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Roadside Management and Transportation Operations

CONSERVATION MANAGEMENT OF HISTORIC ROAD RESERVES IN AUSTRALIA

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Abstract: Road reserves have a rich history of human impacts, and are important social, economic and ecological component of agricultural landscapes in Australia. Road verge, or roadside environments are gaining greater recognition for their role in nature conservation. In Australia, road reserves are areas of public land retained for the development of future roads. Many road reserves were originally surveyed at one-chain (20.12m) width, however many historic roads, such as early Traveling Stock Routes (TSRs), were surveyed at widths of up to 1 mile wide. As a result, roadsides often constitute a significant proportion of native vegetation remaining in many agriculture areas.

Many local government authorities have now completed an assessment of the conservation values of road reserves in their municipality. Each roadside has been surveyed using a rapid bio-assessment methodology, and given a conservation ranking (High, Medium or Low). These rankings are then used to determine appropriate management actions for each road category, as described in local roadside management plans. However as local governments authorities have few funds for conservation management of roadsides, resources are often directed towards the maintenance of the better high conservation roads.

Recent research has shown that in many cases, roadside conservation values are a direct legacy of 19th century land policies, and decisions by administrators and surveyors, whose imprint remains on the landscape today. Each road has a unique story to tell, and as such, many high conservation roads with important natural and heritage values could be considered as 'historic roads'. Understanding the development history of roads can provide an important tool to gain new awareness of their cultural and environmental values, and facilitate greater community investment in their ongoing management.

Introduction

The road network is an important social component of agricultural landscapes worldwide; it facilitates transport of people, is an infrastructure corridor and is important for movements of outputs and inputs of agricultural production (Pauwels & Gulinck 2000; Broomham 2001). In the early settlement of rural areas of Australia, roads were vital for communication between isolated homesteads and the nearest towns or supply points (NSW DMR 1971). In recent years there has been growing recognition of the environmental values of historic road reserves (Forman *et al.* 2003; Spooner & Lunt 2004). The environmental values of roads are often undervalued, perhaps due to the ubiquitous nature of roads in most landscapes (Cooper 1991). It is important to recognise that road reserves often contain a significant proportion of remnant native vegetation in cleared agricultural areas of south-eastern Australia (Bennett 1991). Similarly in Europe, the USA and New Zealand, hedgerows and green lanes are gaining greater recognition for their importance in providing agronomic functions and refugia for biodiversity (e.g. Dover *et al.* 2000; Viles and Rosier 2001; Marshall and Moonen 2002; Forman *et al.* 2003).

In managing roadside environments, it is important to recognise that roads have developed for human use, and often have a long history of human inputs (Spooner *et al.* 2004). Despite this, roadside vegetation is often regarded as temporally inert and devoid of human impacts, as some relic of past conditions. As Fensham (1989) states, it is short sighted to assume that the makeup of remnant vegetation can automatically be interpreted as being representative of the historical condition of a site. Remnant vegetation in human altered ecosystems such as roadsides may be vastly different from the original ecosystems from which it developed (Foster *et al.* 2003).

In New South Wales, most attention on the historical value of roads has focussed on major arterial roads emanating from Sydney (e.g. Newell 1938; NSW DMR 1971; 1976). In regards to rural roads, although there is extensive literature regarding patterns of historical settlement (e.g. Buxton 1967; Carnegie 1973; Gammage 1986), these tend to ignore or only superficially detail aspects of the development of associated roads. The aim of this paper is to synthesise information on the historical development of road reserves in southern NSW, Australia, and discuss the implications for conservation management of roadside reserves.

