** – a consistent measure at chest height that allow comparisons to be drawn between different trees. Note: this only applies to the main bole, not subsidiary limbs. If these get in the way of the measurement, try the nearest clear spot up or down the trunk and note the location of the measurement on the recording form.

> **Scar Dimensions** – for consistency, measure the length and width of the current dry face, rather than attempting to estimate the original dimensions of the scar panel. Where present, length should be measured between the outer bands of tool marks.

> **Overgrowth** – there are at least two dimensions to overgrowth, thickness (radial, from the centre of the tree) and width (measured from the outer edge of the overgrowth, where discernible, to its inner edge over the dry face). These measurements (top, left, right, bottom) record the width of overgrowth and allow an estimate to be made of the amount of the scar no longer visible. Overgrowth can be very uneven and so an average measurement will suffice in most cases. When dieback has extended the length of the scar beyond the original bark removal panel, as demonstrated by axe marks or weathering discontinuities, do not record the top and bottom overgrowth measurements as they are misleading.

TOP RIGHT: Zig-zag tool marks made by a steel woodcutting axe (blade 10-15 cm length).
BOTTOM RIGHT: Accurately documenting a scarred tree and its location is the first step to ensuring its future protection. Here the author is using a GPS to record the location of a tree.

- **Scar orientation** – the compass orientation to which the scar is facing (to the nearest 15°), or cardinal point if in doubt.
- **Origin of Scar** – this can be very hard to demonstrate, though it can be assumed that in general most cultural scars will be considered Aboriginal rather than European. Use the criteria outlined in this manual, and if there is any doubt whether a scar is cultural or not, record your reasons for this.
- **Type of Scar** – these types are explained in this manual. In general most Aboriginal scarred trees will be bark removal scars, created by the removal of bark alone.
- **Scar Preservation** – this is a combination of two attributes. Firstly, the extent to which the original attributes of a scar are preserved (e.g. shape, integrity, tool marks), and secondly the extent to which the scar timber has physically decayed. An excellent condition scar will have a clearly defined shape, little distortion to its outline and be solid and stable. A very poor condition scar will have relatively little remaining at all, possibly just a partial ring of overgrowth around a hollow. Only use terms such as 'destroyed' when all signs of a previously identified scar have been physically removed from the tree (e.g. by fire).
- **Toe Holds** – record whether they are present or not and their number in total. In some cases toe holds will be the only scars on a tree.
- **Tool Marks** – these include both hatchet (5–10 cm length) and axe (10–15 cm length) marks. Record the number of surviving marks and whether they are derived from steel (axes and hatchets) or stone (hatchets only). Note that stone tool marks are very rare and that weathered steel tool marks can resemble stone tool marks. If in doubt, tick unknown.
- **Type of Tool Marks** – this refers to the pattern the tool marks form on the scar. Parallel or singular lines commonly appear at the top or base of the scar, usually in

LEFT: Any cultural scar longer than 3 metres is most probably the result of canoe manufacture, as in the case of this scarred narrow-leaved box *(E. microcarpa)* near the Macquarie River, Dubbo. This is almost certainly the result of Aboriginal scarring.

a horizontal orientation. Very occasionally the lines will clearly occur in a circular arc, suggesting that the scar may have been a curved pre-form, such as a container or canoe. Criss-cross or cross-diagonal marks can occur as lines of leaning tool strokes, sometimes all in the same orientation, sometimes forming a zigzag line or series of crosses where the tree has also been hit with a backstroke. Random tool marks occur in a seemingly patternless grouping and are either unrelated to the scar or suggest that the scar was incidental in origin.

> **Epicormic Stem Present** – note whether an epicormic stem is growing from the base of the scar or not. In some cases this could potentially be used to date the scar through dendrochronology.

> **Sketches** – these are valuable opportunities to document the overall character and dominant features of each scar and the relationships between scars on a single tree. There are numerous exceptions to the classic scar and a diagram is the best way of explaining this.

In some situations there may not be adequate time, scope or resources to fully document every scarred tree in a field study to the standard outlined above. In this situation, a series of photographs containing a metric scale showing the following attributes will allow a basic level of recording:

1 > the entire tree including the position of the scar(s), to document the tree size, age, condition and the context of the scarring.

2 > the entire scar(s), showing the full aperture, dry face and overgrowth.

3 > Close-ups of the top, middle and bottom of the scar, as required, to show the position and relationship of any tool marks.

