SPECIALTY WOOD PRODUCTS PROGRAMME UPDATE

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Summary

Highlights:
The *Eucalyptus nitens* flooring product produced by Speciality Timber Solutions (John Fairweather) from trees grown for chip showed very good performance when compared to a commercially available oak flooring product. Dimensional stability was similar although hardness was lower.

A report on the portable sawmilling industry in the Hawke's Bay indicate that a full-time in situ portable sawmilling operation would annually require an area of about 3.4 hectares of softwood forest, or 2.25 hectares of hardwood forest, to ensure a sustainable log supply. Given the number of portable sawmillers in New Zealand, there is significant potential to establish an industry association.

By optimisation of the fastigata veneer peel, veneer moisture content, glue mix, hot and cold pressures it is believed this species could be commercially bonded with standard phenolic formulations to make plywood or LVL.

RESEARCH PROGRESS: Q4 Year 5

Non-durable eucalypts

Specialty Timber Solutions produced three kinds of flooring from unpruned *Eucalyptus nitens* logs – solid, cross-laminated and birch plywood-backed flooring (see image below for all flooring types tested). The performance of these was compared to commercial engineered oak flooring by looking at the board dimensions and levels of distortion at several different moisture contents, and also while soaking one surface in water.

Overall the differences between the engineered oak and *E. nitens* boards were quite small. The lower hardness of the *E. nitens* boards may be a disadvantage compared to the oak. In situations where changes in board width need to be minimised, the ply-backed or cross laminated *E. nitens* were more dimensionally stable than the solid *E. nitens*, but the cross-laminated boards are more prone to cupping, which may cause issues in service unless adequately glued and nailed to the floor substrate.

The *E. nitens* breeding plan addressed the importance of developing this species towards solid wood production. Consequently volume, wood quality (high wood density, low growth strain (growth

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stress), low shrinkage, a small number of or absence of internal checking and collapse), form and adaptability are all proposed as breeding objectives in this updated breeding plan. The intention is to predict wood quality using cores and NIR based models.
It is strongly recommended that the breeding of *E. nitens* take advantage of the application of genomic technologies in breeding in the future.

A project was undertaken to examine the potential of densification of *E. fastigata* and *E. nitens* for improved surface hardness. Image below shows the untreated sample in the back and increasing levels of densification to the front.

Densification is a method of increasing wood density and hardness using compression and heat to deform and flatten the wood cells. Two densification techniques were used, one to compress the entire thickness of the board (bulk densification) and one to just deform and compress one surface (surface densification). Surface densification is intended to give a hard surface, similar to that of bulk densification, but without increasing the overall board density, and without reducing the board thickness as much as the bulk densification.
All densified boards had significant increases in density and surface hardness, with the surface densified boards not having a significantly different hardness to the bulk densified boards.
When soaked in water, the surface densified boards recovered more than 80% of the thickness lost during densification, whereas the bulk densified boards only recovered 40-50% of their original thickness, with the *E. nitens* boards swelling significantly less than the *E. fastigata* boards.

Overall, the *E. nitens* boards densified more successfully, with increased levels of densification possible, and reduced swelling when soaked in water compared to the *E. fastigata* boards.
For both species the surface densifications had the desired effect of increasing the surface hardness without increasing the overall board density, but further work is required to prevent the boards from swelling back to their original dimensions when soaked in water. Image below shows untreated boards to the left, surface treated in the middle and bulk densification to the right.

Following on from the successful peeling of *E. fastigata* a trial was undertaken by Hexion to examine the glue-ability of the veneer produced. The bonds produced with the plywood resin, on veneer dried to 3 to 4% moisture, meet an AS/NZS 2269.0 Plywood A bond standard. By optimisation of the veneer peel, veneer moisture content, glue mix, hot and cold pressures it is believed this species could be commercially bonded with standard phenolic formulations. Images of some excellent dry veneer bonds below.

Naturally durable eucalypts

A report was completed that reviewed the high-level potential for a sustainable small-scale regional industry in the Hawke's Bay Region based on portable sawmilling of locally grown alternative timber species for sale to niche high-value domestic markets. Some key findings:

- In total over 1100 portable sawmills are reported to have been purchased by New Zealanders since the late 1980s.

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- The lack of accurate data to describe the alternative species resource in Hawke's Bay Region (and throughout New Zealand) is a significant constraint.
- Indicative calculations made in the report indicate that a full-time in situ portable sawmilling operation would annually require an area of about 3.4 hectares of softwood forest, or 2.25 hectares of hardwood forest, to ensure a sustainable log supply.
- Given the number of portable sawmillers in New Zealand, there is significant potential to establish an industry association. Commitment to planting alternative species will be most successful if a professional, thriving and well organised small-scale sawmilling industry is developed and promoted.

A report was completed on the value of veneer, wood fibre and posts from improved *E. bosistoana* trees. This study showed that the value of *E. bosistoana* produced under a 10-20 year rotation exceeded growing costs (including an 8% IRR). Additional value can be added, particularly for smaller diameter trees, from selling the peeler core as naturally ground-durable posts for agricultural industries.
However, veneer yields were reduced by the release of growth stresses that caused veneers to split and unfavourable stem form that reduced the amount of theoretically veneer. Therefore, low growth strain and good stem form are key selection traits for the *E. bosistoana* breeding programme when considering LVL.
Tree form and wood properties were found to have a significant impact on tree value – more important than product prices. Processing options, such as utilising a spindleless lathe), could add significantly to the tree value. Photo below shows dried peeler cores from *E. bosistoana* logs.

