

Forest Research

Forest management and use of forest genetic resources in a changing climate

Dr Jason Hubert
Project Leader: Genetic Conservation

European Forest Week Side Event

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A brief history of UK forestry

- Imperial period: timber imported from the Empire, forestry neglected at home
- The shock of the wars: extensive felling and creaming off of the best stands results in the creation of the Forestry Commission
- 1960s - economic forestry
- 1980s - rise of native woodlands
- 1990s - increasing concern over imported planting stock
- 2000s - a strong "local is best" philosophy

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History and Policy

- Policy reflects history and recent politics
- Policy is based on precedent
 - Rio Convention
 - Helsinki Declaration
 - Forest Certification
- Therefore changing policy to reflect an uncertain future is difficult

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Predicted changes in our climate

Now 2050 Hi 2080 Hi

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Quercus robur

This distribution map was compiled by members of the EUROFORGEN Temperate Oaks and Beech and published in Guimaraes, A. and S. Borralho, 2006. EUROFORGEN Technical Guidelines for genetic conservation and use for production and genetic traits (Quercus robur and Q. petraea). International Plant Genetic Resources Institute, Rome, Italy, 17 pages.

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Local is sometimes the best

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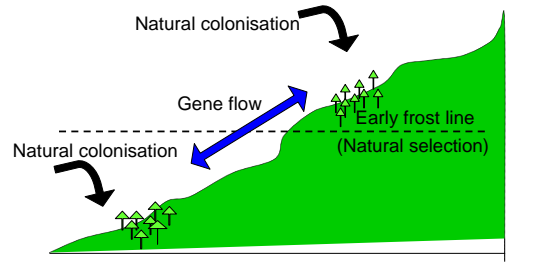
Sometimes local is not best



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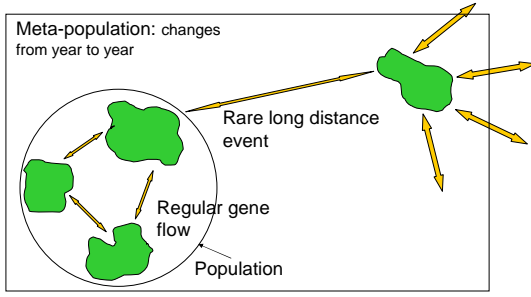
What determines genetic variation at a site?



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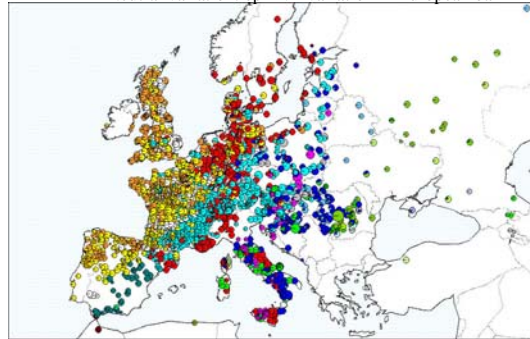
What is local?



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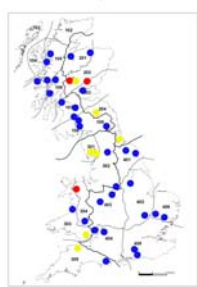
Neutral variation: cpDNA variation in European oak



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What is local?



Neutral markers in ash show very little population differentiation across GB - indicating effective gene flow

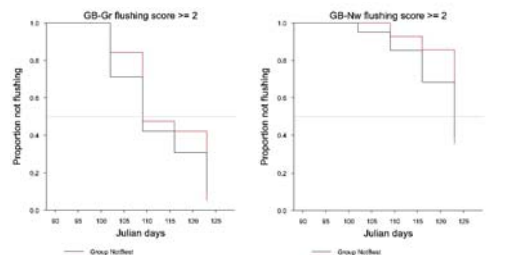
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What is local?