Background: Land Settlement History of Southern NSW

In the 1830-40s, early European pastoralists took up most of the unsettled districts of southern NSW in large leasehold arrangements in 'runs' of up to 100 000 acres (Roberts 1935). The pastoral era continued until 1861, when legislation was enacted in NSW to allow new settlers to purchase leasehold crown lands. To maintain control of 'their' land, pastoralists could exercise pre-emptive rights by way of 'improvements' to purchase the land, and clearing of woodlands and forests by way of ringbarking was a popular and cost-effective choice. But despite their wealth, early pastoralists could still not afford to purchase runs outright, and instead used influence with government land inspec-

tors and surveyors to request that certain areas be reserved as road, stock, water, timber or gold mining reserves. Many such reserves were often revoked later and shrewdly purchased by squatters when funding permitted (Gammage 1986). In the 1870–1890s, pastoralists cleared the land at a feverish pace to gain pre-emptive rights of purchase. During this time, thousands of new settlers also arrived to stake out claims, and promptly cleared the land for cropping. By the late 1890s, apart from road and some public land reserves, most of the land had been cleared for agriculture (Buxton 1967).

During this period of rapid land settlement, surveys were completed to subdivide southern NSW into a system of counties and parishes. Each parish was designed as a support for the Church of England, with land allocations for a church, cemetery, town commons and school site in each parish (Jeans, 1972; Winston-Gregson 1985; Broomham). The original intent was to divide parishes and counties in a grid-based system similarly to that in the United States. However due to government squabbling, and chaotic state of the NSW Survey and Land Departments (which had few resources to survey the vast extent of land being rapidly settled), survey of counties and parishes proceeded in a rather ad-hoc fashion as land was purchased (Hallman 1973). Boundary data annotated on maps of former pastoral 'runs' were used as templates for succeeding parish and county maps, which were then updated as land was claimed or changed ownership (Read 2003). It wasn't until later trigonometric surveys were completed in the early 1900s that many boundary anomalies were corrected. In this context, the first road reserves were surveyed:

Survey of Road Reserves

Throughout the 1800s, the Survey Department of NSW issued survey instructions for roads as a series of notices or circulars, or as more formal statutes or regulations which were gazetted in government parliamentary proceedings of NSW (Hallman 1973; Marshall 1999). The first formal instructions to surveyors regarding road design in rural areas appears to be a Circular dated in 1848. It states (Clause 6):

In laying out a series of country or suburban lots, a way of access must be preserved to each, by marking roads of a **chain wide** (20.12m) at the back of any range of allotments fronting a river...(Williamson 1982; Marshall 1999).

Instructions issued in 1848 detailed the marking of portion boundaries with blazed trees 'with a broad arrow at least 6 inches long...and the portion number' (fig. 1), though the practice of marking corners with numbers and a broad arrow was considered tedious, and limited to the principal points. The mark mainly used was a shovel shaped blaze, and corner trees were often blazed on four sides (Beaver 1953; Marshall 1999). Other methods for marking boundaries included using piles of stones or simple plough lines (Beaver 1953; 1980; Williamson 1982).

In this way, a vast network of narrow 1-chain road reserves was surveyed across the landscape in the 1870s to provide access to allotments. However problems with road usage and construction evidently led to changes in survey design regulations for road reserves. It was initially hoped that newly formed parishes would pay for the upkeep of minor 'parish roads' as in England. But as road construction was a low priority in the late 1800s, as compared to rail (Broomham 2001), most 'roads' of the time were no more than a boggy collection of tracks. The 1872 *Regulations for the Guidance of Licensed Surveyors* detailed these problems. Clause 24 states:

Very serious interruption to traffic in the interior of the Colony has resulted from the fencing in of lands by proprietors either side of projected or reserved roads, previously to the construction and drainage of such roads, and it is considered expedient that... roads according to the nature of the ground and probable traffic may be **100 or 150 links wide (1 – 1.5 chains; 20-30m)**, or even more in cases where materials for road making are scarce.

It appears that the fencing in of one-chain road reserves was causing major problems in road usage and construction. Many roads were in such a deplorable state, 'ploughed up into such a slough by bullock teams', that travellers were forced to take rails out of adjoining paddock fences to circumnavigate problems areas, much to the consternation of neighbouring landholders (Howitt 1855, p. 40).

