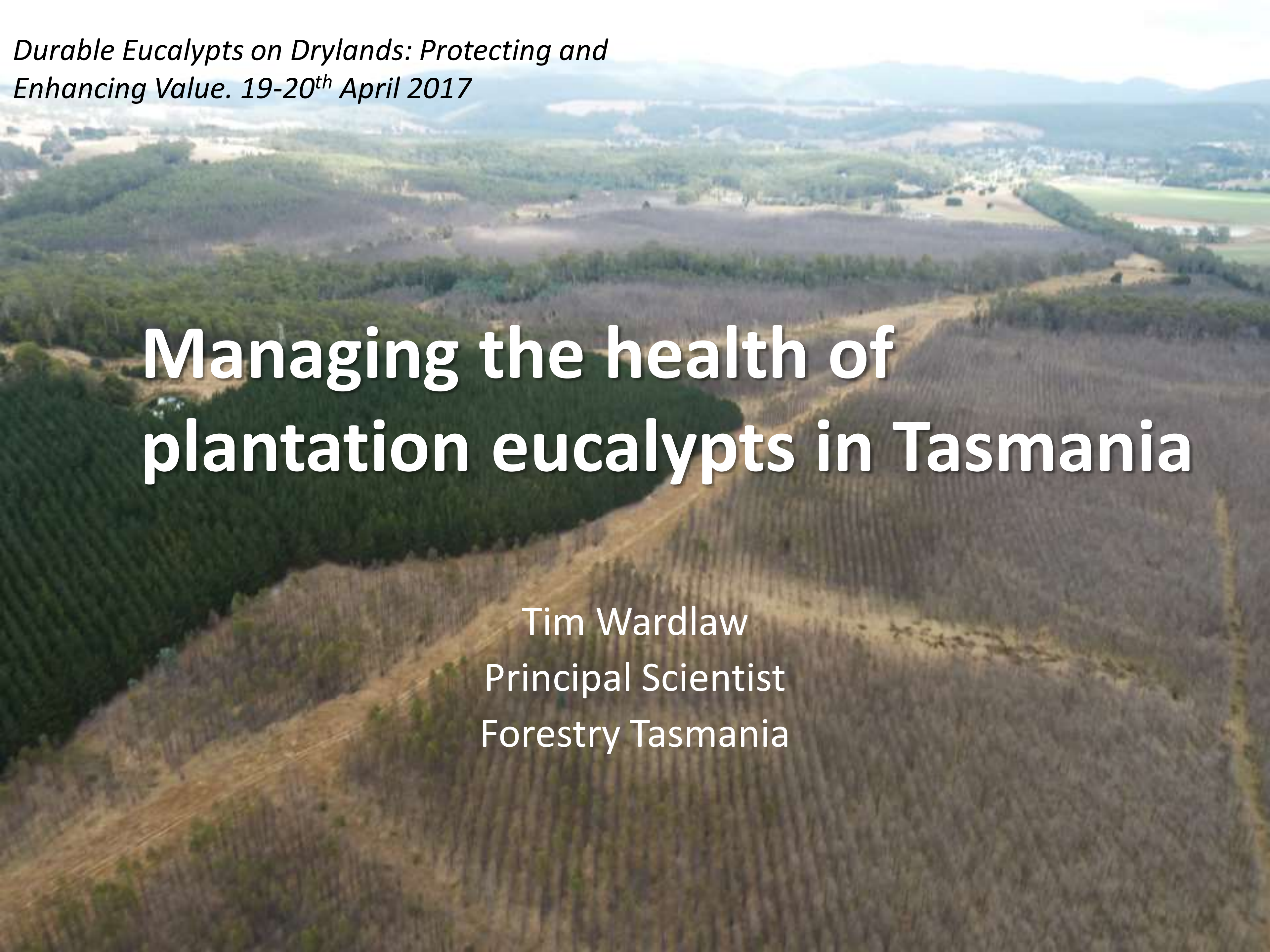
Durable Eucalypts on Drylands: Protecting and Enhancing Value. 19-20th April 2017



Managing the health of plantation eucalypts in Tasmania

Tim Wardlaw
Principal Scientist
Forestry Tasmania

Outline of presentation

- Current status of eucalypt plantation estate in Tasmania
- Summary of main pest threats
- Approach to management
- Looking forward

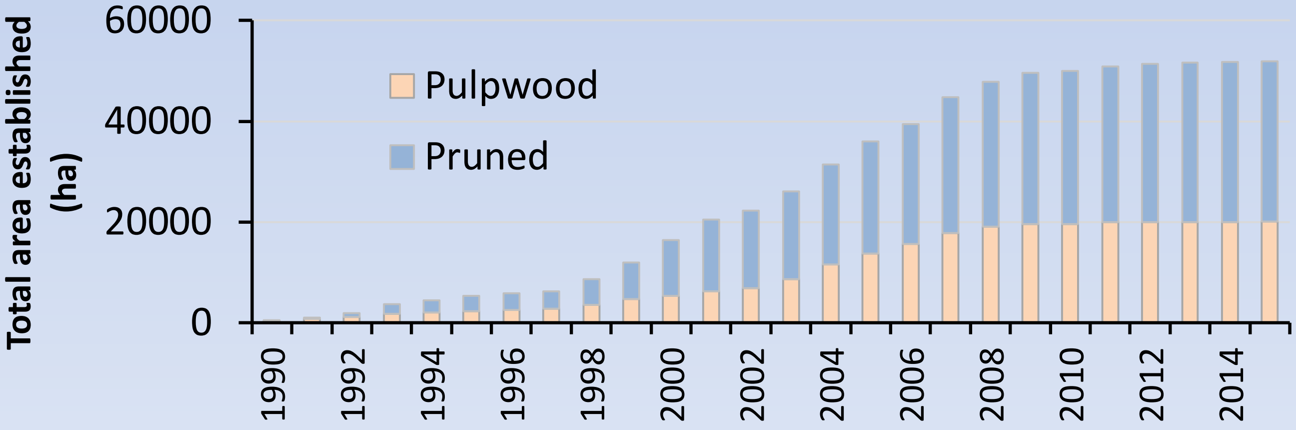
Forestry Tasmania

Current status of the eucalypt plantation estate in Tasmania

Privately owned - 169,000 ha (Private Forests Tasmania 2015-16 Annual Report):

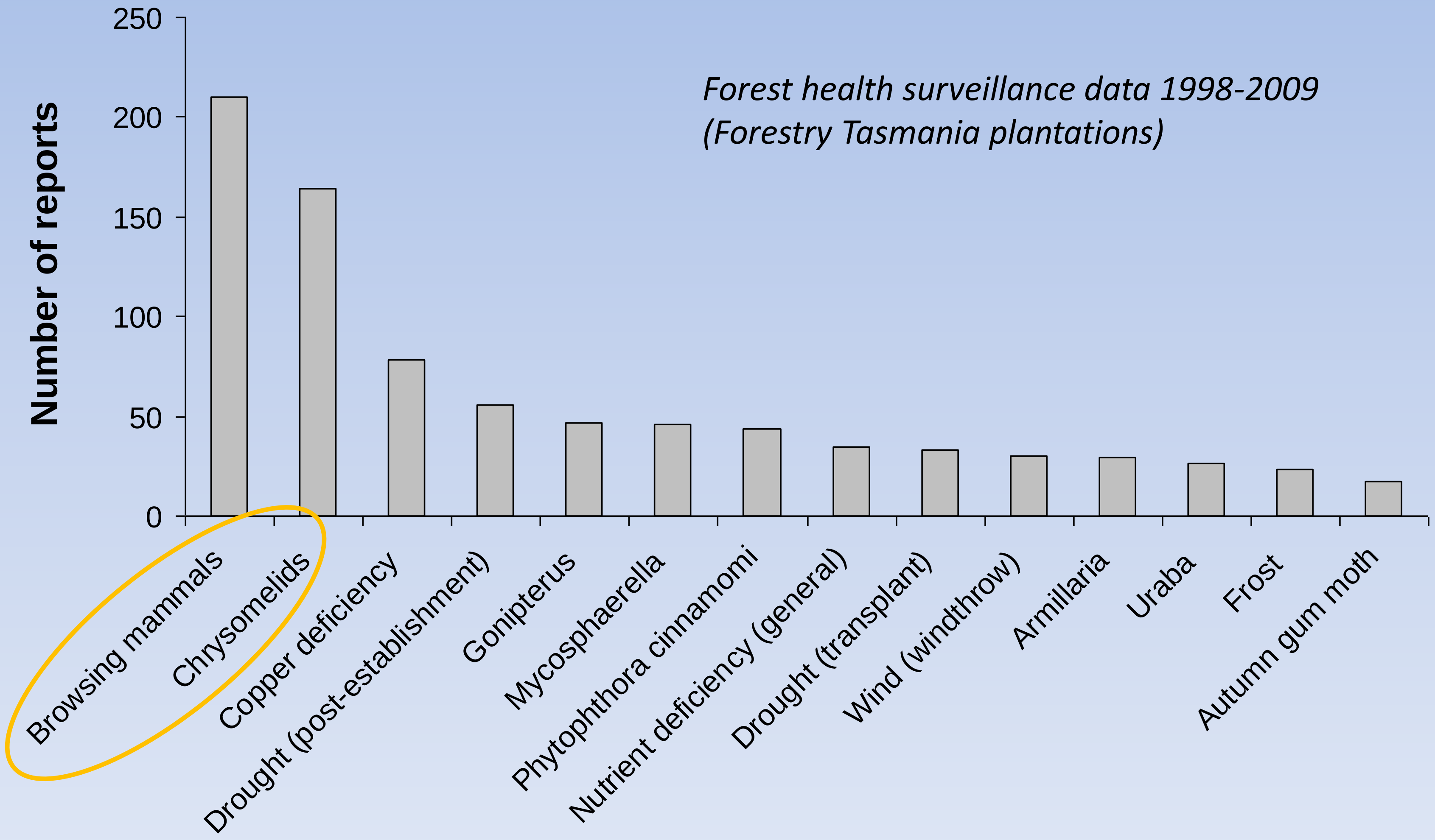
- New Forests (Managed by Forico) – 100,000 ha progressive harvest & replant (6,300 ha replanted in 2016)
- Managed by IFarm (taken over by PF Ohlsen) – 27,000 ha
- Independent private (SFM + PFT) - 42,000 ha

Publicly owned – 57,000 (Forestry Tasmania 2015-16 Annual Report)

