MANAGING INSECT PESTS IN DURABLE EUCALYPT PLANTATIONS

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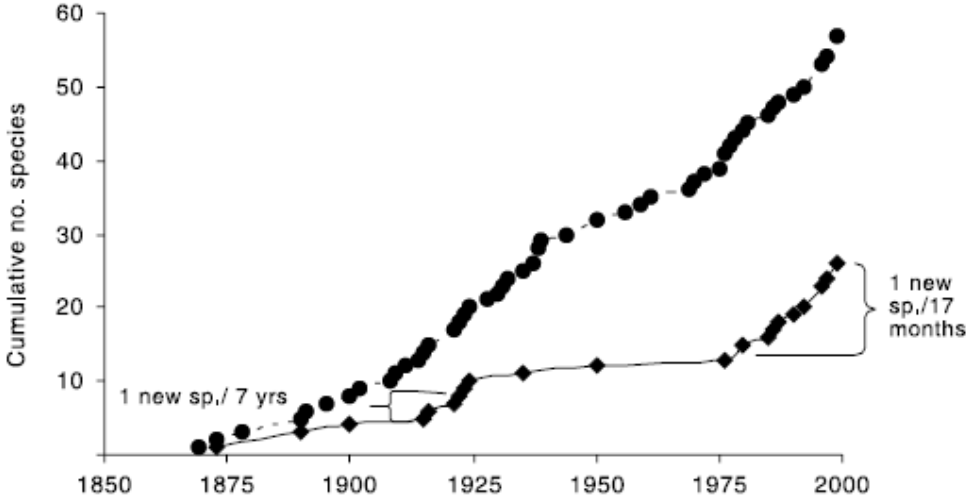
Durable Eucalypts on Dryland: Workshop/Research Update

19 May 2018, University of Canterbury, School of Forestry

Pest Programme: Purpose & approach



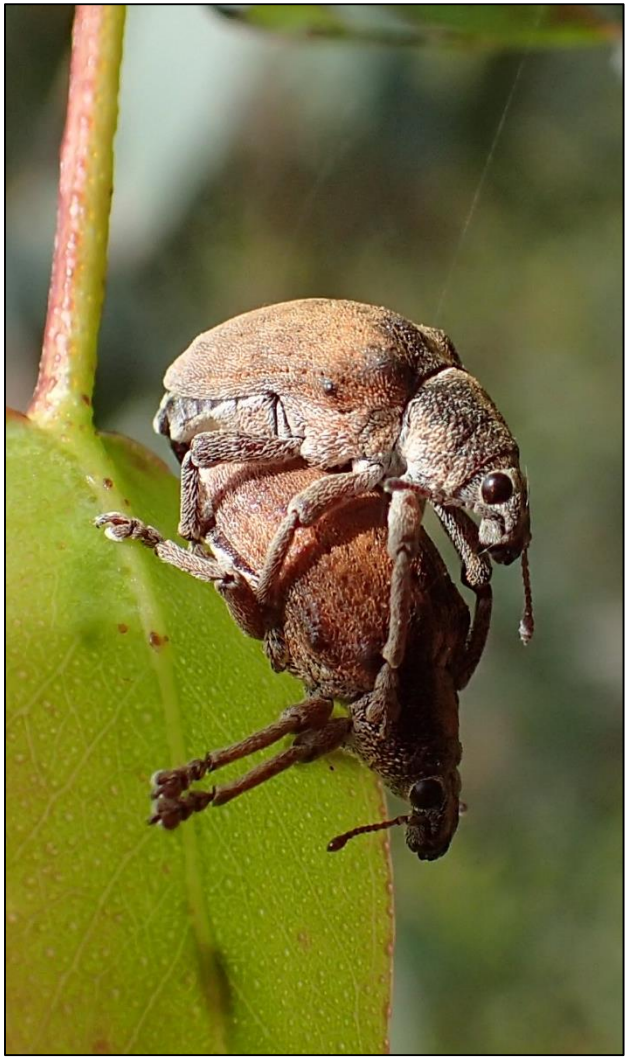
- Pest are inevitable - impacts are not
- Must thrive in the presence of established & future pests
- Future-proof developing industry
  - Reduce pest risks
  - Economically & environmentally sustainable pest management where necessary