If a metric scale is used, it will be possible to accurately estimate the scar and tree measurements from these photographs. If a digital camera and GPS are used it will be possible to provide a basic recording of scar location and characteristics in under five minutes.

Glossary of scarred tree terms

Accelerated growth: The extensive growth of massive *xylem* tissue around the margins of an area of damaged *sapwood*, frequently caused by the *bark removal*, in an attempt to compartmentalise or *overgrow* the dead zone to limit the spread of decay. This process is generally an accelerated response, which occurs at a greater rate than the formation of *annual growth rings*, particularly in mature or senescent trees, which can result in massive bands of *accelerated growth callus* or *burls*. This growth invariably occurs along the lateral sides of scar *dry faces*.

Accelerated growth callus: The woody tissue resulting from *accelerated growth* on the margins of damaged areas of *sapwood* (see also *overgrowth*).

Annual growth rings: A sheath of wood added to the stem and branches of a tree. This growth takes place by division and expansion of cells in the *cambium*, located beneath the protective *bark* and *phloem*. This growth can take place on an annual or irregular basis, and will increase the diameter of the trunk over time. This process slows down as the tree passes from maturity to senescence.

Axe cuts: Evidence of deliberate blows where heartwood has been cut into and removed (e.g. for cutting a possum hole or removal of a wooden artefact blank). Also known as 'scarfs' (see also *Tool marks*).

Bark: A protective covering for the *phloem*, *cambium* and *sapwood* of a tree. Bark is renewed and 'shed' on either an annual or gradual basis as a result of division and expansion of cells within the cambial layer.

Bark slab: A large piece of bark removed from the tree, normally for artefact or structure manufacture (aka *sheet*).

Bark removal: The process of deliberate bark stripping, as opposed to degenerative processes which result in the gradual loss of bark through decay. This process results in a *bark removal scar*, the commonest type of cultural tree scarring in New South Wales.

Bark strip: A small piece of bark removed from the tree, normally for use as a raw material in a manufacturing process (e.g. as twine).

Bio-deterioration: Decay caused by biological processes such as fungal and bacterial alterations. Lichens and other higher plants are included.

Burl: A localised surface irregularity on a tree bole, largely composed of *accelerated callus tissue*. The development of these features is a tree's response to sapwood decay or insect infestation. The development of *accelerated growth callus* is designed to 'compartmentalise' the source of infestation from the healthy areas surrounding the burl. As a result they are usually partially hollow, and often used for bowl or dish ('coolamon') manufacture by Aboriginal groups.

Callus: (see *accelerated growth callus*)

Cambium: The growth zone that occurs at the interface between bark and sapwood across the stem and limbs of a tree. Division and expansion of cells within the cambial layer results in the formation of wood (*xylem*) on the interior surface, with bark and *phloem* added to the outer side.

Dieback: A generic term for a variety of processes resulting in the death of the *cambium* surrounding a scarred area, often above or below the area of a cultural scar *panel*. One explanation for this effect, is that the dislodgement of bark around the periphery of a cultural (e.g. bark removal) or incidental scar (e.g. vehicle impact) allows oxygen to access and destroy the *cambium* across a far wider area than that originally scarred. It is highly characteristic of scars with pronounced horizontal ends (e.g. the removal of large rectangular slabs), which effectively results in the creation of elongated ovate scars, regardless of the shape of the original *panel*. The action of insect infestation may also result in dieback.

Dieback is a gradual, rather than sudden event, and bark can remain adhering to the stem for an extended period before sloughing away. This can result in the development of *overgrowth* beneath the existing bark layer and differences in the

weathering rate for the underlying *sapwood* surface.

Dry face: The dead, exposed sapwood or heartwood surface of a scar.

Epicormic stem: A subsidiary limb on a tree bole, caused by a traumatic event resulting in a reduction of the canopy (e.g. fire, the removal of a sheet of bark or ring-barking event). An epicormic shoot or stem will be located immediately below a section of damaged trunk which interrupts the connection between the roots and the canopy and is a common feature associated with cultural scars.

Extant scar: The extent of the current *scar dry face*, as viewed today, comprising the visible component of the original damaged sapwood surface, as modified by *overgrowth*, *dieback*, terrestrial weathering, erosion (e.g. fire) and other physiological processes caused by subsequent growth of the tree (e.g. dead wood compression and distortion).

Grub procurement scar: A scar or area of compound scarring caused by the deliberate whittling of bark and sapwood in the process of locating and removing the grubs of a variety of moth species.