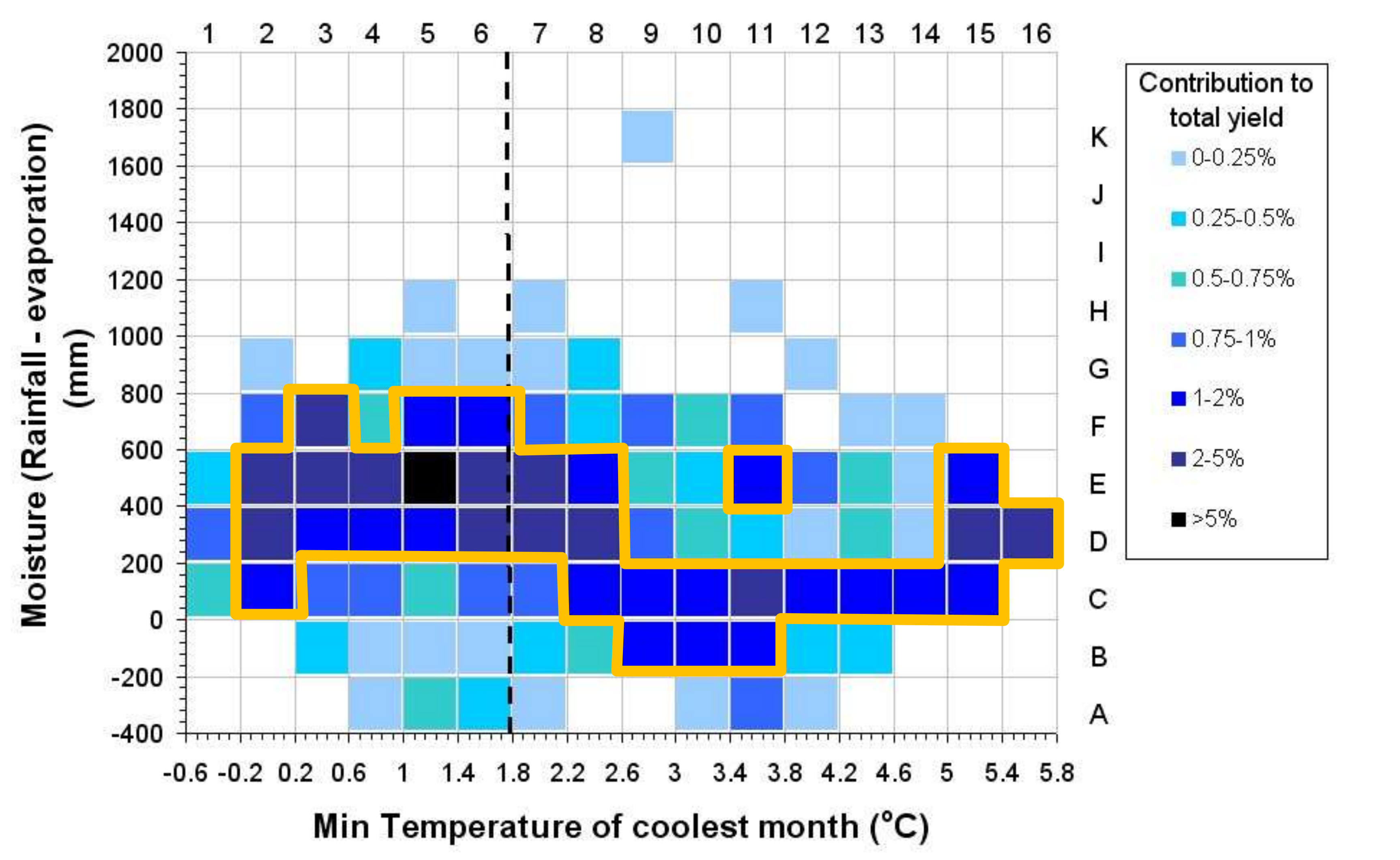


Mature estate transitioning from 1st to 2nd rotation

Main pest threats

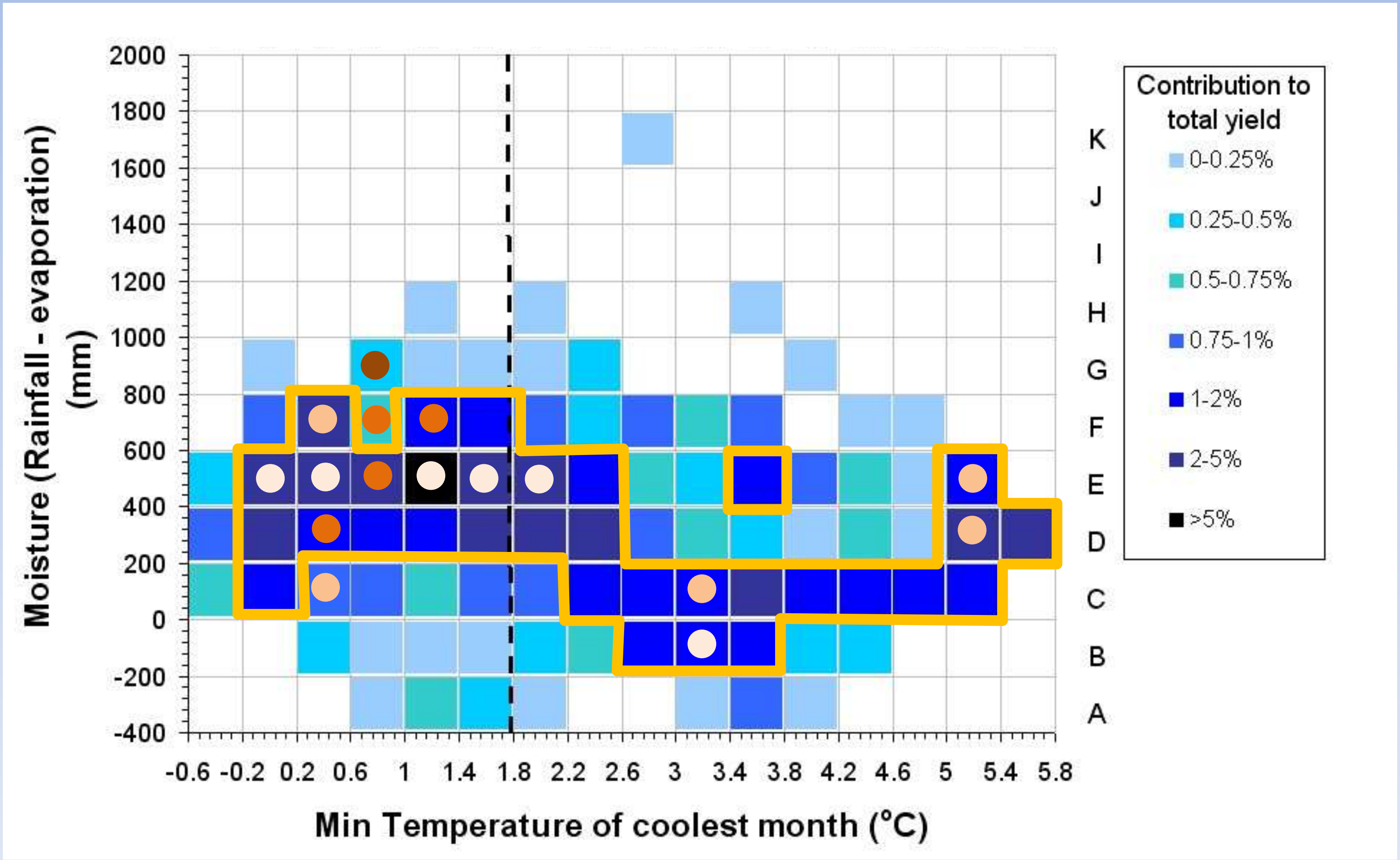


Overlap with productive potential

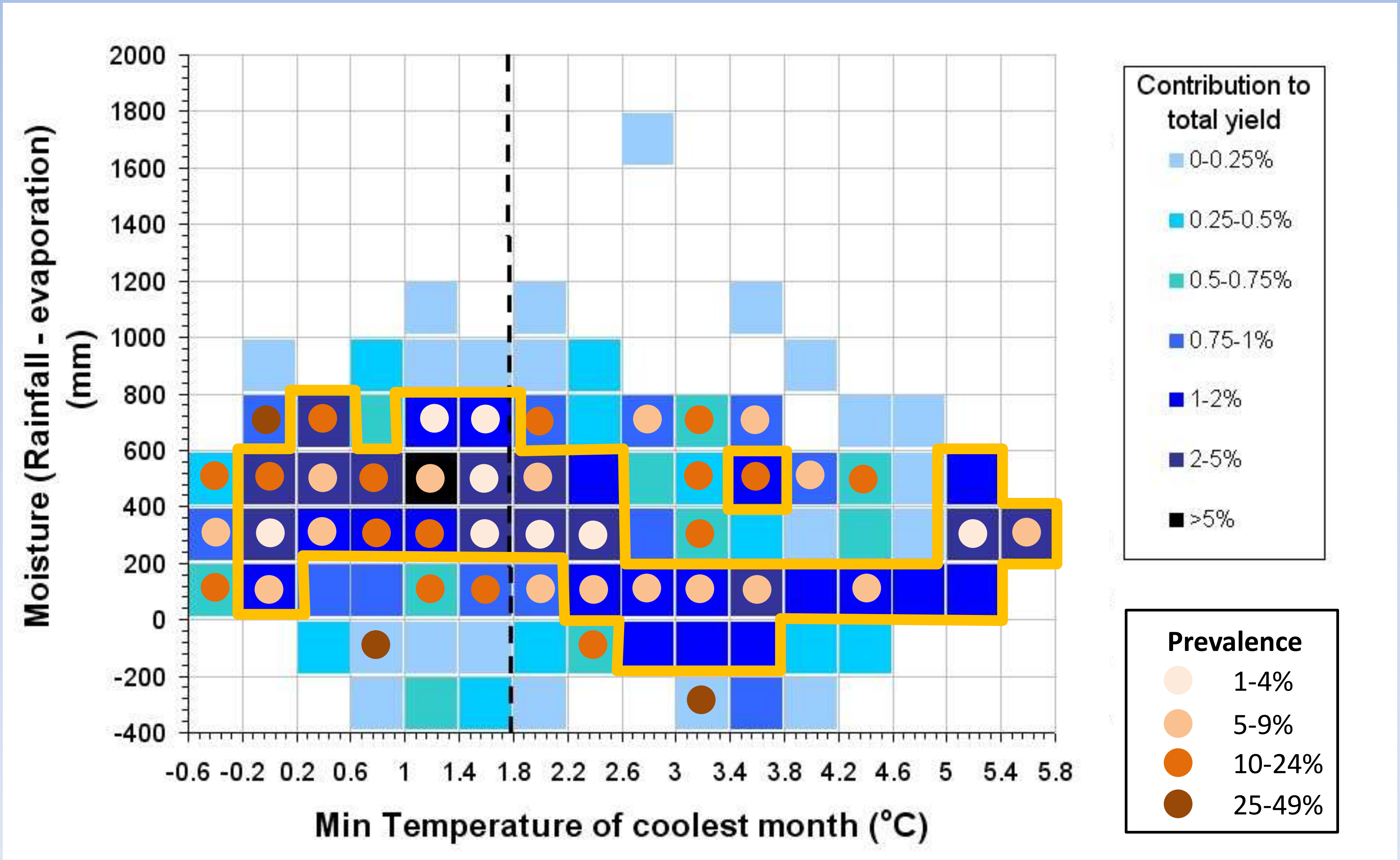


From Wardlaw (2010) DFRD Technical Report 11/2010, Forestry Tasmania

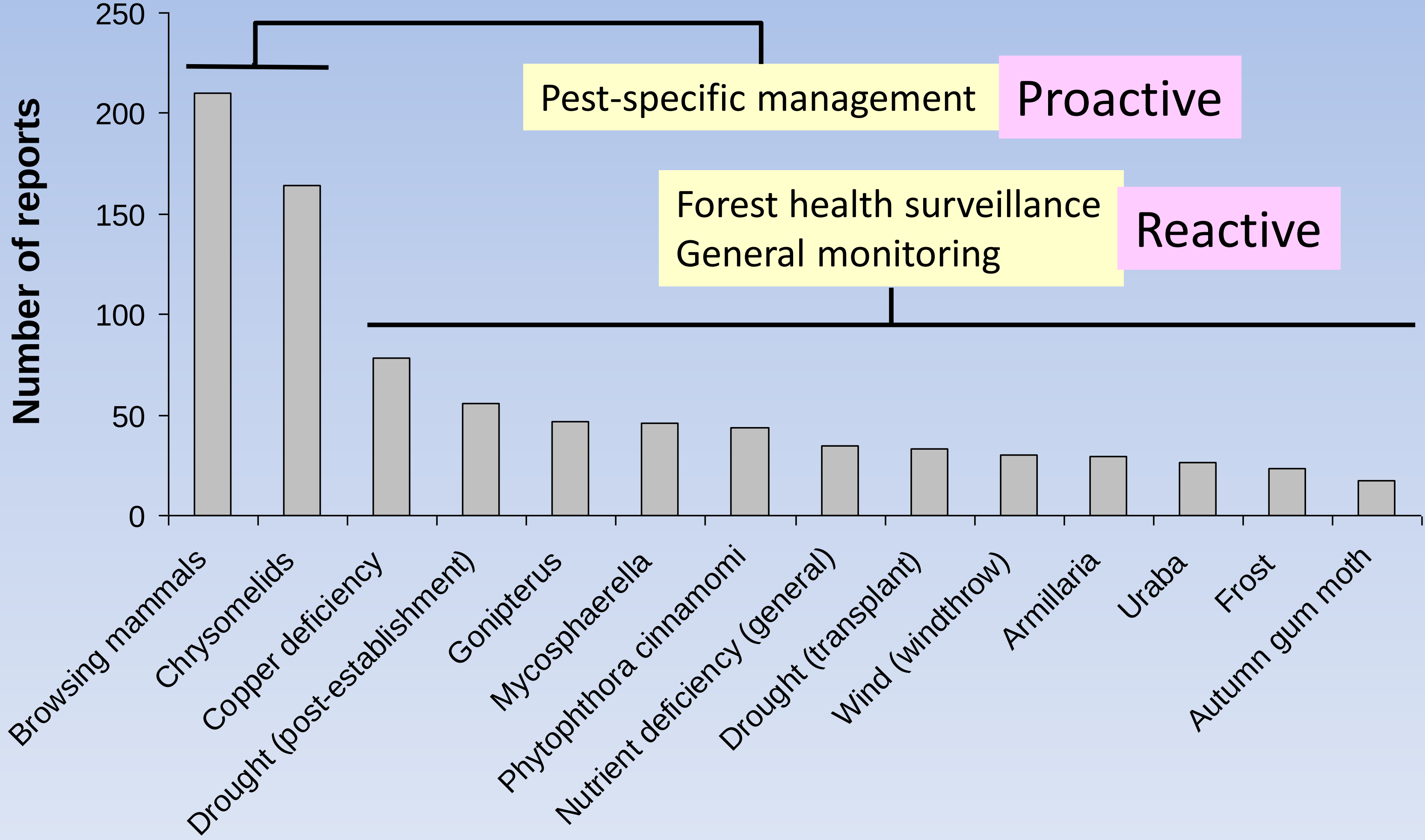
