

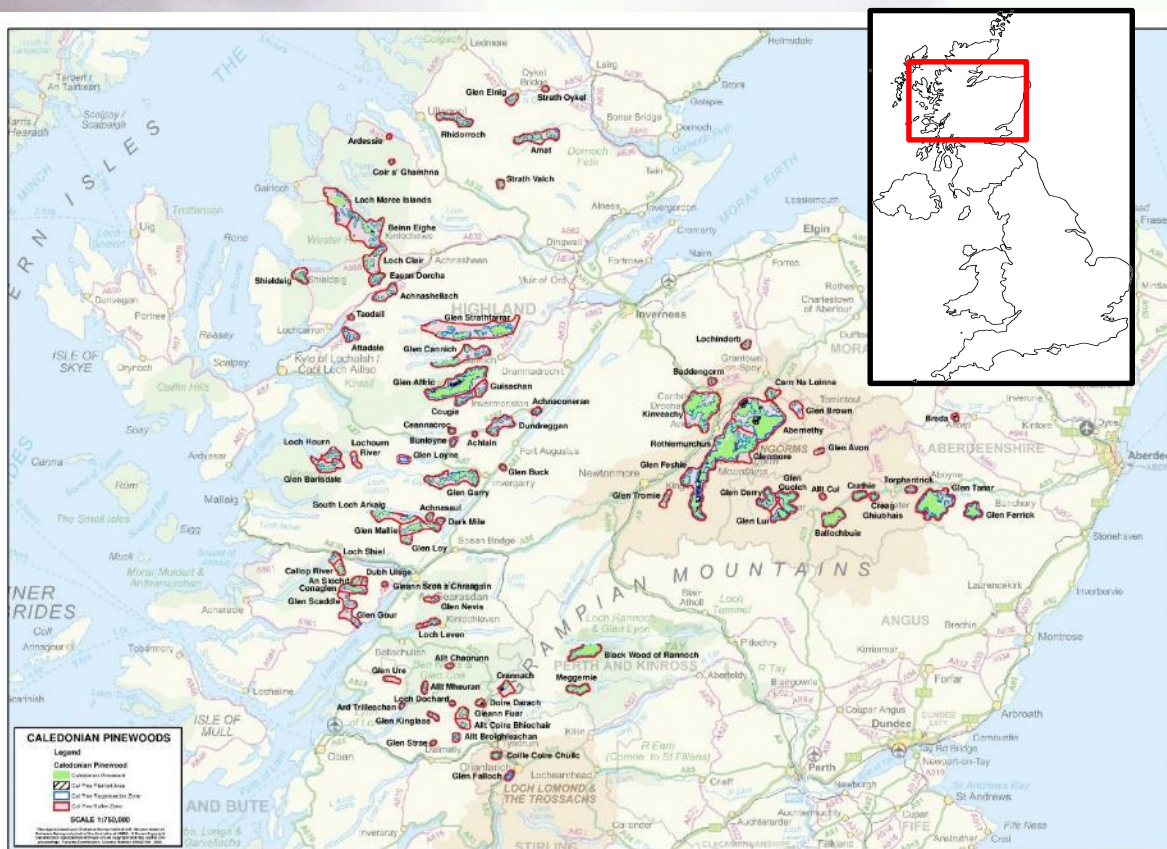


Glen Affric National Nature Reserve, Scottish Highlands

# Can native Scots pine survive *Dothistroma* needle blight?

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# Native Scots pine in Scotland



Caledonian pinewood inventory  
Forestry Commission  
[treesforlife.org.uk](http://treesforlife.org.uk)

