Hovells Creek Landcare Group Inc

Management of Mistletoe in Central West NSW Farmland

'What to do about mistletoe' had been a key issue of discussion for our Landcare group over several years leading up to an application to Meat and Livestock Australia for PIRD project funding support for farmer based trials on management of mistletoe. On one hand we were concerned about heavy infestations of mistletoe resulting in death or poor health of important shade, shelter and fodder trees while on the other hand noting that mistletoe is a native species providing habitat and food for native birds and marsupials and a species of significant environmental interest.

We noted significant cause / effect / control debate on mistletoe in the scientific and popular literature dating back to the 1950's on whether mistletoe results in poor tree health / death or whether pastoral / forest activity results in poor tree health and subsequent susceptibility to mistletoe infection. In our area large old paddock trees, trees in fenced off remnant vegetation and new tree plantings were all subject to heavy mistletoe loads. On one hand our Landcare group was very busy planting more new trees while on the other we were concerned that we were not adequately caring for our heritage trees or young trees in recent plantings.

We were concerned that loss of important shade and shelter trees would lead to lambing / calving losses, reduced weight gains for young stock, heat / cold stress for older animals, loss of fodder trees, increased susceptibility to wind and water erosion and loss of regional biodiversity.

1. What the Group Set Out to Do

Our overall aim was to stop the loss of important shade, shelter and fodder trees, with resulting benefits for animal production, through development of cost effective strategies to manage mistletoe in our pastoral environment. Specifically we aimed:

(i) To determine the level of strategic pruning by physical or chemical means, which is necessary to improve the health of two tree species (Red Gum and Kurrajong) and thus indirectly, shade shelter and fodder reserves for livestock and native habitat; and

(ii) To determine cost/benefit ratios for physical and chemical pruning (thinning) of mistletoe on Red Gum and whether significant benefits and tree health can be achieved for less that $25 per tree.

2. Preliminary Results

(a) Physical Pruning of Mistletoe (*Amyema spp*) on Eucalypts

Sixty red gum (*Eucalyptus blakelyi*) located over seven properties were subjected to four pruning treatments (*complete* removal of mistletoe, *two thirds* removal, *one third* removal and *nil* removal) in May - June 2008. The pruning was undertaken by an experienced tree surgeon using climbing ropes and small chain saw so as to result in minimal pruning of the trees other than to remove mistletoe.

All trees in this treatment hosted more than six mistletoe, some hosted more than 30 mistletoe and the average mistletoe load was calculated at 19 mistletoe. All treatments were arbitrarily assigned. Trees treated in each replicate of four treatments grew in relatively close proximity (ie each treatment tree could be sighted from another tree in the replicate).

All trees in the *complete* removal treatment improved one or two points on our tree health scale (Appendix 1) over the two year period. Half the trees from which *two thirds* of their mistletoe load was removed also showed improved tree health of one point. Most of the trees from which *one third* or *nil* mistletoe was removed showed no change in tree health and some deteriorated in health.

Several additional trees originally assessed in very poor health and subjected to radical pruning, including removal of all mistletoe, but not pollarding, demonstrated remarkable improvement in tree health (2 – 3 points on our scale). Coppicing the trees proved to be a much quicker, though also dramatic, treatment than moving around the tree removing individual mistletoe.

The time taken to prune mistletoe (*complete* or *two thirds* removal) using a professional tree surgeon ranged from 30 – 40 minutes for a relatively compact tree up to 15 metres in

height and hosting up to 15 mistletoe to two hours for a large spreading tree, 15 – 20 metres in height and bearing 30 plus mistletoe. On a good day we were able to treat 12 to 20 trees. At $400 per day for the tree surgeon, plus GST and landholder assistance, the cost per tree was $60 to $240 per tree.

As a footnote, while very effective, and ascetically rewarding, pruning mistletoe by this method proved to be very hard work, not for amateurs and an activity not easily maintained for longer than six hours on cold winter days. Our conclusion is that it is best reserved for high value trees.

NB We replaced red box (*E polyanthemos*) in the original project plan with *E blakelyi* due to available tree numbers and broader distribution on member properties.

(b) Physical Pruning of Mistletoe using a Cherry Picker

Twelve Blakley's red gum Eucalypts and one grey box (*E. microcarpa*) on four properties were pruned of mistletoe by the tree surgeon using a 12 m towable travel tower (cherry picker). The trees selected hosted 7 to 42 mistletoe, with an average of 18 mistletoe per tree.

Pruning using the cherry picker took 30 minutes for an 8 m high tree hosting 8 mistletoe to 90 minutes for a 10 m tree hosting 42 mistletoe. A 15 m tree hosting 26 mistletoe took 2 hours to prune as the travel arm was fully extended at this height and had limited lateral movement. The 20+ m grey box proved too high for use of the cherry picker, even using a pole saw.