Overlap with threats: (i) severe defoliation by eucalypt leaf beetles



Overlap with threats: (ii) severe damage by browsing mammals



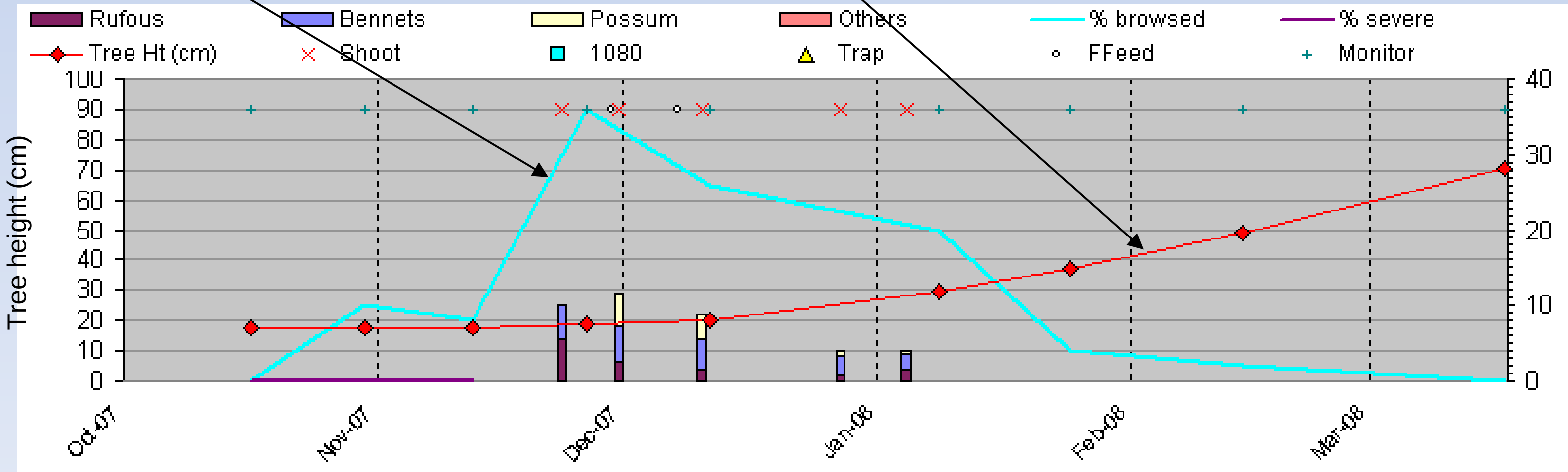
Approaches to management



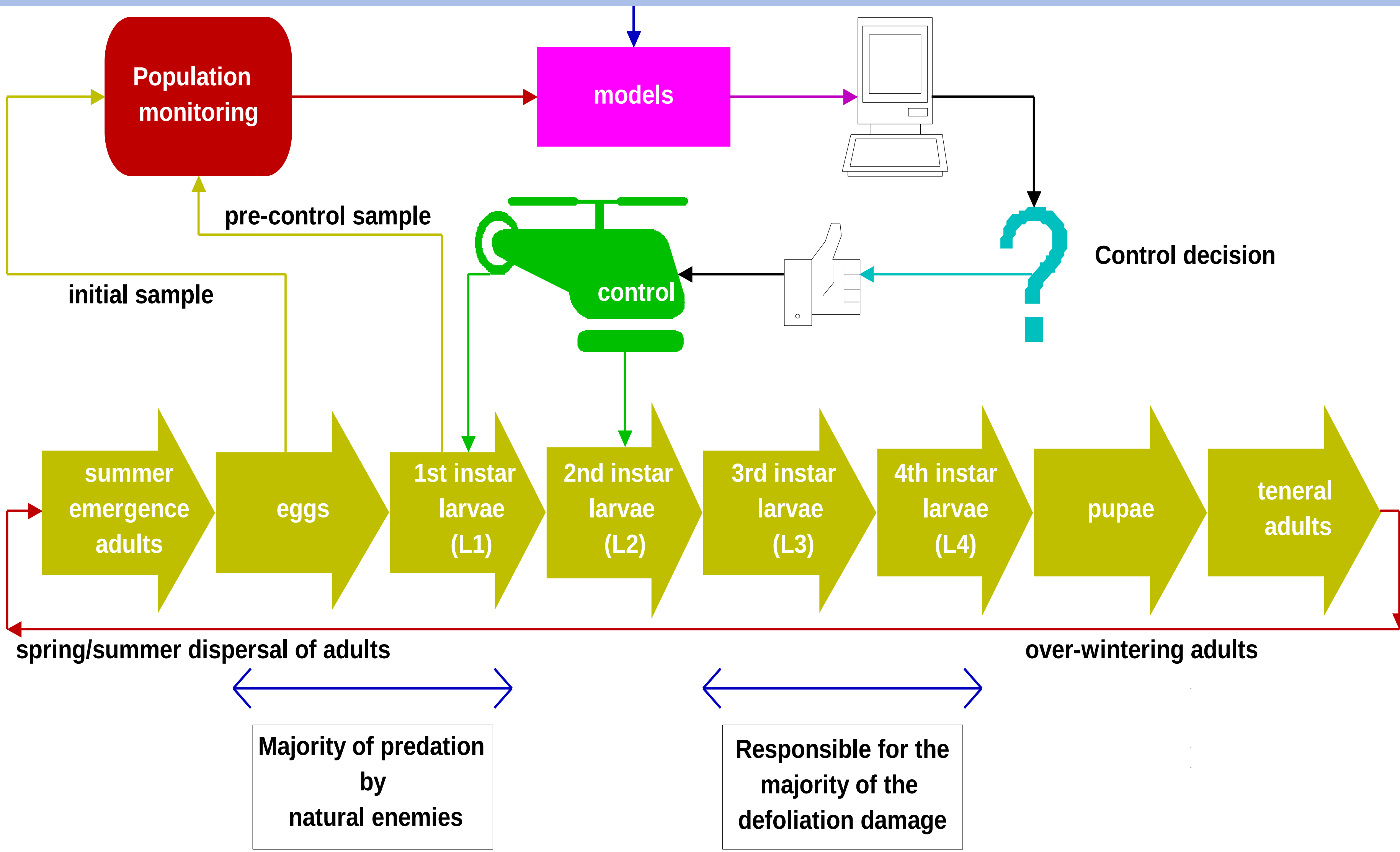
Pest-specific management: Mammal browsing IPM (circa. 2008)

