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Performance of naturally durable eucalypt posts in Marlborough Vineyards



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funded by
forestgrowers
commodity levy



***Established in 1984, Marlborough Research Centre's
focus is on the growth of the Marlborough economy,
and its contribution
to the wider New Zealand economy.***

***The Trust supports the vision and goals of
NZDFI***



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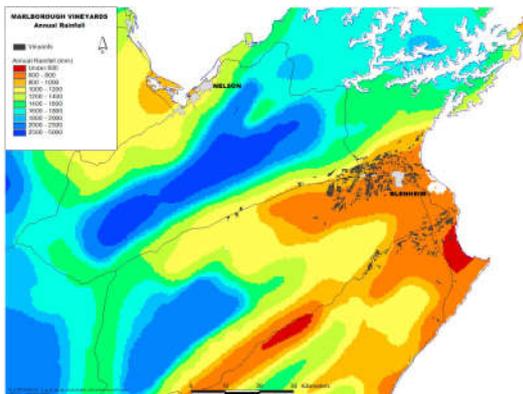
Connecting Research & Business in Marlborough, New Zealand & Beyond

- **2003** \$2million Gov't grant for new Wine Research Centre. Plant & Food Research based here.
- In 2003 Marlborough had 6,831ha of producing vineyards – 44% of national vineyard total.
- **2016** Marlborough has 24,000 ha of producing vineyards – 66% of national vineyard total of 36,000 ha.
- NZ annual export sales \$1.66 billion.
- 1% of world production, 3% of value.



Connecting Research & Business in Marlborough, New Zealand & Beyond

Marlborough's Climate underpins wine industry



Marlborough's climate is strongly influenced by its location and geography.

Mountains to the south and west create a rain shadow resulting in one of NZ's driest regions able to produce some of NZ's best wines.

Innovative mechanisation in vineyard operations has increased productivity

Machine harvesting (24-7 during vintage) and mechanised pruning.

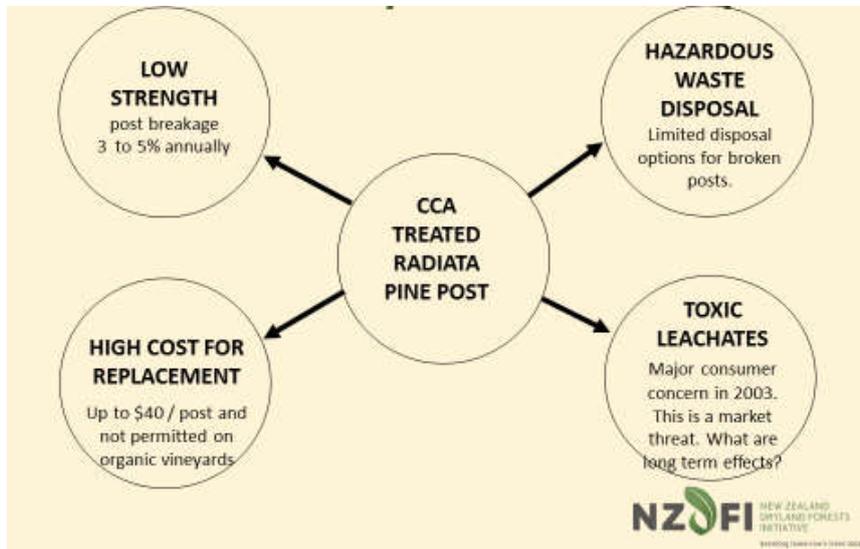


3% to 5% of posts break annually

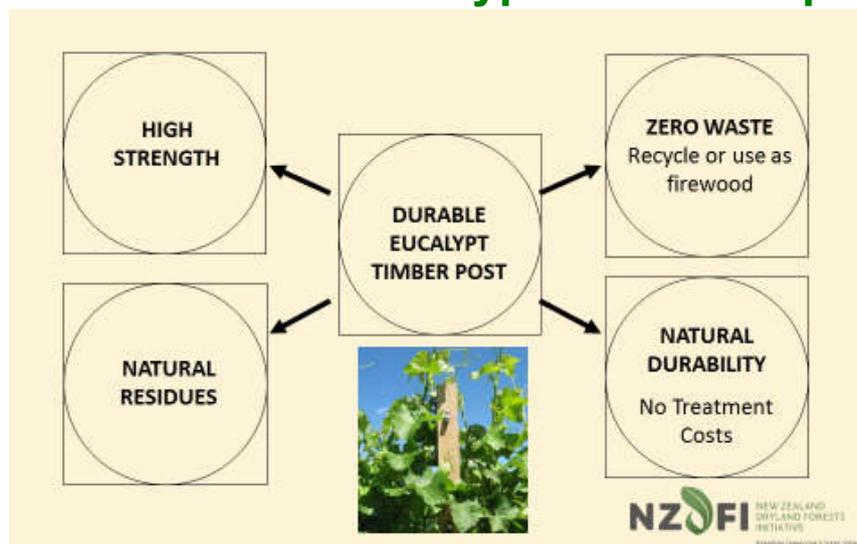
>95% of vineyards use CCA pine posts that are broken during mechanical harvesting and pruning.