Heartwood: The innermost and oldest wood (*xylem*), located inside the *sapwood* layer. As this tissue is dead, it is no longer functional for water transport or food storage. It is often characterised by coloured deposits of various compounds which result in an enhanced durability (Boland *et al* 1994: 650). The innermost part of the heartwood is known as *pith*.

Occlusion: The process by which the margins of a scar dry face are concealed behind *overgrowth*.

Overgrowth: This term is preferable to the more commonly used 'regrowth', which gives a false impression of the renewal of a bark layer covering the scarred area, as opposed to the partial occlusion of the panel by the lateral growth of *accelerated growth callus*, which is composed of *xylem*. When the bark has been removed the underlying *sapwood* is effectively dead, and under normal circumstances will be preserved, together with any cultural attributes (e.g. *tool marks*), behind the overgrowth. A distinction is made within this report between *primary overgrowth*, which occurs around the original scarred area and *secondary overgrowth*, which occurs around areas of subsequent damage (e.g. *dieback*).

Outline: This term can be applied to the edge of both the extant scar dry face, as viewed today and the original *panel*, which defines the size and shape of the bark slab removed.

Panel: The part of a *scar dry face* defined by *tool marks* resulting from the removal of a bark *slab*. A panel is invariably modified by post-scarring processes including *overgrowth* and *dieback* (aka frame)

Phloem: Vascular tissue that conducts synthesised foods (e.g. sugars and proteins) from the leaves to the roots in plants. Also known as the 'Inner bark', the phloem occurs as a thin layer overlying the *cambium*.

Pith: The central and oldest part of the tree, lying at the centre of the *heartwood*.

Possum hole: A *resource extraction* hole specifically designed for the location or removal of small animals from the interior of hollow trees. Although commonly known as possum holes, these 'cuts' may also be used for locating honey, eggs and any other arboreal resource.

Resource extraction: The process of removing small animals, eggs or honey from trees, frequently involving the cutting of small holes (*resource extraction holes*) into tree boles or limbs for locating, smoking out or removing game (*Possum holes*). This process may also result in the manufacture of *toe holds*.

Sapwood: The most recently formed, outermost portion of the stem and limbs, which is functional for the transport of water and mineral nutrients (commonly starch) up the stem to the crown for storage. Sapwood is living tissue and non-durable. Consequently, this layer weathers rapidly in

comparison to the underlying dead tissue of *heartwood* (Boland *et al* 1994: 653).

Scar: The cambial surface of the sapwood exposed by wounding. On weathering, the scar *dry face* may also be composed of heartwood.

Scarf: An angular cut made in a tree bole or limb with axe, saw or similar, usually in the process of felling a tree. These cuts could also be the result of grain or heartwood inspection, resource extraction holes or vandalism (see also '*Axe cuts*').

Toe hold: A small incision into the bark designed to create a hold utilisable in tree climbing. Commonly known as 'toe holds', these shallow cuts could be equally used with the hands. Normally these occur in staggered lines on steep to moderately steeply angled trees resulting from a single tree climbing event. Given the small size of these scars, authentic Aboriginal toe holds are usually only found on dead trees.

Tool mark: A residual indentation displayed on a scar *dry face*, caused by the incision of the overlying bark layer. Unlike *axe cuts*, these marks were not deliberately intended to cut into the sapwood layer. In the case of steel tools, these will be very shallow (<5mm), but may be deeper in the case of stone axe marks.

Tree marking: A surgical cutting of the bark layer for symbolic of demarcation reasons, potentially revealing the underlying *cambium* and resulting in a scar. This process is distinct from tree carving, which involves cutting into the sapwood layer.

Wood removal: The incision of *sapwood* or *heartwood* for the purposes of wood extraction, either for artefact manufacture (e.g. Aboriginal shields, waddies *etc.*; non-Indigenous fence posts, slabs etc.) or the creation of a *resource extraction* hole.

Wounding: Any event which results in the death of the cambium over an area sufficient to cause the overlying bark to die and peel off.

Xylem: Wood produced by the division and expansion of cells on the inner side of the cambial layer. The most recent xylem is *sapwood*, which forms an outer layer of living tissue to the *heartwood* (which forms the more durable dead centre of the tree).

Some further reading

Baillie, M. 1982. *Tree Ring Dating and Archaeology*. Croom Hem, London.

Basedow, H. 1914. 'Evidence of bark canoes and food containers on the river Murray, South Australia', *Man* 14, 129.