- Non-lethal tactics (seedling stockings)
- Culling (shooting / trapping with free-feeding)
- Regular monitoring (damage / growth)

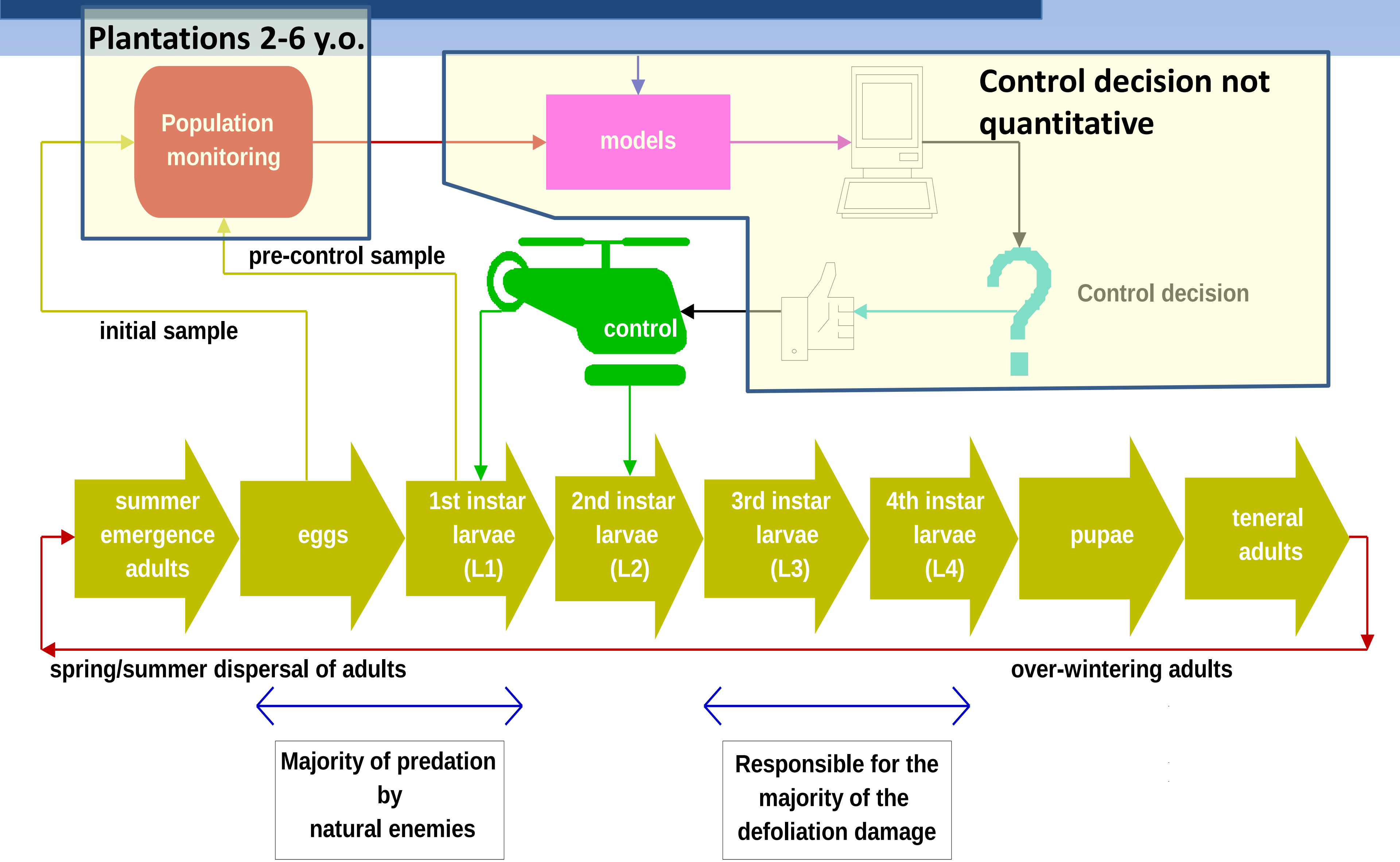
Browsing management tool
PDA-based tool to efficiently capture browsing damage and seedling growth



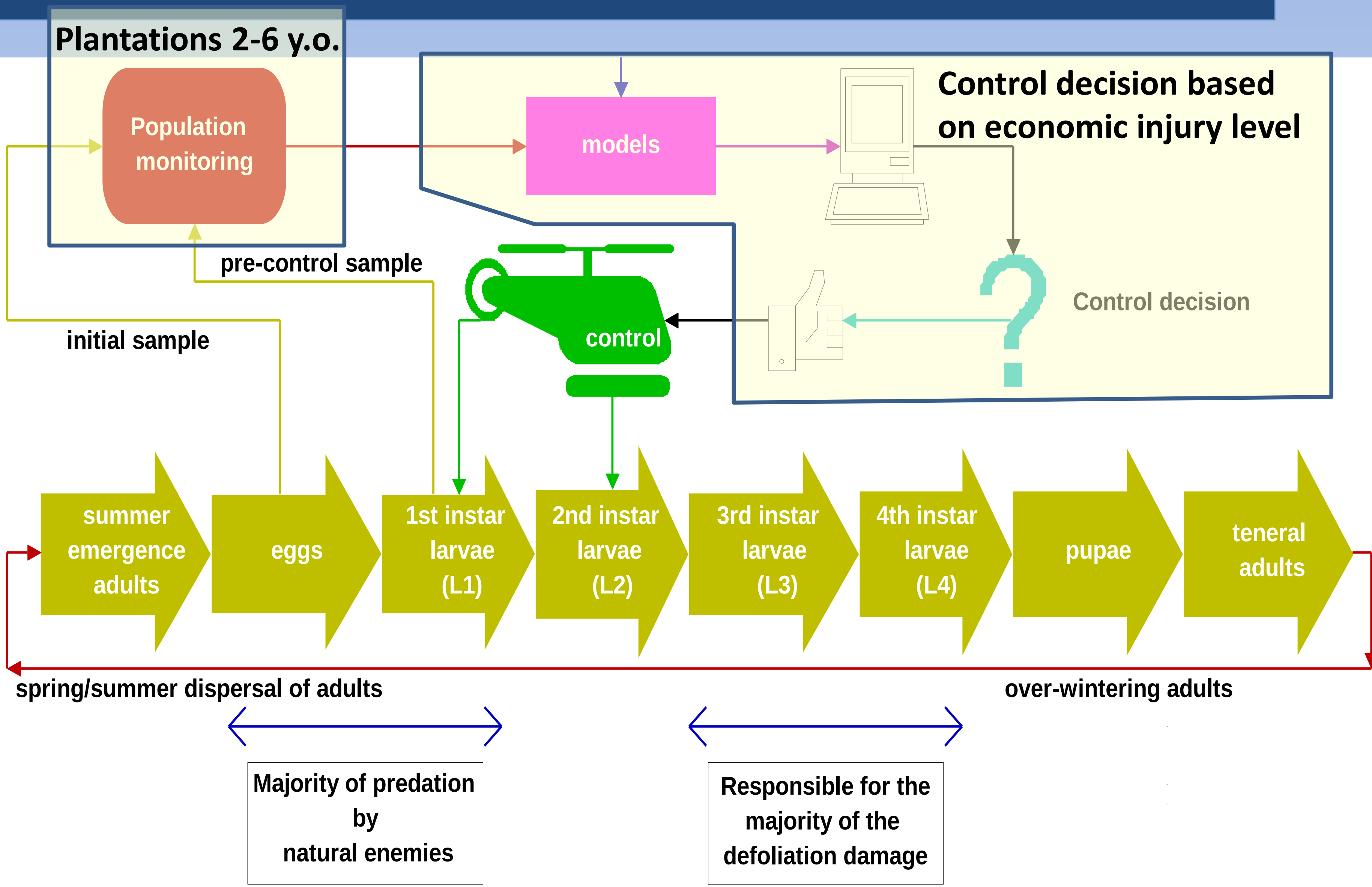
Pest-specific management: Leaf beetle IPM



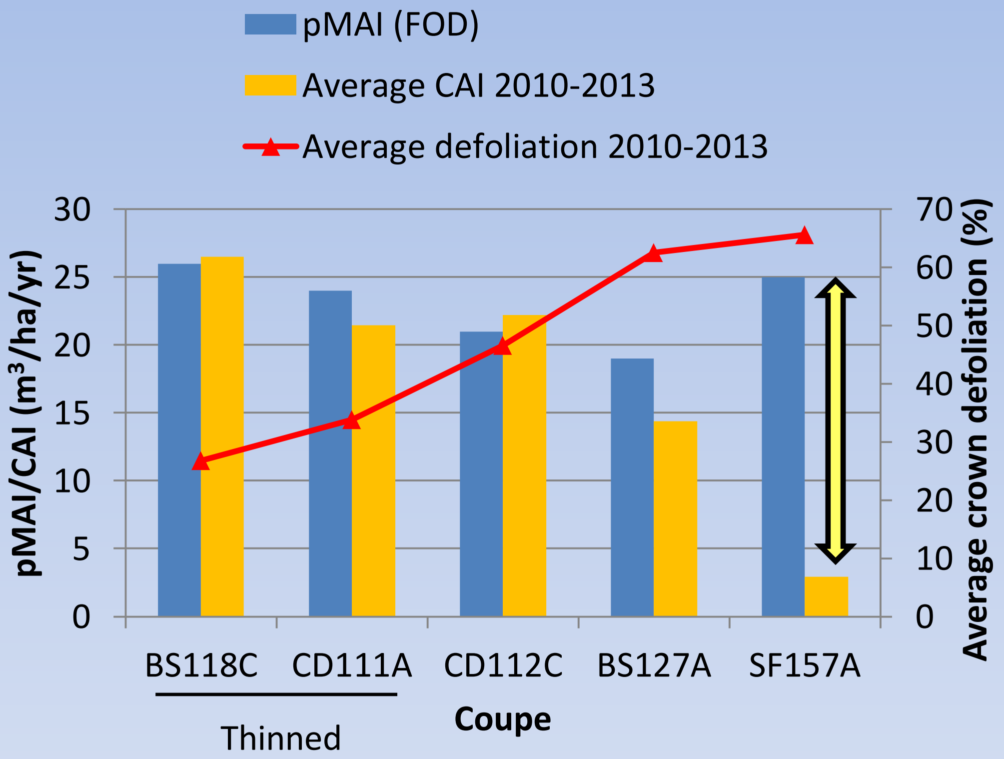
Leaf beetle IPM: Initial period 1992-2000