Pest Programme: Purpose & approach

Two approaches

1. Selection for pest tolerance
   - Weed out most susceptible genotypes from un-improved material
   - Retain & improve least susceptible genotypes

2. Improve monitoring and develop thresholds for management intervention
   When is it worth managing pests?
   - Pest impact on growth
   - Economic costs of control
   - Environmental cost of control



1) General Tolerance Programme

Eucalypts vary in nutritional, physical, chemical characteristics

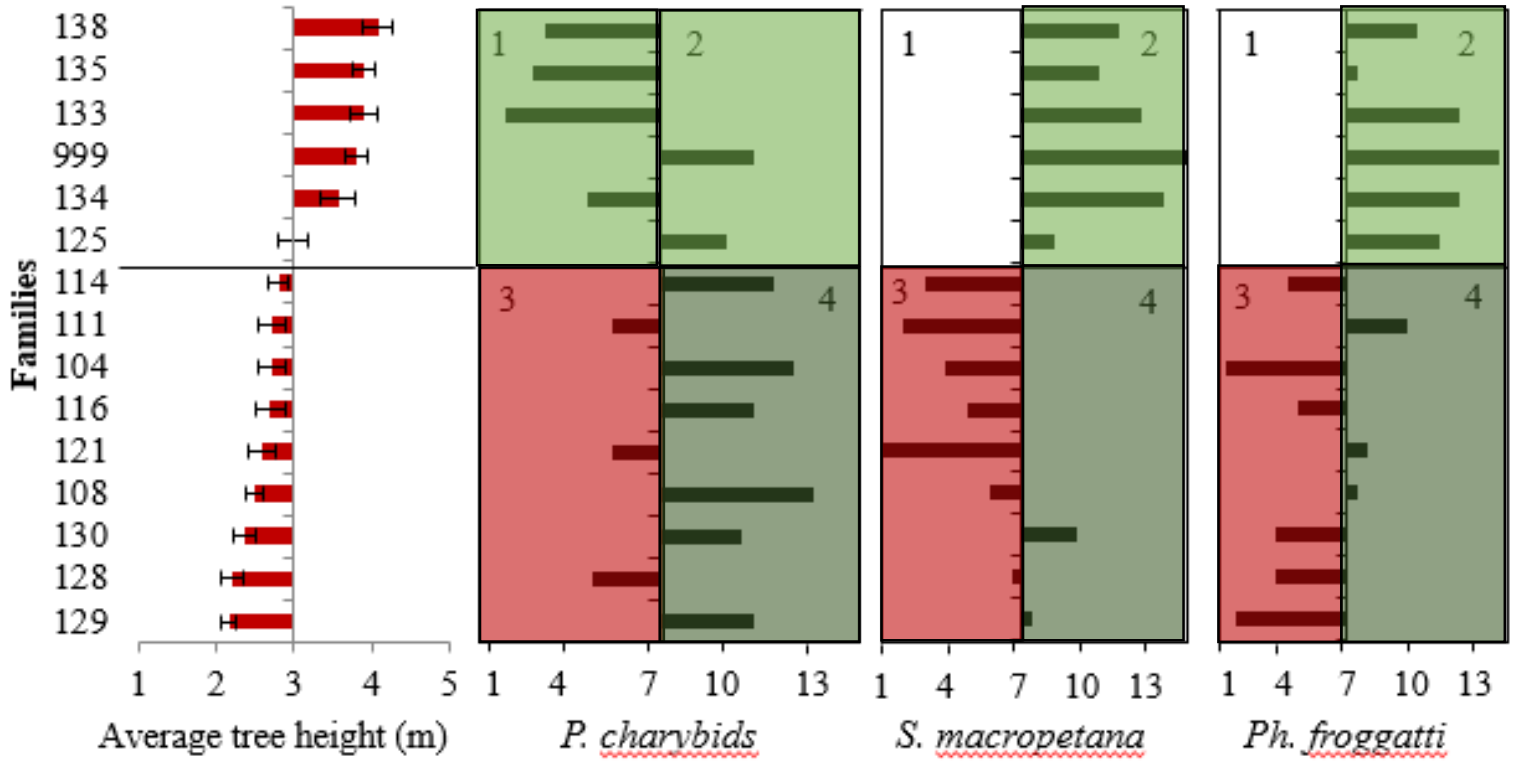
= basis for selection

- Part 1: screen un-improved genotypes for one species to develop assessment method (*E. bosistoana* – variation observed)
- Part 2: roll out screening across species & genotypes in as many sites as possible to inform selections (also allows detection of environmental influence on tolerance: site-species matching)
- Part 3: screen improved selections to confirm selection choices
- Part 4: repeat screening of initial material to determine the ability of early assessment to represent health & growth later

