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LINKING LAND AND WATER MANAGEMENT TO RESOURCE CONDITION TARGETS
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Landscape history and vegetation change in the Muckleford region of Victoria

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Background

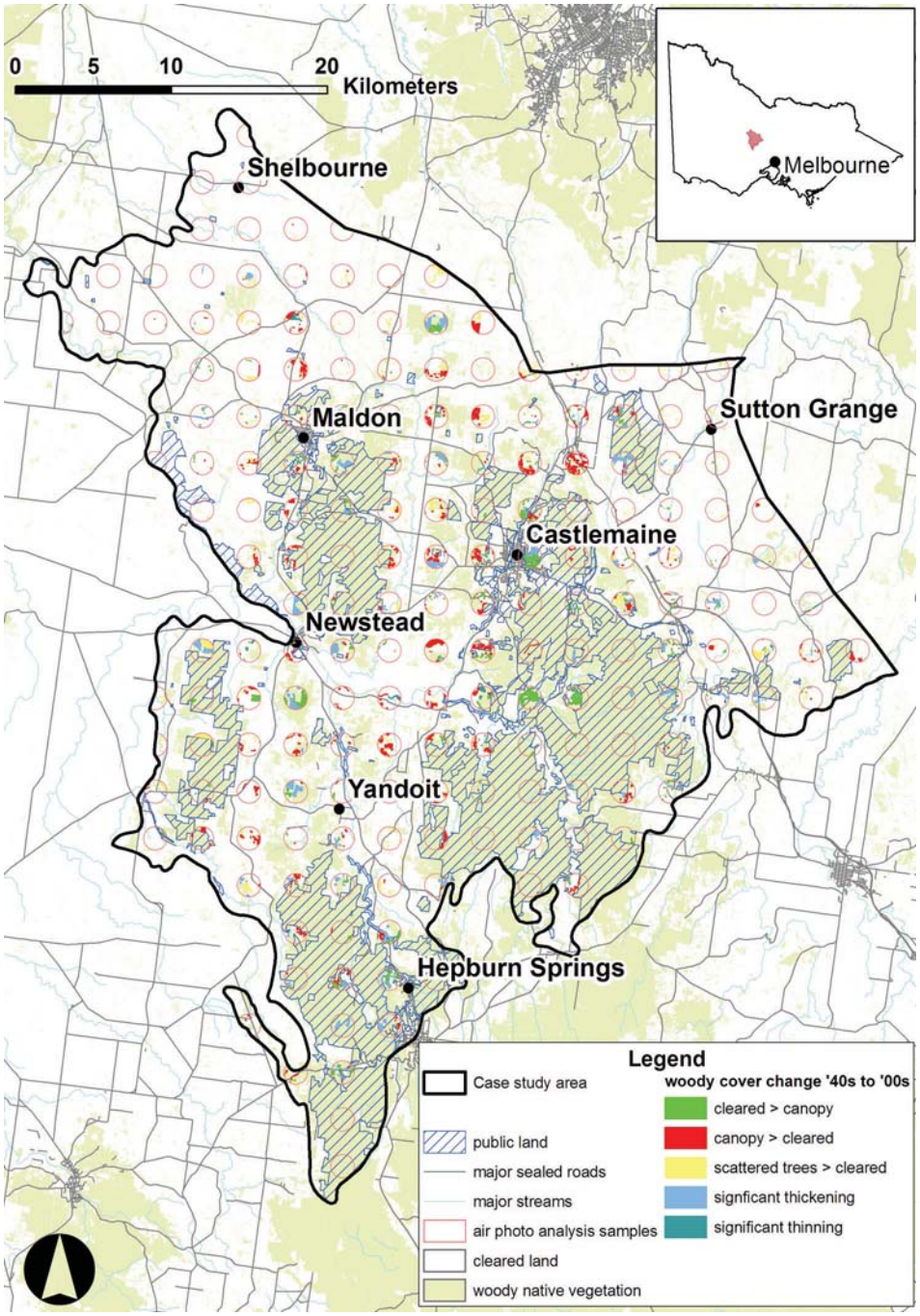
This report summarises the major human activities and other events thought to have influenced change in native woody vegetation in the Muckleford area of central Victoria [Figure 1].

