



Pining for the future: *which pine trees where?*



Jenni Stockan, Joan Beaton, Alison Hester, Glenn Iason

Stephen Cavers, Annika Perry (CEH)

Joan Cottrell, Roger Moore (FR)



The James
Hutton
Institute

Aim & objective

- To understand and manage the consequences of environmental and climate change for ecosystem resilience.
- Effects of tree genetics and environmental factors on tree performance, tree health including pests and pathogens, associated biodiversity and ecosystem processes.

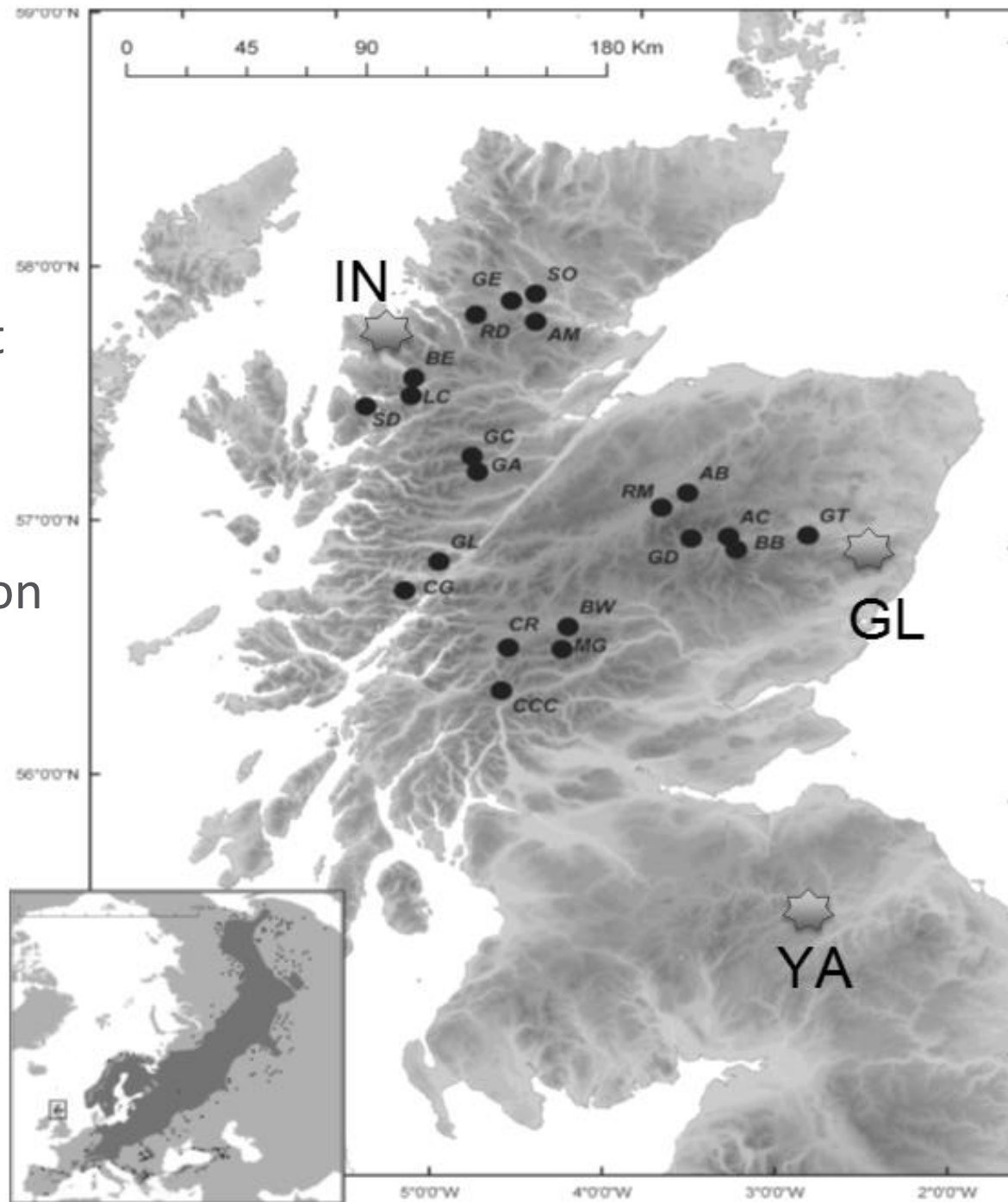


