Fire in Mallee Communities

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Fire is a 'natural' process in Mallee Communities. Noble *et al* (1980) found Mallee plant communities notable for their flammability and identified fire as a significant problem for land managers. Fire, along with drought, frost & storms, is a recurring disturbance event in Mallee communities (O'Brien, 1989, LCC 1989). Because of this, the flora & fauna of the Mallee has evolved in an environment with fire as a recurring event (Cheal *et al* 1979). This has led to plant adaptations to fire such as lignotubers (Mallee *Eucalyptus* spp), serotinus seeding (*Banksia ornata*) and a large proportion of resprouting species (Gill - Biota?, Cheal *et al* 1979).

The Mallee contains key habitat for several nationally rare and threatened bird species (Nat Plan ?). Four species which are of particular conservation concern are: slender-billed thornbill (*Acanthiza iredalei hedleyi*), mallee emu-wren (*Stipiturus mallee*), red-lored whistler (*Pachycephala rufogularis*), and malleefowl (*Leipoa ocellata*). The slender-billed thornbill and mallee emu-wren appear to favour vegetation which is recovering from fire, however as the vegetation becomes taller and denser (10 - 30 years after fire) their abundance decreases. Whereas the abundance of red-lored whistler generally increases after this period. The malleefowl prefers older vegetation (> 30 years), where mallee trees are taller and the understorey is more open and surface litter levels are higher (Benshemesh ?).

Other Mallee species, including mammals, reptiles and invertebrates are less well known, but appear to be have similar habitat preferences for different 'seral' stages of vegetation. Hence maintaining a range of successional states is important in determining Fire Regimes for Mallee vegetation. Even if the habitat favoured by each species is uncertain we can be sure that in a larger Mallee areas such as the Big Desert and Sunset, there are some species that need each of the successional states.

Ecologically-based Fire regimes

The process currently being used to develop 'ecologically appropriate' fire regimes in Victoria is based on 'Vital Attributes'. The 'Vital Attributes' of the flora and fauna of an area are used to determine the minimum and maximum Tolerable Fire Intervals for a particular vegetation type which will maintain the suite of species which it contains (Friend & Tolhurst 2001). This then forms the key tool to identify critical fire management issues which need management.

The vital attributes scheme of Noble & Slatyer (1980) is based on classifying plant species on the basis of their Regeneration strategy, Conditions for establishment and Relative longevity (Table 1).

Table 1: Noble & Slatyer's Vital Attributes for Flora

Species' Vital Attributes.

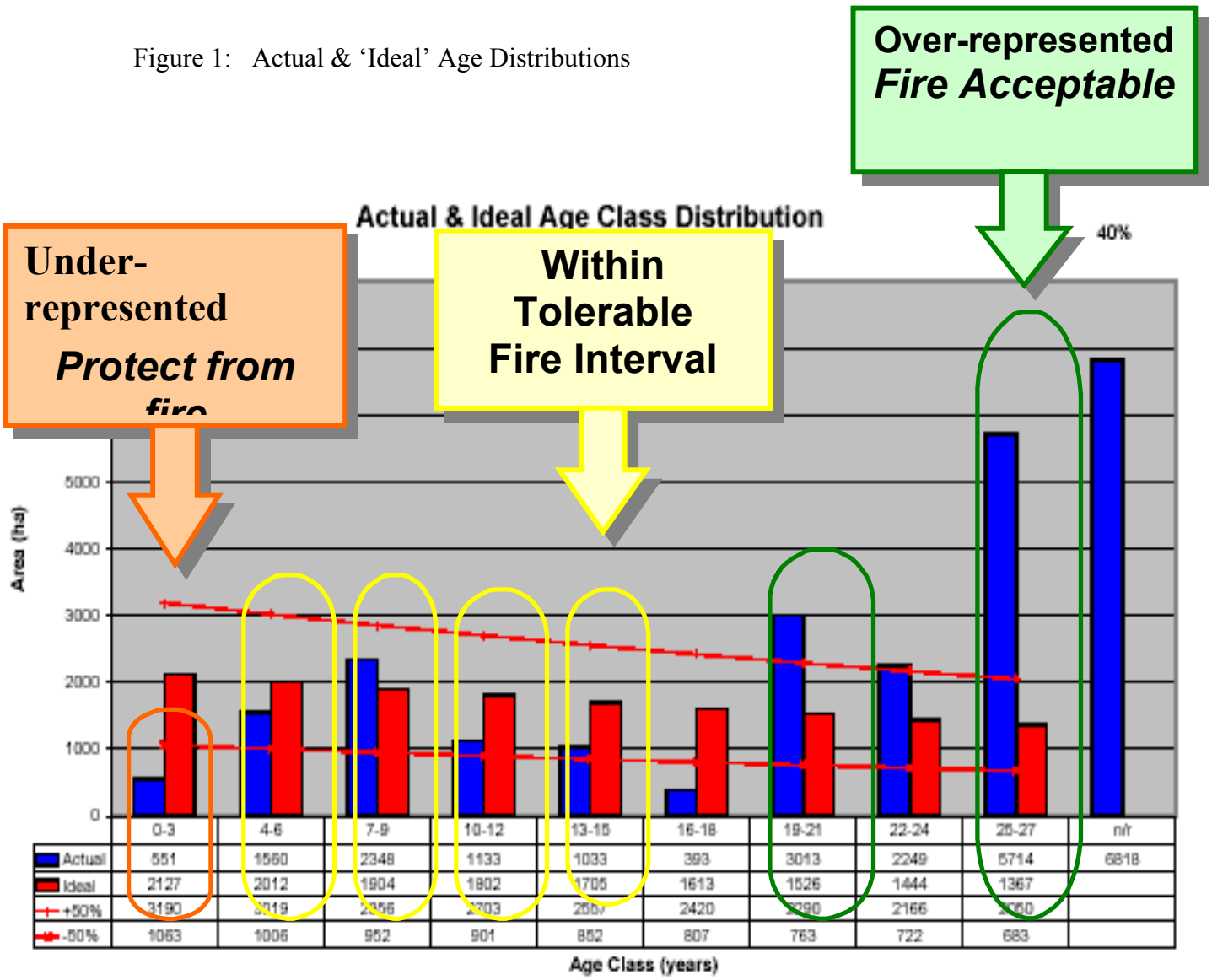
Regenerative Strategy / Method of Persistence (RS)	
	Seedling establishment
D	Seed dispersed long distances
S	Seed stored, maintains viability for long period, partial germination per disturbance
G	Seed stored, maintains viability for long period, single germination per disturbance
C	Seed short-lived, exhausted after single germination
	Vegetative mechanisms
V	sprouters: all ages survive, all become juvenile
U	sprouters: mature remain mature, juveniles remain juvenile
W	sprouters: mature remain mature, juveniles die
	Dual mechanisms
d (δ)	dispersed seed + mature remain mature + juvenile may or may not resprout (D + U or W)
s (σ)	Seed store + mature remain mature + juvenile may or may not resprout (S + U or W)
g (γ)	Seed store with one germination + mature remain mature + juveniles die (G + W)
Conditions for Establishment (TIR)	
T	tolerant, will establish in presence of adult competition (multi-aged population)
I	intolerant, needs disturbed site with competition removed (single aged population)
R	requires some precondition to be met before establishment, delayed establishment
Relative longevity (m, l, e)	
m	the time taken for a species to reach reproductive maturity (sexual or vegetative)
l	the longevity of the species reproductive population within the community
e	the time taken to reach local extinction (no reproductive material remains)