Aerial photography obtained for 1946 and 2006 indicated changes in the extent of native woody vegetation, both decreases and increases, in the Muckleford study area. There has been great variation in activity and events across the study area, with spatial variation related to the presence of remnant native vegetation, type of land tenure (e.g. private farmland, state forests), agronomic potential (e.g. high-production cropping, low-production grazing), and historical events (e.g. areas affected by the 1969 bushfire) [Figure 2].

Field visits and a three-hour 'landscape history workshop' were held over two days in October 2008. An important part of this method was the involvement in a guided conversation of a small group of people with considerable knowledge of the history of local land-use. The group of nine people included landholders, ecologists, environmental project managers and leaders of community-based environmental projects. The participants collectively provided a preliminary understanding of some of the major causes of change in vegetation during 1946–2006, and when these changes occurred, which has been summarised in this report.

Members of the project team are using this understanding to guide more in-depth photo analysis, site visits and interviews with landholders during 2009. This research is part of a larger national research effort known as Landscape Logic, which aims to understand links between land and water management and environmental condition [**www.landscapelogic.org.au**].

Figure 1: Map of the Muckleford study area



Early influences on native vegetation

Although this study has focused on changes in the extent of native woody vegetation during 1946–2006, it is necessary to understand earlier influences as they provide useful explanations for observed change.

The study area covers land traditionally owned by the Djadjawurung and Taungurong indigenous people[1], who are believed to have managed native vegetation as a source of food, shelter and cultural significance.

The discovery of substantial gold deposits between 1850 and 1880

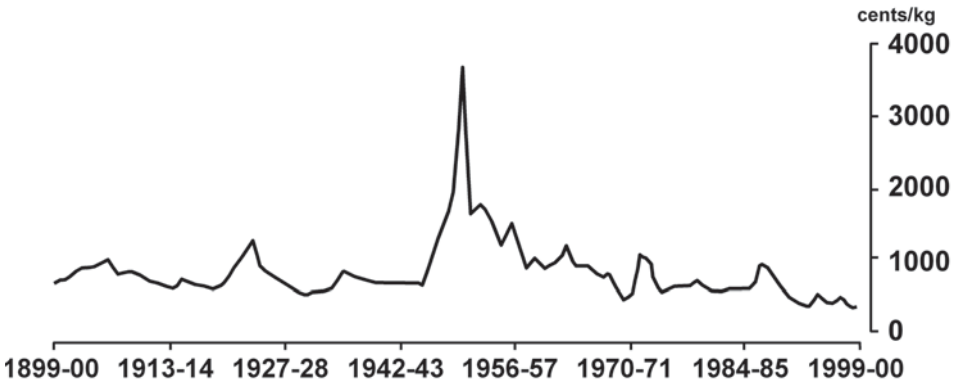
around Bendigo (reputably Australia's richest gold mine at the time) and Castlemaine led to a population boom. The voracious search for gold meant that much native vegetation was cleared to make way for mining and provided timber for building, fuel and mine props. Small farms and towns soon developed to support the goldfields, retaining some of the ensuing wealth. However, the level of activity in the once-celebrated goldfields faded considerably after the 1880s and much of the region was converted to privately-owned farmland or reclaimed by the state. For the next 100 years, agriculture underpinned the region's economy, as it did in most of Australia's rural areas.

Even during the Great Depression there was considerable growth in Australia's agricultural sector. The presence of rabbits in plague proportions during this period depleted the native understorey, hindered regeneration of native vegetation and severely degraded the soil. The rabbit plagues maintained and exacerbated the bare landscape long after the gold-driven clearing subsided. One local farmer recalled an entry in his grandfather's diary written in the 1920s stating: '… there were no trees on the Newstead to Campbelltown road and few 'roos and wallabies … far fewer than today' [2008].

Changes in farming: 1946–2006

In broad terms, the amount and type of agricultural activity in the Muckleford study area reflects the national trend – with steady growth in the area of farmland, mostly for livestock, until its peak in the mid-1970s. However, during the 1950s the widespread promotion and establishment of introduced pasture species (mainly Phalaris and Cocksfoot), together with increased application of fertiliser, led to a notable increase in productivity and profitability of farming. Returns for wool producers in particular were buoyant for many years, although prices fluctuated from year to year [Figure 3].