Beesley, J. 1989. The Scarred Tree; a project for the Victoria Archaeological Survey. VAS, Melbourne.

Bell, D. 1979-1980. Aboriginal Carved Trees in New South Wales. 2 parts. Unpublished report to NSW National Parks and Wildlife Service.

Bell, D. 1982. Aboriginal Carved Trees in South Eastern Australia. Unpublished report to NSW National Parks and Wildlife Service.

Berndt, R. 1941. 'The bark canoe of the lower river Murray, South Australia', *Mankind* 3 (1), 17-28.

Berndt, R., Berndt, C. and Stanton, J. 1982. *Aboriginal Visual Art: a Visual Perspective*. Methuen, Melbourne.

Beveridge, P. 1883. 'On the Aborigines inhabiting the Great Lacustrine and Riverine Depression of the Lower Murray, Lower Murrumbidgee, Lower Lachlan and Lower Darling', *Journal and Proceedings of the Royal Society of New South Wales* 17, 19-74.

Beveridge, P. 1889. *The Aborigines of Victoria and Riverina, as seen by Peter Beveridge*. Hutchinson, Melbourne.

Black, E. 1947. 'The canoes and canoe trees of Australia', *Mankind* 3 (12), 351-361.

Black, E. 1965. 'Australian canoes and canoe trees', *The Journal of the Anthropological Society of South Australia* 3 (5), 7-8.

Black, L. 1941. *Burial Trees*. Robertson & Mullens Ltd, Melbourne.

Boland, D., Brooker, M., Chippendale, G., Hall, N., Hyland, B., Johnston, R., Kleinig D. and Turner, J. 1994. *Forest Trees of Australia*. CSIRO.

Bourke, C., Johnson, C. and White, I. 1980. *Before the Invasion; Aboriginal Life to 1788*. Oxford University Press, Melbourne.

Chattaway, M. 1953. 'The anatomy of bark. The genus eucalypt'. *Australian Journal of Botany* 1 (3), 402-433.

Costermans, L. 1983. *Native Trees and Shrubs of South-eastern Australia*. Second Edition. Lansdowne Publications Pty Ltd., Sydney.

Curr, E. 1886-87. *The Australian Race*. (4 volumes.). John Ferres, Melbourne.

Davidson, D. 1935. 'Chronology of Australian watercraft'. *Journal of the Polynesian Society* 44 (173), 79-81.

Davidson, D. 1937. 'Transport and receptacles in Aboriginal Australia', *Journal of the Polynesian Society* 46, 175-205.

Dick, T. 1915. 'Origins of the heliman or shield of the coastal Aborigines of New South Wales', *Journal and Proceedings of the Royal Society of New South Wales* 49, 282-289.

Edwards, R. 1972. *Aboriginal Bark Canoes of the Murray Valley*. Rigby, Adelaide.

Enright, W. 1900. 'The language, weapons and manufactures of the Aborigines of Port Stephens', *Journal and Proceedings of the Royal Society of New South Wales* 34, 95-129.

Etheridge, R. 1918. *The Dendroglyths or "Carved Trees" of New South Wales*, Memoirs of the Geological Society of New South Wales, Ethnological Series 3. Government Printer, Sydney.

Fletcher, P. C. 1890. *Hints to Immigrants; a Practical Essay upon Bush-Life in Queensland*. Brisbane.

Florian, M. 1982. Conservation of Aboriginal Carved Trees, Unpublished report to NSW National Parks and Wildlife Service.

Geering, K., Ravenscroft, M. and Roberts, C. 1991. 'The preservation and management of Aboriginal carved trees,' *Historic Environment* 8, 42-46.

Govett, W. 1977. *Sketches of New South Wales, Written and Illustrated for The Saturday Magazine in 1836-37*. Gaston Renard, Melbourne.

Gunson, N. (ed.) 1974. *Australian Reminiscences and Papers of L.E.Threlkeld, Missionary to the Aborigines 1824-1859*. 2 volumes. AIAS Australian Aboriginal Studies 40.

Henderson, J. 1854. *Excursions and Adventures in New South Wales*. 2 Volumes. Saunders and Otley, London.

