



## BREEDING FOR BROWSING TOLERANCE IN DURABLE EUCALYPT SPECIES

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## Durable eucalypts breeding programme

- Maximise durability
  - Match species to sites
- AND....
- Minimise pest risk



- Low productivity drylands
- Erosion



High demand for CCA-free poles from sustainable source



**NZDFI**  
 NEW ZEALAND DRYLAND FORESTS INITIATIVE  
 breeding tomorrow's trees today

Alternative sustainable land use option

Naturally durable eucalypts

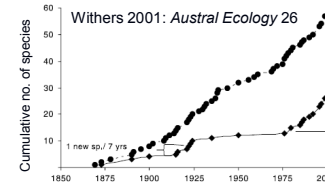
Ground durable poles and posts



## Pest programme: objectives



- Pest are inevitable - impacts are not
  - Must thrive in the presence of established & future pests
1. Minimise pest risks to developing industry
  2. Develop thresholds for economically & environmentally sustainable pest management (when is it necessary?)



## Pest programme: approach



- Selection for relative *resistance* or *tolerance*
  - Weed out most susceptible genotypes from unimproved material
  - Retain & improve least susceptible genotypes
  
- Screening → inform selections → confirm choices

## Comparing pest tolerance: *E. bosistoana* families

- Proxies for resistance / tolerance
  - Insect load
  - Defoliation level
  - Growth relative to control
- Pests with different feeding habits
  - Roller (moth)
  - Miner (sawfly)
  - Chewers (leaf beetles / GEM)

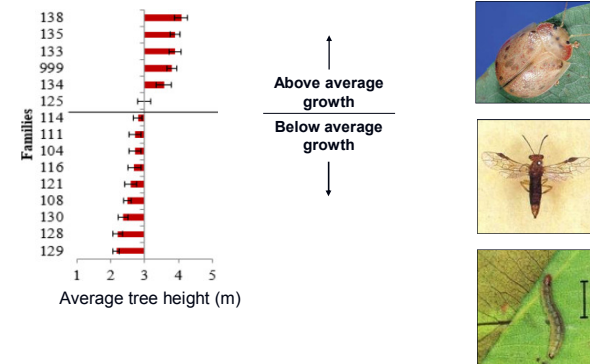


## Basis for selection

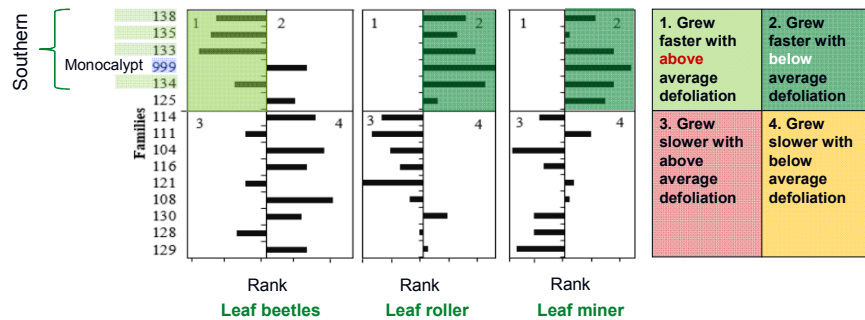


- Natural variation in;
  - Physical properties
  - Nutritional properties
  - Chemical properties
    - Terpenes
    - Phenols
    - Essential oils
- Drive herbivore preferences
- Basis for selection if heritable

## Families ranked for height growth then susceptibility to defoliating pests:



Families ranked for height growth then susceptibility to defoliating pests:



Species tolerance to *Paropsisterna variicollis*

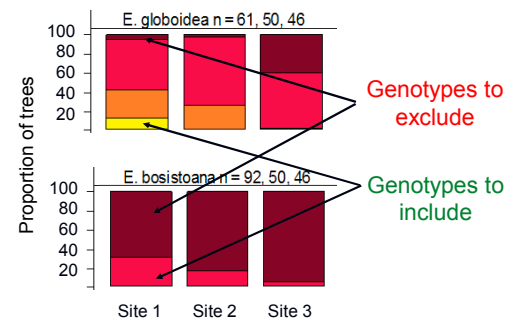
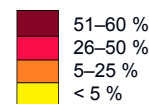
- New Pest – Eucalypt Variegated Beetle (EVB)
- Does it show host preferences among NZDFI species?
- Eleven species, 3 sites in Hawkes Bay
  - Graded % crown damage
  - Lin *et al* (2017) NZPPS 70: 45-51



Key points:

- All four southern provenance families showed above average height growth **in the presence of pests**
  - Three out-performed *E. globoidea* (monocalypt)
- Southern families were **attacked less** than average by leaf miners and rollers
  - *E. globoidea* out-performed all *E. bosistoana*
- Southern families **attacked more** than average by *Paropsis*
  - 5/14 *E. bosistoana* families performed as well or better than *E. globoidea*
  - **BUT still grew = less resistant but more tolerant?**

Crown damage level

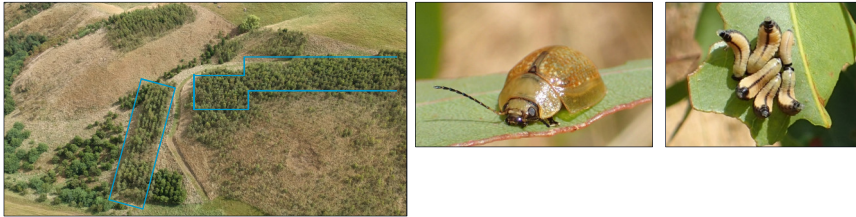


Key points:

- No defoliation above 60%
- Variation in all 11 species = **basis for selection**
- For most species some individual trees suffered only minor defoliation
- Site effect - not fully tested, different families at each site

## Repeat assessment including families

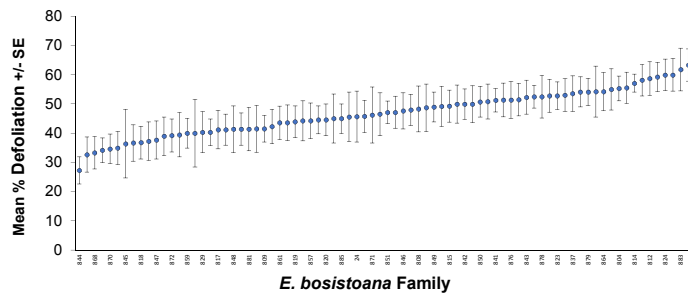
- Site 3 only (EVB present for 2 seasons)
- Defoliation assessment for 80 families in March 2018
- 889 trees (vs. 46 in earlier assessment)
- High population of EVB adults, small population of *Paropsis*



## Summary

- Variation in herbivory within & between species
- Low levels in some individual trees = focus for selection
- Some *E. bosistoana* perform as well or better than single monocult apt assessed → potential for improvement
- Provenance appears important
- EVB range extended to South Island
  - Observed at Cravens Rd. during thinning
  - Both affected families **consistent with predictions** from Lin *et al* 2017 (southern provenance)

- Significant defoliation by paropsines in upper crowns of *some* trees
  - 5% to 90% defoliation per **tree**
  - 27% to 63% mean defoliation per **family**
  - Variation **within family** always large (>30%)
  - **BUT individual trees** in 39/80 families <10% defoliation



## Acknowledgements

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