By 1900, the 'road' network in most local government areas was nothing more than an ad-hoc collection of narrow 1-chain wide vegetation corridors, allocated by surveyors for road access to various land titles as described above, in which travellers navigated their way through the trees along rough bush tracks. As Prichard (1991, p. 19) states:

When Lockhart Shire was formed most of the access roads consisted of unformed tracks wandering through a mass of trees. Frequently it was necessary for the farmer to remove some trees to make it trafficable for vehicles.

In the early 1900s, a major task of rural councils was to identify and declare all road reserves currently in-use (or projected) as 'public roads', to secure vital funds from State government authorities for upkeep (Prichard 1991). This process was the first major step in constructing some semblance of a useable road network from the hundreds of one-chain road reserves and TSRs (see below) surveyed across the landscape. This would not have been an easy task, as property boundaries were still in flux. These actions were in part instigated by the *Public Roads Act* (1902), which provided for the resumption and dedication of land for roads, the payment of compensation and the closing of

unnecessary roads (NSW DMR, 1976). As a result, many road reserves that were not utilised would later be closed or resumed into adjacent private land. Many of these can be observed today as linear patches of remnant vegetation.

By the 1920s there were still few constructed roads in most parts of southern NSW, except for main routes (NSW DMR, 1976). Road construction was initially carried out in scattered locations with no specific plan, where in many cases, roadworks were carried out by landholders at their own expense (Prichard, 1991; Lockhart Shire Council, 2003). During the depression in the 1930s, councils received unemployment relief grants which were provided for labour intensive work (NSW DMR, 1976). Most men were employed 'on clearing timber from unformed roads'. In the postwar period of the 1940s, there was rapid development of the road network, due to greater external funding and purchase of heavy machinery. Works included realignment of numerous 'dog-leg' corners, a legacy of previous ad-hoc land subdivision. By the 1970s, road networks had developed into a modern network to transport people and agricultural production.

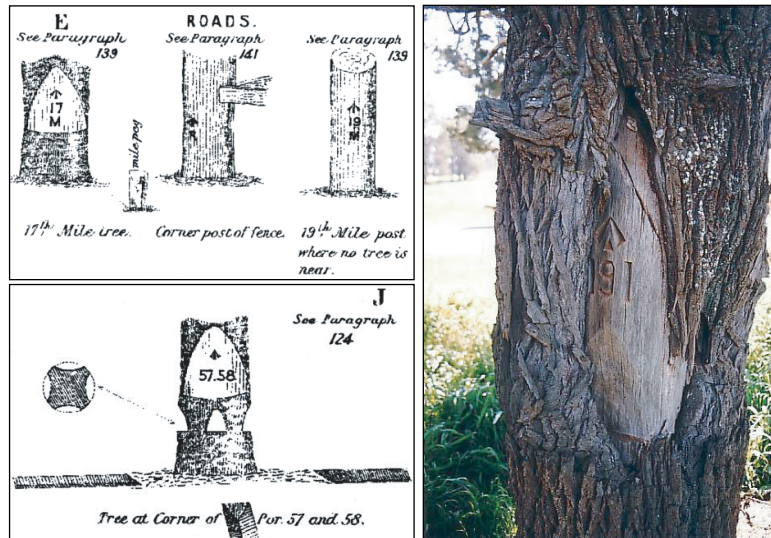


Figure 1. (a) Diagram showing survey regulations for roads and boundary markers in 1882 (Marshall 1999). (b) A rare example of an original survey boundary, tree circa 1890, in good condition (Photo: P. Spooner).