Leaf beetle IPM: Economic injury model 2000-2010



Mid-rotation chronic thin crowns



High levels (>50%) of defoliation linked to large drop in growth rates

- Develops in plantations older than the age range targeted by the IPM

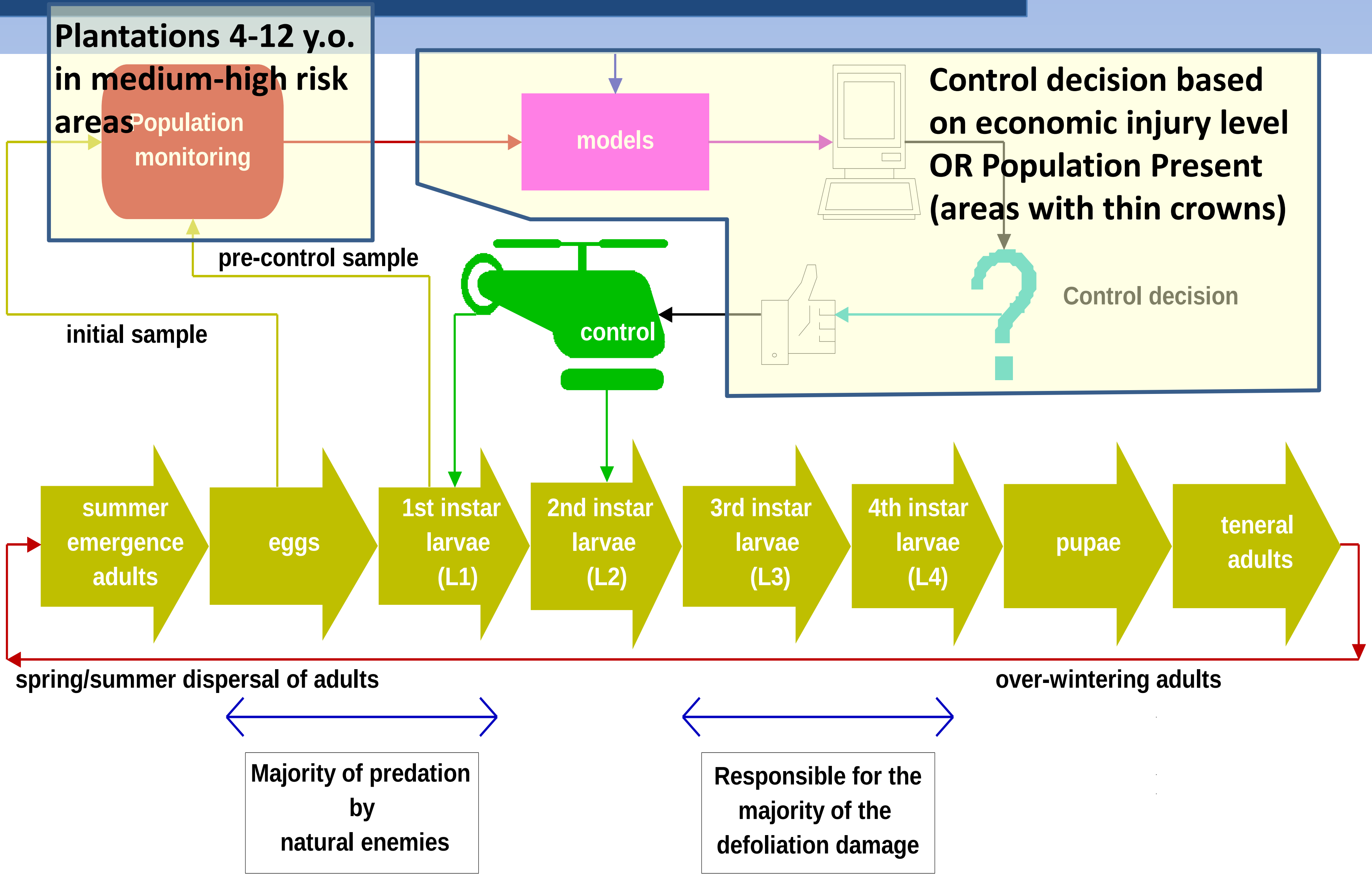
Mid-rotation chronic thin crowns: new research findings

1. Risk of above-threshold populations (Sophie Edgar BSc (Hons)
   - Landscape, stand, topographic and climatic factors as predictors of above-threshold populations
   - Elevation >550m and within 10 km of native grassland best predictors of the likelihood of above-threshold leaf beetle populations

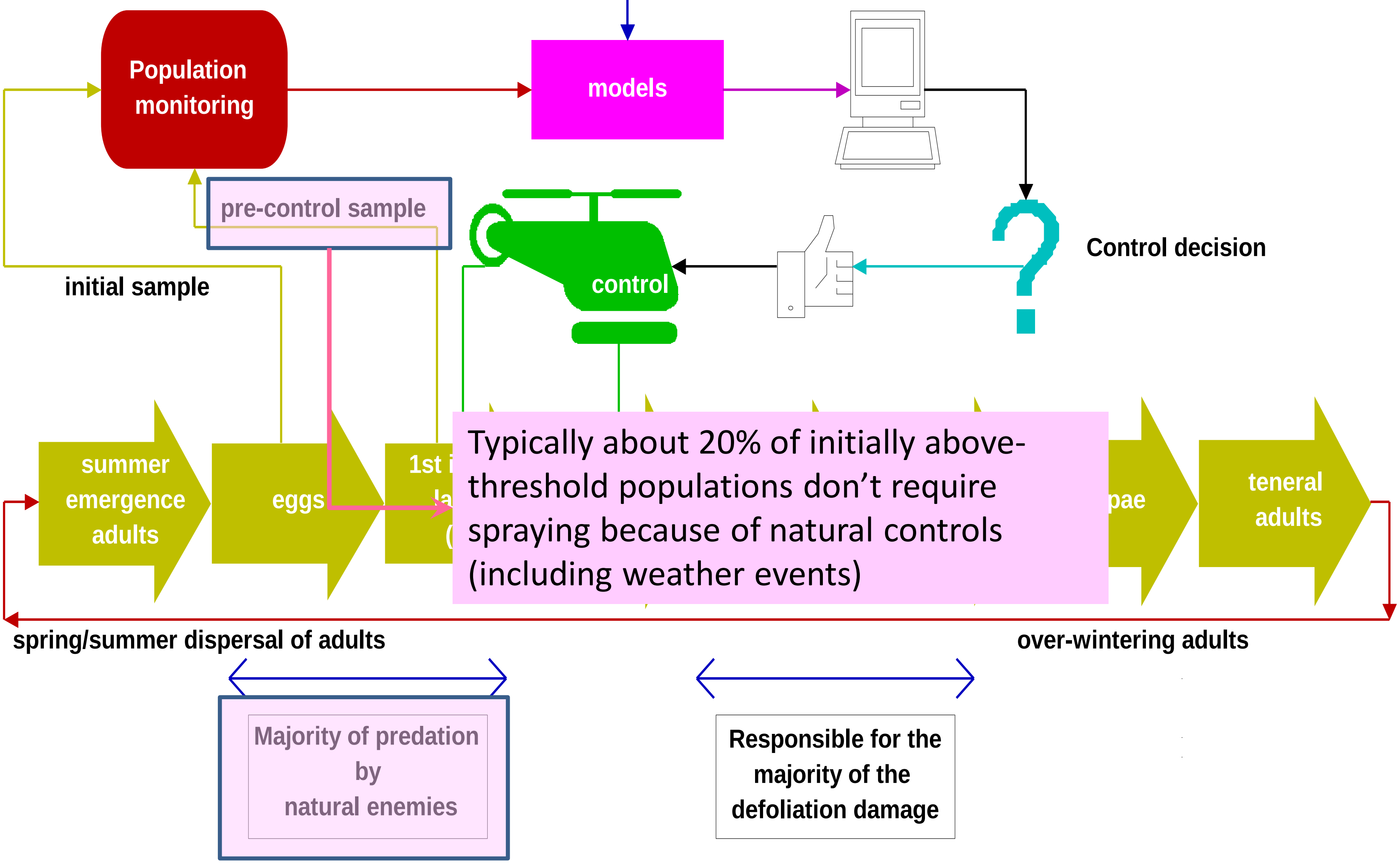
2. Intensive shoot monitoring (Karl Wotherspoon & Sue Jennings)
   - Feeding by recently emerged beetles (after overwintering) removed most of Oct-Dec new seasons leaves in thin crown plantations

3. Growth-impact plots (Karl Wotherspoon & Tim Wardlaw)
   - Severe (>50%) defoliation at the beginning and end of the growing season linked to ca. 95% reduction in CAI
   - Growth rates recover well the season after refoliation of chronically thin crowns

