Milling Australia’s forests

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Introduction

When the First Fleet arrived in Australia in January 1788, Aboriginal people were using wood and bark for spears and digging implements, carrying water, constructing canoes, providing shelter, and for the indispensable fire which enabled food to be cooked and provided warmth at night. Sawpits were constructed at Botany Bay on 21 January and, when the site of the settlement was shifted to Sydney Cove, orders were given to dig fresh pits on 26 January. On the following day, a box of splitting wedges and a dozen cross-cut saws were unloaded. The timber industry in Australia could be said to begin on this date when the first timber sawn in the newly established Colony of New South Wales was produced manually over sawpits using convict power. Timber was the most important building material available and Australia’s foundations could be said to have been constructed largely in indigenous timber. Sawing timber was such slow, hard manual labour that splitting and hewing probably produced the bulk of the timber used. Timber sawing continued on a ‘subsistence’ level for decades. The only method of transporting logs or sawn timber was the power of muscle – either convict or bullock and later horse. This was insufficient to overcome the long distances and difficult terrain of the new Colony. The water power that had pioneered world sawmilling in Europe and the American colonies was in short supply in Australia, and could be used only on parts of the east coast of the mainland and in Tasmania. It was within these constraints that the first sawmills struggled to make their presence felt.

The pioneer sawmills and water transport

Powered sawmills were established in Tasmania in 1825, Western Australia in 1833, NSW in 1838, Victoria in 1841, South Australia in 1848, and Queensland in 1853. The Northern Territory had little commercial timber and a low population compared with the other States, and forest industry was less of a priority. Many of the very early sawmills were associated with grain mills, working on each raw material on a seasonal basis. Timber being cleared from land intended for agriculture provided a convenient synergy where both occurred close to a waterway. Water transport was essential in those early years. In Tasmania, the Derwent estuary carried timber from sawing stations farther afield to the main settlement of Hobart. In Victoria, a coastal trade developed in the 1850s supplying Melbourne with stringybark and mountain ash timber from sawmills at Apollo Bay and Wilsons Promontory. In NSW, the extensive waterways of Sydney Harbour supplied the means to transport timber to the growing city until sawmilling moved north and south along the coast. Rivers were used where navigable to bring out the valuable red cedar of the Richmond and Clarence Rivers, but the coastal trade remained the most important form of water transport. In Queensland, the Brisbane River was use to transport hoop pine logs to the sawpits and sawmills of the young settlement prior to dispatching sawn timber to Sydney. As sawmilling moved south from Perth to the valuable forests of jarrah and karri in the south-west, coastal shipping brought timber north from Bunbury, Hamelin Bay and Flinders Bay.
Before long, this WA coastal trade had expanded into one rare in Australia where the durable hardwoods were exported directly overseas.

**The Bureaucrat’s domain**

In the early years of Australian sawmilling, control of the forest resource was very much in the hands of the sawmillers. So long as the annual site licences and jinker licences were paid, there was little supervision. Much timber was simply wasted. Only the best trees were taken, and there was no follow-up silvicultural treatment to ensure regeneration. Land selection policies discouraged the retention of timber and, with no way to get it to market, millions of hectares of timber were simply ringbarked and burnt by settlers Australia-wide. Ironically, some of these areas are now being replanted with the realisation that timber was the crop best suited to the land after all.

This situation persisted throughout much of the nineteenth century. It was only during the 1890s that it was realised that some form of control had to be implemented if Australia was to become self-sufficient in timber. Individual States struggled with this problem until a string of quasi-independent forest conservancy bureaucracies were established: in South Australia (where the shortage of timber was most desperate) in 1875; in Victoria and Queensland in 1907, in NSW in 1909, in Western Australia in 1919, in Tasmania in 1921, with a national body founded in 1927. The 'Imperial model' of Forestry was imported from Europe via India, and it was within this framework of increasing official control that Australian sawmilling and timber transport developed.