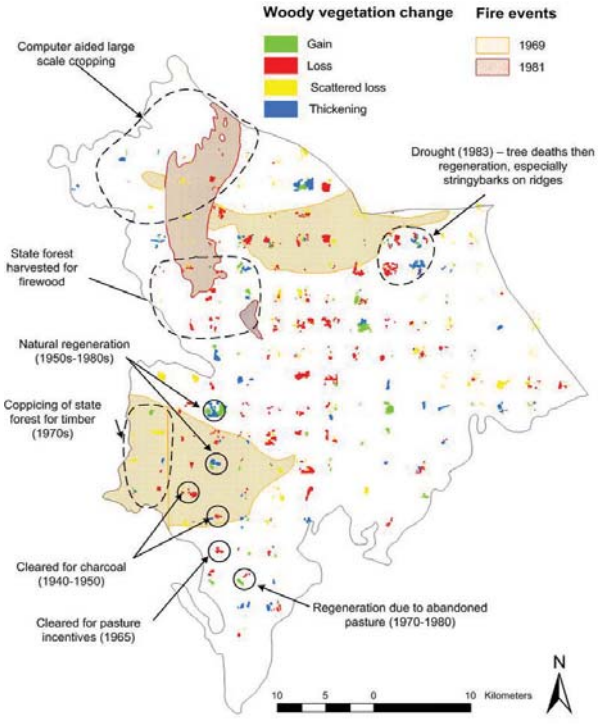
Figure 3: Average wool price in Australia: 1900-2000.[2]



While this had no direct impact on native woody vegetation cover, the use of a competitive perennial grass, as well as increased use of fertiliser, led to a decline in native pastures. More recently there has been renewed interest by some landholders in pastures of native grasses.

Agriculture itself was not responsible for the large-scale clearance of native woody vegetation during the 1850s, and in the 1930s and 1940s when mining and rabbits respectively, were the primary drivers of change. However, whenever farming ceased this has been associated with regeneration of native vegetation. This also appears to have been a feature of public lands where withdrawal of grazing licences led to the regeneration of native vegetation. This first occurred on hilltops and ridgelines in the 1950s as part of a soil erosion prevention program initiated by the Soil Conservation Authority. A second wave of regeneration occurred in the early-1970s when grazing licences for much of the remaining public land were revoked by the Land Conservation Council, although grazing still occurs in some riparian zones.

Figure 2: Sites of vegetation change in the Muckleford study area.



While wool production was the dominant farming use in the region in terms of area, the flatter and more fertile farmland was used for cropping and cattle, both beef and dairy. Indeed most of the agricultural sector up until the early-1980s comprised mixed-enterprise family farms, with much of the region's produce processed locally. The conventional knowledge at the time focused on assisting farmers to expand the area farmed to increase production. Several farmers reported that livestock numbers had fluctuated since the 1950s in response to wool prices and seasonal conditions. When prices for wool were high (e.g. 1952–54) a considerable area of public land was leased for grazing. However, given the relatively poor yields from grazing on most public land (such as unimproved partially-cleared native forest), the area leased declined dramatically after the early-1970s.

Despite the increase in agricultural production during the 1950s–1970s, it appears, from interpretation of historical aerial photos, that there was considerable regeneration of native vegetation across parts of the region from the 1930s. This seems to be both by design (e.g. trees along rivers left for shade and to stablise banks, management of state forests for long-term timber production) and by default (e.g. rocky areas inaccessible to farm machinery left uncultivated). Some people at the workshop noted that as livestock numbers declined there has been a greater increase in the regeneration of native vegetation on farmland with 'lighter' soils.

Workshop participants reported fewer people involved in cereal cropping today than in 1946, yet there is greater concentration in the area where cropping occurs and it is practiced more opportunistically. Participants were uncertain whether the total area of cropping had changed over this period. Also, cropping tends to be done on larger commercial farms which have invested in cropping machinery.

A changing community

Workshop participants reported that small farming properties were far more common in the 1940s and 1950s than today, with a noticeable move towards larger commercial farms in the region from the 1970s, with the larger properties generally further away from towns. Also, the population in the region is more concentrated in and around towns, with fewer people living on farms than previously.