Inverewe

Warm, wet

+2 °C

140 %
precipitation



Glensaugh

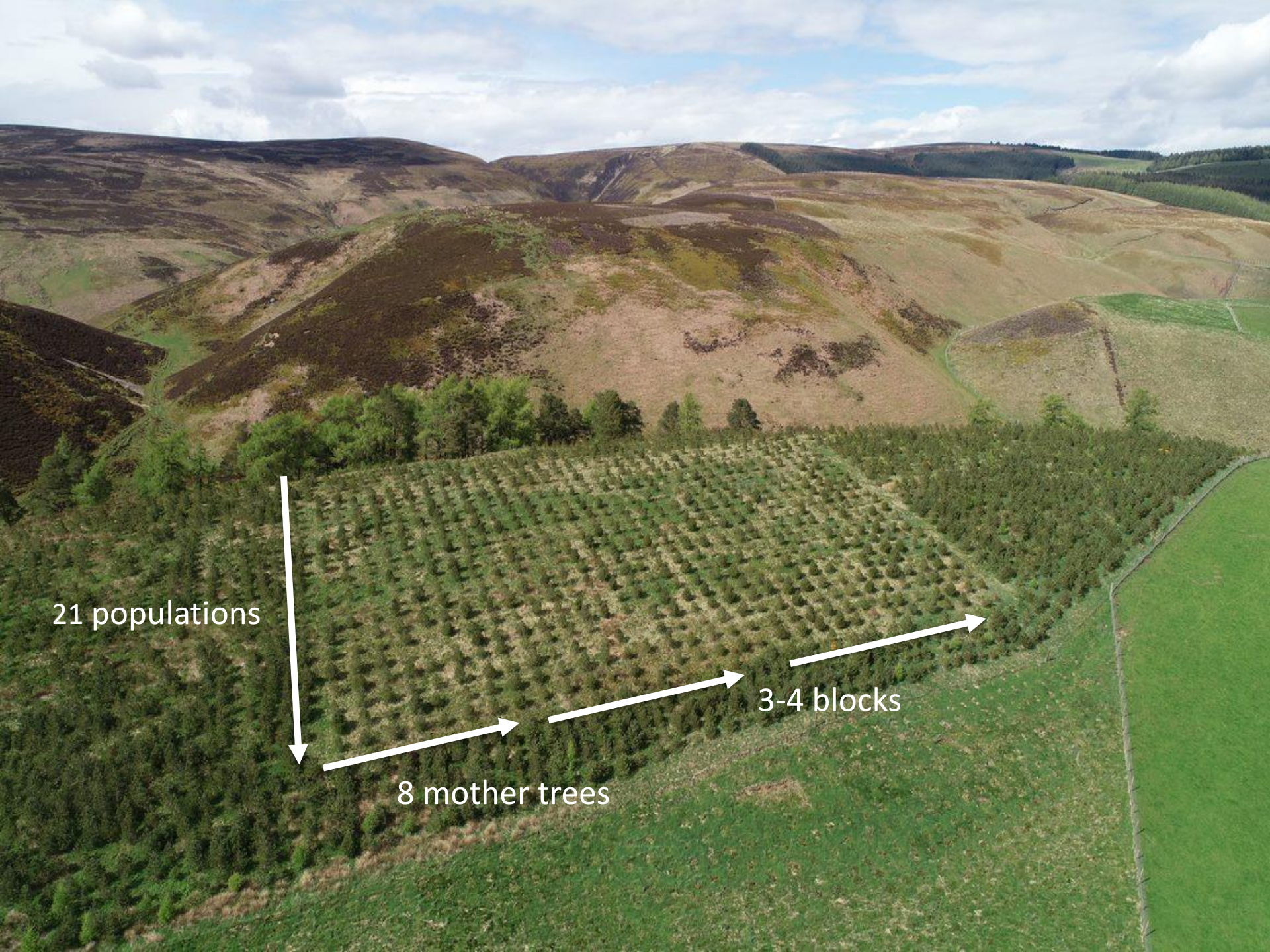
Cool, dry

Yair

Warm, dry

+2 °C

75 %
precipitation



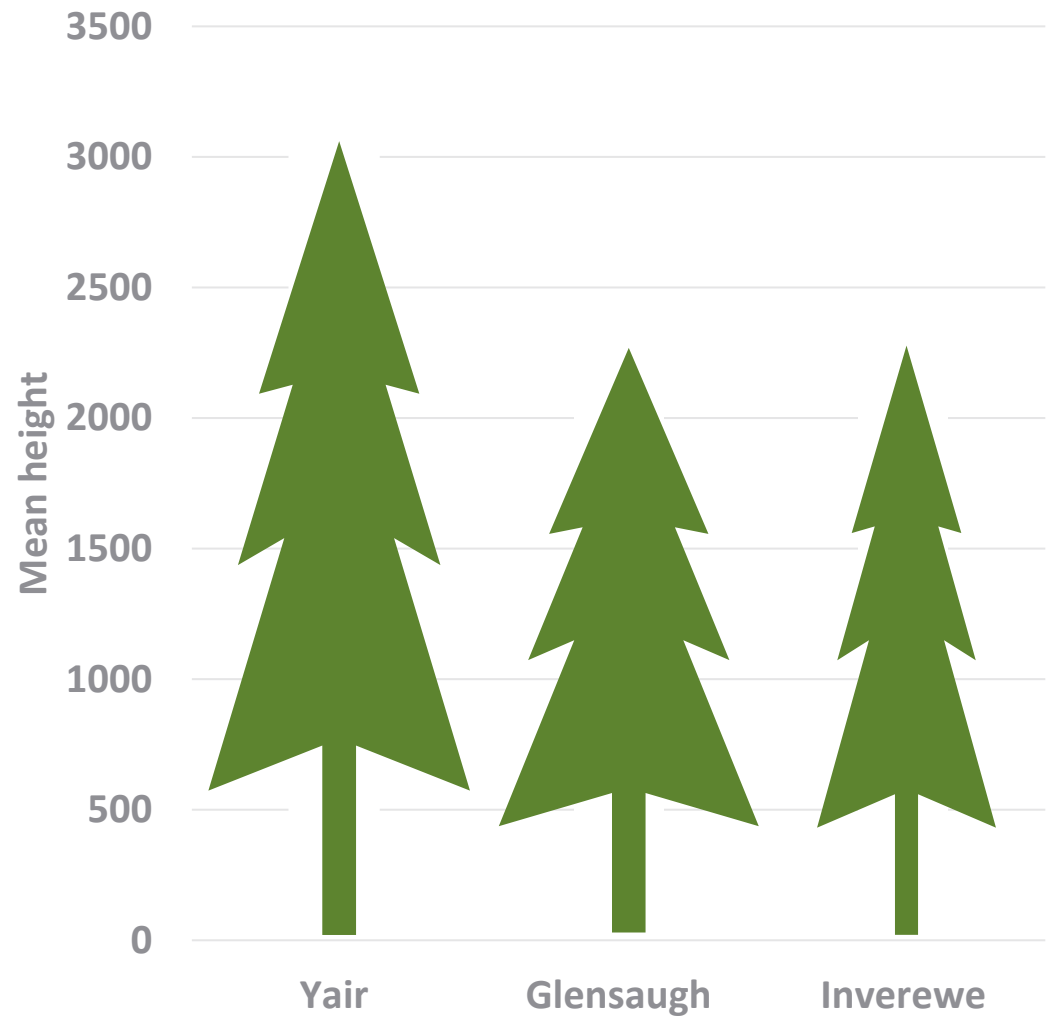
21 populations

3-4 blocks

8 mother trees



Survival & growth





Survival & growth

	Wald	<i>p</i>
Site	403.76	<0.001
Provenance	8.59	<0.001
Family	1.85	<0.001

REML analysis with Site, Provenance and Family (nested within Provenance) as fixed effects, Block nested within Site as a random effect.



Invertebrate Biodiversity

	Year	Variable	Wald
Abundance	2015	Site	26.26***
		Provenance	42.68**
	2017	Provenance	31.92*
		Family	87.82*
Species richness	2015	Site	19.02***
		Provenance	48.61***
	2017	Provenance	31.90*
Abundance pine specialists	2015	Site	44.41***
	2017	Site	5.47**

Insect pests

Causal group	Year	Variable	Wald
<i>Hylobius abietis</i>	2015	Site	72.98***
		Site*Provenance	82.02***
	2017	Site	17.92***
		Site*Provenance	33.27*
Symphyta	2015	Site	132.65***
		Site*Provenance	84.19***
		Family	95.66*
	2017	Provenance	45.03***
		Family	97.36**