**Rail transport and the Australian timber industry**

The first steam railway in Australia, opened in Melbourne in 1854, heralded an Australian revolution in timber transport and enabled the fledgling sawmilling industry to move inland away from the coast. Whilst some water transport remained important into the twentieth century, local timber transport by water had its last gasp in coastal NSW and the Red Gum trade on the Murray River. The railway enabled regional sawmillers to become more independent of seasonal conditions, since timber could be sent away at almost any time of the year. At the same time that the first railways were being built, gold rushes, especially in Victoria, provided an important new market for almost every type of timber. By the end of the first golden decade, the population of Victoria had grown from less than one hundred thousand to in excess of half a million. The boost given to Victoria’s finances allowed money to be raised for new railways heading north-west from the capital towards the Central Goldfields. At the same time, the first experiments were being carried out with linking sawmills with railheads by the construction of timber tramways.

Australian timber tramway technology borrowed from European and American traditions but on a smaller scale more suited to the timber resources of Australia. Tramways were used most intensively in Tasmania, Victoria and Western Australia and, to a lesser extent, in NSW and Queensland. In Victoria, the first tramways dated from the mid-1850s and were concentrated around the central goldfields, supplying sawn timber, pit-props and firewood to the mines. A variety of track-laying methods were used, with 'principal and stringer' dominating in the 1860s and 1870s. Sawn wooden rails were laid over the decked principal and stringer foundation, sometimes capped with iron plates where sharp curves or heavy traffic contributed to significant wear. Haulage was exclusively by horse and bullock power until the introduction of the first steam tramway locomotives: in Queensland in 1870, in Western Australia in 1871, and in Victoria in 1873. All three were Australian-built. Others followed, mostly imported standard-design narrow-gauge industrial locomotives with rod drive running on iron rails. In the Victorian bush, the principal and stringer tramway was extinct by the twentieth century, having been replaced by a foundation of split timber packing laid transversely with sawn wooden rails running longitudinally. Most log trams were operated with horses. The grade was usually in favour of the...
load, allowing logs to be delivered to the mill by gravity controlled by a brakeman, with the empty trucks being returned to the bush by horse teams.

Few Australian timber tramways developed to the extent demonstrated by the American model from which they were largely drawn. However, each major timber-producing State had its exception: in Tasmania, the Huon Timber Company; in Victoria, the Victorian Hardwood Company; in NSW, the British-Australian Timber Company; in Queensland, Lahey's at Canungra; and in Western Australia, the powerful combine created by the amalgamation of eight sawmilling firms that formed Millars Karri & Jarrah Company. All of these companies approached the American scale in terms of locomotive numbers, track length and standard of construction. The long-term timber leases offered by the WA Government in contrast to the short-term licences generally available almost everywhere else encouraged investment in infrastructure. As a result, tramways were of the same gauge as the WA government railways and used similar locomotives, mostly of conventional drive and wheel arrangement, and the WA tramway system most closely approached American practice.

A number of American steam-powered geared locomotives were imported into Australia—at least sixteen of the 'Shay' type and fourteen of the 'Climax' type hauled timber on Australian tramways, with a number of geared locomotives also built locally locally. Local production of steam-powered tramway locomotives seems to have been concentrated in Tasmania, where a large number of geared and chain-driven types were manufactured, some from former steam road vehicles. Some were built by local engineering firms, others by the sawmillers themselves. In Victoria, locomotive production was, apart from two geared steam locomotives, largely limited to internal-combustion engined rail tractors. The first of these was introduced at Warburton in 1911. In the 1920s, the rugged and widely available Fordson tractor power plant formed the basis of a large number of rail tractors produced by the Melbourne firms of Malcolm Moore and Day's Engineering. These were widely used on the east coast for timber transport from the late 1920s until the late 1940s, by which time the timber tramway was largely displaced by road transport.

Above: A log train on the 1067mm gauge Goodwood Company’s line west of Noojee in Victoria. This is typical of the larger-scale timber tramway systems in Australia, and was based on West Australian practice.