High genetic diversity / gene flow  
Adaptive genetic differentiation

# *Dothistroma* needle blight



# What is needed for resilience to DNB?



# Common garden trial

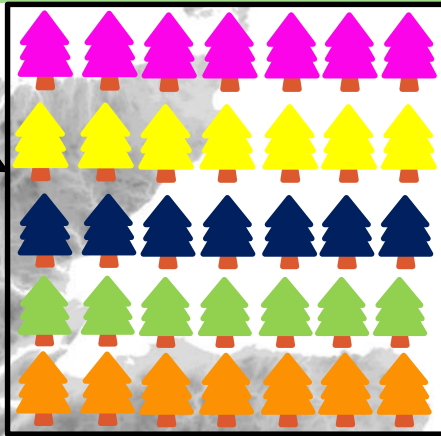


$$V_P = V_G + \cancel{V_E}$$

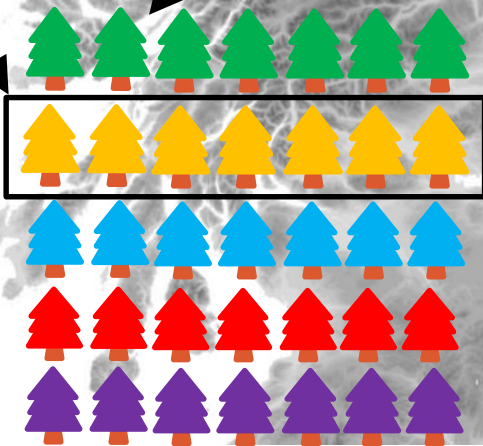
 = Mean annual precipitation 1961-1990

# Progeny-provenance trial

A provenance



A family  
(share a  
mother)