The cost of hiring the cherry picker at $300 per day plus GST adds $50 per hour to the cost of pruning, but can be used by less experienced operators to prune smaller trees. Larger travel towers require a ticketed operator, are significantly more expensive and are not readily available in country areas. The cherry picker also takes time to level, or it will not elevate, and is not safe to operate on ground with more than 5 percent slope.

(c) Physical Pruning of Mistletoe using a Pole Saw

Several trees were pruned using a commercial pole saw with a 3.5 m extension arm. This proved a practical method for relatively small trees (up to 6 m high) from the ground, or for higher trees using the cherry picker at minimal extra cost.

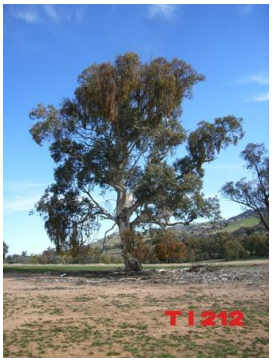
Longer pole saws or clippers proved unavailable despite a wide search.

The team also became quite skilled at throwing a shot bag and line over tree branches some 10 m off the ground and physically breaking the host branch to allow the mistletoe to fall to the ground.

(d) Chemical Treatment using 2,4D Tree Trunk Injection

Eight Blakelyi's red gum and two red box (*E. polyanthemos*) on two properties were injected with a 10 percent solution of 2,4-D. The technique and dose rates were developed by Greenham and Brown (1957) of the CSIRO in Canberra and used extensively by Forestry Commissions in NSW and Victoria during the 1960's and 1970's. This involved drilling 25mm diameter holes approx 40mm deep (depending on the thickness of the bark) into the trunk of the tree at 100 to 120mm spacing at chest height (1.2m) around the tree and injecting approx 10ml of the solution into each hole. The Greenham and Brown dose rate is determined from the diameter of the tree at chest height. The treatment was undertaken in the spring of 2008, at a time when we judged sap movement in the phloem of the tree to be most active.

The treated trees ranged from 12 to 25m in height (600 to 1200mm in diameter) and hosted from 8 to 50+ mistletoe (average 24 mistletoe). This treatment had a dramatic impact on both the tree and its mistletoe load. Within six months all trees lost more than 50 per cent of their foliage, most, if not all, mistletoe lost foliage and tree health was rated down one or two points. Within 18 months, most, but not all, trees had recovered their initial tree health score. One very tall tree which hosted in excess of 50 mistletoe remains in poor to fair condition. Only 10 per cent of the mistletoe hosted on the treated trees survived the treatment (average 2.3 per tree).



A further six apple box (*E. bridgesiana*) and four Blakelyi's red gum on an adjoining property were treated using this technique in the spring of 2009. While the impact on the mistletoe was similar, there was no apparent impact on the Blakelyi's red gum by June / July 2010. The treated apple box were all large (> 1m diameter) trees with very thick bark at chest height, and hosting 7 to 23 mistletoe (average 15). To date there is no apparent impact on the trees or significant impact on the mistletoe load, though 2 – 5 on each tree are now dead. 2009 was a dry spring in our area and the 2,4-D solution may have bee adsorbed within the thick apple box bark rather than being taken up into the tree by the phloem sap flow.

Tree trunk injection with 2,4-D proved to be the most cost effective on farm treatment for management of mistletoe. Each tree can be drilled and injected from the ground within 15 – 20 minutes using readily available farm equipment and relatively unskilled labour at a cost estimated at $10 - $12 per tree. However, there is a risk, noted by Greenham and Brown (1957), that some trees may die.

(e) Ground Spraying of Mistletoe using 2,4-D or Roundup CT

Mistletoe on twenty four Blakelyi's red gum were sprayed from the ground using the manufacturers recommended spot spray rate for 2,4-D and Roundup CT (12 trees for each) using a high pressure spray rig operated by the Boorowa based Southern Slopes Noxious Plants Authority in the spring of 2008.

The treated trees ranged from 4 to 15m in height and hosted from two (on the small trees) to 40 mistletoe (average 22 mistletoe). The spray treatments proved to be an operational challenge. While the mistletoe on smaller trees and lower branches could be saturated with spray to run-off point, it proved difficult to saturate spray the higher mistletoe even with a long lance handpiece and maximum spray rig pressure. Even the slightest breeze on a very calm morning also resulted in spray drift.

While the Roundup CT treatment resulted in death of some mistletoe on lower branches the average was less that 0.5 mistletoe per tree. Treatment with 2,4-D spray had similar minimal impact, even though the treatment is quick (10 – 20 minutes per tree) and low cost ($10 – $15 per tree).