Selection for pest tolerance

- Proxy's for pest tolerance
  - Insect load
  - Defoliation level
  - Growth relative to control
- Pests with different feeding habits
  - Roller (moth)
  - Miner (wasp)
  - Chewers (Paropsis / GEM)

	More susceptible families	Less susceptible families
Above average growth	1. Grew faster but more susceptible	2. Grew faster and less susceptible
Below average growth	3. Grew slower and more susceptible	4. Grew slower but less susceptible



Key points:

- All four southern provenance families showed above average height growth in the presence of pest (138, 135, 134, 133)
  - Three out-performed *E. globoidea*

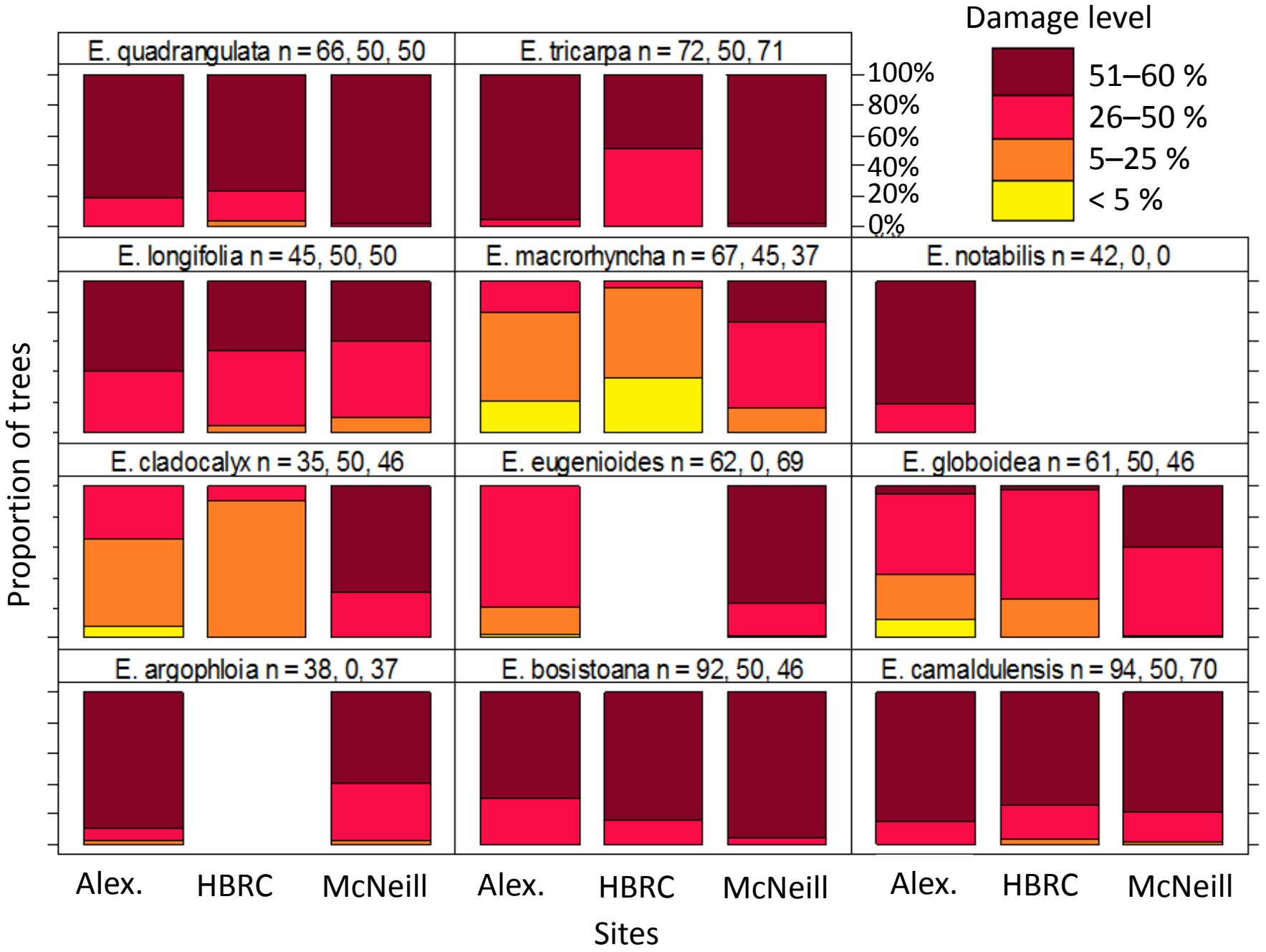
- Southern families *attacked less* than average by miners and rollers
  - *E. globoidea* out performed all *E. bosistoana*

