SPECIALTY WOOD PRODUCTS PROGRAMME UPDATE

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Highlights

The results after two years testing of thermally modified Douglas-fir and *Cupressus lusitanica* shows improved durability in both the heartwood and the sapwood of both species.

The veneer produced from fastigata logs shows significant lift in stiffness over radiata (14 versus 10 GPa).

A summary was prepared for the progress after 5 years of the programme. It describes how we are tracking against original aims for each species and project area.

RESEARCH PROGRESS: Q1 Year 6

Douglas-fir

As part of the Douglas-fir processing strategy a resource evaluation was undertaken. Findings included North Island and upper South Island growers do not see their future in Douglas-fir, with most citing the effect of Swiss needle cast as the primary reason for their reluctance to replant this species. Southland and Otago are committed to replacing Douglas-fir after harvest. The available volumes over the next 40 years are variable with 2 5-year intervals (2035-39 and 2040-44) having significantly more harvest volume predicted than the other time periods. The next stage of this work is to examine the various processing options available for Douglas-fir.

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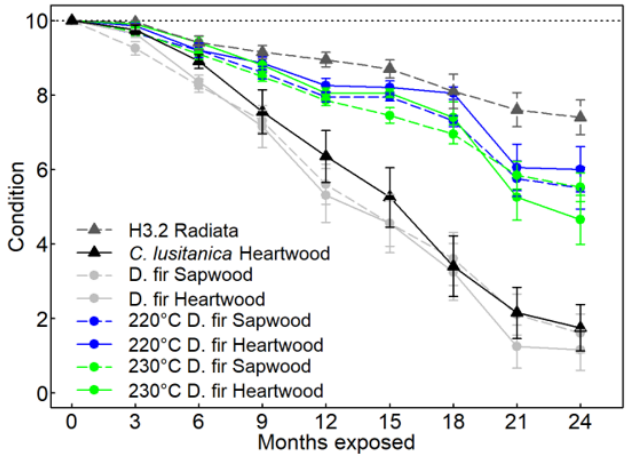
Durability testing of thermally modified Douglas-fir is now two years along and results (figure below) and show improved durability in both the heartwood and the sapwood. Longer term durability testing is required to confirm the durability of these treatments. The untreated samples are showing significantly lower durability than the thermally modified wood in this accelerated decay trial.



Non-durable eucalypts

The peeling and drying of *Eucalyptus fastigata* has been previously reported on in terms of veneer and green timber produced. The current report covers the veneer stiffness and dry lumber grades. The high veneer stiffness predicted has now been validated. This confirms that the *E. fastigata* veneers are, on average, significantly stiffer than radiata pine (average stiffness of 14.1GPa, compared to 9.9GPa for radiata pine). The figure below shows the comparison between the mill (Metriguard) and Scion stiffness values for the veneer (from the high stiffness logs only).

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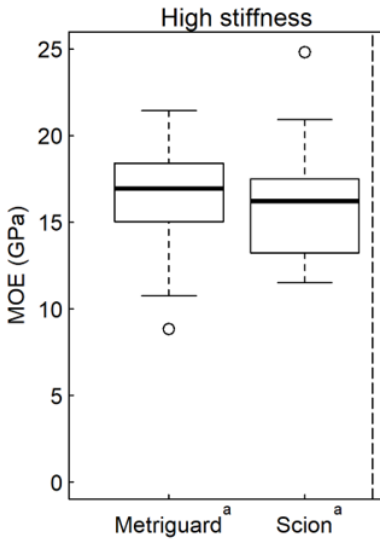
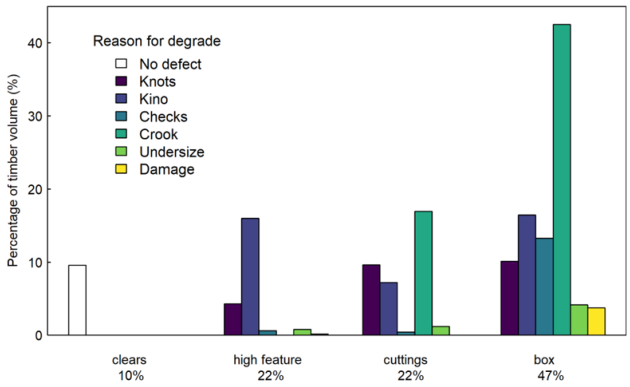


The boards were air-dried and many of the boards exhibited collapse during drying. Once the boards were close to fibre saturation (20-30% MC) they were steamed to recover the collapse, then kiln dried. The boards showed no collapse following drying but did develop high levels of crook. The major defects seen in the graded boards were crook (around 56% of boards), kino veins (36%) and knots (26%). 10% of boards achieved clears grade, 22% high feature grade and 22% cuttings grade (shown in figure below).



If crook were ignored (assuming it could be removed by improving the sawing process) 19% of boards achieved clears grade, 55% high feature grade and 8% cuttings grade. Overall, this shows that sawing and drying pruned *E. fastigata* is possible, but the sawing methods could be improved to increase overall recovery and to mitigate the effects of crook.