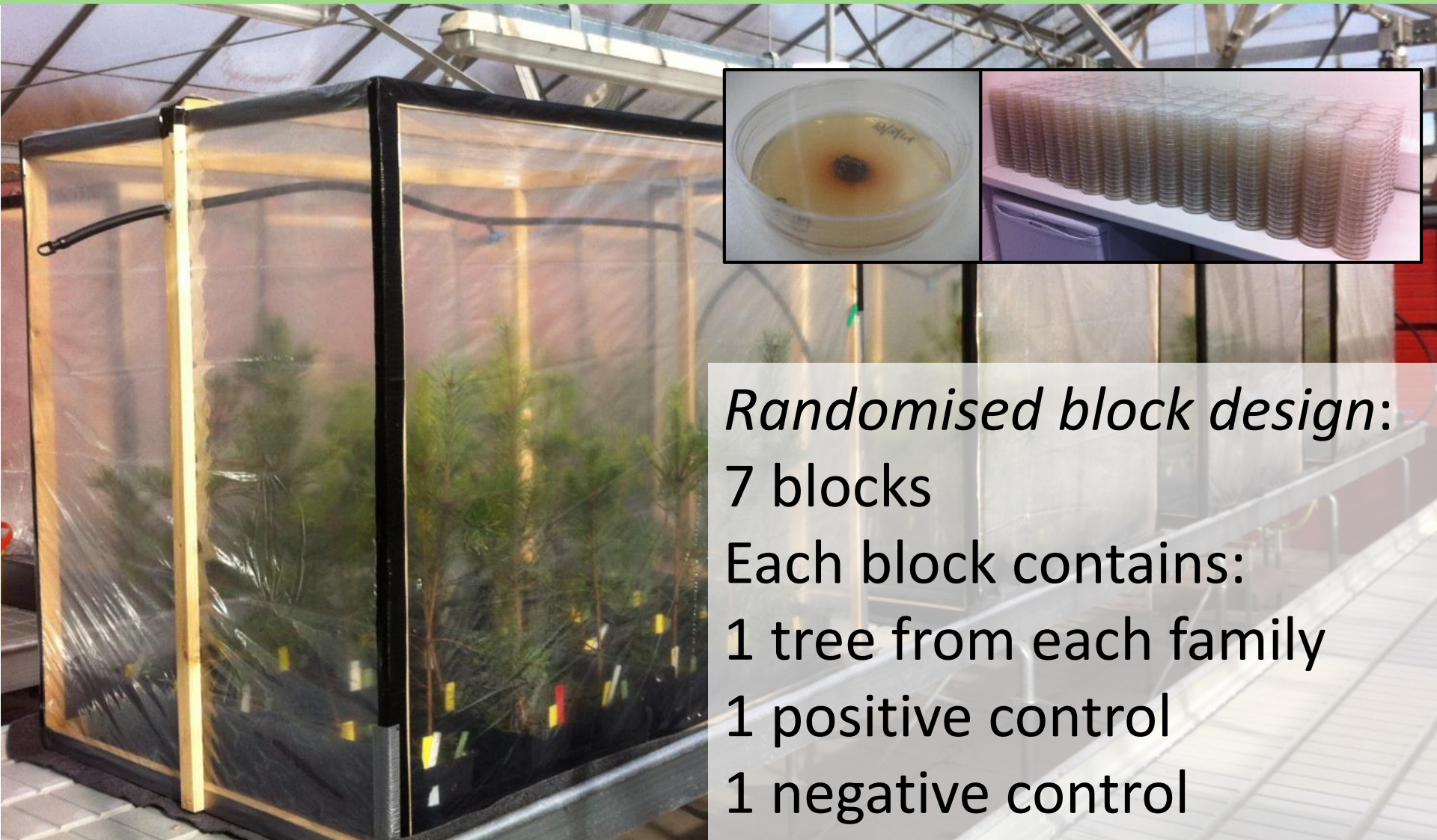
Between provenances

*Genetic similarity*

Within provenances  
(Between families)