A similar scheme for describing the vital attributes of fauna species has been proposed by Friend (1999, 1989?). Response patterns in fauna are closely tied to the species shelter, food and breeding requirements, which generally depend on the structure and floristic composition of the habitat/vegetation.

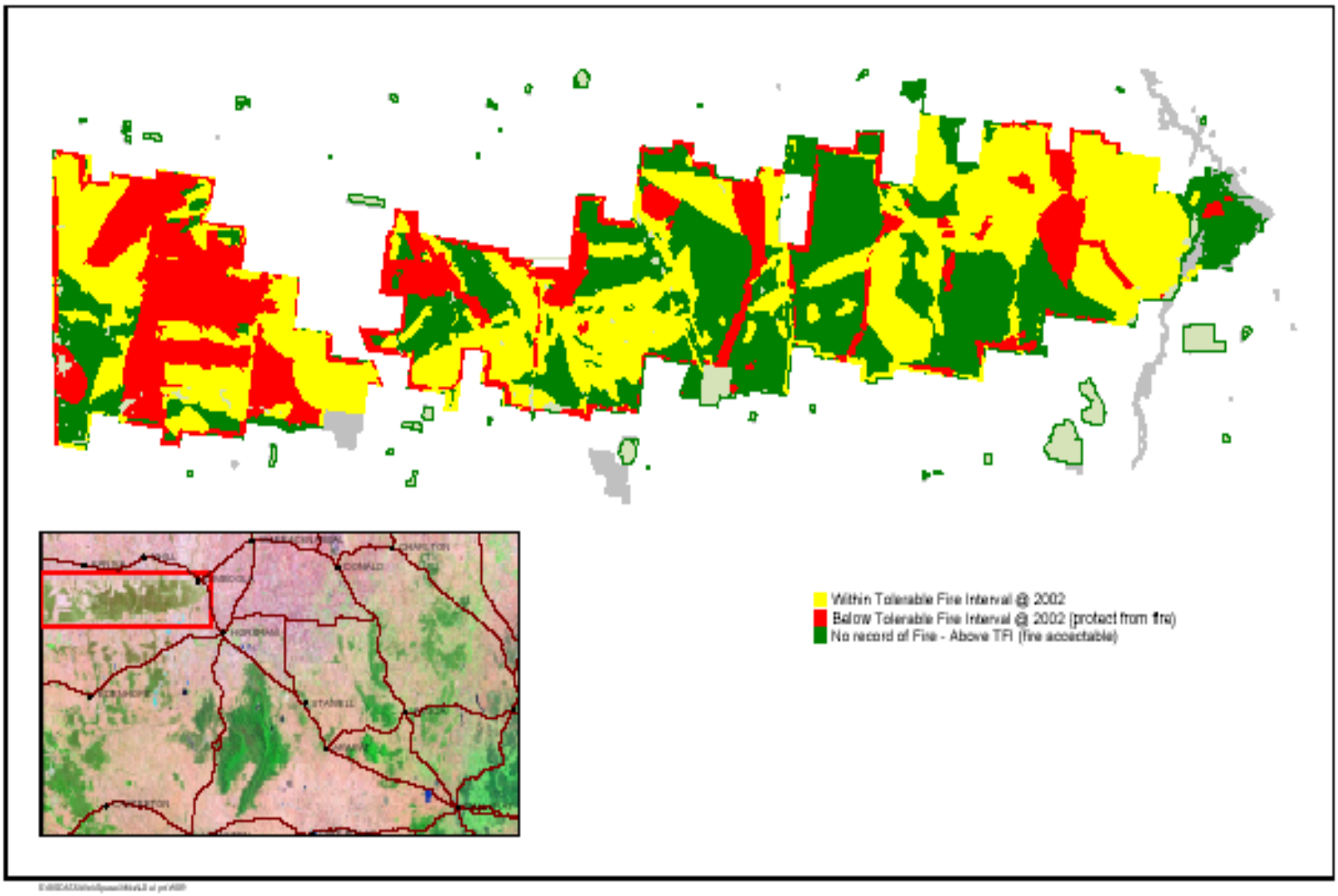
From these 'Vital Attributes' of the flora and fauna of the Mallee, we can identify those species which are most vulnerable to extremes of fire regime (eg too frequent fire intervals or too infrequent fire intervals) – we call these Key Fire Response Species (Friend & Tolhurst 2001). They are the most likely species to be affected by inappropriate fire intervals and hence are species which are critical in determining appropriate ecological fire regimes. The Key Fire Response species most likely to be affected by too frequent fire events, will determine the lower tolerable fire interval for a vegetation/habitat type, and the species most likely to be affected by too infrequent fire events, will determine the upper tolerable fire interval for a vegetation/habitat type. We now have some tools with which to assist planning fire regimes in relation to biodiversity outcomes.