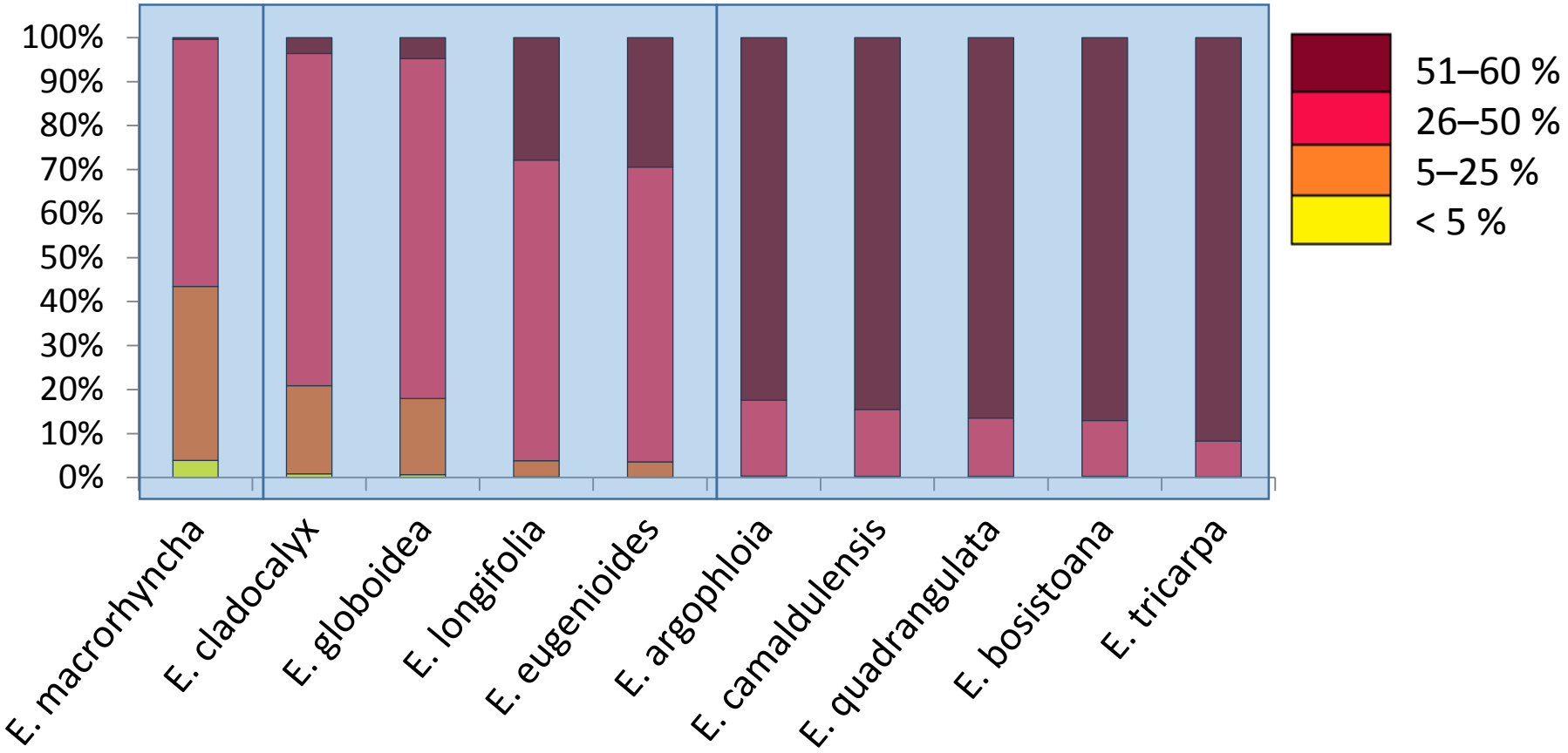
- Southern families *attacked more* than average by *Paropsis*
  - 10 - 30% defoliation vs. < 5% for other families incl. *E. globoidea*
  - 5/14 *E. boistoana* families performed as well or better than *E. globoidea*
  - *BUT still grew = less resistant but more tolerant?*