Hodgkinson, C. 1845. *Australia from Port Macquarie to Moreton Bay; with descriptions of the natives, their manners and customs; the geology, natural productions, fertility, and resources of that region.*

Hornell, J. 1946. *Water Transport; Origins and Early Evolution*. Cambridge.
Kenyon, A. 1940. 'Tree Marks of the Blacks', *Wild Life* 2 (11), 14-16.
Krefft, G. 1866. 'On the Manners and Customs of the Aborigines of the Lower Murray and Darling', *Transcripts of the Philosophical Society of New South Wales* 1862-1865, 357-374.
Lane, K. 1978. 'Carved trees and initiation ceremonies on the Nambucca River', in McBryde, I. (ed.) *Records of Times Past; Ethnohistorical Essays on the Culture and Ecology of the New England Tribes*. AIAS, Canberra, 222-234.
Lindsay, H. 1957. 'Canoe trees of the Murray Valley', *Riverlander* Dec. 6, 21
Long, A. 1997. Draft Guidelines for the Identification, Recording and Conservation of Scarred Trees. Unpublished report to NSW National Parks and Wildlife Service.
McBryde, I. 1985. 'Thomas Dick's Photographic Vision', in Donaldson, I and T. Donaldson (eds.) *Seeing the First Australians*. Georegg Allen & Unwin, Sydney: 137-163.
McCarthy, F. 1935. 'A shield tree', *Australian Museum Magazine* 5 (11), 375-376.
McCarthy, F. 1940. 'The carved trees of New South Wales', *Australian Museum Magazine 7* (5), 161-166.
McCarthy, F. 1944. 'The making of a bark canoe', *Australian Museum Magazine* 8 (6), 184-187.
McCarthy, F. 1945. 'Australia: Archaeology. Catalogue of the Aboriginal Relics of New South Wales. Part 3. Carved trees or dendroglyths', *Mankind* 3 (7), 199-206.
Mckenzie, E. 1964. 'An Aboriginal "possum tree"', *The Queensland Naturalist* 17 (3-4), 58-59.
Maiden, J. 1889. *The Useful Native Plants of Australia (including Tasmania)*. Committee of Management, The Technological Museum of New South Wales, Sydney and Trubner & Co., London.
Mann, J. 1883. 'Notes on the Aborigines of Australia', *Proceedings of the Geographical Society of Australasia (New South Wales Branch)*, 1 (1), 27-63.
Mathews, R. 1896. 'Australian ground and tree drawings', *American Anthropologist* 9, 33-44.
Mathews, R 1905. *Ethnological Notes on the Aboriginal Tribes of New South Wales and Victoria*. F.W. White, Sydney.
Megaw, J. 1994. '"There's a hole in my shield...": a Textual Footnote', *Australian Archaeology* 38, 35-37.
Pleydell, J. 1991. 'Wattle bark stripping', *Gippsland Heritage Journal* 11, 46-47.
Ravenscroft, M. 1986. Conservation of Aboriginal Carved Trees. Unpublished report to NSW National Parks and Wildlife Service.
Rhoads, J. 1992. 'Significant Sites and Non-site Archaeology: a Case-study from South East Australia', *World Archaeology* 24 (2), 198-217.
Sharp, L. 1952. 'Steel axes for stone age Australians', in Spicer, E (ed.) *Human Problems in Technological Change; a Casebook*. The Russell Sage Foundation.
Simpson, B. 1940. 'Aboriginal Trees', *Wild Life* 2, 28-29.
Smyth, R. Brough 1878. *The Aborigines of Victoria and Other Parts of Australia and Tasmania* (2 vols.), John Ferres, Government Printer, Melbourne.
Stephens, E. 1889. 'The Aborigines of Australia', in *Journal and Proceedings of the Royal Society of New South Wales* 23, 476-503.
Sullivan, S. 1984. 'Aboriginal scarred trees', *Heritage Australia* 3 (2), 36-41.
Thomas, N. 1905. 'Australian canoes and crafts', *Journal of the Anthropological Institute of Great Britain and Ireland* 35, 56-79.
Thomas, N. 1906. *Native Tribes of the British Empire – The Natives of Australia*. Archibald Constable & Co., London.
Watchman, A. 1991. Aboriginal Carved Tree Conservation Project; Final Report. Unpublished report to NSW NPWS.
Worsnop, T. 1897. *The Prehistoric Arts, Manufactures, Works, Weapons, Etc., of the Aborigines of Australia*. C.E. Bristow, Adelaide.
Wyndham, W. 1889. 'The Aborigines of Australia', in *Journal and Proceedings of the Royal Society of New South Wales* 23, 36-42.
Yu, P. 1976. '"possum trees", trees scarred by Aborigines to aid in the hunting of possums', *Aboriginal and Islander Identity* 2 (7), 7-9.

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