Historic Roads: Travelling Stock Routes (TSRs)

During early settlement, Travelling Stock Routes (TSRs) and reserves were informally developed by squatters to move stock from their runs to principle markets in major cities or the goldfields (Figure 3). This complex network of crown road and land reserves was estimated to cover 2.27 million hectares, or 2.8% of NSW (McKnight 1977). During the 1850-90s, TSRs became the first road transport routes in many parts of southern NSW, particularly those linking towns and railway stations. Many TSRs are up to **1 mile wide**, and therefore are important landscape components across south-east Australia.

So how did TSRs originate? The first government references to Travelling Stock Routes or Reserves originated in 1874. Records suggest that TSRs were formally developed due to concerns by District stock inspectors, who expressed some urgency to gazette the existing network of informal stock routes and reserves before hungry land settlers took up the land (NSW LA 1875a,b). As an early government report states:

These reserves (Reserves for Travelling Stock) are very far from being in a satisfactory state. A great deal too few have been proclaimed, and the most suitable land for them is being fast taken up by selectors along the main droving roads; while those that have been proclaimed are rendered comparatively valueless to drovers (stock herdsman) by the occupants of the adjoining land consuming the grass... (NSW LA 1875b).

In response, the Chief Inspector of Stock requested district stock inspectors to supply details of 'droving roads' as they were called at the time, including descriptions, usage by stock, and also requested suggestions for **sufficient stock route widths**, to ensure there were no difficulties in 'bringing stock to markets' (NSW LA 1875b). In reply, district stock inspectors reported details of stock routes in use, and recommended varying widths from **five chains to a 1 mile wide**, depending on stock usage at the time (NSW LA 1876). This correspondence explains why the width of stock routes is quite variable across NSW (fig. 2a).

Information supplied by district stock inspectors and surveyors was used to produce what appears to be the first official 'Map of New South Wales Stock Routes' in 1880 (NSW LA 1881). In later years, TSRs were re-surveyed 3 chains wide and previous land sold to adjacent landholders (fig. 2b). In this fashion, it is clear that for many TSRs, government authorities merely surveyed and administered pathways *already in existence*. The origins of TSRs are therefore of great historical interest, as they are a lasting imprint of people and transport patterns long ago. It has been suggested that many may have started as trails of the indigenous people, tracks of native animals, early explorers, or as routes

between early settlers homes, water-points and townships (Gammage 1986; Anderson 1994). For example, there is evidence that trails of previous indigenous inhabitants were utilised to great advantage in the early pastoral settlement of many regions of south-eastern Australia (Reynolds 1990; Harrison 2004). Not surprisingly, TSRs are now gaining new attention as historic roads in many rural areas of Australia.

In this way, for many road networks in Australia, each road often contains sections surveyed at different periods in the past. More by necessity than design, road reserves that were surveyed during the period of rapid land development of the late 1800s, were put into use as settlement patterns dictated. In the early 1900s, local councils were then left with the enormous task of creating a trafficable road network from a myriad of road reserves surveyed across the landscape. Simply due to lack of resources, only the immediate road surface area was cleared of vegetation. Today, roadside verges now provide important refuge for native vegetation.