Adaptive variation can be seen in ash: natural selection


Grimsthorpe, Lincs. (52.48N) Newton, Morayshire (57.44N)



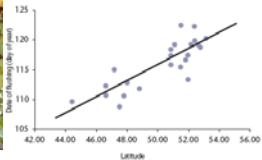
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Adaptive variation: flushing times



The clinal change in flushing date in relation to latitude of origin for different provenances of oak. The data were collected in 2004 at a trial established in Suseer (51° 06' 53.54" or 35.13 10) in 1999 (from Broadmeadow and Ray, 2005).



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What is "best"?

- Natural selection can only operate on the material present at a site, therefore,
- the best genotypes on a site are only better than the other local possibilities
- there may be better genotypes on other sites

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What is "best"?






Reciprocal transplant expts. are not showing a local advantage for ash

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Long distance transfers do show local advantage

Romanian (approx. 45N) Brockhampton, Worcs (52.11N)

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Climate change and Genetics

- "The Knowns"
 - Our tree species have the ability to migrate
 - Our climate is changing
 - Uncertainty, and therefore risk, is increasing
- "The Known Unknowns"
 - Do our native provenances have within them the genetic capacity to respond?
 - Will the rate of climate change be too fast for them to respond?

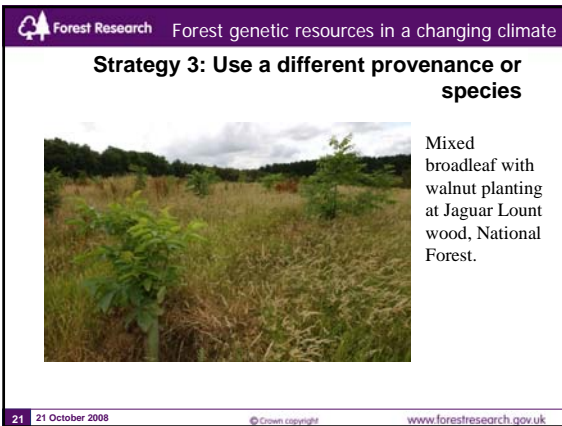
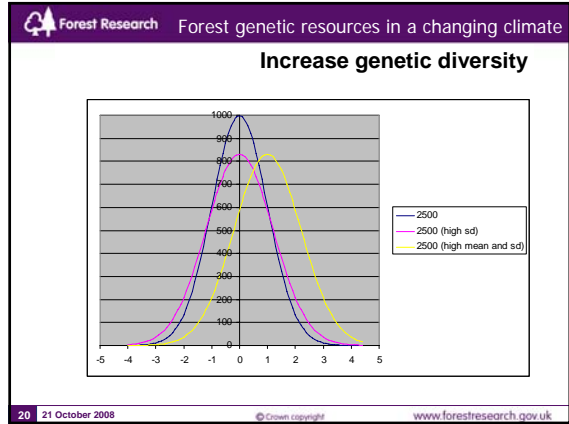
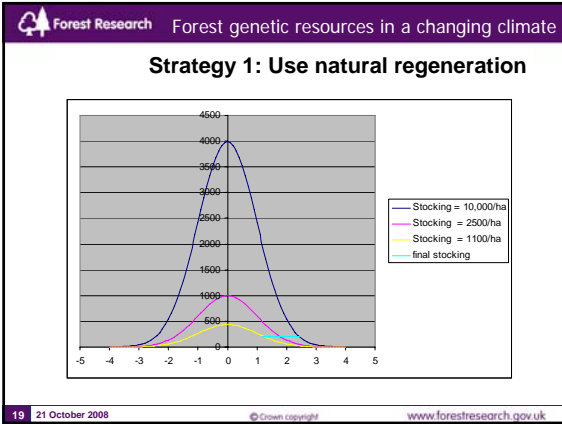
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Options for Managers

- Maintain genetic variation and promote natural regeneration
- Adopt a portfolio approach and plant a mix of provenances alongside the current population
- Use assisted migration by planting a different provenance or species

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Information Notes are available from the FC website
www.forestry.gov.uk
(Library; publications)

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- Forest Research Forest genetic resources in a changing climate
- ### Acknowledgements
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