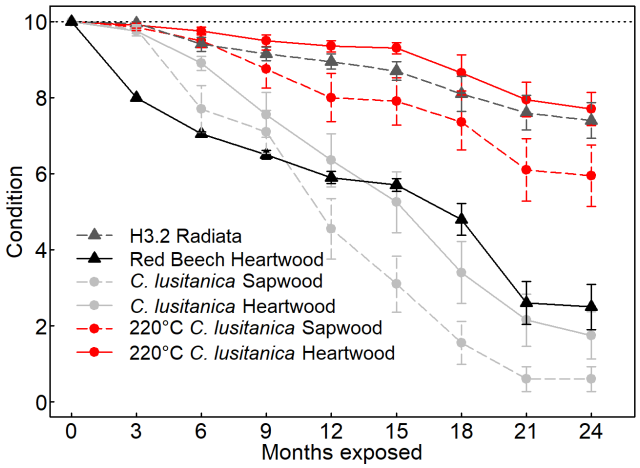
A high-level economic analysis of the logs and wood products from this trial suggest that significant value needs to be added to the logs or products to make this species economically viable. Improving the recovery from the sawing would go some way towards improving this but identifying higher value markets for the logs that were not suitable for this study would have a substantial positive impact on the economic viability.

Naturally durable eucalypts

The 2012 JNL Ngaumu trial was assessed for heartwood however only 8% of trees had formed heartwood at this point. Trials of a similar age but different locations had up to 80% heartwood so the low levels of heartwood in this trial were unexpected and prevented calculation of genetic values for heartwood traits. Consequently, the trial needs reassessment at a later stage if breeding values for heartwood traits are needed.

Cypresses

Durability testing of thermally modified *C. lusitanica* is now two years along and results (figure below) and show improved durability in both the heartwood and the sapwood. Longer term durability testing is required to confirm the durability of these treatments. The untreated samples are showing significantly lower durability than the thermally modified wood in this accelerated decay trial.



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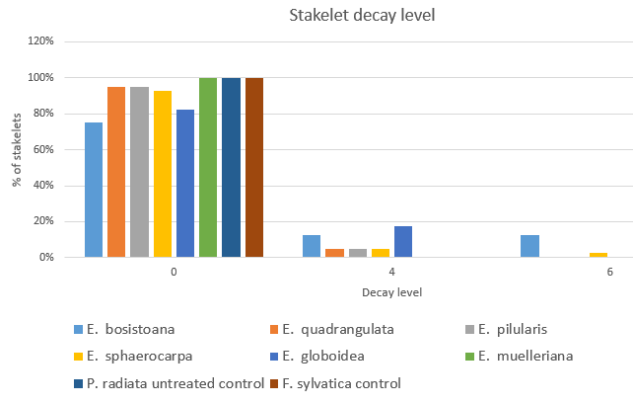
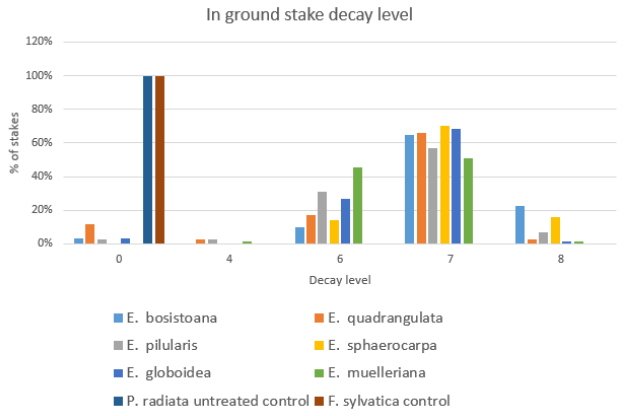
Durability

Six eucalypt species were evaluated for durability in stakelet and stake trials. Trees were only 15 years-old and grown in Northland. Species tested were *E. bosistoana, E. quadrangulata, E. pilularis, E. sphaerocarpa, E. globoidea*, and *E. muelleriana*. After four years exposure 90% of all the stakelets had failed. The stakelets showed a significant number failing for each species and the remainder having deepening or severe decay. Figure below shows the decay level of the stakelets. The decay levels are described below the I ground stake figure.
Stakelets from 14 individual trees have failed giving them a group average life between one year 5 months to three years 5 months.



In the in-ground stakes test most of the samples showed a range of minor but established decay through to extensive established and deepening decay. The figure below shows the two untreated controls having 100% failure and the 6 eucalypt species having decay levels mainly 6 to 8.



10 = No decay or insect damage.
T = "Trace" discolouration, decay suspected but not positively identified.
9 = Minor decay or damage at defects, less than 3% of the cross section.
8 = Minor but established decay, 3 - 10% of the cross section.
7 = Well established pockets or extensive surface damage, 10 - 30% of the cross section.
6 = Extensive established and deepening decay, 30 - 50% of cross section.
4 = Deep and severe decay, more than 50% of cross section.
0 = Disintegrating, failed.