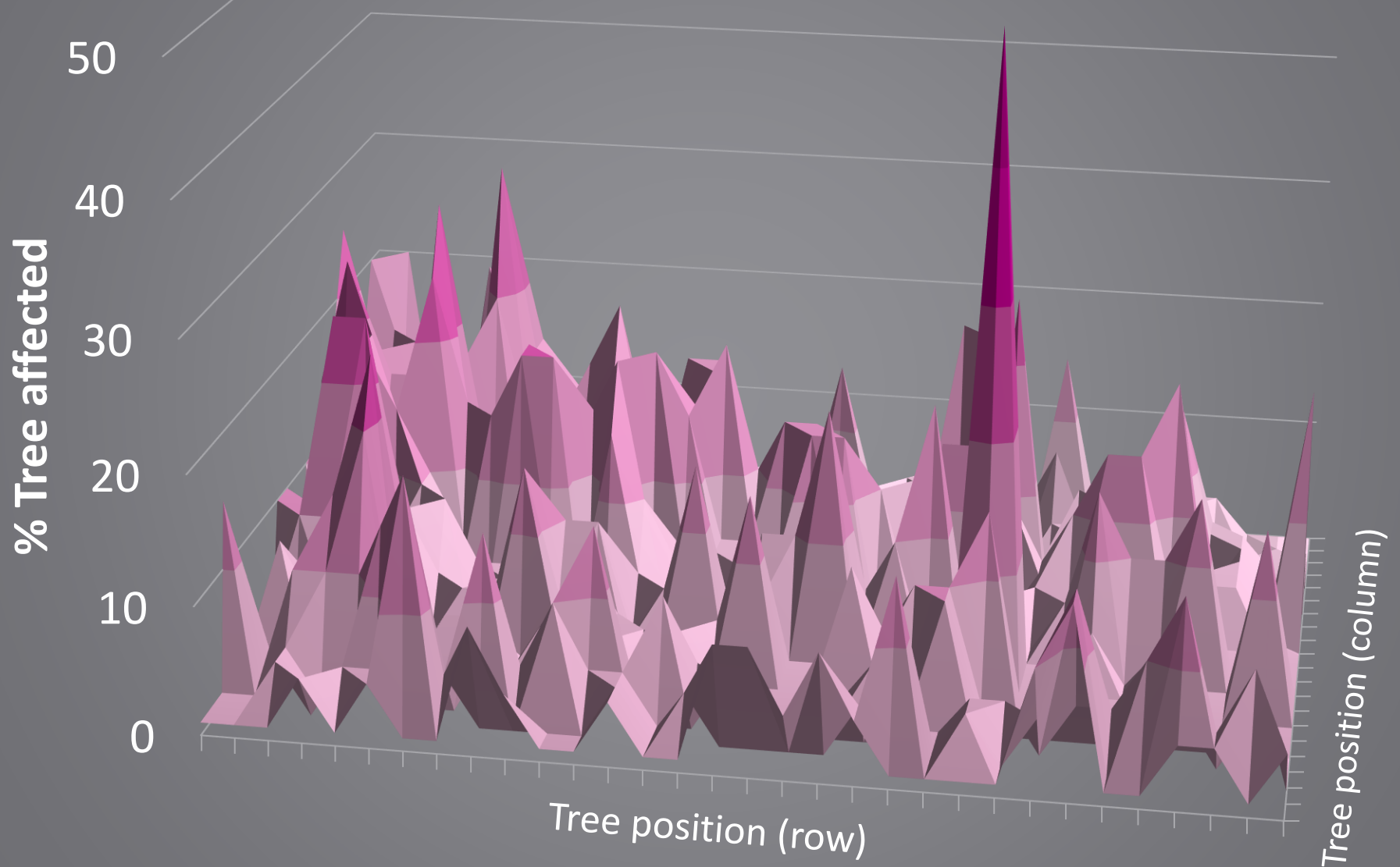




Fungal pathogens

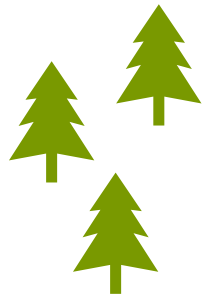
Species	Variable	Wald
<i>Dothistroma</i>	Site	193.08***
	Provenance	1.88*
<i>Lophodermella</i>	Site	25.91***
	Provenance	5.81***
	Site*Provenance	3.23***
<i>Lophodermium</i>	Site	92.91***
	Provenance	1.82*
<i>Coleosporium</i>	Site	24.10***

Dothistroma prevalence (Glensaugh)



Conclusions

- Growing site has the greatest effect on tree growth, associated biodiversity, pests and pathogens
- Provenance (and family) have a significant influence
- Western provenances grow faster, greater biodiversity, fewer pathogens



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