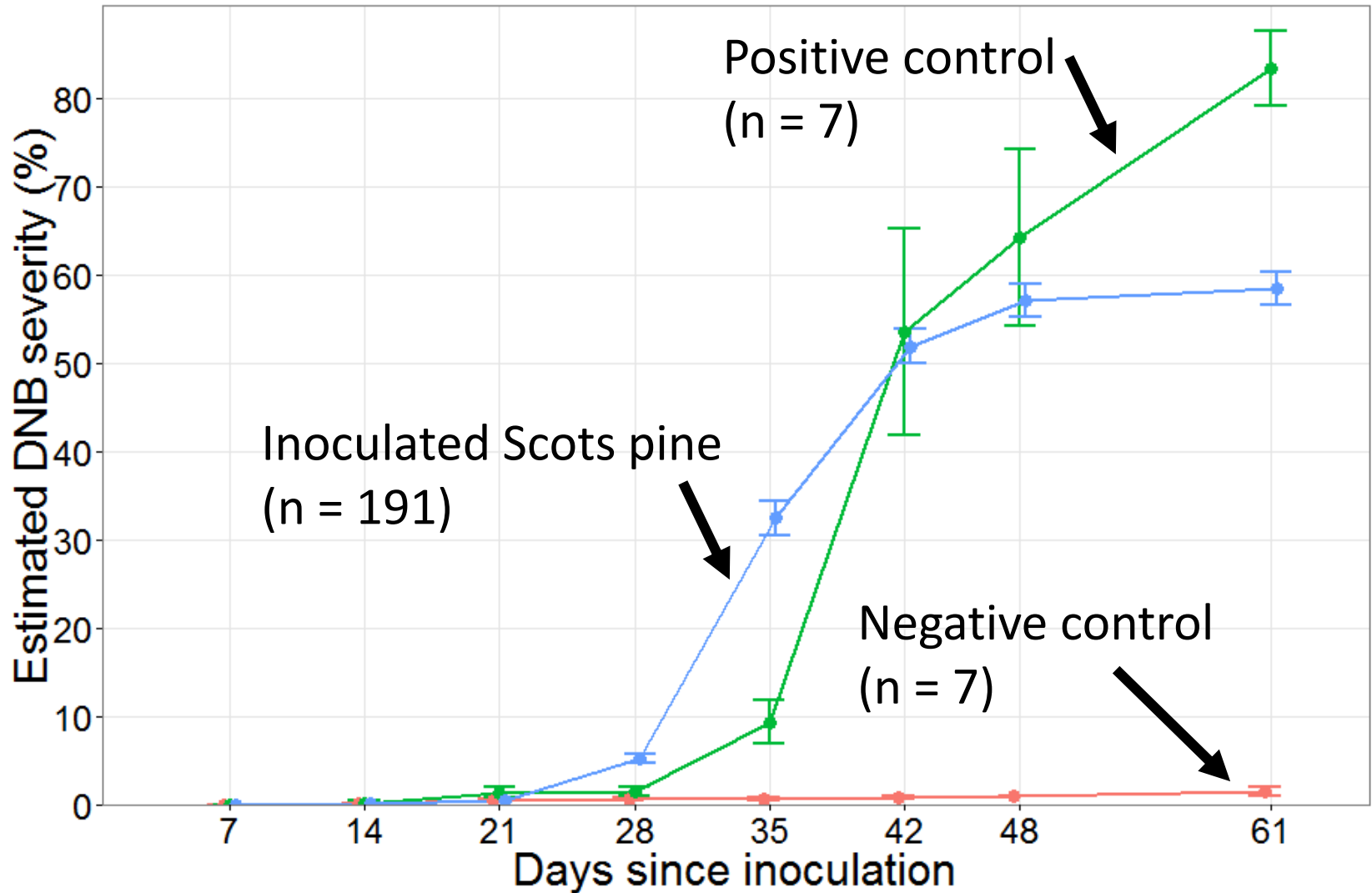
Within family

# Artificial inoculation trial



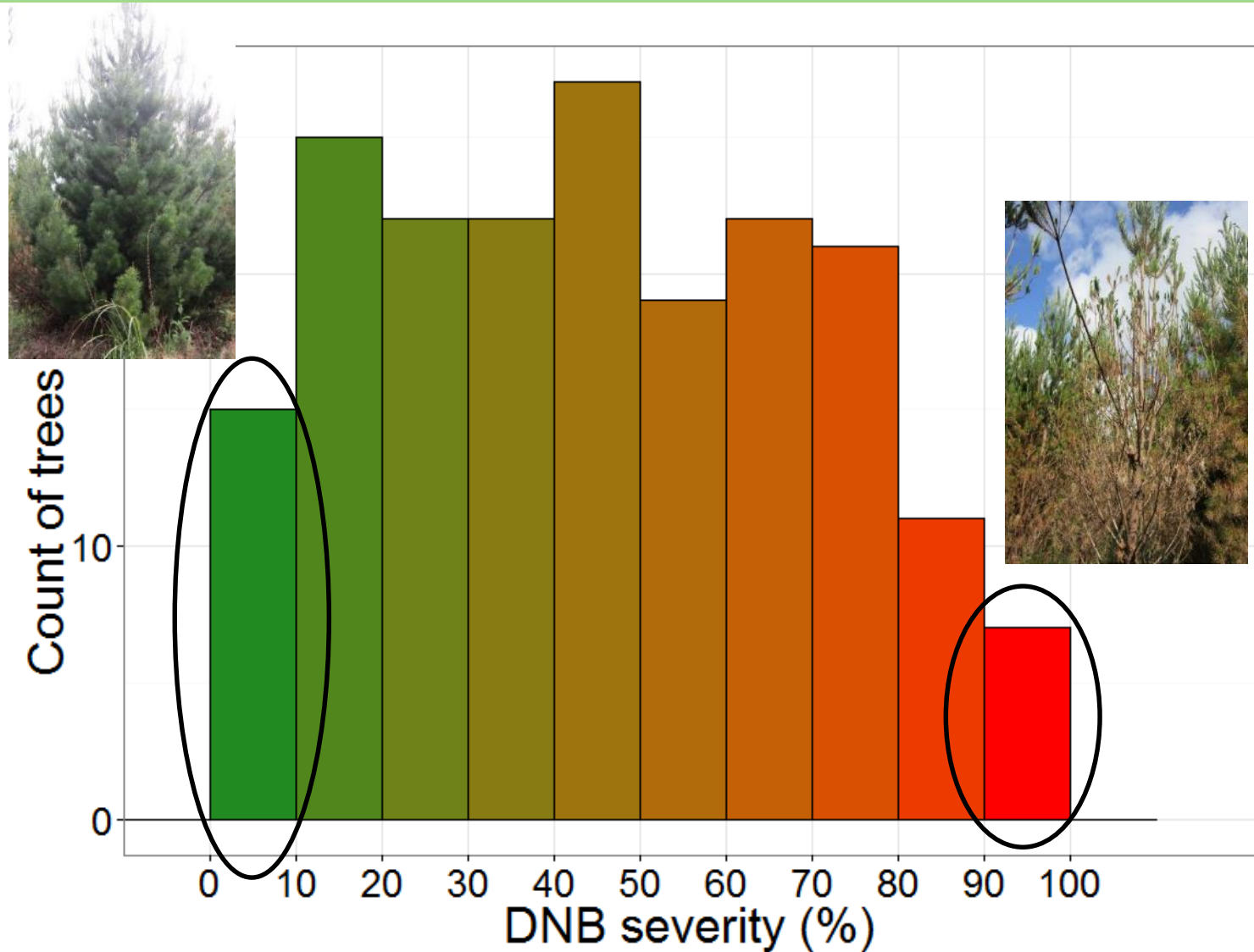
*Randomised block design:*  
7 blocks  
Each block contains:  
1 tree from each family  
1 positive control  
1 negative control