Wine industry concern with CCA pine posts



2003 - Vineyard Timbers Ltd established to produce durable eucalypt hardwood posts



Potential Market for Vineyard Posts in Marlborough

- 25,000 ha vineyards in Marlborough.
- Vineyards have approx 600 posts / ha.
- Total existing posts = 15 million.
- Potential replacement @ 3% p.a. = 450,000 posts per year.
- Potential replacement @ 5% p.a. = 750,000 posts per year.
- BUT NO LARGE AREA OF DURABLE HARDWOOD FORESTS IN NEW ZEALAND!



This is not a new idea....Australian hardwood used for vineyard posts!



- Hunter, Mildura & Clare wine regions

Defining Natural Timber Durability

- The natural durability of the SWPP timbers can be classified on the basis of the expected life performance of wood from each species in either an indoor/protected from weather application; or exposed to weather above or in ground applications.
- *Definitions*
- *Natural Durability* is defined as the inherent resistance of a specific timber to decay and to insect attack.
- *Natural Durability Classes* provide the basis for rating the timber's performance and longevity in contact with or above the ground when exposed to average environmental conditions.

Classification of Natural Durability of Timber

- Reference: Australian Standard No 5604, Timber – Natural Durability Ratings, 2003

Class	Probable in-ground life expectancy (years)
1	Greater than 25
2	15 to 25
3	5 to 15
4	0 to 5

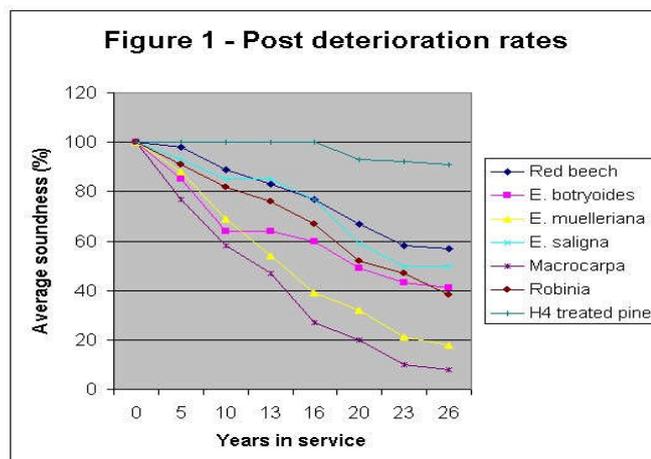
Natural Durability Caveats

Classifications not precise due to variability of wood properties within species and wide variety of ground conditions in which it may be used. Therefore classifications are a guide with the actual life dependent on the local ground conditions and other factors that include the following:

- These classifications only apply to heartwood with all sapwood having poor resistance to decay and insect attack.
- The inner core of heartwood around the pith, generally has lower durability than the rest of the heartwood.
- Durability is also influenced by the size or diameter of the post i.e. the larger the piece size the longer is will last.
- The age of the tree used to cut the timber also generally influences natural durability with mature trees producing more durable timber than semi mature trees.

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NZ Forest Research of natural durability of timber posts



Vineyard posts produced from *E. bosistoana*

- Portable sawmilling 60 year old *E. bosistoana* in Te Kuiti 2006 & 2008.
- Class 1 durable timber
- High density (1100 kg/m³)
- High MOR (163 MPa vs. P rad 60-90 MPa)
- High MOE (22 GPa vs. P rad 7-9 GPa)
- Well suited for wide range of applications including vineyard posts and crossarms.



Vineyard posts produced from *E. globoidea*

- Rapaura Timber sawing posts from 80 year old *E. globoidea* sourced from Marlborough farm woodlot. Class 2; 700-800 kg/m³; 11-14 GPa



SWP project to assess performance of VT posts in Marlborough vineyards

- Six vineyard owners purchased 1399 posts. Sales from 2003 to 2013.
- *E. bosistoana* = 746 (2006-08)
- *E. globoidea* = 298 (2007-09)
- *E. species* = 355
- Recently three vineyard owners had reported excellent performance and were prepared to allow access for an assessment.