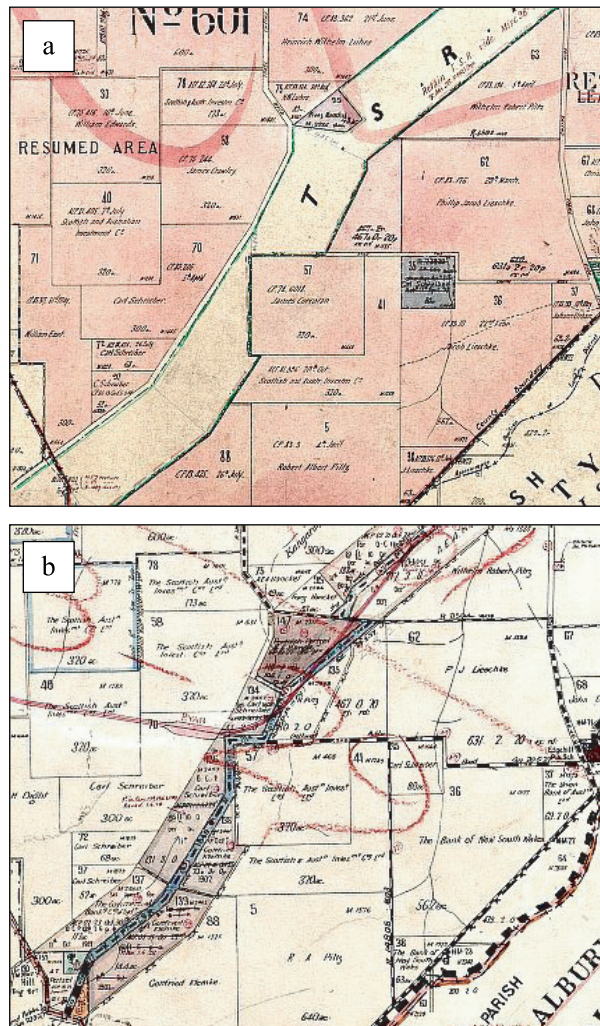


Figure 2. Reduction and alteration of a Travelling Stock Route, Parish of Edgehill, County of Mitchell (1888-1899, and 1913-1928). The first map (a) shows a ½ mile wide TSR gazetted in 1878, and evidence of early settlers claiming parts of the route (see Portion 57) before survey and marking. The second map (b) shows that by 1928, this TSR was reduced to its present-day width of 3 chains (NSW LPI 2001).

Present-day Roadside Conservation Values

In much of south-eastern Australia, local government authorities have completed assessments of the conservation values of road reserves in their municipality. Each roadside has been surveyed using a rapid bio-assessment methodology, and given a conservation ranking (High, Medium or Low) based on attributes such as the width of the road reserve, proportion of remnant native vegetation, percentage of weed cover, degree of site disturbance, potential habitat value, and presence of any threatened species of flora or fauna. These rankings are used to determine appropriate management actions for each road category, as described in local roadside management plans. These plans vary from one council area to the next, depending on local conditions and funding, but the following general principles apply:

1. To ensure that high conservation value vegetation and special management areas (historic roads, heritage sites, locations for rare and threatened species) are able to continue as self maintaining weed and pest free environments, protected from disturbance from road or utilities works, and supplied with appropriate grazing and fire regimes (fig. 3)
2. To improve medium conservation value areas towards high conservation value, self sustaining areas;
3. To minimize threats to ecosystems within reserves to ensure that low conservation value areas are maintained so as to ensure safety of road users, avoid weed spread, assure fire control and retain their aesthetic values. In these areas, limited firewood collection and grazing is permitted (NSW REC 1996).

As many local governments have few funds for conservation management of roadside habitats, resources are often directed towards the maintenance of high conservation value roads (fig. 3). For example in southern NSW, Catchments Management Authorities (CMAs) and local government agencies are developing management plans for roads of high conservation value, many of which have important heritage values as 'historic roads'. Plans consider the unique nature of each road (e.g. species present, land-use history, current disturbance regimes) and road characteristics (width, road category & traffic volume).

Influence of Land-use History on Roadside Conservation Values

So why is the structure and composition of individual segments of roadside vegetation often so variable? Are road-sides a legacy of past conditions as often assumed? In recent work by Spooner & Lunt (2004), historical information on the development of road reserves was collated from recently digitised 19th and 20th century pastoral and parish maps, such as road reserve age, road width, as well as data relating to locations of old pastoral fencelines, county or parish boundaries, previous reserves, stock routes and road re-alignments.

Regression analyses showed that road reserve width and road age were important predictors of roadside conservation rankings. There was a significant difference ($P < 0.001$) in mean road reserve width and age between road segments of different conservation ranking (Table 1). In general, wide road reserves had a higher percentage of roads segments classified as high conservation status (> 300 links/ 3 chains: 43%) than narrow roads (100 links: 15%) (fig. 4).