Leaf beetle IPM: Risk-based IPM 2011-



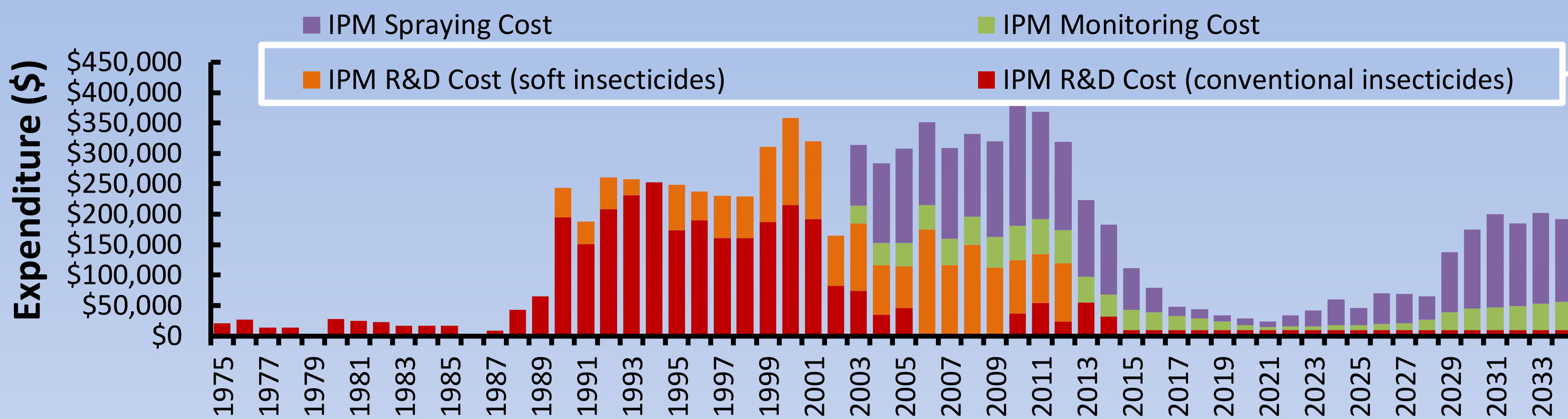
Leaf beetle IPM: The “integrated” part

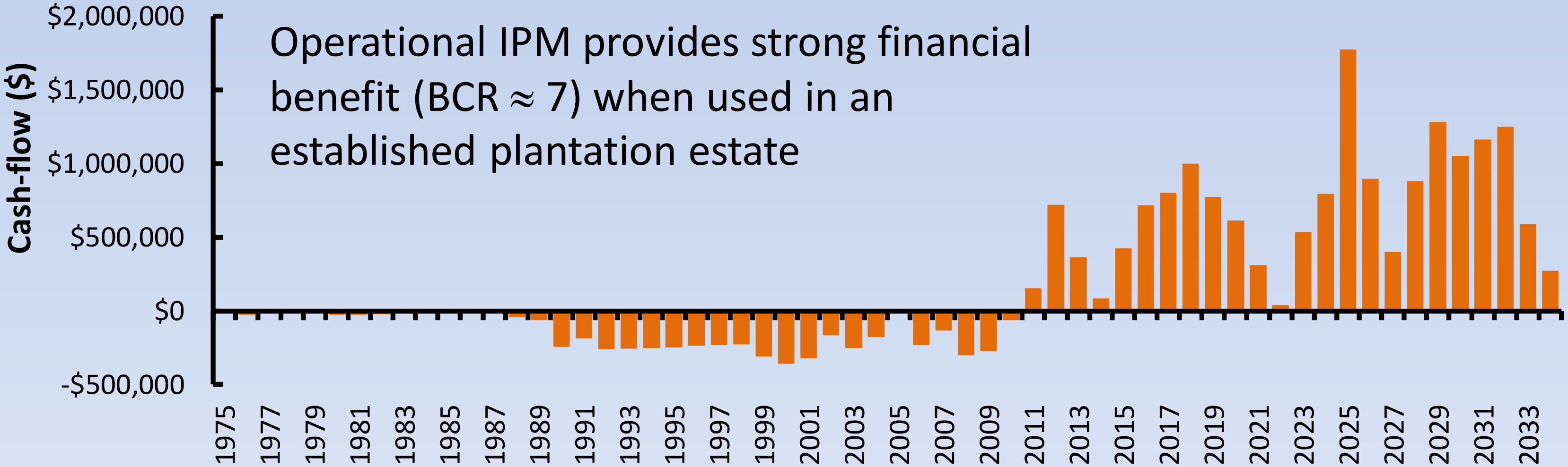


Typically about 20% of initially above-threshold populations don’t require spraying because of natural controls (including weather events)

Financial analysis of Leaf beetle IPM

Research contributed to 2/3 total expenditure (1974-2034)





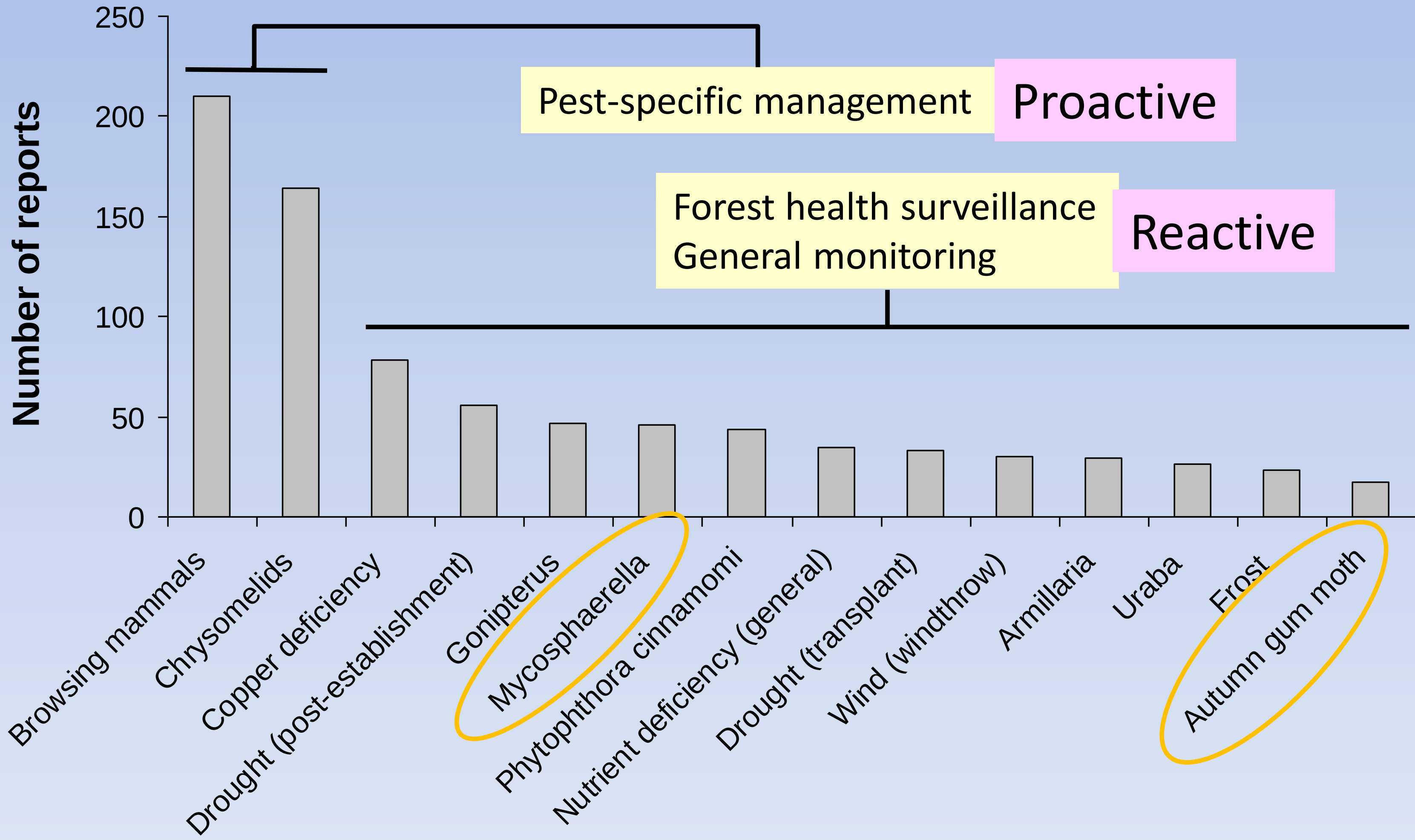
Carnegie, A., Lawson, S., Cameron, N., Wardlaw, T., Venn, T. (2017*) Evaluating the costs and benefits of managing new and existing biosecurity threats to Australia's plantation industry*. Final report PNC: 362-14/15. Forest and Wood Products Australia. Melbourne.

A couple of less common pests / diseases that can cause severe damage

Autumn gum moth

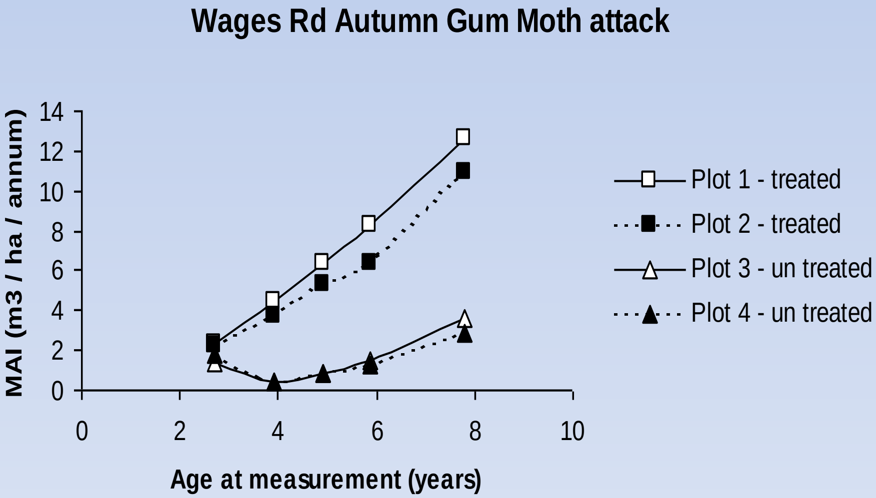
Foliar fungal diseases

Approaches to management



Autumn gum moth

- Late-season defoliation – long-term impact on productivity (high mortality)
- Difficult to predict when / where outbreaks will occur
    - general surveillance too hit and miss;
    - not sufficiently common to justify expense of pest-specific monitoring;
- Ideal candidate for pheromone trapping to detect pest presence as a trigger for more intensive monitoring
- Pheromones identified and field efficacy verified but not yet taken through to operational use.