SWP Project Objectives

- To engage vineyard owners/managers with durable eucalypt vineyard posts in a survey to record their knowledge and experience with using these posts.
- To locate all surviving unbroken *E. bosistoana* and *E. globoidea* vineyard posts in Marlborough vineyards.
- To assess the level of in ground decay in a sample of 50 posts of these two species.
- To assess the cause of failure for any failed posts found.

Survey of vineyard owners/managers

- **Six vineyard owners contacted to request their feedback on the performance of their durable eucalypt vineyard posts.**
- **Three owners who responded were the original purchasers of the posts.**
- **Two vineyard managers who responded had been working 2-3 years in the vineyard.**
- **One vineyard owners couldn't respond as recent acquisition.**

Vineyard owners/managers feedback

- **Five owners manage under organic standards with mechanical harvesting and pruning.
Two use under vine mechanical cultivation.**
- **Three reported a few posts had broken during harvesting due to large knots in the posts but none reported failure due to decay.**
- **Positives reported included posts providing good service, also naturally durable and acceptable for their organic standards.**

Vineyard owners/managers feedback

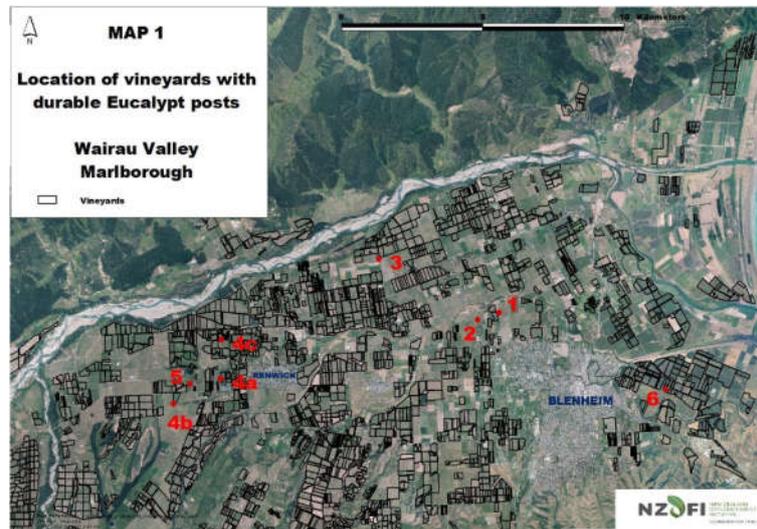
- The main negatives were the timber is hard for nailing or fastening wire hangers; also the lack of regular supply. One owner had posts twist in storage due to cross grain.
- Two suggested the posts could be larger.
- Four would use again if posts were available.
- Four commented that certification of sustainable production or local production was important as was price.

In service assessment of durable eucalypt posts

- The posts were installed as replacements for broken CCA posts by four owners. One set up a new vineyard and another used posts in a small feijoa orchard.
- In service assessment involved using 'pull' test.



Location of vineyards for in service assessments



Results of in service post assessment

- Vineyard owner 1
288 *E. bosistoana* posts purchased in 2007 & 265 installed in new vineyard.
16 posts have broken which is 6% breakage.
4 broken posts fully excavated for further analysis.
- Vineyard owner 2
Purchased 69 *E. bosistoana* and 120 *E. globoidea* posts between 2006 – 2008 for replacements.
54 *E. bosistoana* and 110 *E. globoidea* posts found still in service.
This suggests 20%(?) breakage for *E. bosistoana* and 8.3% breakage for *E. globoidea*.
- Vineyard owner 3 (site with small feijoa orchard)
180 *E. globoidea* posts purchased in 2007.
161 posts installed in orchard with no breakages/replacements evident.

Results of in service post assessment

- Vineyard owner 4
120 *E. globoidea* posts purchased in 2009 and 90 *E. paniculata* posts in 2013.
All posts used as replacements across 3 vineyards.
All posts found in service except one reported broken last year by owner.
- Vineyard owner 5
308 posts purchased of various species from 2003 to 2009 for replacements.
All similar dimensions so unable to differentiate. 121 posts found in service in a 15 hectare section of 45 ha vineyard with another 32 posts in storage.
- Vineyard owner 6
149 *E. bosistoana* posts purchased in 2008.
Posts block stacked for 3 years before starting to use for replacements.
Uneven drying and cross grain resulted in some rejects before use.
37 posts found in service.