Photo: Rex Jones, author’s collection.
Road transport

Following the First World War, road transport found increasing favour with sawmillers. While timber from small sawmills had always been dispatched on rough, rutted roads behind bullock teams and steam traction engines, it was the internal-combustion engine that wrought a revolution in timber transport. The timber industry's move away from tramway and railway and towards road transport would have been impossible had it not been for the development of the crawler tractor, which not only revolutionised the logging industry, but made possible for the first time the economic production of side cuts for gently graded forest roads. The smaller sawmillers were the first to embrace road transport, followed by those cut off from a railhead. The larger and well-established sawmillers already had a significant investment in tramways terminating at railway stations and were loath to see this investment wasted. For forest managers, there were certain advantages both for the management of the forest and sawmill operations in the use of road transport. Roads enabled fast and easy access for supervision and fire-fighting, and provided ready extraction routes for forest produce. The easier access also tended to increase the royalty rate that could be charged for logs 'at the stump'. Once milling moved on from an area, the roads remained a permanent asset for both fire protection and silvicultural purposes. Roads also provided an access route for the extraction of secondary forest produce such as piles, poles, and pulpwood not worth extraction by tramway, further maximising revenue from the forest.

However, the greatest cost savings were for the sawmiller and the timber merchant. Where a mill could be sited close to an existing road, the cost of an export tramway was saved. As most forest mills had a limited life, this meant that the mill did not have to carry the large capital outlay necessary to construct such a tramway. A short road built into the mill itself was relatively inexpensive to construct and meant that there were no transshipment costs associated with the outer terminus of an export tramway. Road transport, therefore, opened up remote forest areas that could not otherwise be economically exploited. Roads could also surmount grades impossible for a tramway without the installation of cable-worked inclines which could prove to be bottlenecks in the timber production process.

Where obtaining an order for sawn timber was conditional on fast delivery, road transport beat rail transport hands down. Speed was not the only advantage; transport direct from the mill to the building site reduced double handling to and from rail trucks and at break-of-gauge stations. Road trucks could carry back-loading of mill supplies cheaply and, when a mill was closed temporarily for some reason, could be put to other work while a tramway system would have remained idle. Road transport was also more flexible for city timber merchants. Rail trucks carried around 12 cubic metres of timber and demurrage was charged while the trucks were unloaded and therefore unavailable for use by the railways. The sudden influx of 12 cubic metres of sawn timber could strain the yarding resources of a small city mill or timber merchant. Motor truck loads of between 3.5 cubic metres and 4.7 cubic metres allowed more flexibility, both as far as yarding and special orders for certain classes and sizes of timber were concerned.

While road transport of sawn timber offered economic advantages to the industry and the consumer, transport of logs by road had the potential to change the way in which forests were logged and the entire social framework of the sawmilling industry. Sawmills would no longer be restricted to operating in areas where almost every tree was of commercial value and warranted the construction of logging tramways through an area of forest solely allotted to one sawmiller. Isolated patches of bush with road access could be logged and every tree of commercial value taken to a sawmill located in a central position in a forest district or in a town. When coupled with the mobility of crawler tractors, which were slowly replacing steam winches in the late 1930s, motor log-trucks promised a new way of working forests—timber could now be allocated on the basis of a given volume of logs from a district rather than from a set area with definite boundaries allotted to one sawmiller. The transport of logs by road also meant that there would be additional pressure to charge royalties on log volume rather than on the volume of sawn timber after conversion. The construction of an efficient network of roads also allowed forest managers to construct working plans to utilise and regenerate the forest more efficiently. Where the sawmiller chose the mill site and planned his own investment in tramways, utilisation was
based on what the sawmiller thought best for himself. Where the forest manager planned and
built a network of roads, it had greater control over the way in which the forest was worked. A
system of graded logging could then be introduced whereby the sawmiller removed the best logs
for conversion to high-grade sawn timber, the case miller followed and removed the inferior and
smaller logs for case timber and, finally, the pulp operator followed and removed the remainder
for conversion to paper pulp. Today's 'integrated harvesting' would be impossible without an
efficient road system.

The social implications of effective roading were even more far-reaching. Up until the
introduction of logging by motor truck, sawmills were of necessity located close to their resource.
Large numbers of people, including women and children, had to live close to the mills in isolated
locations, far from hospitals and good schools and often under adverse climatic conditions and
under threat from bushfire. With the mills removed from the forest to townships, hardship was
reduced, and often a better class of labour was available to the sawmill owner.

While motor trucks made deep inroads into export tramway and railway transport during the
1930s, logging by motor truck in general made little headway until after the Second World War. Today, forest roads are well-constructed to handle what is today increasingly the standard logging
truck, the B-double.