Species tolerance - *Paropsisterna variicollis*

- New Pest - EVB
- Distribution & impacts

- Does it have host preferences among DFI species?
  - Graded % crown damage (a-d) + pest counts
  - NZPPS 70: 45-51 (2017)


Damage level
51–60 %
26–50 %
5–25 %
< 5 %
E. quadrangulata n = 66, 50, 50
E. tricarpa n = 72, 50, 71
E. longifolia n = 45, 50, 50
E. macrorhyncha n = 67, 45, 37
E. notabilis n = 42, 0, 0
E. cladocalyx n = 35, 50, 46
E. eugenioides n = 62, 0, 69
E. globoidea n = 61, 50, 46
E. argophloia n = 38, 0, 37
E. bosistoana n = 92, 50, 46
E. camaldulensis n = 94, 50, 70
100%
80%
60%
40%
20%
0%
Proportion of trees
Alex.
HBRC
McNeill
Sites



- Damage varied within and between species and sites and with tree height
- For most species some individual trees suffered only minor defoliation → variation → basis for selection
- Further assessment required – synchronise sampling with egg presence

Pest Programme: Purpose & approach

Two approaches

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   - Retain & improve least susceptible genotypes

2. Improve monitoring and develop thresholds for management intervention
   When is it worth managing pests?

   - Pest impact on growth balanced with;
     - Economic & environmental costs of monitoring & control

2) Pest Monitoring & Management

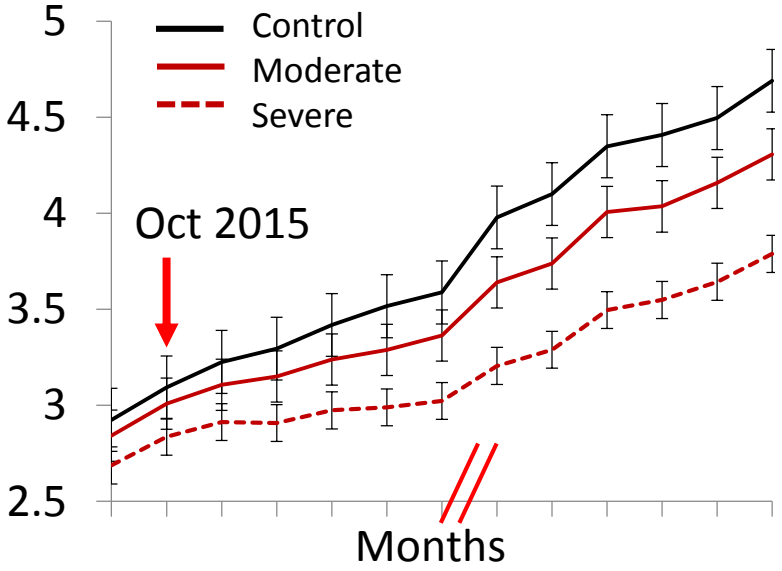
- Overall aim – provide growers with tools and knowledge to manage pests only when economically necessary which will reduce environmental impact of pesticide use