# Did the artificial inoculation work?

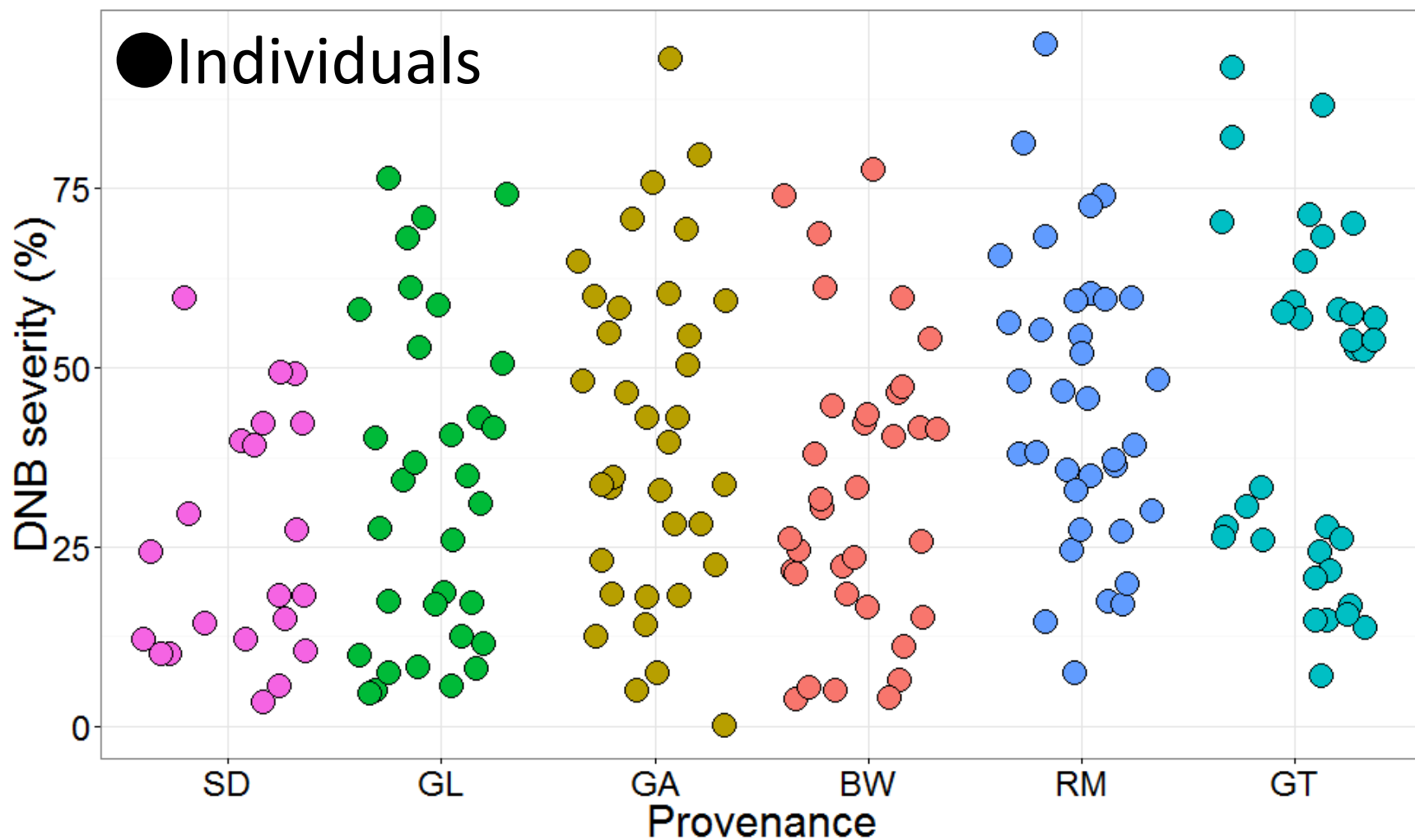




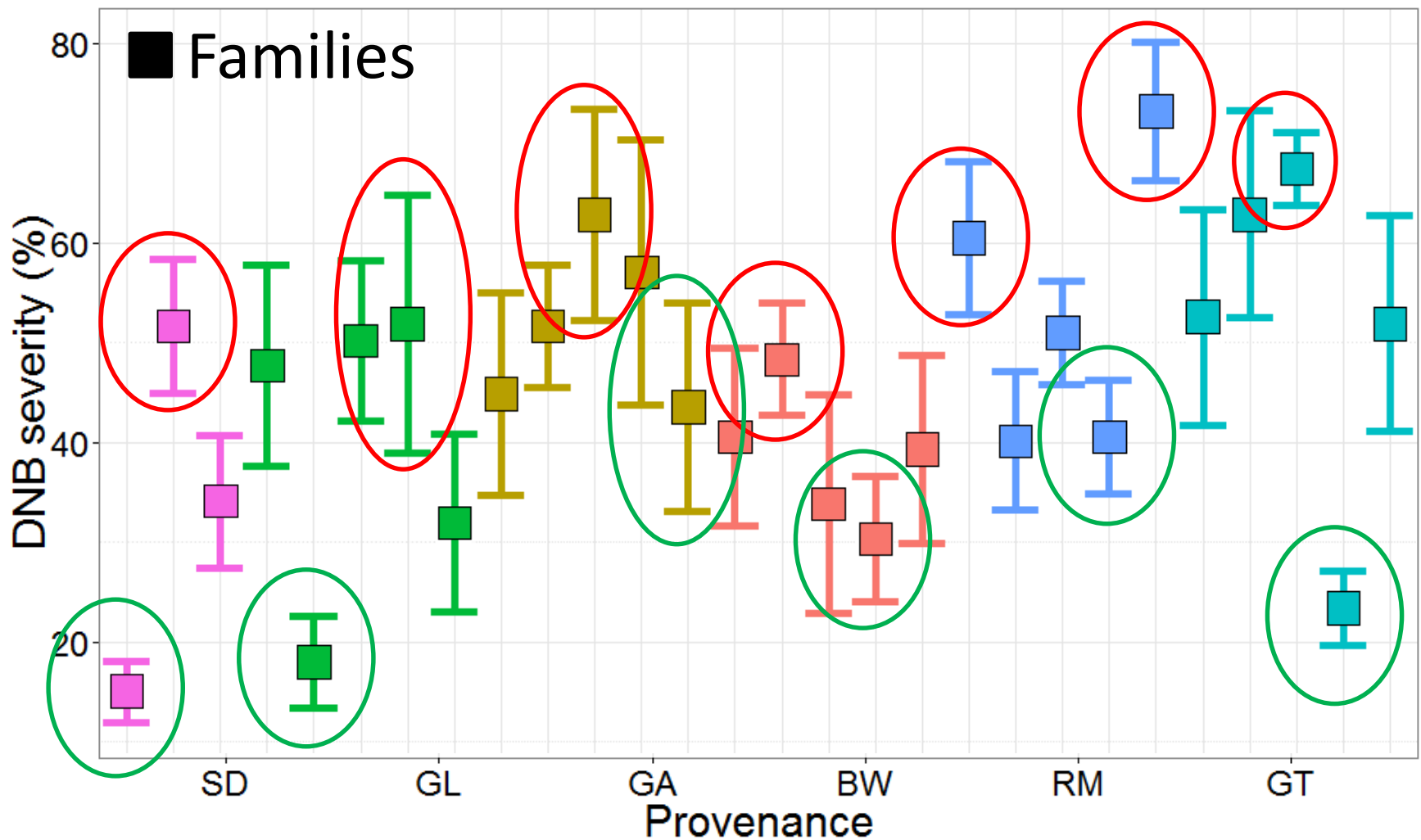
# Extent of variation in susceptibility



# Distribution of variation in susceptibility



# Distribution of variation in susceptibility



# Distribution of variation in susceptibility

## Nested Analysis of Variance (ANOVA)

Response variable: **DNB severity**

Sources of variation:

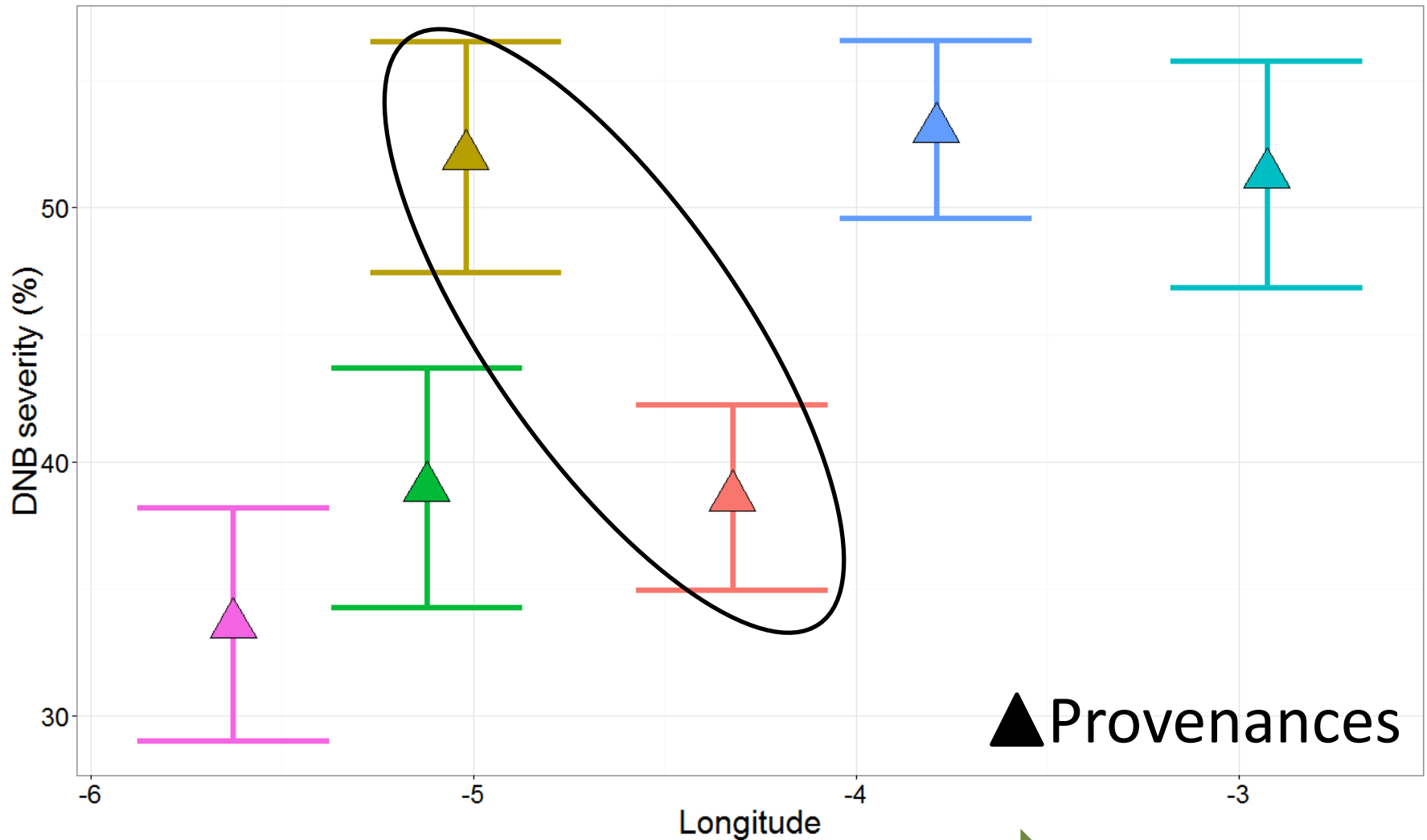
<b>Provenance</b>	Fixed	$p = 0.181$
<b>Families within provenance</b>	Random	$p < 0.001$
<b>Block</b>	Random	$p = 0.003$