In service assessment of durable eucalypt posts

- Vineyard 1



In service assessment of durable eucalypt posts

■ Vineyard 2 and 3 (feijoa)



Vineyard 4



In service assessment of durable eucalypt posts

■ Vineyard 4

and seen over the fence



In ground assessment of durable eucalypt posts

- 148 posts were sampled to assess the post condition in the top 200 mm of the soil horizon as this is where maximum decay is likely to be found.
- 75 *E. bosistoana* posts assessed at two vineyards.
73 *E. globoidea* posts assessed at three vineyards.
- Assessed by Dr. Clemens Altaner, UoC School of Forestry
- Remove top soil to a depth of ~15-20 cm
- Label posts
- Use pointed knife to judge decay depth

In ground assessment of durable eucalypt posts

- Decay was classed into the categories below.
- Deepest point of decay assessed, not the average decay depth – therefore 30 mm of decay possible without post failure.

- < 2 mm
- 2-5 mm
- 5-10 mm

- 10-20 mm
- 20-30 mm
- > 30 mm – failed

In ground assessment of durable eucalypt posts

Range of decay in *E. bosistoana* posts

< 2mm

2-5 mm

10 -20 mm

> 30mm



In ground assessment of durable eucalypt posts

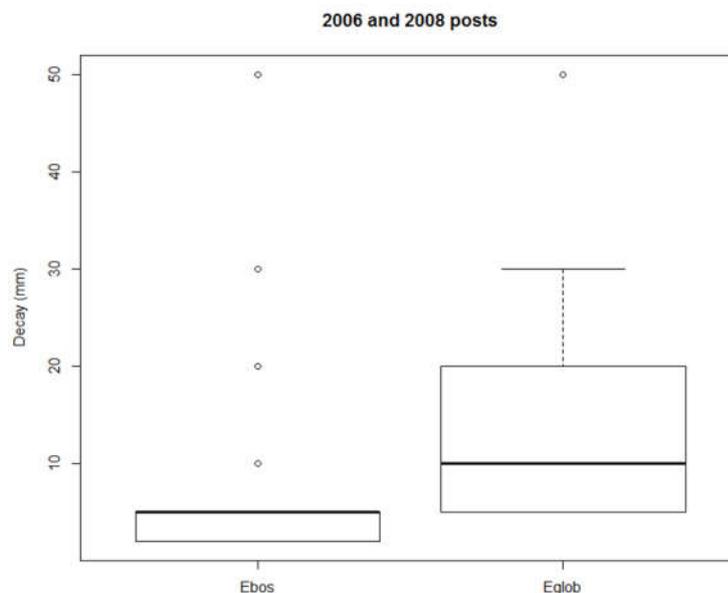
White-rot (left) and brown-rot (right) were found on posts of both species



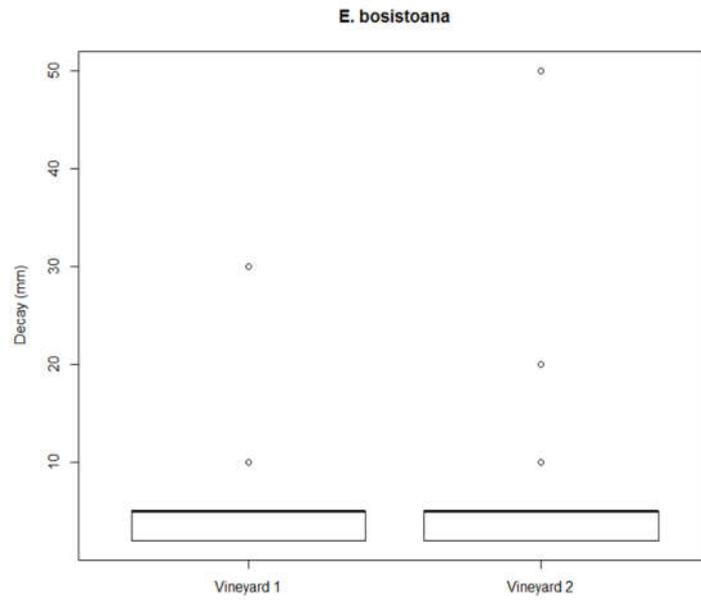
In ground assessment results

- *E. bosistoana* posts had less decay than *E. globoidea* posts after 8-10 years in service.
- Analysis confounded by site, as not all sites had posts of both species.
- *E. bosistoana* posts performed well at both assessed sites.
- Performance of *E. globoidea* was site specific. After 10 years several posts at vineyard 2 had severe decay while posts in the feijoa orchard had little decay. May be due to undervine cultivation at vineyard 2.