The age class distribution for vegetation can be assessed against one that is 'ideal' for the range of flora & fauna of a vegetation type (Figure 1). The areas identified for management action can then be mapped (Map 1).

Figure 1: Actual & 'Ideal' Age Distributions



Map 1: Mapped Areas above/within/below Tolerable Fire Intervals



Fire Patterns in Victorian Mallee

In Victorian Mallee, the average fire occurrence (including prescribed burning) since 1932 is around 24,000 ha per year (Figure 2) and single fire events, occurring approximately every 20-30 years account for a significant proportion of this area (Figure 3). A high proportion (xx%) of these fires are caused by lightning and occur in the remote areas of the Big Desert and Sunset. Under the current climatic conditions and fire management arrangements, these historic levels of fire occurrence are likely to continue into the future.

Mallee communities in Victoria occupy both large blocks (> 1,000,000 ha in Sunset & Big Desert) and small reserves (some 400+ reserves of < 100 ha, most < 20) (Map 2). There have been some 500 fire events (both wildfires and prescribed burns) mapped since 1932 (Map 3), with a wide range of areas and locations. One of the key issues which need to be addressed in developing ecological fire management for the larger areas is catering for Malleefowl and the suite of other Mallee birds appear to prefer mature mallee habitat for breeding (i.e. > 40 years since fire). Currently only some 30% of Mallee communities provide suitable habitat for these species (Map 4). This is mainly due to the large fires in 1958, 1973, 1977, 1981, 1985, 1999 and 2003.

In the absence of fire events, this area will increase significantly over the next 30 years (Maps 5-7). However if the average area burnt per year of around 24,000 ha continues, this habitat gain may be significantly diminished (Figure 5).

