9. The contribution of bark as fuel

Bark fuel consumed on standing trees can make an important contribution to fire behaviour in eucalypt forests, particularly during dry conditions in summer and autumn. Dead bark contributes to the available fine fuel load, and can provide a pathway for flames to spread vertically up the stem and into the crown of a tree. Bark characteristics also have a dominant influence on the propagation of spot fires (McArthur 1967). Fires burning in forests composed of trees with fibrous outer bark, as exemplified by stringybark and peppermint bark types, can exhibit concentrated short-distance spotting which greatly increases the difficulty of fire suppression. Long ribbons of loose bark, which tend to accumulate on the stems of smooth-barked eucalypts, can cause long-distance spotting many kilometres ahead of a spreading fire.

Bark consumption is also important from an ecological and silvicultural perspective, because it affects the extent to which stems are heated during a fire. Thermal damage to the cambium can result in fire-scarring and subsequent wood degrade. Bark thickness is the principal factor governing temperature rise at the cambium during a fire (Martin 1963, McArthur 1968, Vines 1968). Bark texture and moisture content also play a role in stem heating, because these factors affect the ignition and extent of consumption of the outer bark (Gill and Ashton 1968). Repeated bark loss as a result of fires may have a cumulative effect on the capacity of trees to withstand thermal damage.

In this study we chose to concentrate on the contribution of jarrah bark as fuel, because jarrah is the dominant eucalypt species in the overstorey and intermediate canopy level at both study sites, and because the jarrah bark has been observed to be an important source of firebrands for spotting. Jarrah has a fibrous bark (stringybark) that extends over the entire stem to the fine branches, and varies in condition according to the previous fire history of the stand. Jarrah stems in stands subject to low-intensity fuel reduction burning are often lightly charred to a height of a few metres, while stands recently burnt by intense wildfires may be heavily charred to the full height of the trees (30–35 m). Peet and McCormick (1971) observed that char heights on the bark of jarrah were greater as a result of fires occurring in autumn than in spring. Where fire has been absent for 20 years or more, jarrah bark is brown to grey in colour and may become fissured to a depth of 2–3 cm. The other common eucalypt at both study sites is marri (*Corymbia calophylla*), which has a bloodwood-type bark. Marri bark tends to burn in-situ on the stem rather than flaking off to form firebrands.

The important contribution of bark fuel to fire behaviour has long been recognised, and several previous studies have examined the quantity of bark consumed during fires in the jarrah forest (Peet and McCormick 1965, Burrows 1987, Burrows *et al.* 2001). Bark losses from red stringybark (*Eucalyptus macroryncha*) in the ACT were found to be correlated with fuel load, rate of fire spread and fire intensity (Gill *et al.* 1986). Kellas (1992) noted the importance of fire intensity, seasonal dryness and existing bark condition in determining bark loss from messmate stringybark (*Eucalyptus obliqua*) in the Wombat Forest of western Victoria.