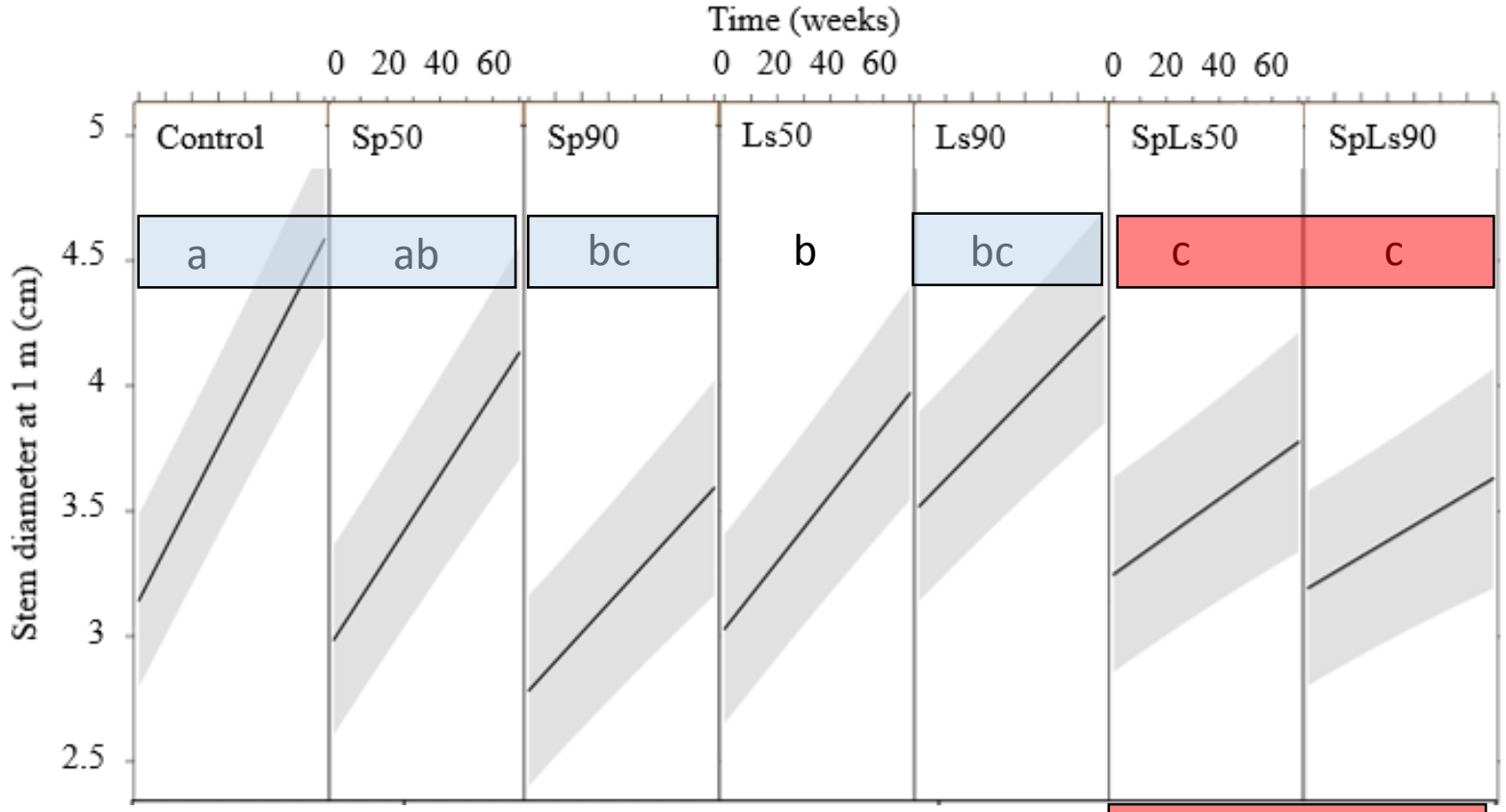
- Understanding link between defoliation & impact
  - How much defoliation can eucalypts withstand?
  - In which part of season?
  - In which part of rotation?

- Determining action thresholds
  - Understand regional pest phenology
  - Quantify links between pest numbers & future impacts
  - Optimise monitoring methods

Defoliation impacts

- Mod. (~50%) v. severe (~90%)
- Spring v. late summer v. both
- Timing and frequency as important as severity
- 50% defoliation in early spring may be tolerable
  - only 5% reduction