Figure 2: Annual Areas Burnt in Victorian Mallee 1932-2003

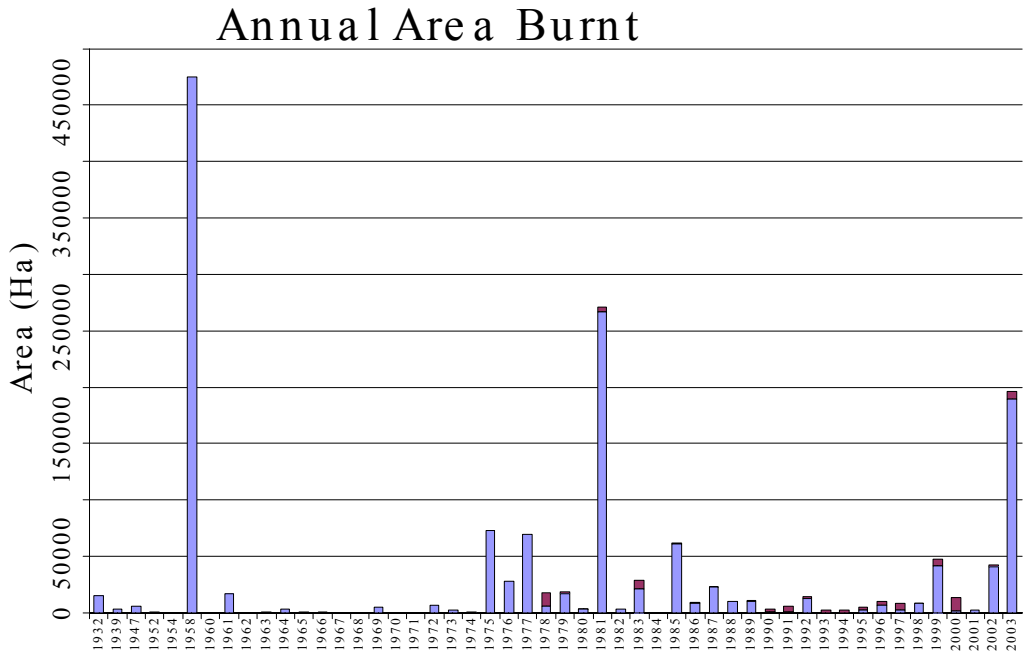


Figure 3: Average Annual Areas Burnt in Victorian Mallee

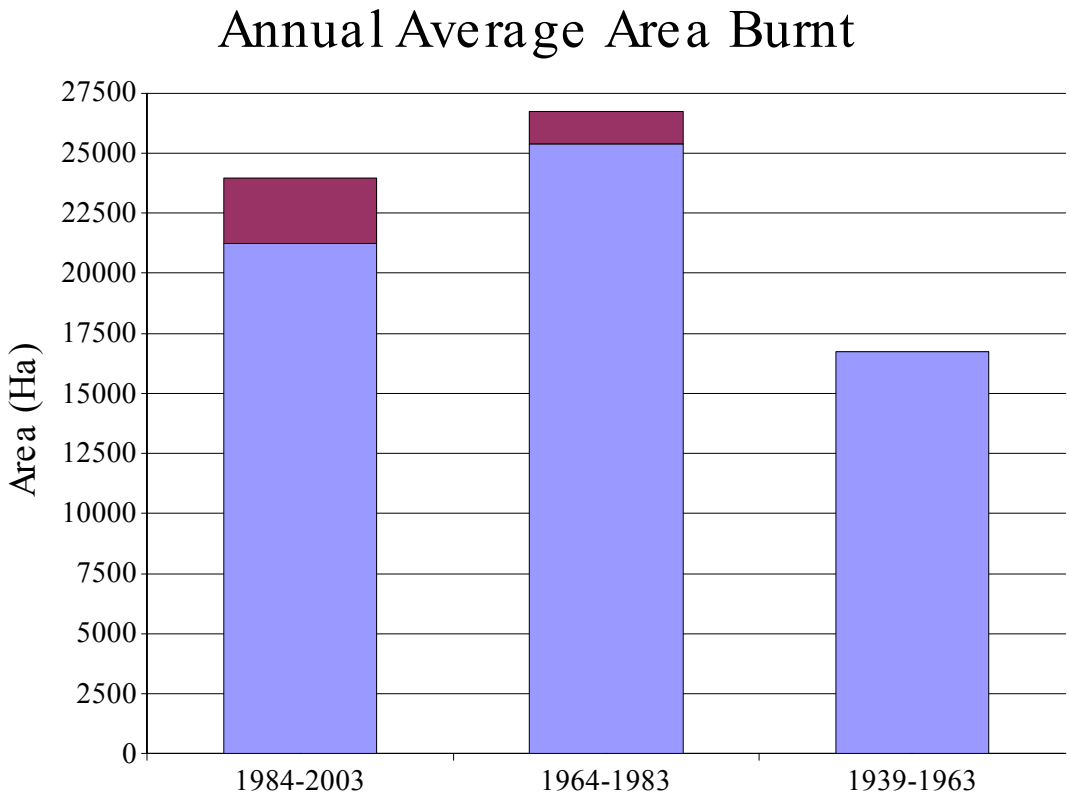
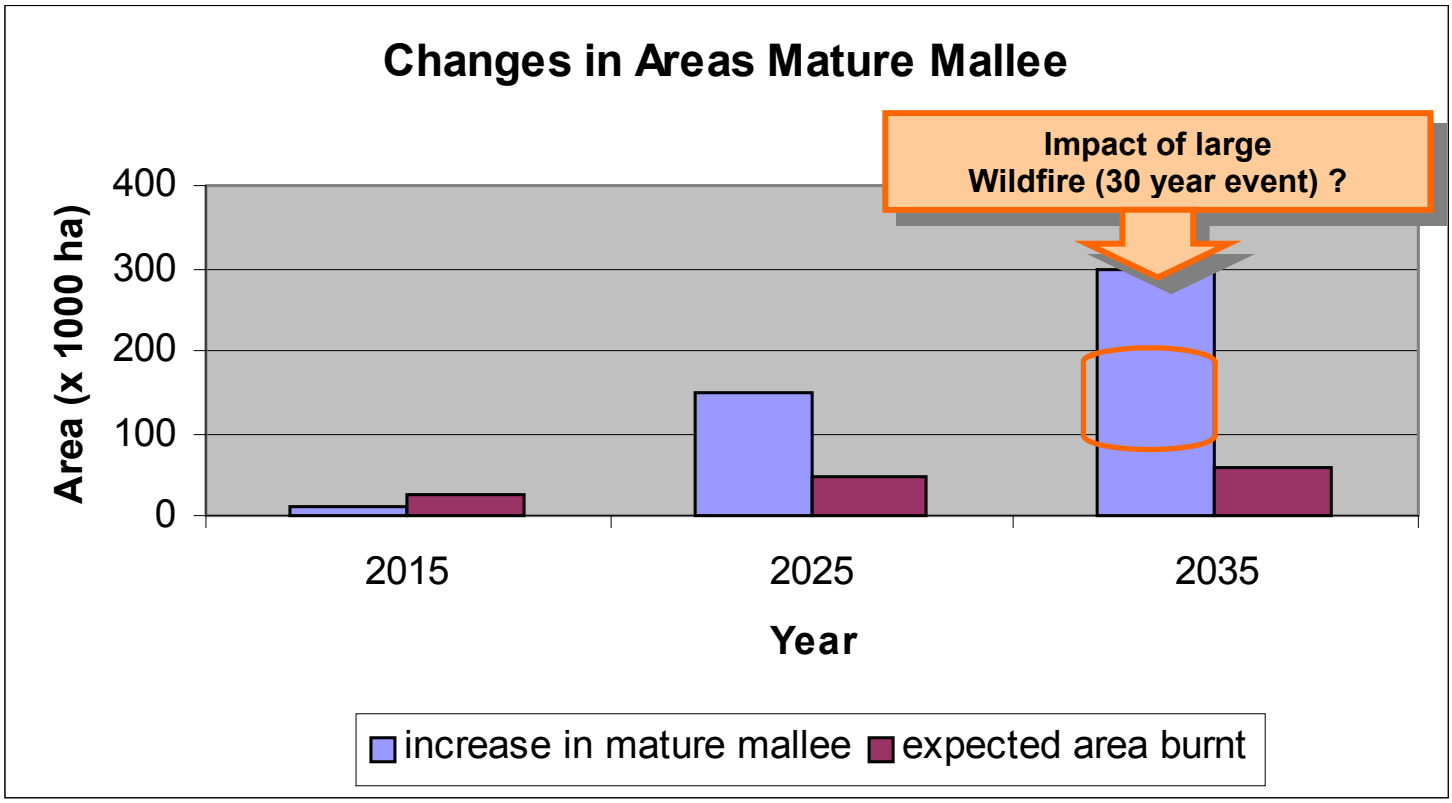


Figure 4: Changes in Area of Mature Mallee (without fire)



Managing Fire in Mallee Communities

In summarising, Fire is an important tool to manage Mallee communities, and achieve good conservation outcomes. To ensure the ecologically appropriate use of fire in Mallee Communities, we need to shift our management away from trying to re-introduce 'natural' or 'historic' fire regimes and think in terms of 'ecologically appropriate' fire regimes & the 'windows' of tolerance needed to maintain the biodiversity elements in the communities occurring across the landscape. We need to actively manage fire (including prescribed burning, fire exclusion and fire suppression) in the Mallee environment. Fire events will (and need to) occur in Mallee communities, we as land managers, biodiversity managers, fire managers and the community need to focus on how to manage their impacts & effects.

Focusing more closely on Malleefowl (the focus of this Forum) and fire, there are several key actions which need to occur. The habitat requirements of Malleefowl needs to be more clearly identified and hence the critical habitat for fire management (i.e. key areas of > 40 years post-fire) determined. We need to combine and analyse fire, habitat (vegetation) and malleefowl density data for the various states, so that the regional & longer-term habitat situation for the species can be assessed (particularly with respect to fire). Clear fire management objectives for Mallee communities & the species they conserve (including, but not only Malleefowl) need to be set so fire (including fire suppression, fire protection of sensitive areas and the active use of fire for long term habitat) can be appropriately planned and managed.