Further analysis with individual Mann-Whitney U tests showed that mean road reserve width and age were significantly greater on historic roads and travelling stock routes (Spooner & Lunt 2004).



Figure 3. Picture of a high conservation road in southern NSW, which is placed along a parish boundary, and is 2-chains (40.1m wide). The large tree in the left foreground has a survey blaze from the 1870s on its trunk (Photos: L. Smallbone).

Table 1: Comparisons of mean road width and road survey age for road segments of different roadside conservation rankings ($P < 0.01$; Kruskal-Wallis tests)

| Roadside conservation value | Road width (m) | Road survey age (years) |
|-----------------------------|----------------|-------------------------|
| 1 (High) | 46.3 | 121.9 |
| 2 (Medium) | 37.7 | 117.9 |
| 3 (Low) | 31.9 | 113.3 |

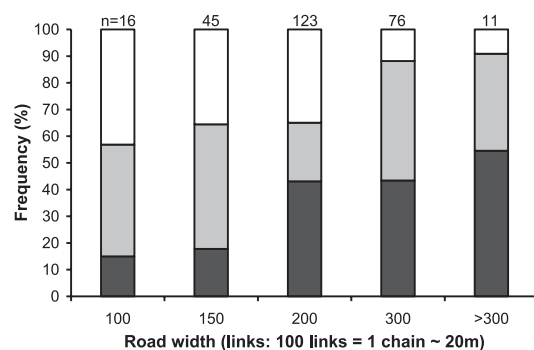


Figure 4. Frequency distribution of roadside conservation ranking's in five road width categories (original empirical units shown), showing road segments scored as High (black bars), Medium (grey bars) and Low (white bars) conservation value.

In this study, most wide roads were past or present Travelling Stock Routes (TSRs), and some rail reserves. As described, TSRs were surveyed at various widths up to one mile wide to provide enough fodder for stock travelling to markets. This highlights the important, albeit unintended, role of early surveyors in conserving native biota in roadside environments today. The work by Spooner & Lunt (2004) has shown that road reserve age was also important in predicting roadside conservation values. Variability in roadside conservation values is usually attributed not to road reserve age, but to internal processes such as grazing by stock, or external processes such as edge effects, weed invasions, roadworks and nutrient transfers from the agricultural matrix (e.g. Foreman et al. 2003, Spooner et al. 2004). As this study has demonstrated, an explicit understanding of road development history can explain much of the variability in roadside conservation values. More specifically, this study has identified that many road reserves of high conservation value are old roads – and in that sense have important heritage values to consider as ‘historic roads’.

Identification and Management of Historic Roads

It is important to identify and preserve historic roads, not just for heritage values, but also for their aesthetic, natural and conservation values. Formal listing on State and National registers may result in opportunities in gaining funding for management from sources otherwise not considered. However what criterion constitutes an historic road is not well understood in Australia. The term immediately evokes thoughts of famous roads such as Route 66 and the Columbia River Highway in the United States, or the Great Ocean Road in Australia. In New South Wales, the **Old Great North Road** (north of Sydney) is the only historic road listed on the NSW State Heritage Registry, and is significant because:

“.. it is associated with several notable figures in colonial administration, surveying and engineering including Governor Darling, Surveyor General Thomas Mitchell and Percy Simpson, one of Australia’s earliest scientific road engineers. ..The Old Great North Road physically demonstrates the work patterns, skills and organisation of convict work gangs...It has technological value in that it demonstrates the standards and practice of road engineering in the colony during the ‘Great Roads’ period of the late 1820s and 1830s. (NSW Heritage Office 2007)

Further inspection of the State Heritage Register shows that in relation to historic roads, the focus of heritage assessments is more on the built environment (e.g. old trestle bridges, early convict constructions, associated infrastructure) rather the natural values of the route. An historic road can be listed on the NSW State Registry if it meets one of the following criteria:

- (a) an item is important in the course, or pattern, of NSW’s cultural or natural history;
- (b) an item is important in demonstrating aesthetic characteristics, or
- (c) an item possesses uncommon, rare or endangered aspects of NSW’s cultural or natural history; e.g. plants (NSW Heritage Act 1977, Amended 1998).