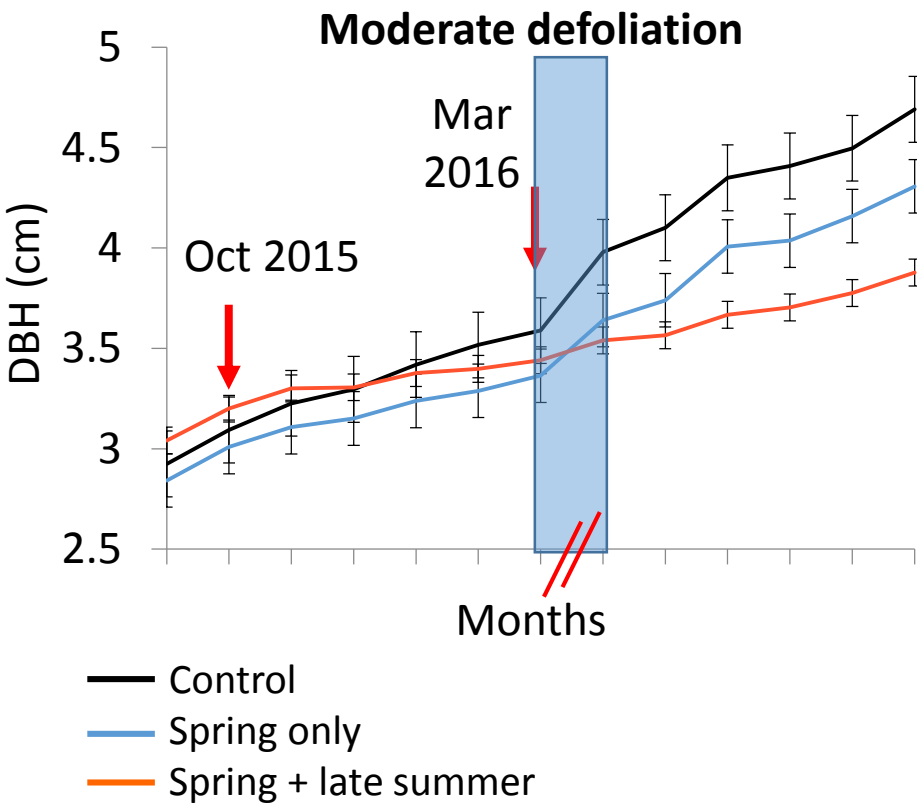


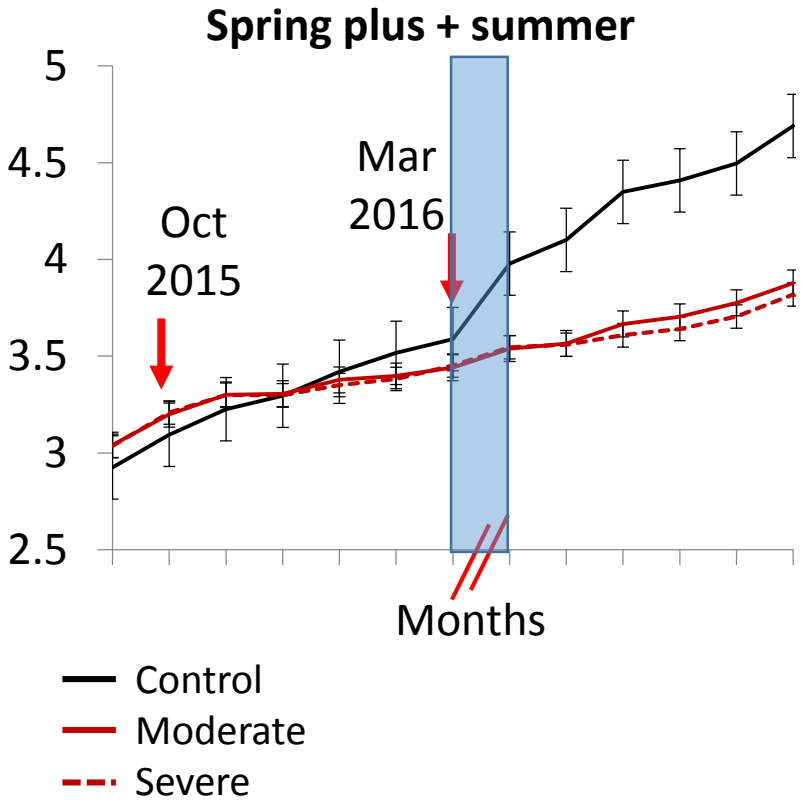


	Control	Sp50	Sp90	Ls50	Ls90	SpLs50	SpLs90
Δ Diameter	54%	49%	36%	41%	33%	21%	20%
Δ Height	36%	32%	28%	27%	23%	23%	20%

