



# SPECIALTY WOOD PRODUCTS PROGRAMME UPDATE

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## Summary

This programme has been running for over 2 years now with significant effort going into Douglas-fir, non-durable and naturally durable eucalypts. Recent highlights:

Douglas-fir selections for breeding were updated based on assessing form in two trials. These updated selections will be used to rouge seed orchards and take the best material forward.

Within *E. nitens*, drying temperature had a significant effect on levels of degrade seen in boards and there is an indication it may be possible to segregate low checking and collapse logs based on standing tree measures. Thermal modification of *E. nitens* improved the dimensional stability and significantly reduced the levels of checking.

In the durable eucalypts space a vineyard post survey was undertaken in Marlborough that found the rate of breakage of *E. bosistoana* and *E. globoides* posts had been a fraction of the breakage rate of radiata posts (0.3% compared to 5%).

The SWP programme was reviewed by 3 international experts whom noted that the main strengths included active industry/research collaborations, strong science, and a large team with diverse expertise. The main weakness were insufficient focus on activities that will have the greatest impact on achieving long-term project goals, particularly related to identifying and developing products for international markets. This review led to some changes in the funding allocation to increase the investment in processing research. These new workplans are currently being contracted.

## RESEARCH PROGRESS: Q1 Year 3

### Douglas-fir

**Breeding** - Douglas-fir breeding trials were re-assessed. A portion of the selections made after the 2007 assessment at Gowan Hill were no longer acceptable in terms of tree form, especially for stem straightness. Oregon and Washington provenances showed superior quality for an overall breeding goal compared with Californian provenances. The updated selections will be used to rouge seed orchards and take the best material forward.

Photo of Gowan Hill trial below.



A traditional breeding programme was shown to have the potential to deliver a benefit of \$36.2 million to both the forest growing and processing sectors. A genomics programme potentially adds an additional \$11.6 million, representing an additional \$290 per ha over the predicted 40,000 ha of new plantings.

### Non-durable eucalypts

**Breeding** - Volume, wood quality, form and adaptability are all proposed as breeding objectives. Additionally, at Keens Block, the focus is on improvement of wood quality whilst selections at Howdens Block will be used to identify genotypes which have a better tolerance to defoliating leaf beetles (i.e. *Paropsis charybdis*).

**Drying** - Drying temperature had a significant effect on levels of degrade seen in *Eucalyptus nitens* boards. The report suggests potential to screen standing trees



# SPECIALITY WOOD PRODUCTS PROGRAMME UPDATE

to select those which are less likely to develop degrade during drying. This is currently being validated. (Photo - sawing *E. nitens* logs)



**Thermal modification** - The strength of knots relative to clear timber was not affected by thermal modification in *E. nitens*. Dimensional stability in humid air environments is significantly improved by thermal modification at 210°C. Between-ring checking at the lab scale modifications have significantly reduced levels of checking (however they are still high). Interim fungus cellar results show the modified samples not performing as well as H3 treated radiata pine in terms of durability. The two images below show the nitens before and after thermally modification at 210 degrees C.



## Naturally durable eucalypts

**NIR** - It is possible to measure mechanical strain in wood by NIR spectroscopy under laboratory conditions. Work continues to measure growth-strain in standing trees or freshly felled/debarked logs.

**Heartwood** - Young trees were wounded to try to encourage the early formation of heartwood. No correlation between the wound response in the ~2-year old seedlings and heartwood diameter or extractive content in 7-year old trees was found. Therefore it is not possible to assess heartwood formation early in a breeding programme by measuring the wound response in 2-year old seedlings. Photo below shows a tree being wounded and the internal response.



A method was developed to quantify compounds in heartwood extractives of durable eucalypts.

**Vineyard post** – 6 vineyards had their *E. bosistoana* and *E. globoidea* posts assessed. The feedback from vineyard owners/managers and the results of the decay assessments demonstrate that most of the durable eucalypt vineyard posts of both *E. bosistoana* and *E. globoidea* are continuing in service after more than 10 years with a very low percentage of broken posts. In the case of 1 vineyard this was equivalent to annual breakage of only 0.3%. Photo below shows a *E. globoidea* post in service.





# SPECIALITY WOOD PRODUCTS PROGRAMME UPDATE



## Cypresses

A workshop was held to determine the research priorities for Cypress within the Farm Foresters group. The priorities will help inform the investment SWP makes in Cypress. Photo below is of the workshop group visiting a cypress clonal trial planted by FRI 20 years ago (owned by Stephen Brailsford).