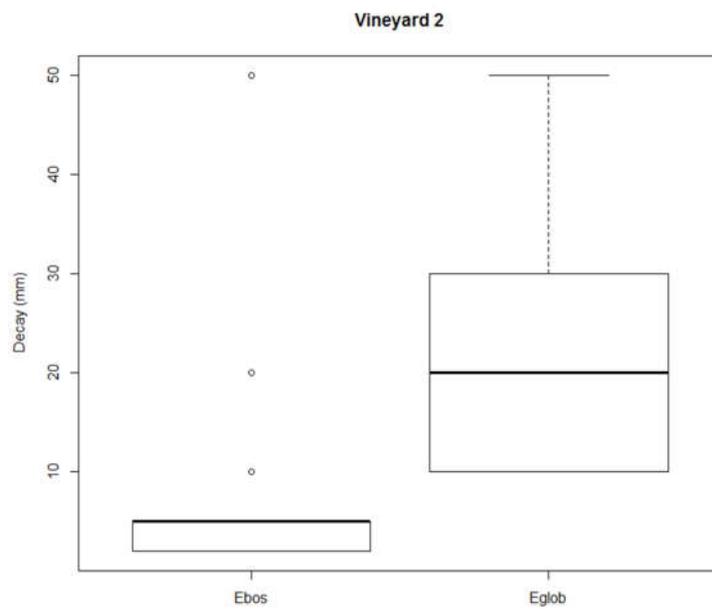
In ground assessment results



In ground assessment results

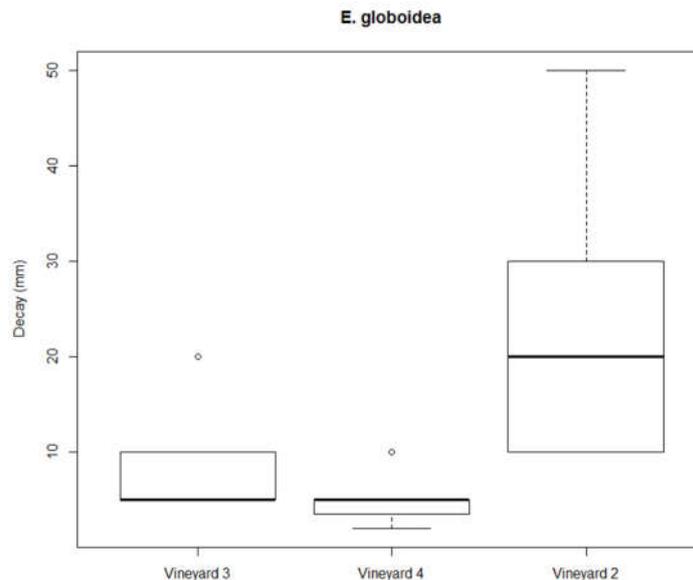


In ground assessment results



In ground assessment results

Vineyards 2 & 3 posts installed 10 years and Vineyard 4 posts installed 5 years



Project Summary

- Feedback from vineyard owners/managers and results of our assessments demonstrate that durable eucalypt vineyard posts of both *E. bosistonana* and *E. globoidea* are providing a useful service life after 10 years.
- In ground assessments found *E. bosistoana* posts still in service with low levels of decay due to their class 1 durability classification in the Australian Standard.
- By comparison class 2 *E. globoidea* posts are showing higher decay rates (particularly on one site) but many are still in service and should remain so for a number years.

And thanks to NZDFI team

Shaf van Ballekom, Chairman NZDFI (Proseed NZ Ltd, Amberley)
Gerald Hope, CEO (Marlborough Research Centre Trust, Blenheim)
Professor Bruce Manley, Dean (School of Forestry, UoC)
Dr. Clemens Altaner, Wood science (School of Forestry, UoC)
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Dr. Luis Apiolaza, Tree Genetics (School of Forestry, UoC)
Professor Euan Mason, Physiology & modelling (School of Forestry, UoC)
Dr. Tara Murray, Forest entomology (School of Forestry, UoC)
Dr. Justin Morgenroth, Forest GIS systems (School of Forestry, UoC)
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Harriet Palmer, Communications consultant (under contract to NZDFI)
Roger May, Forestry GIS mapping specialist (under contract to NZDFI)
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8 UC PhD students and 26 landowners
Check out www.nzdfi.org.nz for more information

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