Cypresses

A strategy is being developed for cypresses. As part of stage one industry consultation was undertaken in March and April 2020. Two sectors of the industry were involved (i) corporate growers and other major landowners, and (ii) the harvesting and marketing and consultancy sectors. Two well-recognised factors are combining as barriers to planting cypresses – the threat and reality of canker in macrocarpa (and in other cypress species in the North Island), and under current regimes and market conditions, cypress cannot compete with radiata pine as a corporate investment resource. Encouragingly, a number of corporate growers are looking to increase their forest's diversity and are actively reviewing their strategies around alternative species. The next step in this project is to draft a strategy for cypress including a research plan and model the economics of three clonal cypress regimes.

Durability

Sets of framing samples were exposed in high humidity conditions of 85-90% relative humidity and 25 – 27°C. The species included in this test were:

- Untreated *Cupressus lusitanica*.
- Untreated Douglas-fir.
- Untreated *E. nitens* (installation was delayed by approximately six months).

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- Untreated *E. regnans*.
- H1.2 treated radiata pine.
- Untreated radiata pine.

After 24 months:

- Active mycelium had developed on all of the samples of *C. lusitanica*, Douglas-fir and *E. regnans*.
- Decay had developed in all of the *C. lusitanica*, Douglas fir and *E. regnans* (see image below) samples, and samples in each group had failed due to decay.

After 18 months:

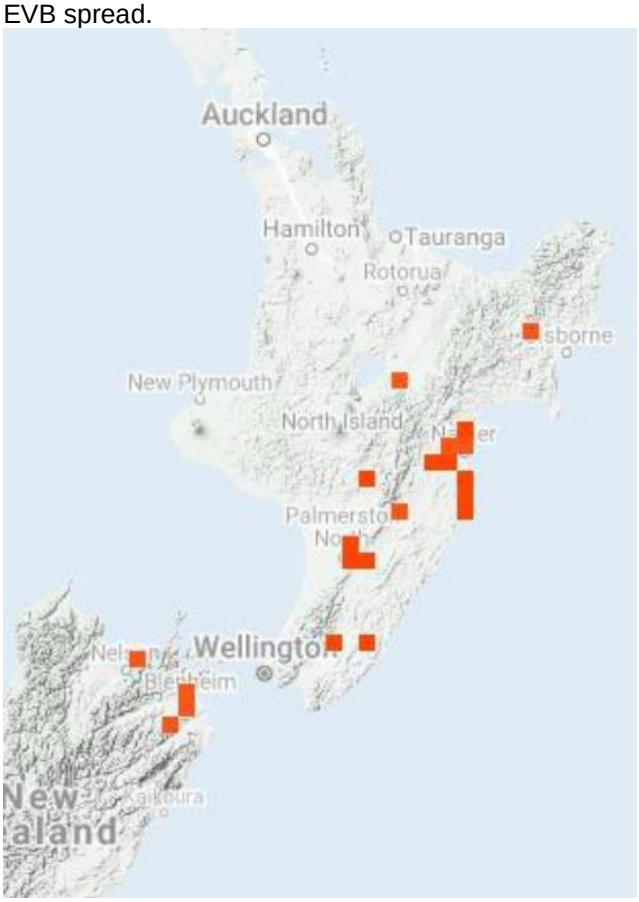
- Decay had developed in all of the *E. nitens* samples, and sixteen of the twenty samples had failed due to decay.
- Decay had developed in all of the untreated radiata pine samples, and six of the ten samples had failed due to decay.

Other durability testing including stake tests conducted at Scion showed *C. lusitanica* and Macrocarpa (*C. macrocarpa*) to be moderately durable and classified as class 3 towards the upper end. However, this study has shown that *C. lusitanica* is susceptible to decay in a leaky building situation. It is recommended that further testing of *C. lusitanica* be conducted and compare the performance against Macrocarpa and Totara. Further testing of boron treated *C. lusitanica* could also be conducted.

Pest and disease

The eucalyptus variegated beetle (EVB *Paropsisterna variicollis – see image below of one colour variant*) has had a name change to *Paropsisterna cloelia.*

Research in the field and reports from the public and NZDFI have tracked *Pst. cloelia (= variicollis)* spread through both islands of New Zealand, including now being established in Marlborough and having reach the central North Island plateau. See map below of EVB spread.



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Unfortunately, all of the *Eadya daenerys* individuals (potential parasite for paropsis) that were collected last year in Tasmania were infected by either, or both, of a microsporidian or a sporozoan species. These cannot be let out of containment.
Scion has located two sites where *E. daenerys* were reared from *P. agricola* and *P. m-fuscum*. These collections will provide Scion with two possible sites (Mortlake and Heywood) in Victoria, Australia where we might be able to recollect *E. daenerys* for the biocontrol of *Paropsis charybdis* in the future as Scion seeks a disease-free population for release in New Zealand.

Reports completed

Report No.	Document Title
SWP-T096	The decay resistance of some wood species used as framing
SWP-T097	Assessing properties of *E. nitens* laminated flooring
SWP-T099	NZ Cypress Forestry Strategy Stage One 2019-2020
SWP-T100	Portable sawmilling of locally grown alternative timber species.
SWP-T101	Value of veneer, wood fibre and posts from improved Eucalyptus bosistoana trees
SWP-T102	Forest Protection SSIF research on species other than radiata pine 2019/20
SWP-T103	Bonding of *Eucalyptus fastigata* veneer
SWP-T104	Eucalyptus nitens breeding plan update 2020
SWP-T105	Densification of E. fastigata and E. nitens for improved surface hardness

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