Could dwarf mistletoes help solve New Zealand's wilding conifer problem?

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The Wilding Conifer Problem in NZ

- Wildings present on ~1.8 million ha.
- Increasing by ~6%/yr
- Despite $11m/yr on control + new chemical tools
- 20% of NZ land area by 2035 years (5.4m ha)
- Major economic, environmental and social consequences

Pinus contorta invasion sequence Mid Dome, Southland

Douglas fir invading beech forest

Biological Control of Wildings in NZ?

- Workshop in 2003 in NZ
- But biocontrol initiatives “parked” due to fierce opposition from forestry industry
- To which my response was …..

- Sure enough – we’re back promoting bc of conifers
- Part of MBIE research in “Winning against Wildings”

Biological Control of Wildings in NZ?

- Commercial forestry in NZ ~$5 billion/yr
- Need extreme host specificity if targeting non-commercial wilding species e.g *Pinus contorta*
- Seed/cone-feeding bc agents could target commercial species provided no-risk of transmitting or facilitating con


Douglas fir gall midge, *Contarinia oregonensis*


Pine cone weevil, *Pissodes valdidirostris*

- *Not* talking about these today, although they are likely to have a role.

Terminating Wilding Conifers in NZ?

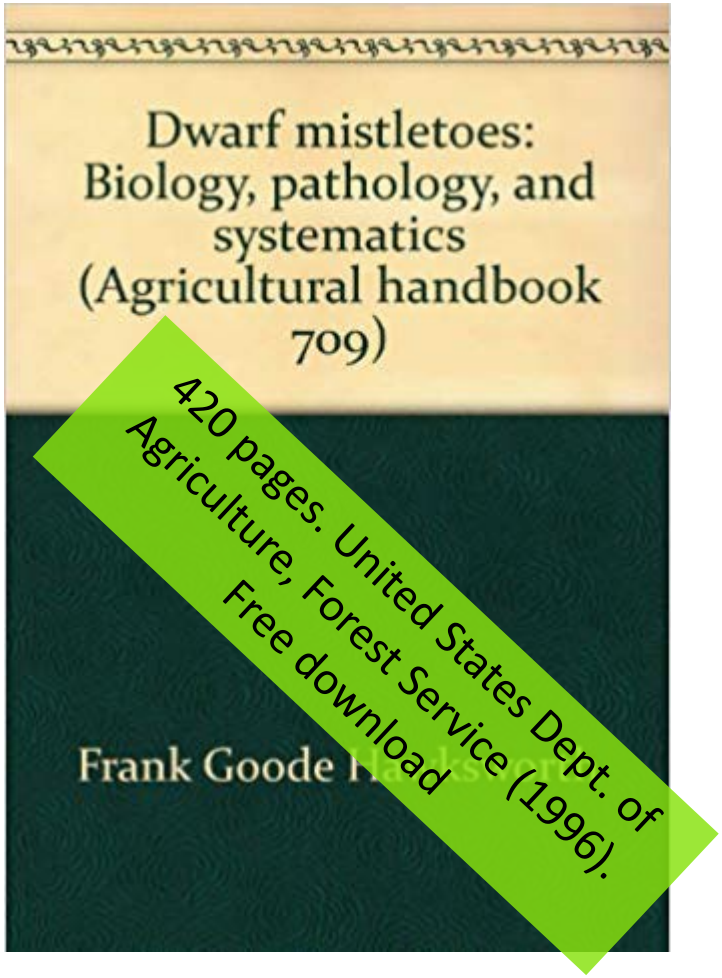
- May not have a phased plasma rifle
- But we do have a new class of biocontrol agents – dwarf mistletoes

Young dwarf mistletoe

Advanced infestation causing dieback in *Pinus contorta* in USA

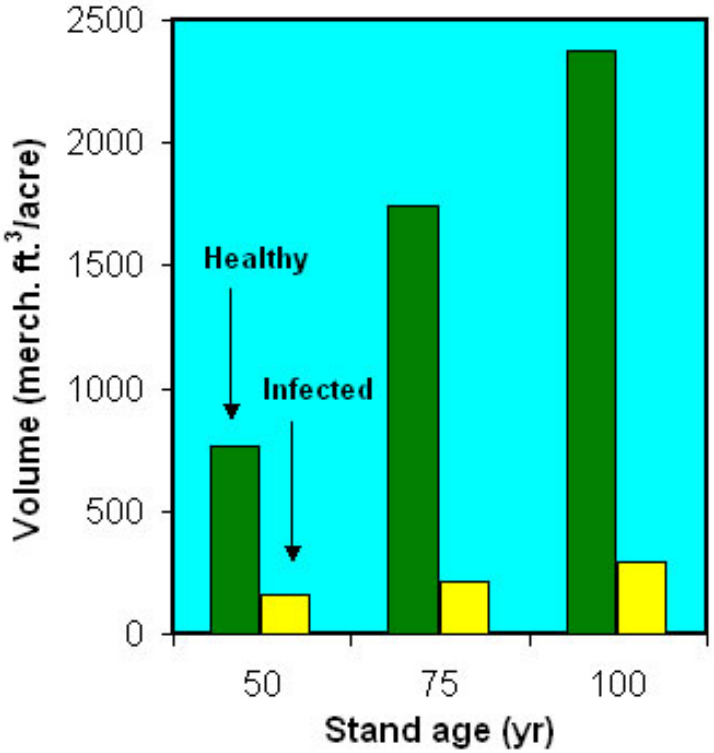
Dwarf Mistletoes

- Dwarf mistletoes cause the most serious diseases of conifers in North America
- Very well studied biology, damage/management and host specificity
- 26 species in North America, many specific to one or a few conifer hosts
- Dispersal only ~0.5m/yr by exploding seed capsules and sticky seeds
- 5 yr to flowering