References

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Land Conservation Council (1987) Mallee Area Review. Land Conservation Council - Victoria, Melbourne.

Noble, J.C., Smith, A.W. & Leslie, H.W. (1980) Fire in the Mallee shrublands of western New South Wales. Aust. Rangel. J. 2:104-14.

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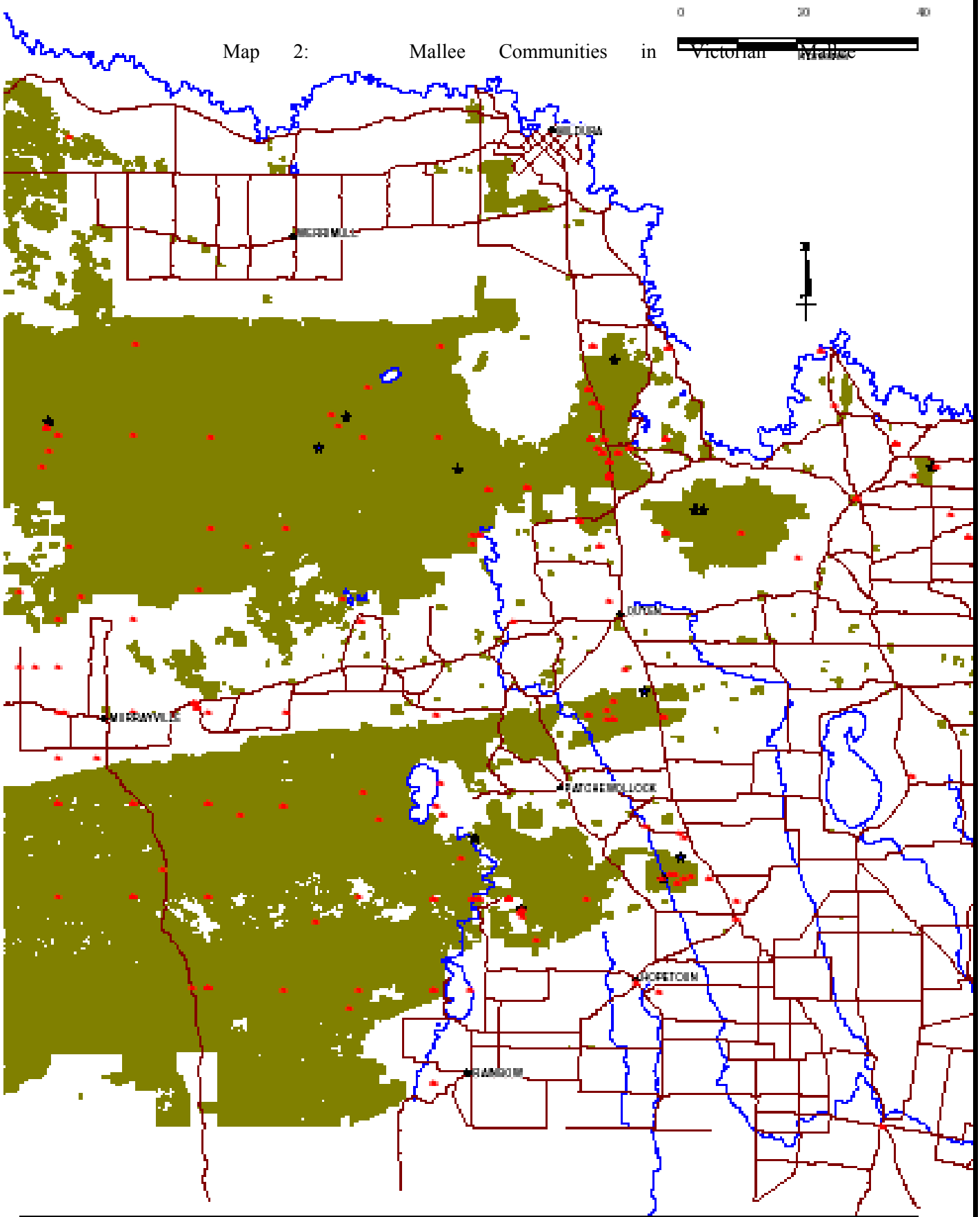
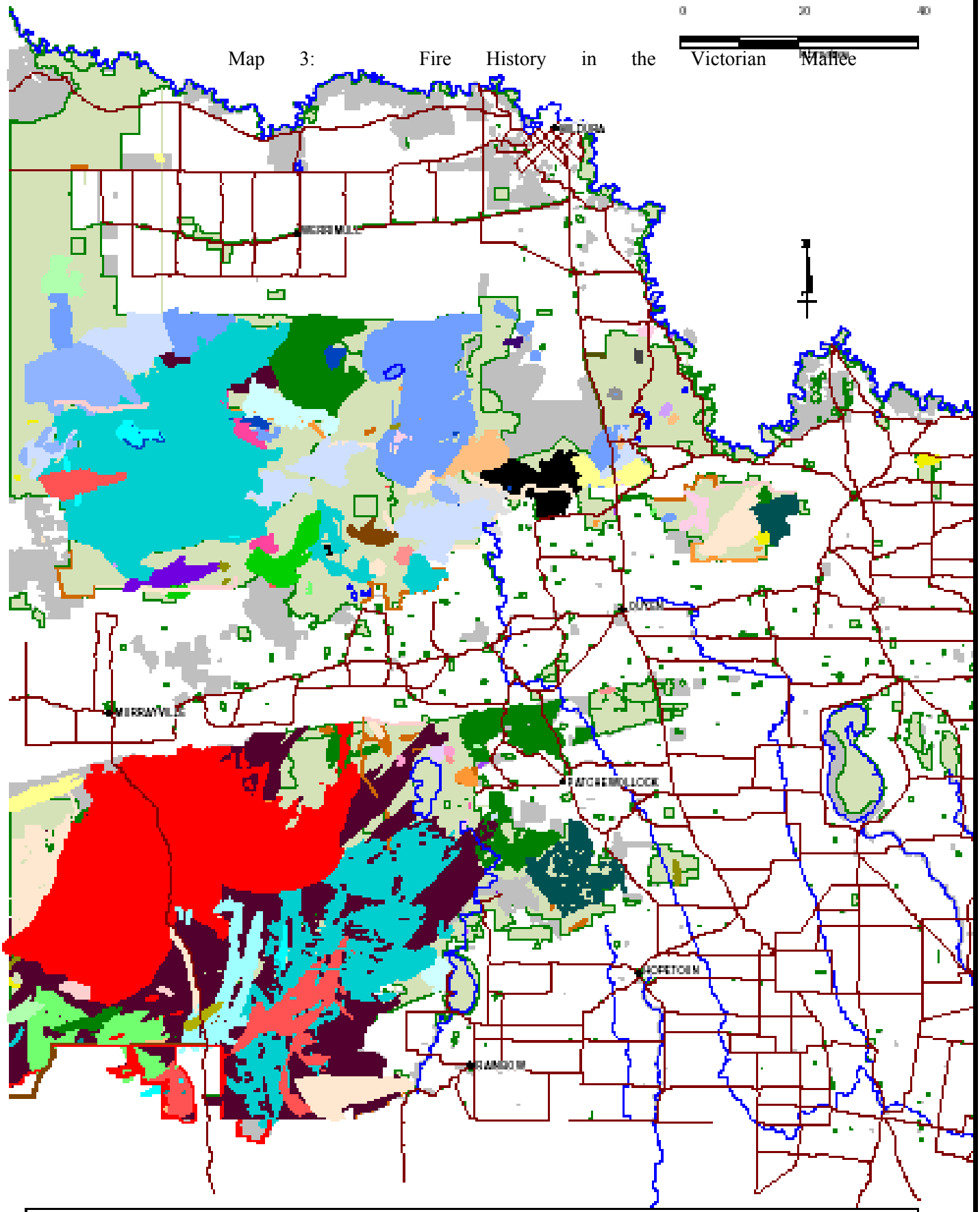
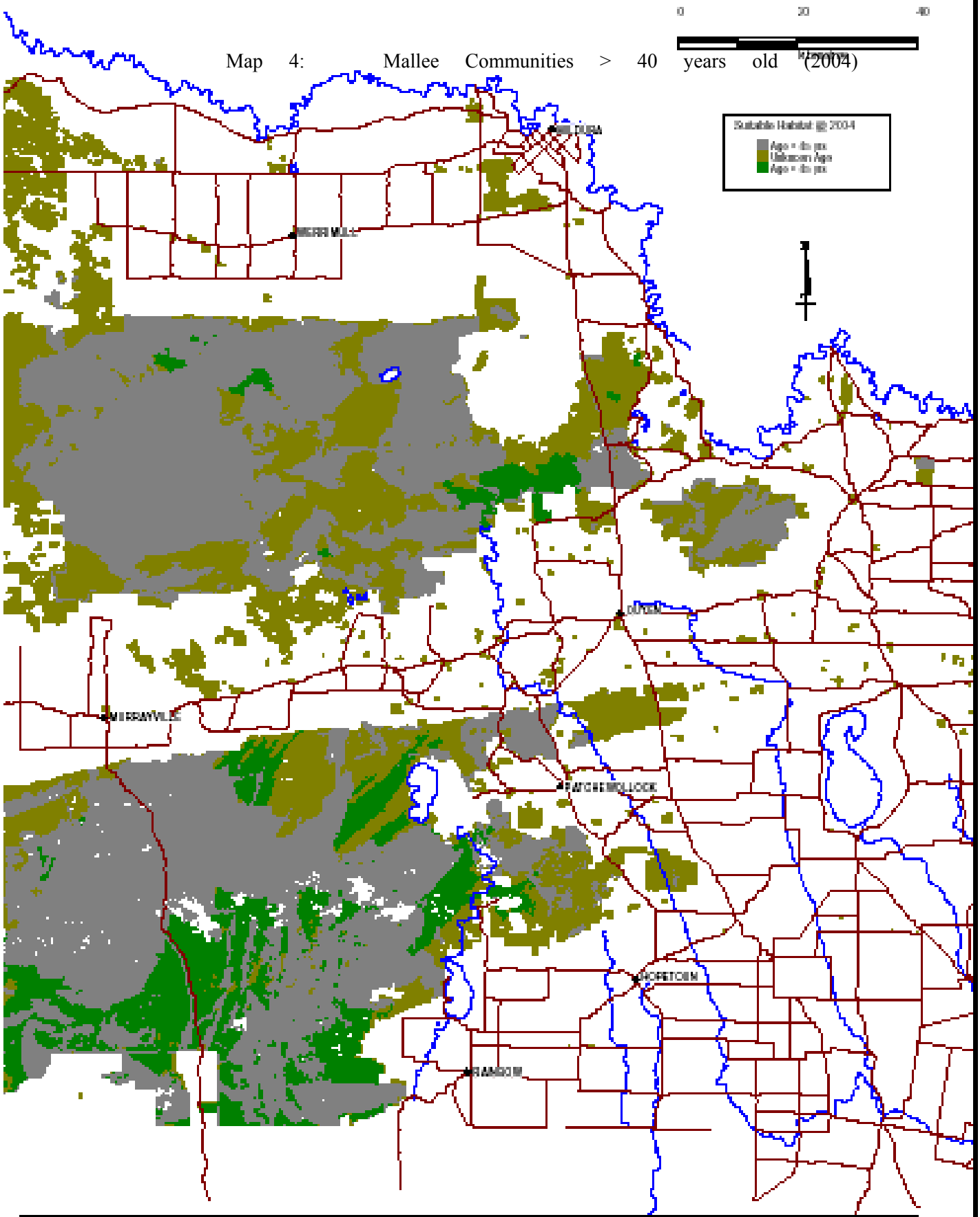
Map 2: Mallee Communities in Victorian Mallee