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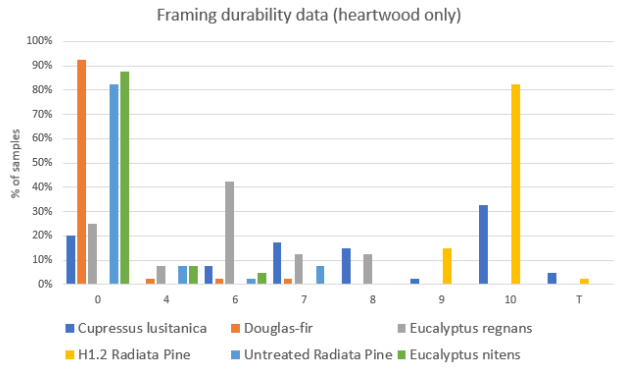
A range of species were tested in framing trials. The species included: Untreated *Cupressus lusitanica*, untreated Douglas fir, untreated *E. nitens* (installation was delayed by approximately six months) and untreated *E. regnans.* The figure below shows the % of decay for all species (heartwood only). The decay levels are described in the figure above.



After 18 to 24-months of testing it was recommended that untreated *E. nitens* and *E. regnans* are not suitable for use as house framing. Untreated Douglas-fir is not suitable as house framing in medium and high-risk designs

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under the building code. It is recommended that further testing of boron treated *E. nitens, E. regnans* and Douglas-fir should be conducted.

Regional business cases

A survey was undertaken of NZ's portable sawmilling as part of determining whether there is support and motivation by those working in the existing portable sawmilling sector to begin the process of establishing an alternative species sawmilling and wood processing industry group. Encouragingly 75 completed surveys were received. There was a wide range in business sizes (from those who were full time with employees to those that occasionally did commercial work). From the respondents the top five potential benefits identified from an industry association were:

- developing and promoting alternative species grading and standards
- developing a NZ wide-network of professional smaller-scale sawmill operators, supported by a web site, promotion, and marketing events
- research and product development
- developing branding and collaborative marketing
- providing help with Health and Safety and employment responsibilities.

The next crucial step will be to give members of the alternative timbers sector the opportunity to set goals for a collaborative strategy and action plan that will increase the capability and sustainability of this vital industry.

To this end, the main recommendation of the report is for a workshop to be convened. The aim of the workshop would be to (i) identify a framework and timetable for the next stage of work, and (ii) select members of a project steering group from within the sector which would be prepared to lead the next stage of the project. And (iii) identify what level of cash investment could be raised to leverage government support for the next stage.

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A pilot inventory project was started in Hawke's Bay. The first stage of this project was to test a new methodology for inventory of alternative species forests. Some examples of images below.

The total small-scale owners' area mapped was 3566 ha and the total corporate/large-scale owners' area mapped was 914 ha. Comparing these results to the existing NEFD data (for forests over 1 Ha) showed that this mapping exercise identified an additional 604 ha of alternative species forests not accounted for by the NEFD (a 19% differential).
The table below shows the breakdown by species in the large-scale grower's alternate species resource in the Hawke's Bay.

Corporate/large-scale owners species breakdown

Species group	Area (ha)
Eucalypts	598
Poplars	47
Cypresses	74
Redwoods	57
Native spps	30
Pinus nigra	26
Larch	23
Others*	85
Total	**914 ha**

The new methodology should also be capable of mapping and identifying areas of alternative species which are smaller than 1 hectare, because these small areas make a significant contribution to the total resource. The suggested next step is to develop an algorithm that can automatically identify species from aerial imagery. This would enable a much more

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accurate (and cheaper) identification of the areas of different alternative species which comprise the small-scale growers' resource nationally.

Other

The annual nursery was undertaken, and the table below shows the number of seedlings produced since 2015 (data prior to the start of the SWP programme) up to 2019 for the alternate species.

Species	Seedlings produced since 2015
P. menziesii	7,275,015
E. nitens	1,898,348
E. fastigata	662,776
E. regnans	60,502
Naturally durable eucalypts*	1,887,883
Redwoods	492,574
Cypresses**	412,751
Total	12,689,849

*Naturally durable eucalypts consist of *E. bosistoana, E. globoidea, E. quadrangulata* and some other minor species.

** Cypresses consist of *C. macrocarpa, C. lusitanica, C. nootkatensis* and Ovens/Leyland hybrids.

It is assumed that these plantings will be replanting for the Douglas-fir and ash eucalypts (*E. nitens, E. fastigata* and *E. regnans*) and new planting for the naturally durable eucalypts, cypresses and redwoods.

Reports completed

Report No.	Document Title
SWP-FN100	Douglas-fir resource characterisation
SWP-FN103	Nursery survey- alternate species
SWP-FN105	Thermal modification of Douglas-fir and *C. lusitanica*
SWP-T096	The decay resistance of some wood species used as framing
SWP-T106	Survey of small-scale sawmillers
SWP-T107	SWP progress on 5 years of activity (2015-2020)
SWP-T108	Heartwood in Eucalyptus bosistoana (JNL Ngaumu 2012 trial)
SWP-T109	Peeling and sawing pruned E. fastigata for high-stiffness veneers: Part 2. Dry grade recovery and downstream testing
SWP-T110	Stage One of Hawke's Bay Region pilot project
SWP-T111	The decay resistance of six Eucalyptus species after four years exposure

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