(f) Physical Pruning of Mistletoe on Kurrajong

Twenty Kurrajong (*Brachychiton populneus*) located on two properties were subjected to four pruning treatments (*complete* removal of mistletoe, *two thirds* removal, *one third* removal and *nil* removal) in June – July 2008. The pruning was again undertaken by an experienced tree surgeon.

All trees in this treatment hosted more than six mistletoe (*Notothixos subaureus*, a completely different family of mistletoe than those hosted on the Eucalypts), some hosted more than 30 mistletoe and the average mistletoe load was calculated at 17 mistletoe. All treatments were arbitrarily assigned. Trees treated in each replicate of four treatments grew in relatively close proximity. (though due to the rugged rocky terrain in which Kurrajong grow not all treatment tree could be sighted from another tree in the replicate).

All the treatment trees remained in good tree health throughout the two year period. Very little is known about the impact of mistletoe on Kurrajong (David Watson, personal communication) but it appears mature Kurrajong can host quite large mistletoe populations (at least 20 – 30 mistletoe) without significant impact. Most of the pruned trees have responded with new growth. Kurrajongs have been utilised for many years as a supplementary fodder sours in dry times on farm.

Three additional trees hosting in excess of 40 mistletoe each and with less than 5 percent remaining Kurrajong foliage were heavily coppiced. One tree immediately responded with new growth, one has only just responded with new shoots around the trunk after 18 months and the third tree has not responded and appears to be dead.

Kurrajong are relatively squat trees (5 to 16m in height) and with numerous branches which makes it relatively easy for and experienced tree surgeon to climb around within the canopy and prune up to 20 mistletoe within 30 minutes. Our group utilised a larger than normal support group of interested farmers for this part of the trial, but $60 per tree is a reasonable estimate of cost for a two person pruning team for Kurrajong.

(h) Other related trials

Initially the Group planned a number of ad hoc trials, eg the reintroduction of possums to remnant woodland and strategic burning, to complement the pruning treatments above.

Longtime residents of our area believe that mistletoe has become more prevalent since the 1950's when possums also disappeared from remnant bushland and 1080 was introduced for fox and rabbit control. Possums are now rarely seen in the district and only in farm buildings or in farmhouse roofs. Possum interest in young mistletoe shoots as a food source is recorded in the literature.

Despite the strong recorded relationship between possum and mistletoe ecology and possible tree health, NSW Department of Natural Resources officers refused to grant the necessary permits to allow possum relocation.

The trial period also coincided with dry years (the area was drought declared) with resulting lack of ground fuel or inclination on the part of landholder members of our local Bush Fire Brigade to test David Watson's beliefs on the strong relationship between fire / smoke and mistletoe prevalence.

Reference

Greenham, CG and Brown, AG (1957) The Control of Mistletoe by Trunk Injection. Journal of the Australian Institute of Agricultural Science Vol 23: 308 - 318

Acknowledgements

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Appendix A

HCLG Tree Health Score

Reid et al (1994) utilised relative foliage biomass (RFB) as their measure of tree health. RFB was an uncalibrated estimate of host foliage biomass, expressed as a percentage of the potential quantity of host foliage biomass on the tree in full leaf, ie with a dense entire crown, without dead or leafless branches and without parasites (Mistletoe). Leafless trees of any size scored 0%, and unaffected trees with a perfect dense canopy scored 100%. The independent estimated of trained observers were usually within 10% and Reid et al considered the measure to be a robust index of tree health.

However, if Mistletoe is a natural and desired component of the Australian landscape, then a healthy tree might be expected to be able to carry a low Mistletoe load without undue impact. For example, some Red Box trees carry very high Mistletoe loads (>10) but still have dense Eucalypt foliage and appear otherwise healthy. On the other hand, Red Gums with a Mistletoe load >10 appear to be in poor health and rapid decline.

HCLG Project measure of tree health:

Tree Health Score	Description
1 Very Poor	Little, if any tree, foliage, numerous dead branches. Possibly accompanied by heavy Mistletoe load (>10), constituting the majority of leaf foliage on the tree. Tree considered close to death.
2 Poor	Sparse tree foliage, many dead or bare branches. Accompanied by high Mistletoe load. Tree considered 'at risk'.
3 Fair	Medium to good level of tree foliage (for the species), some dead branches (but not excessive). Mistletoe load > 6. Tree considered not yet in danger, but of concern.
4 Good	Medium to high level of tree foliage, some dead branches (considered normal), tree looking quite vigorous and healthy. Possibly accompanied by low level of Mistletoe load (<6).
5 Very Good	High level of tree foliage (for the species), few, if any, dead branches, tree looking healthy and vigorous. Possibly accompanied by a low level of Mistletoe load (1-2).

Notes