Organised social functions, churches, schools and sporting clubs provided much of the communication and social networks amongst rural communities during the 1940s to 1970s. However, there were no local commodity- or production-specific groups (e.g. WoolCheck, BeefCheck) for farmers during this period. Landcare groups began to form in the region from 1991, with many still active. There is some variation in the focus of these groups, reflecting whether members are predominantly commercial farmers or 'lifestyle' landholders.

Several people reported that Landcare had been effective in raising awareness amongst landholders and the wider community about tree planting, control of pest plants and animals, and identification of native species. This awareness appears to have led in part to an increase in participation by landholders in the Victorian Department of Sustainability and Environment's *Land for Wildlife* program and Trust for Nature's vegetation covenants.

The provision of natural gas supplies to many households in the region during the 1970s and 1980s led to a noticeable decline in demand for firewood, reducing the frequency and amount of harvesting from large areas of state forests. It is uncertain whether reduced harvesting has led to greater canopy cover in native forests, thereby reducing sunlight and moisture to maintain a vibrant understorey. Also, the reduction in harvesting for firewood has led to much of the coppice regrowth being a dominant feature of the state forests previously managed for firewood production.

Fire and drought – catalysts of change

Critical environmental events that affected native vegetation in the study area include wildfires and drought. The fires in 1969 and 1981 were noted as particularly severe, although only parts of the study area were burned. Where this occurred it seemed that the principal effect on native woody vegetation was a period of intense regeneration, resulting in a thickening of existing vegetation rather than an increase in area.

The study area experienced highly variable rainfall during 1935–2000 [Figure 4], as is common in many parts of Australia. However, the drought in 1982–83 was mentioned as having far-reaching consequences for land management and native vegetation. This drought was reported to be a catalyst for the exit from commercial agriculture by a significant number of farmers, allowing a noticeable influx of 'lifestyle' rural landholders (mainly in the vicinity of towns). Both the new landholders and many of the remaining farmers increased the number and size of dams on their properties – a trend that has continued. This would have decreased the water available for natural river flows with potential effects on the recruitment and growth of species such as River Red Gum (*Eucalyptus camaldulensis*). The increase in small 'lifestyle' properties would also have effectively removed some farmland in the Muckleford study area from production, some of which is being recolonised by native vegetation.

This drought also encouraged farmers to use practices to minimise run-off and conserve soil moisture (e.g. establishing perennial pastures, retaining stubble and direct-drilling). Several people at the workshop suggested that a combination of these factors had significantly reduced run-off into creeks and rivers (e.g. the Loddon River).

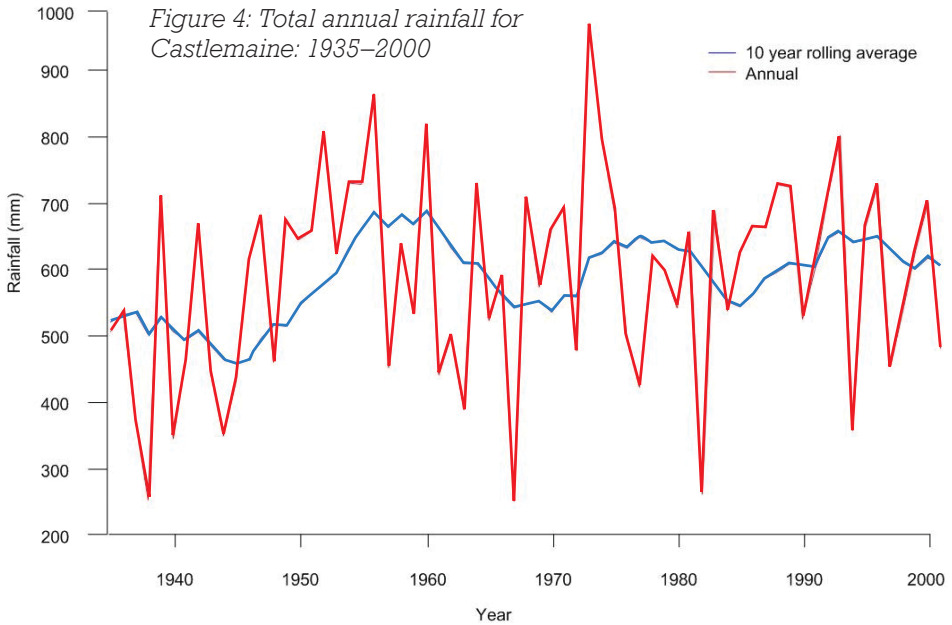
The drought also had a noticeable impact on native vegetation, with many large Red Stringbark (*Eucalyptus macrorhyncha*) trees dying along the dry ridges. However, with favourable rainfall in 1983, there was considerable regeneration of native vegetation on the same ridges. While floods occurred during 1946–2006 in the study area, it was suggested that the variable terrain in the catchment allowed flood-waters to quickly drain away, minimising damage to rural areas. Indeed, floods were reported to be valuable for some of the 'flatter' country (e.g. west of Maldon), leading to deposits of silt and increased soil moisture for extended periods.