Data from David de Little

Walker et al. (2009) *Journal of Chemical Ecology*, **35**: 1411-1422

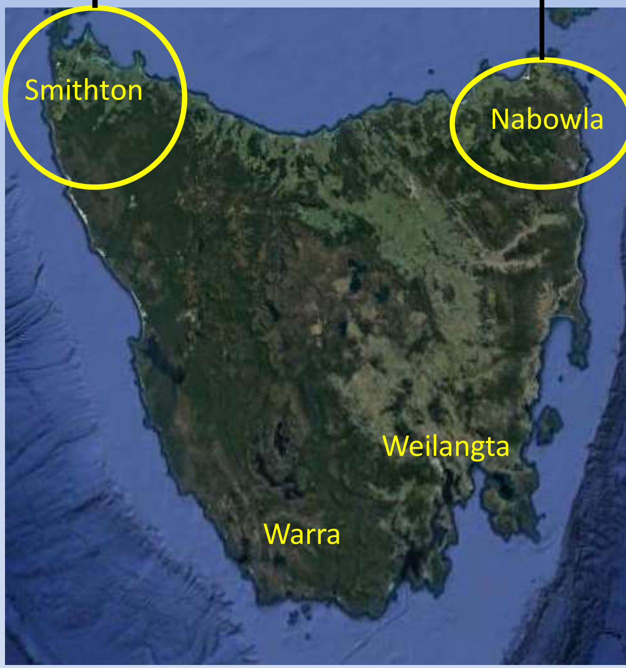
Foliar fungal diseases

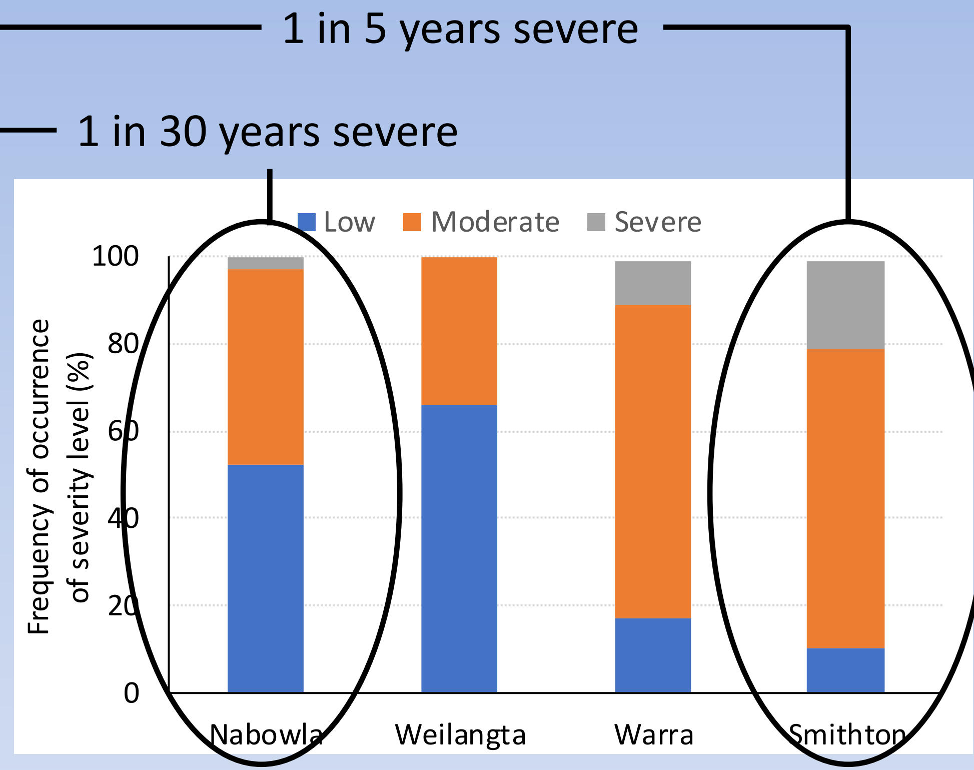
Teratosphaeria pseudonubilosa
(split from *T. nubilosa* = *Mycosphaerella nubilosa*)

Teratosphaeria eucalypti (= Septoria pulcherrima, Kirramyces eucalypti, Phaeopleospora eucalypti)

Puccinia psidii

T. nubilosa: climatic suitability for disease



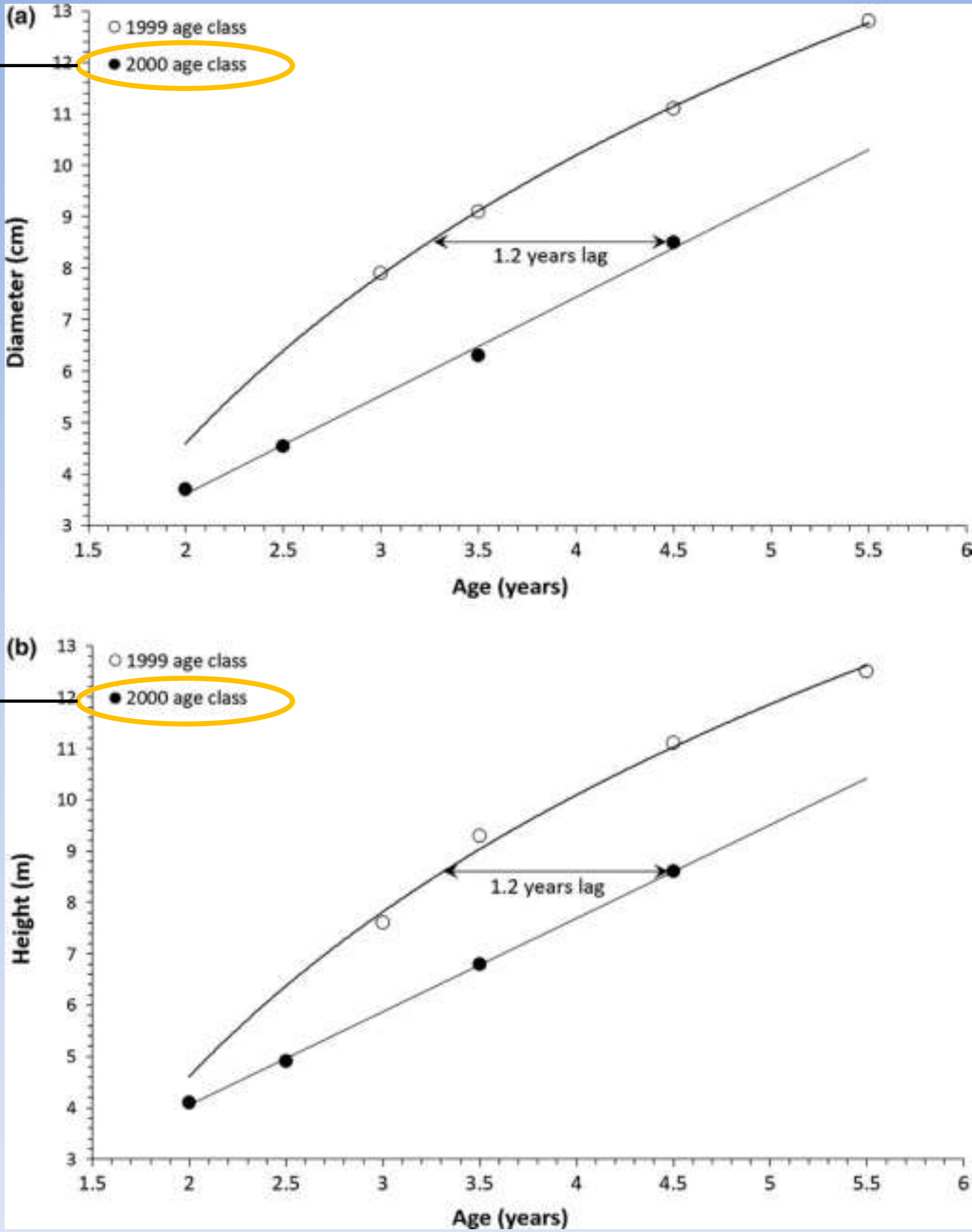


From Pinkard, E., Kriticos, D., Wardlaw, T., Carnegie, A., Leriche, A. (2010) *Ecological Modelling*, **221(23)**: 2828-2838

- Smithton: milder winters provide stronger overlap between new foliage production and moist conditions
- Nabowla: moist conditions and new foliage production coincide with occasional years of abnormally high summer rainfall

T. nubilosa growth impact

- Growth rates rapidly recover from single severe epidemic;
- Superior wood properties of *E. globulus* may be sufficient to compensate for greater MLD susceptibility



Smith, A., Wardlaw, T., Pinkard, E., Ratkowski, D., Mohammed, C. (2016) *Forest Pathology*: DOI: 10.1111/efp.12310

Glasshouse screening of the susceptibility of Tasmanian eucalypt species to *Puccinia psidii*

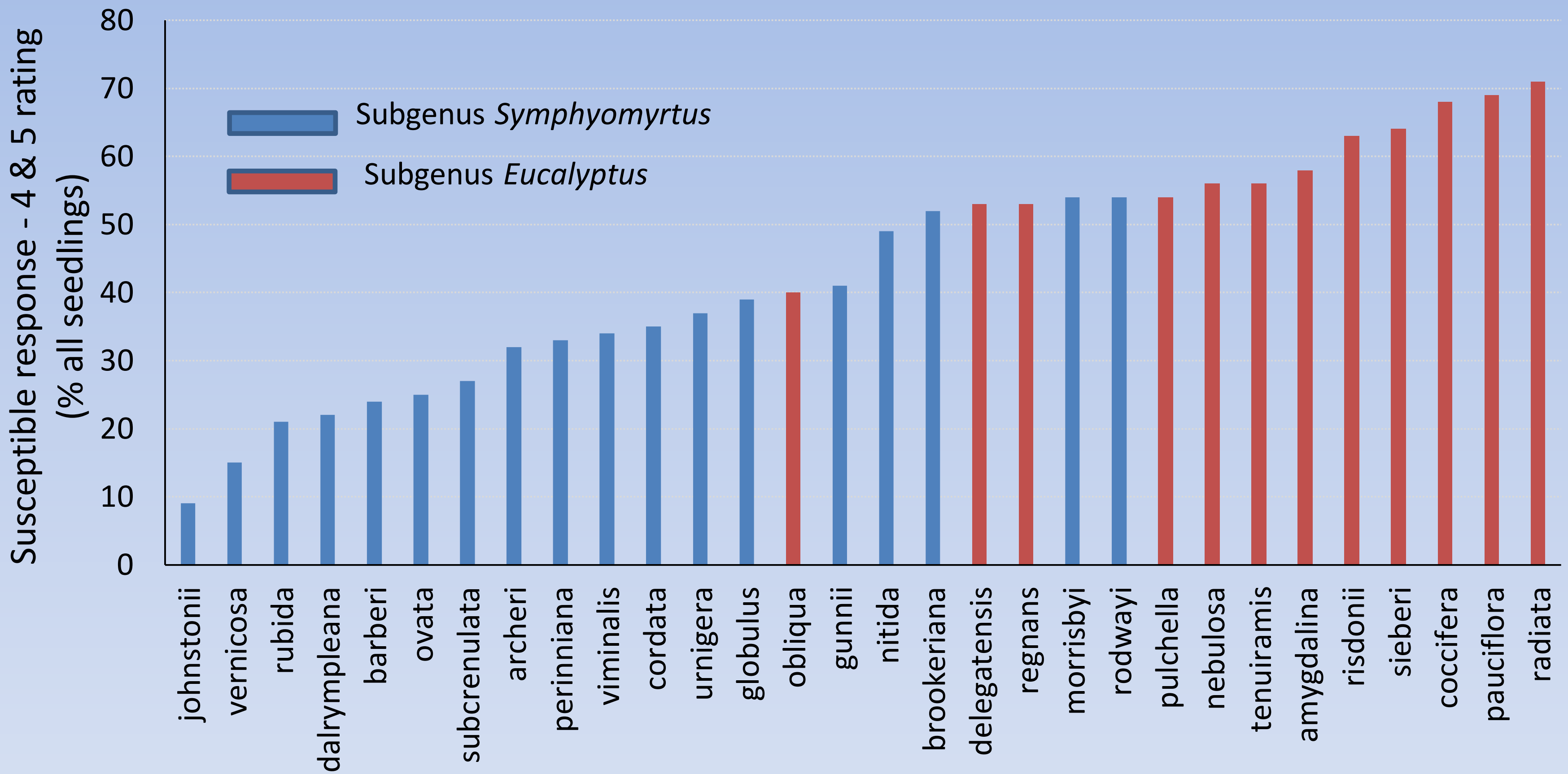
Inter- and intraspecific differences in rates of *P. psidii* susceptibility