# Heritability and evolvability

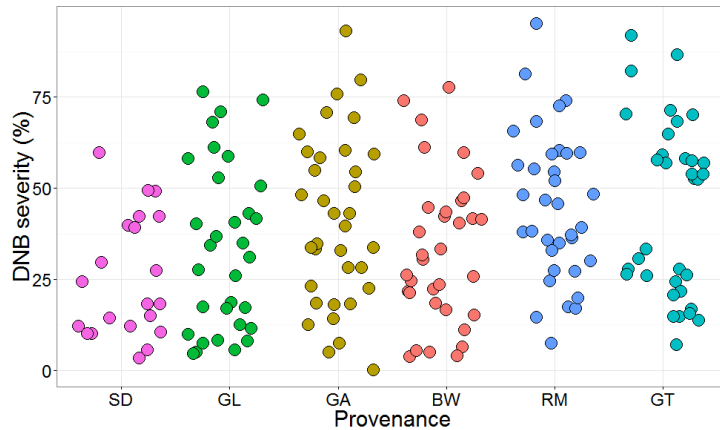
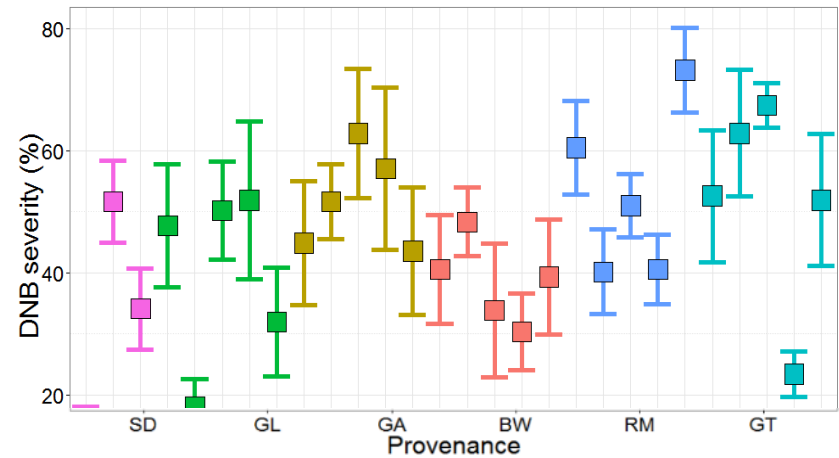
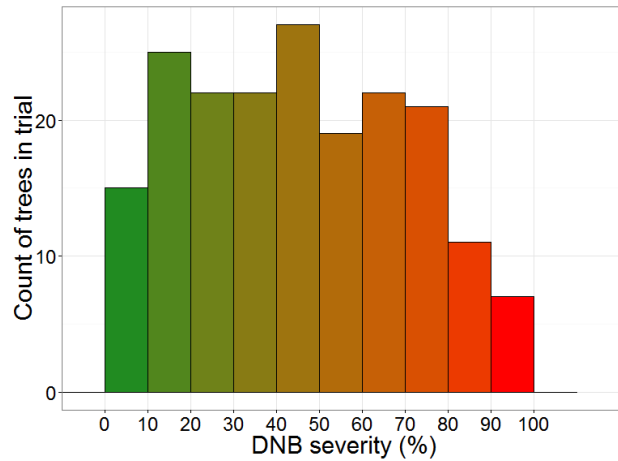


	Variance (%) due to		$h^2 \pm SE$		$CV_A$
	Family	Block	Full sibs	Half-sibs	
<b>DNB severity</b>	18.86	6.77	$0.38 \pm 0.40$	$0.75 \pm 0.99$	23.47
<b>Height</b>	40.59	1.64	$0.81 \pm 0.47$	$1.62 \pm 0.73$	12.48

# Distribution of variation in susceptibility



# Summary and implications of results



High  $h^2$

High  $CV_A$



Glen Affric National Nature Reserve, Scottish Highlands

# Can native Scots pine survive *Dothistroma* needle blight?

Answer: **Yes!** **but...**



# Thank you for your attention

## *Acknowledgments*



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