**Sawmilling technology**

The first Australian sawmills consisted of little more than a power source (either a waterwheel or
a steam engine) and a single saw, usually reciprocating. Logs would be 'spotted' by adzing a flat
face on one side and then broken-down into large flitches, each with a flat face to provide the
basis for further sawing. Once reduced to flitches, the saw would be replaced with one with finer
teeth, and the flitches ripped into sawn timber. The next step in the evolution was to introduce
separate breaking-down and rip benches into the sawmill, allowing the daily output to be roughly
doubled if enough logs were available. In the nineteenth century, the breaking down saw was
usually vertical and reciprocating. By the twentieth century, the vertical reciprocating saw was
increasingly displaced by the twin circular saw of North American practice. A mill with a large
twin-cylinder portable steam engine, twin breaking-down saws and two rip benches, could turn
out between 14 and 23 cubic metres per day if the log supply was adequate. However, apart from
the few larger sawmilling companies already listed in the tramway section, this was largely where
Australian sawmilling practice stopped for fifty years. From the 1890s to the 1940s, Australian
sawmilling was dominated by small family owned firms often financed by a large city timber
merchant, which guaranteed to take a significant portion of the mill's output. The short-term
nature of the three-year licence prevalent in most of Australia discouraged further investment,
and the small size of the local market limited opportunities to expand. The refractory nature of
Australian hardwoods, which were difficult to cut and season, contributed to a lack of exports
and a constant battle with imported timber, notably Baltic and North American softwoods. As a
result, the large electrically-lit, multi storey American bandsaw mill made only rare appearances in
Australia, and those that did either operated only for a short period due to lack of an extended
log supply or operated at a significant loss. As a result, several generations of Australian
sawmillers followed in their grandfathers' and fathers' footsteps in small family firms before a
number of factors brought an end to this practice.

In January 1939, devastating fires in Victoria and, to a lesser extent, Tasmania and southern
NSW, destroyed a large number of sawmills and the resource on which they worked. In Victoria, the
race was on to salvage the fire-killed mountain ash before the timber rotted. At the same
time, the Second World War created a huge national demand for timber and a simultaneous
dearth of labour, materials and machinery for sawmilling. Even forest managers were in short
supply due to the formation of Forestry Companies and their transfer overseas as part of the
military effort. Small sawmills increasingly fell into the hands of timber merchants to which they
owed their continued financial existence. Following the War, sawmills were forced out of the
forest as a boom in employment reduced the number of men willing to live at remote sawmills.
Simultaneously, a ready supply of cheap machinery provided the mechanism by which logs could
be transported to regional sawmilling centres clustered around railheads, where electricity was available to power the saws. The efficiencies of scale quickly reduced the number of sawmills as entrepreneurial owners bought up licences of small, struggling sawmills, and aggregated the log supply. In Victoria, the wholesale destruction of the timber along the Great Dividing Range caused the sawmilling industry to largely relocate to the east of the State while the Ash regrowth matured. Today, a reduced number of sawmills owned by a few large timber companies operate on a diminished resource constrained by the demand for paper pulp, the application of sustainable yield requirements, and pressure from the environmental movement to cease logging in Australia’s native forests.

Above: Hayden’s sawmill under construction in the Otway Ranges, Victoria, in 1919. The mill is typical of most Australian sawmills in the first half of the twentieth century. The mill is yet to be roofed. Note from the right to the left of the picture: the log yard with logs ready to be rolled onto the breaking-down bench track, the drive shaft for the saw benches, the skids to slide flitches from the breaking-down to the rip bench, the twin-cylinder portable steam engine and, just to the left of the engine, the excavation for the export tramway. This mill was capable of cutting about 12 cubic metres of sawn timber per day. Beyond the sawmill, rough accommodation is under construction for the mill workers. Note that the forest has recently been ravaged by fire, a common occurrence in the fire-adapted Australian bush.

Postcard: author’s collection

Logging technology

The first logs drawn from Australian forests were carried on the shoulders of a convict 'centipede'. Bullocks quickly replaced convicts until, in turn, being displaced by horses for hauling logs from the bush to the landings on the log tramways. For most of the nineteenth century, Australian logging continued to rely on muscle-power until America signposted the way to the future. Sawmillers in North America shared a common problem with their cousins in Australia—
large trees and difficult terrain. In 1882, John Dolbeer patented his steam logging engine based on marine winch technology. Twenty years later, the technology had matured into the standard North American logging engine consisting of a large vertical boiler and twin-cylinder engine driving multiple winch drums with aerial haulage of logs on complex ropeways commonplace.