- 30 species + 2 subspecies
- 85 provenances
- >1000 parent trees sampled

Fig. 4 Different ITs observed among seedlings raised from a seed lot of *Eucalyptus globulus* :
L–R: HR (0), R (1-C), MR (22+C), S (3+) and VS (4)

Potts, B., Sandhu, K., Wardlaw, T., Freeman, J., Li, H., Tilyard, P., Park, R. (2016) *Forest Ecology & Management*, **368**:183-193

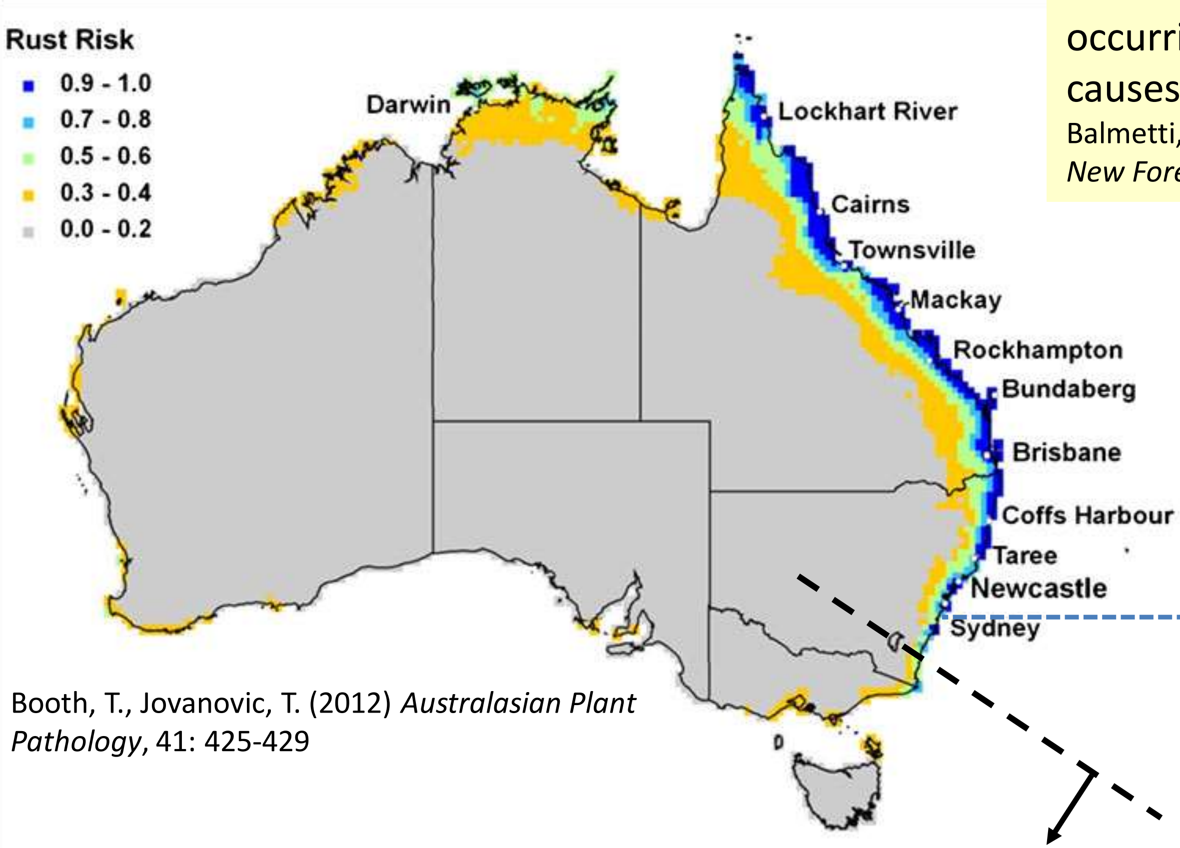
Susceptibility of Tasmanian eucalypt species to *Puccinia psidii*



Phylogenetic effect: *Symphyomyrtus* has more resistance to myrtle rust than *Eucalyptus*

Potts, B., Sandhu, K., Wardlaw, T., Freeman, J., Li, H., Tilyard, P., Park, R. (2016) *Forest Ecology & Management*, **368**:183-193

Conditions in southern Australia sub-optimal for epidemic *P. psidii* disease



Booth, T., Jovanovic, T. (2012) *Australasian Plant Pathology*, 41: 425-429

Teratosphaeria nubilosa + *Puccinia psidii* co-occurring in *E.globulus* progeny trial. *T. nubilosa* causes more severe damage.

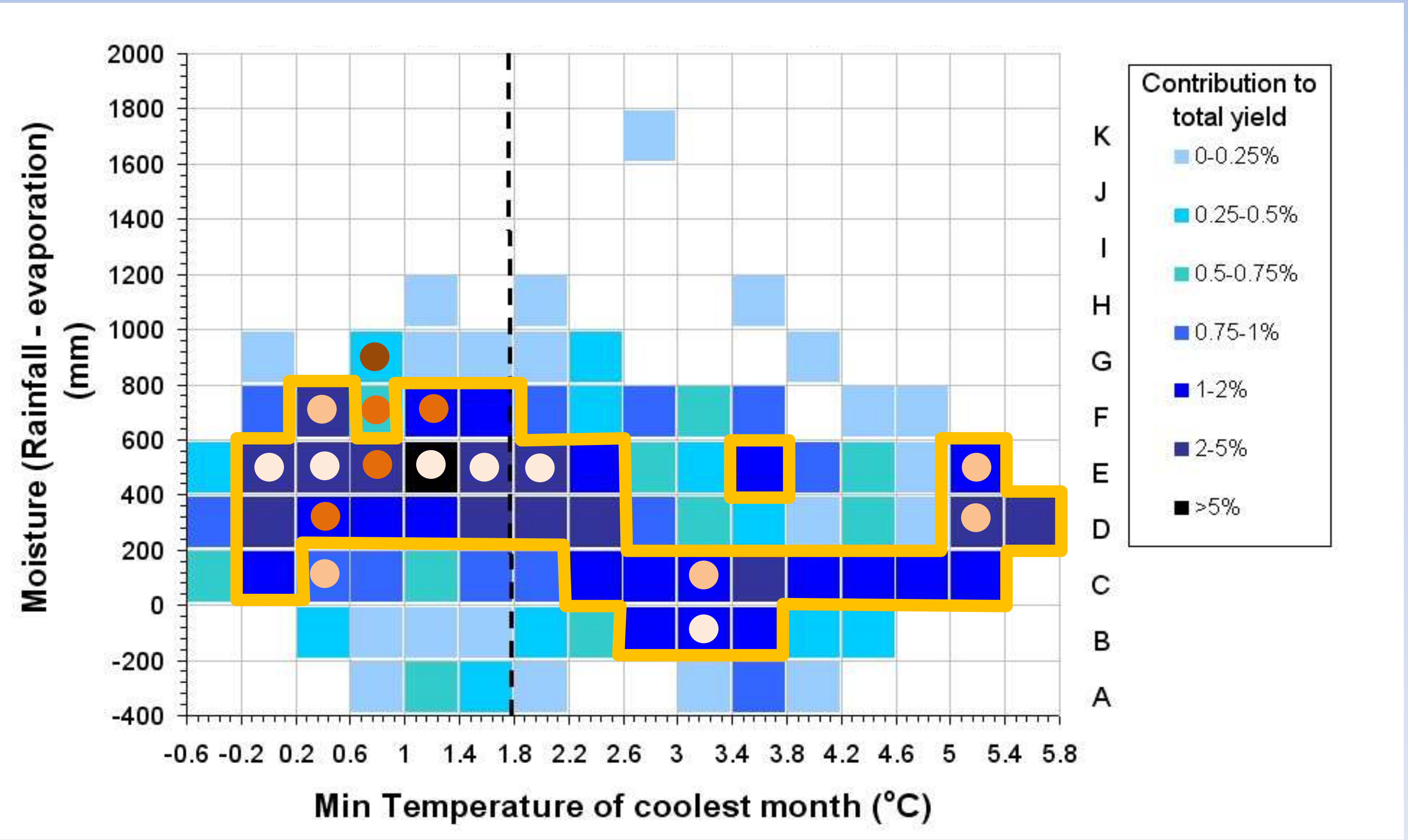
Balmetti, G., Simeto, S., Altier, N., Marroni, V., Diez, J. (2013) *New Forests*, **44**: 249-263

No natural spread into native plant communities (yet)

Indigenous foliar pathogens (*Teratosphaeria* spp.) are likely more damaging to eucalypts than *P. psidii* in southern Australia (and NZ)

Concluding remarks

1. Can manage main pest threats effectively and it is economically viable to do so



Concluding remarks

2. **Severe damage can occur** – BUT consequences are worse on sites at the edge of the climate envelope of species

Concluding remarks

3. Pest and disease management will continue to evolve as:

- new threats appear;
- plantation estate changes (age-class, choice of species / genotypes, sites change, products change);
- refinements are made to address sub-optimal management or changes to the tools available for management;

NEED TO MAINTAIN CORE EXPERTISE