The latter criterion (c) suggests that suitable assessment mechanisms are in place to identify historic roads in NSW for their conservation (natural) values, however few are listed. A similarly inspection of the register of the Register of the National Estate (Australian Commonwealth) reveals two roads are listed:

- **Bala Travelling Stock Route - Remnant Vegetation Site**, Boorowa NSW
- **Somerton Road Travelling Stock Route**, Lower Somerton Rd, NSW.

In contrast to the NSW register, these historic roads (or routes) have been listed for “..**possession of uncommon, rare or endangered aspects of Australia’s natural or cultural history**”, as they contain ‘intact’ remnants of endangered White box woodlands, and provide refuge for a number of rare or endangered plant species (Australian Heritage Council 2007). Similar criteria exist in the United States (Historic Roads 2007) to identify historic roads.

Therefore as ‘historic roads’ often contain endangered remnant ecosystems, which make a significant contribution to conservation targets in many cleared landscapes of Australia, there is considerable scope and opportunities for road

management authorities, land managers, and local communities to formally identify 'historic roads'. In particular, components of the Travelling Stock Route network, which represent important aspects of Australia's natural and cultural history. But why go to the trouble?

As stated in *Historic Roads* (2007), the benefits of identifying, preserving and managing an historic road are diverse. They may include opportunities for tourism and economic development, and assistance for restoration of historic structures and features such as bridges, survey trees, indigenous camp sites etc. Preservation of certain road sections may result in improved road safety and traffic flow. Furthermore, such a process may foster community pride associated with a more comprehensive understanding of their cultural and transportation heritage. Importantly, understanding the development history of historic roads can provide an important tool to gain new awareness of roadside environmental values, and facilitate greater community investment in their ongoing management.

Conclusion

The present day road networks of south-eastern Australia are a historical vestige of past land-use decisions; a collection of TSRs, former pastoral run boundaries, county and parish boundaries, overlaid onto an uncoordinated collection of mostly one-chain roads, some of which were given 'character' by 19th century surveying errors. More by necessity than design, road reserves that were surveyed during rapid land development in the late 1800s, were later put into use as settlement patterns dictated. Many road reserves still contain important evidence of past land-use history in the form of historic survey trees, indigenous scar trees, stock ramps, camps, old tree stumps, bridges, rail sidings, post and rail fences and old wells, to name a few. In this way, each road reserve has a unique story to tell, often containing sections surveyed at different times with different histories, some with important historical and cultural values to the region.

An historical perspective of roads can greatly assist our interpretation of associated roadside and remnant eco-systems. As described, the conservation values of many roadside environments can be attributed to past land-use decisions. Many roads of high conservation status are often older roads, and in turn, many of these have important heritage values as historic roads. Understanding the land-use history of agricultural and other landscapes, and associated development of road networks, can provide new insights of the social and cultural values of roadside environments; a key issue to the successful conservation of these unusual landscape elements. Recognition of regional land-use and transportation histories, its legacies, and human relationships can only enrich our understanding of roadside environments.

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- (a) Spooner, P.G. 2005. On squatters, settlers and early surveyors: historical development of road reserves in southern New South Wales. *Australian Geographer* 36, 55-73. It is produced courtesy of Taylor & Francis Ltd. <http://www.tandf.co.uk/journals/titles/00049182.asp>
- (b) Spooner, P. G. and Lunt, I. D. 2004. The influence of land-use history on roadside conservation values in an Australian agricultural landscape. *Australian Journal of Botany* 52, 445-458. It is produced courtesy of CSIRO publishing. <http://www.publish.csiro.au/paper/BT04008.htm>

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