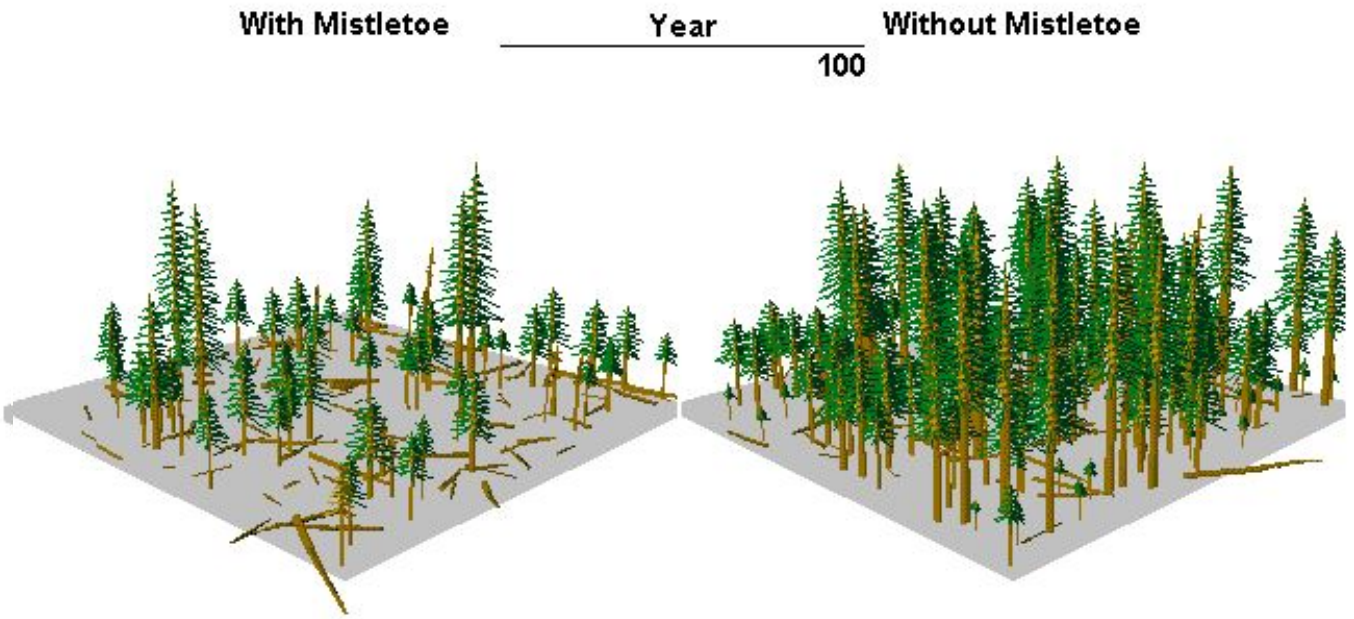
Pinus contorta Dwarf Mistletoe

- *"infested stands show dramatic yield loss and substantially increased mortality rate"* (Richardson 1998)



- *"Lodgepole pine that does not burn can become dominated by …. more shade-tolerant (species) as the dwarf mistletoe suppresses host growth and kills the pine"*

Pinus contorta in North America



- Not a quick fix – but potential long term management tool for heavily infested catchments in NZ
- May be a bit faster in NZ – assisted dispersal and lack of mistletoe natural enemies

Pinus contorta Dwarf Mistletoe for NZ?

- Need to check genetics of *P. contorta* in NZ (different subspecies in USA attacked by different mistletoe species)
- Host range test provenances of *P. radiata* planted in NZ
- All dwarf mistletoes are “Unwanted Organisms” in NZ
- Need to check for associated organisms e.g. plant diseases
- But ought to be straightforward introduction

Going Further with Dwarf Mistletoes

- Douglas fir and *Pinus radiata* – both have damaging and host specific dwarf mistletoes in North America
- Seems mad, but …..
- Very slow rate of spread of mistletoes (0.5m/yr)
- Physical barriers + land hygiene before planting = mistletoe has to invade *and* cause damage before plantation is harvested
- Risk of animal dispersal very low – plus dioecious
- Plan – start with *P. contorta* dwarf mistletoe
- Then measure dispersal/impact (model system for assessing risk of targeting feral populations of commercial conifer species)

Summary

- Dwarf mistletoes are new potential bc agents for some North American wilding conifers in NZ
- Only cost-effective tool for large, dense infestations e.g. where whole catchments are invaded
- Cause long-term decline – minimise unwanted side-effects (e.g. caused by rapid chemical control)
- Fire management could be an issue
- Dead wood might also encourage some pine pests
- Need to focus other management tools/other bc agents against wilding conifers that don’t have dwarf mistletoes

Thanks

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