Control of pests

The release of myxomatosis in the mid-1950s was particularly effective in reducing the rabbit population. With reduced pressure from rabbits and buoyant wool prices around this time, many farmers began to invest in improving pastures. Several people at the workshop reported that myxomatosis was particularly effective at killing rabbits in rocky (inaccessible) areas, which then allowed greater regeneration of native vegetation.

Since the mid-1980s, several people reported that high numbers of kangaroos and wallabies have had a damaging impact on native vegetation – particularly understorey, in localised areas. Also, an increase in the number of wood ducks using and polluting farm water supplies was noted as a current issue in parts of the study area.

Figure 4: Total annual rainfall for Castlemaine: 1935–2000



1 Horton, D.R. (1994) The Encyclopaedia of Aboriginal Australia, Aboriginal Studies Press for the Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra, ACT.

2 Australian Bureau of Statistics (2001) Australian Agricultural: Agricultural Commodities Produced – historical data. ABS publication 7113, Canberra, ACT.

Conclusion

Influences on the extent of native vegetation can be immediate (e.g. conversion to cropping) or incremental (e.g. native species favoured by decline in use of fertiliser), and direct (e.g. revegetation or seed-sowing) or indirect (e.g. control of rabbits, change in demographics).

Some influences can be highly visible (e.g. clearing for town settlements) while others might only be significant in aggregate (e.g. drought plus increases in pests). Observable changes in land-use and specific events identified through the preliminary appraisal process have been recorded on the timeline [Figure 55]. However, these may not be the only, nor necessarily the primary, influences on changes in native vegetation at localised sites in the study area since 1930.

The workshop had insufficient time to explore the influence from a variety of government (Commonwealth, state and local) policies, regulations and programs. More detailed research by the project team in 2009 will seek to enhance understanding of the major influences on changes in the extent of native woody vegetation in the Muckleford study area.

For more information about this study please contact Dr David Duncan, Department of Sustainability and Environment [email: david.duncan@dse.vic.gov.au; phone (03) 9450 8750]. If you would like to know more about the research supported by Landscape Logic, visit www.landscapelogic.org.au.

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LANDSCAPE LOGIC is a research hub under the Commonwealth Environmental Research Facilities scheme, supported by the Department of Environment, Water Heritage and the Arts. It is a partnership between:

- six regional organisations – the North Central, North East & Goulburn–Broken Catchment Management Authorities in Victoria and the North, South and Cradle Coast Natural Resource Management organisations in Tasmania;
- five research institutions – University of Tasmania, Australian National University, RMIT University, Charles Sturt University and CSIRO; and
- state land management agencies in Tasmania and Victoria – the Tasmanian Department of Primary Industries & Water, Forestry Tasmania and the Victorian Department of Sustainability & Environment.

The purpose of Landscape Logic is to work in partnership with regional natural resource managers to develop decision-making approaches that improve the effectiveness of environmental management.

Landscape Logic aims to:

1. Develop better ways to organise existing knowledge and assumptions about links between land management actions and environmental outcomes.
2. Improve our understanding of the links between land management actions and environmental outcomes through historical studies of the effects of private and public investment on water quality and native vegetation condition.

Acknowledgements

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Figure 5: Timeline of key activities, events and changes in the Muckleford study area: 1930–2006.