Map 3: Fire History in the Victorian Mallee

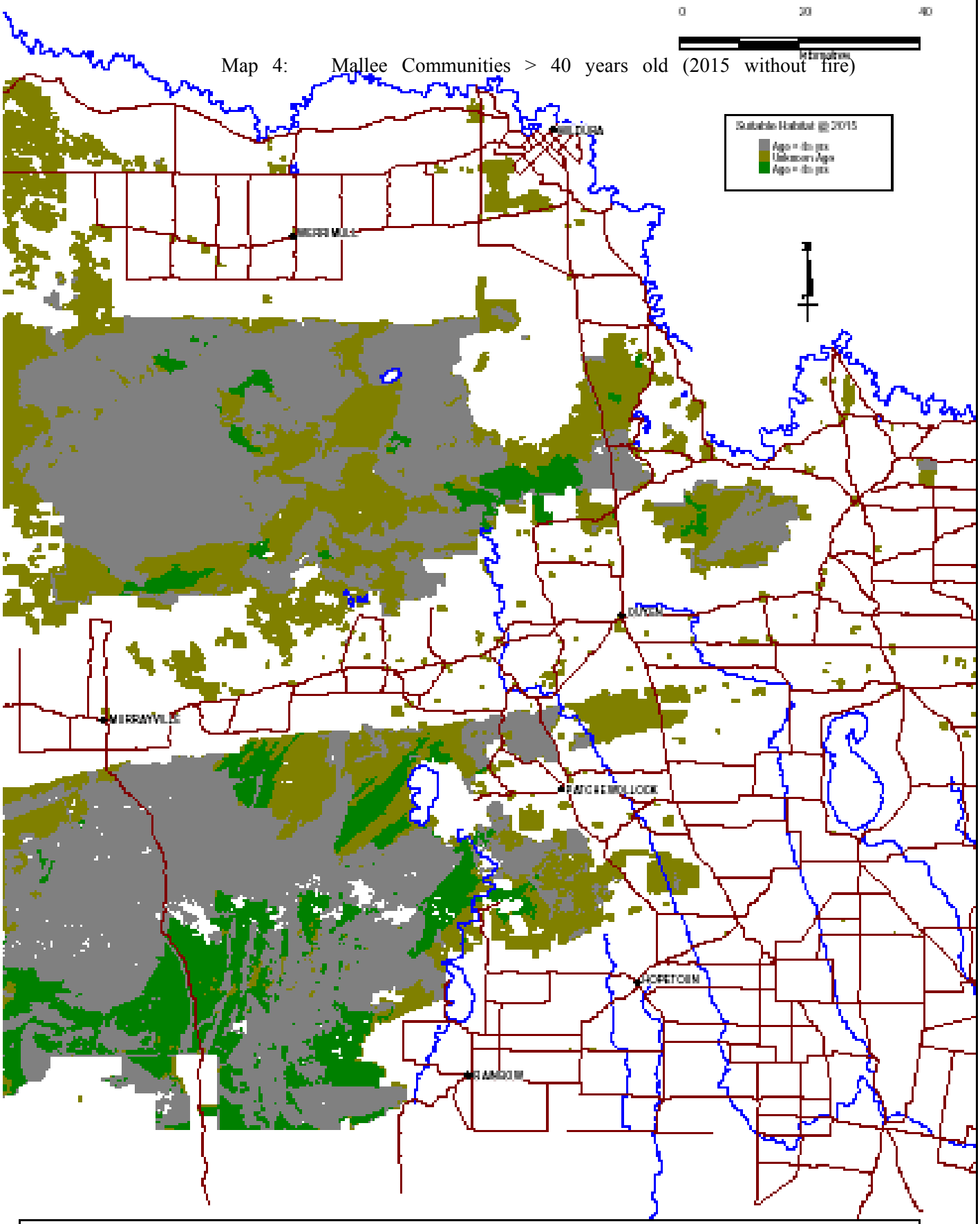


Map 4: Mallee Communities > 40 years old (2004)