Cypress trial plantings were completed in early August. There are three trial sites for *C. lusitanica* and four trial sites for hybrids.

## Pest management

Clear differences were seen in a South Island trial in the incidence and severity of natural insect pest damage sustained by different *E. bosistoana* families to *Paropsis charybdis*. Only one generation of *P. charybdis* was observed in each of the two years monitored. This contrasts with two

generations usually observed in the North Island.

The eucalyptus variegated beetle (*Paropsisterna variicollis* – photo below) was found in the Hawkes Bay in March 2016.

The naturally durable eucalypt trials in this region were assessed for insect damage by species to get early indications of resistance to this new pest. *E. bosistoana* sustained the greatest defoliation and incidence of eggs and larvae, and *E. macrorhyncha* the least. Results indicate EVB will exhibit a wide host range in New Zealand but variability observed in the levels of defoliation between species may be linked to heritable traits that can be exploited through current breeding programmes.



Scion is hoping to introduce another natural enemy to paropsis in 2018 (a parasite that targets the larval life stage). The importance of integrating aerial spray technologies with biological control agents to minimize negative impacts on these beneficial insects cannot be underestimated. An integrated management strategy will be the key to achieving successful suppression of this pest and ensure the long term sustainability of *E. nitens* as a valuable alternative plantation species for New Zealand. A method to assess the tolerance to paropsis



# SPECIALITY WOOD PRODUCTS PROGRAMME UPDATE

damage was developed. Image below is of *Paropsis charybdis*.



## Site species matching

An updated growth model for Douglas-fir has been produced. The model provides precise spatial information of Douglas-fir productivity throughout New Zealand and a range of management scenarios can be tested without the costly establishment of a large number of PSP's and silvicultural trials.

Maps have been previously developed that provide an understanding of potential Eucalypt spp. suitability at a regional scale. Unfortunately, the resolution of these maps prevents their use in an operational setting and so it is unlikely that these maps alone will provide forest managers with the confidence they need to plant Eucalypts. The next step towards this is to explore Eucalypts spp. response to its growing environment at a finer resolution. This will allow managers to effectively match species to individual sites.

A survey revealed that the majority of growers and forest managers favoured a decision support system that was simple to use but delivered a recommendation on which specialty species should be grown where. This would help lift the confidence in getting the specialty species planted more widely.

## Reports completed

Report No.	Document Title
SWP-T018	Eucalyptus nitens breeding plan
SWP-T019	A regional approach to matching specialty timber species to sites
SWP-T020	Predicting strain levels in air-dried wood using near infrared spectroscopy
SWP-T021	Thermal modification of Eucalyptus nitens
SWP-T022	Drying Eucalyptus nitens: Screening for checking and collapse
SWP-T023	100 years of the Eucalyptus Tortoise Beetle
SWP-T024	Early Heartwood Screening by Wounding
SWP-T025	Improving Heartwood of Durable Eucalypts
SWP-T026	Measuring strain in wet eucalyptus wood by NIR
SWP-T027	Modelling growth of Eucalyptus spp. on New Zealand dryland micro-sites
SWP-T028	Heartwood in Eucalyptus bosistoana
SWP-T029	Pest management for durable eucalypts
SWP-T030	Methods and recommendation for assessing defoliation Eucalyptus nitens from Paropsis Charybdis for breeding purposes
SWP-T031	Preliminary DSS Stakeholder Analysis – towards the Scion SFF proposal for site-species matching
SWP-T032	Phenotypic assessment and quantitative genetic analysis of two Douglas-fir progeny tests



# SPECIALITY WOOD PRODUCTS PROGRAMME UPDATE

SWP-T033	Economic comparison of traditional and genomics breeding for Douglas-fir
SWP-T034	Initiation of genomic selection research, collection of cambium and extraction of DNA from a Douglas-fir breeding programme
SWP-T035	Expert Advisory Panel review of the SWP programme - 2017
SWP-T036	Potential for growing and processing durable eucalypts
SWP-T037	Quantifying compounds in heartwood extractives of durable eucalypts
SWP-T038	Development of the Douglas-fir Productivity Spatial Surface using the Process-based model 3-PG
SWP-T039	Performance of naturally durable eucalypt posts in Marlborough vineyards.