Only two years after Dolbeer’s ground-breaking patent, a steam log hauler was in use in the southern forests of Tasmania, with a second introduced by 1888. In 1902, The Huon Timber Company imported a huge Lidgerwood logging engine and obtained a second engine from the Washington Iron Works. Local manufacture was taken up by Russell Allport & Coy, which became a major winch builder dominating the Tasmanian market. Steam logging technology had moved to Victoria by 1901 with a double-drum winch installed in the Otway ranges. In 1913, Alfred Harman of Port Melbourne patented a double drum logging winch with a cast steel frame that was to become ‘standard issue’ to Victorian sawmillers. In 1926, two Victorian sawmillers purchased the logging engines of the Huon Timber Company. After these engines were installed at Starvation Creek near Warburton, they provided a feast of logs for the sawmills of their new owners and, perhaps for the first time, sawmilling in Victoria became unsustainable as the forests were cut-out at a rate that astounded the local Forest Officers. Further American logging engines were introduced into Western Australia by the Kauri Timber Company. Following the 1939 bushfires, two of these engines were moved to Victoria where they became an important part of timber salvage operations. However, the days of steam-winching technology were already numbered as something more flexible had already become available.

Above: A Washington Iron Works multiple-drum winch installed at Starvation Creek, Victoria, for the Federal Timber Company in the 1940s. American steam logging technology at its best working in an Australian mountain ash forest.
Photo: Des Morrish, author’s collection

The first all-crawler tractors were introduced into Australian forests in the 1930s. Following the Second World War, the ready availability of these tractors quickly ousted steam as a force in
log haulage. When fitted with an auxiliary PTO winch, these tractors could remove logs from relatively steep terrain. The tractors were at first used to take logs to tramway landings. However, when fitted with a blade controlled by hydraulic rams, the tractors could also be used to construct roads relatively cheaply. This meant that motor trucks could be used to move logs direct from the forest landing as well as transport sawn timber away from forest sawmills. The major drawback was that the initial investment in a crawler tractor was relatively large. While a double-drum steam winch and boiler could be purchased for around £1000 in 1936, a new Caterpillar tractor fitted with a blade cost between £1860 and £2590, almost equalling the cost of equipping a small sawmill. The new technology was therefore only available to successful sawmill owners who commanded sufficient spare capital to make the purchase. This tended to make the smaller sawmills even less competitive and was one of the factors which led to the emergence of larger sawmilling companies during the late 1940s in what had once been an industry dominated by small family-owned enterprises.

Social history and heritage
Most bush sawmills were isolated, with the only connection to the outside world being via a rough bush tramway. All timber left via this tramway, and all food that could not be grown in a bush garden came in over it. Mill housing was usually provided by the sawmill owner. Single men were housed in small huts, the minimum size of which was laid down by the Timber Workers’ Union. Married couples were accommodated in larger houses, often some distance from the huts of the single men. All buildings were constructed of rough-sawn timber and unlined except with hessian or newspapers. Large wooden chimneys lined with corrugated iron and stones served the dual purpose of a fireplace for warmth and a place to cook food. A number of the larger sawmill settlements boasted a school for the children and, perhaps, the luxury of a rough tennis court surfaced with crushed ants’ nest. Social life was largely what the inhabitants made of it.

Today, the remnants of mill housing, mill foundations, and immense sawdust heaps are all that remain to remind us of the bush sawmilling era in Australia. The heritage value of such sites has only recently been appreciated, and the implementation of the Regional Forest Agreement process in the 1990s saw intensive field-work at historic sawmilling sites in all States except NSW. As a result, a large number of historic sawmill and tramway sites have been added to the Register of the National Estate as a permanent reminder of the history of sawmilling in Australia’s forests.

Further reading
Additional information was drawn from the regional sawmilling histories published by the Light Railway Research Society of Australia: http://www.lrrsa.org.au/Lrr_Pubs.htm To date, there has been no comprehensive published overview of sawmilling in Australia, gaps in particular relating to South Australia, Tasmania, Queensland and New South Wales.