- Moderate defoliation in spring did not reduce growth rate significantly
- Severe defoliation had similar negative impact regardless of timing
- Additive defoliation had greatest impact regardless of severity

Timing, severity & additive effects





Monitoring methods

- Compared several methods for forest health assessment
- Quantitative and repeatable vs. fast and efficient

- Pest counts → Quantitative BUT time intensive & time constrained
- CDI (tree)
- CDI (shoot) → Still quantitative but less time/seasonally constrained
- Tree grade → Quick BUT least quantitative, prone to observer variation

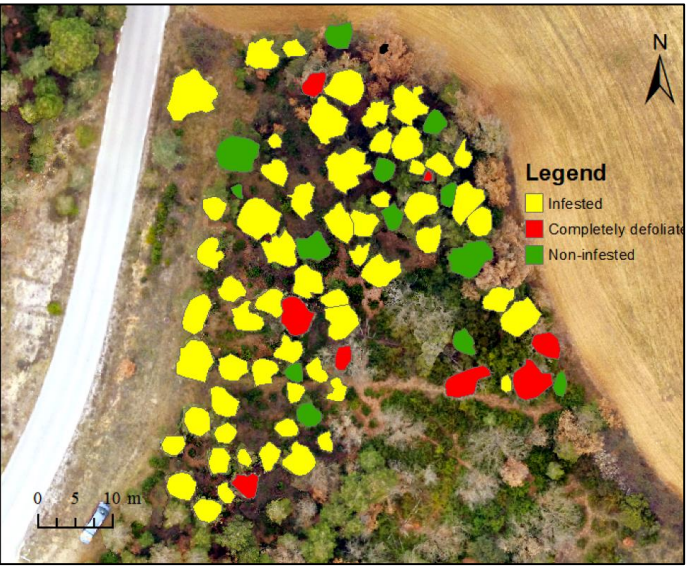
- No silver bullet!
- Still can't deal with tall trees

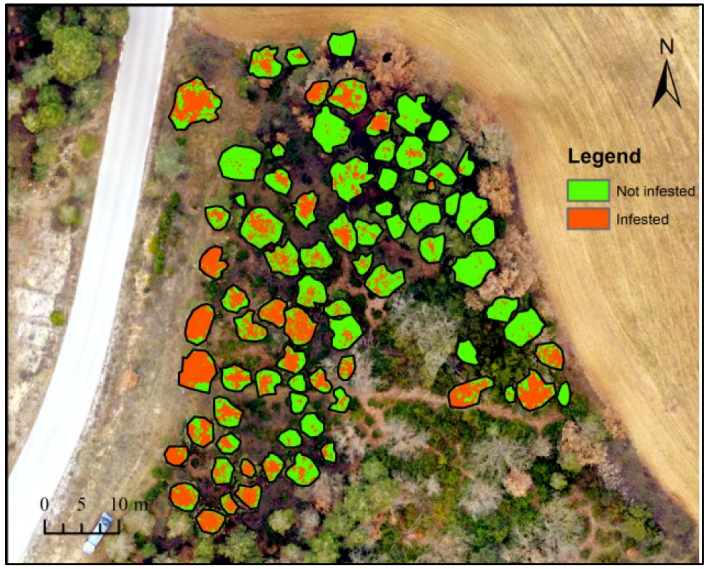
Some findings

- Counting only option for leaf roller
- CDI / grading better for *Paropsis* unless timing perfect
- Recommended CDI tree or tree grading overall but counting if need quantitative analysis

Where next?

- Methods optimised for;
  - New pest info
  - Management decisions
  - Breeding decisions
- With Scion trialling simplified counts like forestry Tasmania
  - Tried OLS + grading for EVB last summer
  - Need to sync with eggs/larvae for host info
- Breeding trials – foliar chemistry?
  - Tolerant chemotypes? Gas chromatography?
  - Remote sensing (RGB/Lidar?)





Manual assessment vs RGB aerial imagery classification of pine processionary moth infestation

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EVB Distribution Update

- March 2016 Te Pohue
- January 2017 Tutira
- April 2017 Woodville
- February 2018 Tihape

- Active in winter !
  - June 2018 Woodville

- Parasitism observed
  - NZ Tree Grower May 2018

- PhD on offer to assess biocontrol options