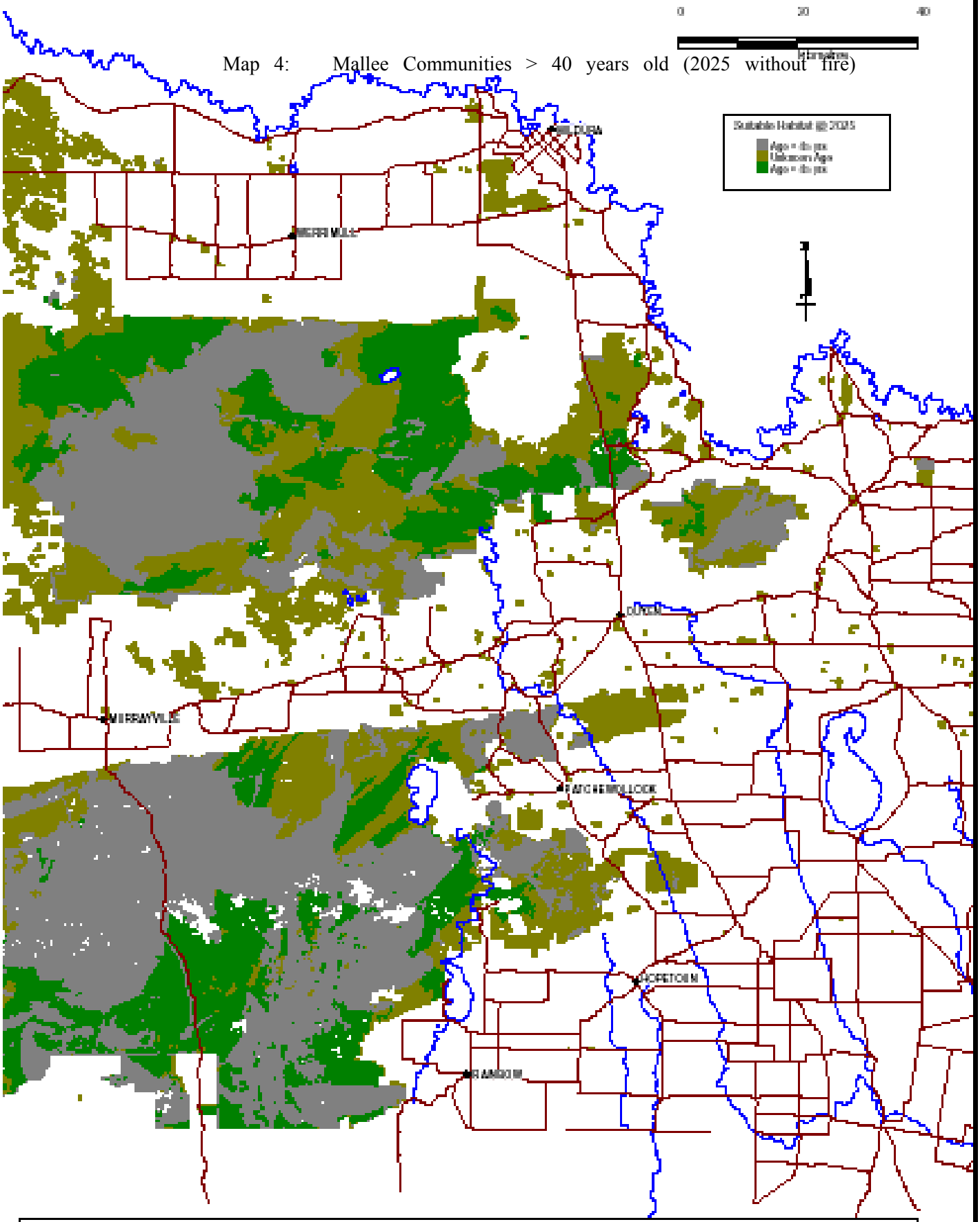
Habitat @ 2004

Map 4: Mallee Communities > 40 years old (2015 without fire)

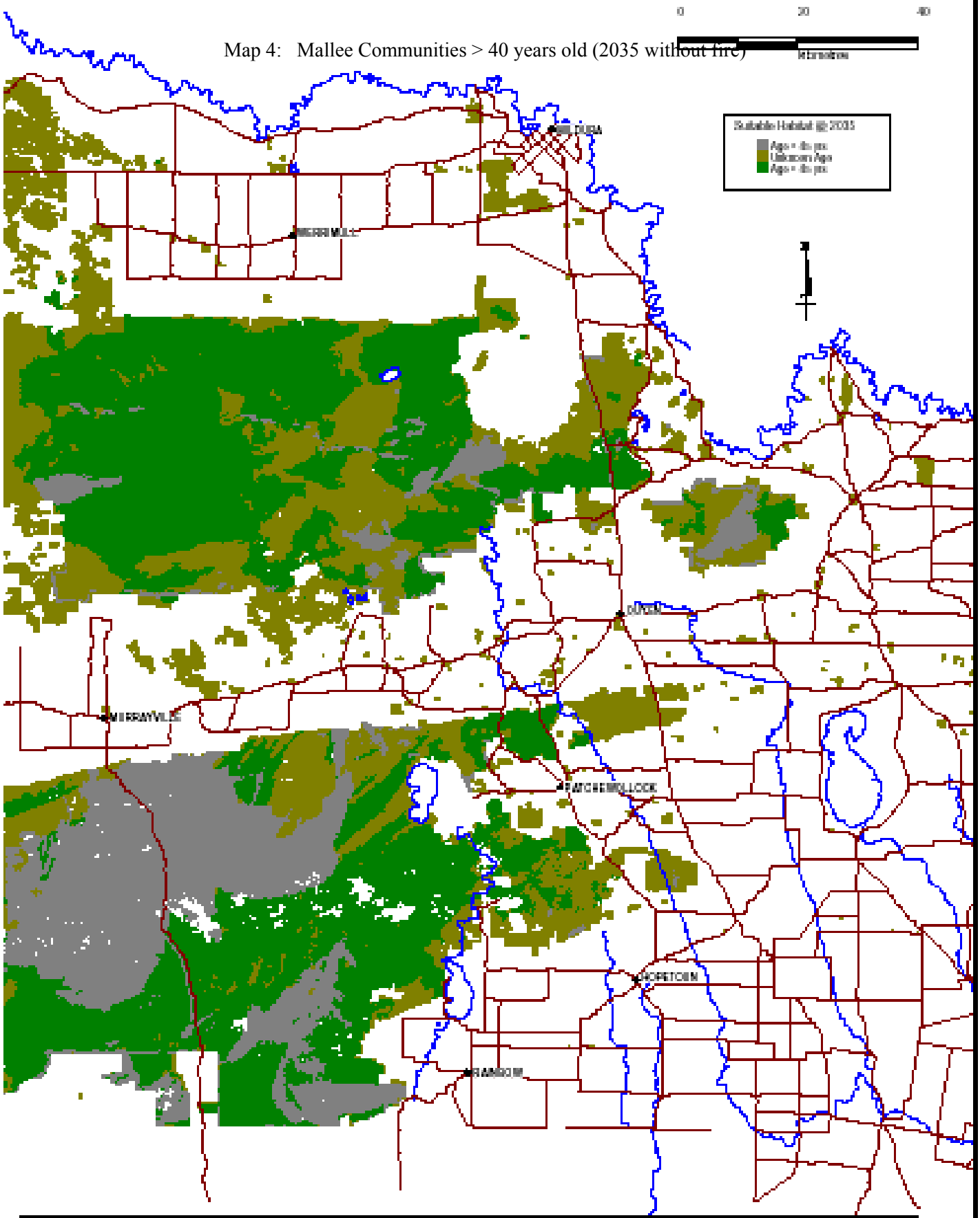


Habitat @ 2015

Map 4: Mallee Communities > 40 years old (2025 without fire)



Map 4: Mallee Communities > 40 years old (2035 without fire)



Habitat @ 2035