The Dynamics and Future of Montane Scrub in Cumbria and the UK

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Montane specialist species			
a.	b.	c.	d.
Betula nana	*Juniperus communis* ssp. *nana*	*Salix arbuscula*	*Salix herbacea*
e.	f.	g.	h.
Salix lanata	*Salix lapponum*	*Salix myrsinites*	*Salix reticulata*

Maps generated from the National Biodiversity Network Gateway, nbn.org.uk

A lot has changed during my research…

- Montane scrub habitat was not recognised as existing in England
- Now is the subject of multiple landscape-scale restoration projects
- Extant downy willows on Helvellyn are now in their thousands
- There has been an explosion of projects over the last 18 months following huge funding pathways for forestry

Aim

To underpin restoration effort *by providing higher quality understanding of the drivers of montane scrub distributions, with a particular focus on the ecology of the northern England populations*

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1. Explore the data

Identified important variables influencing montane scrub distributions in northern England

- Collated remotely accessible data - 22 variables - climate, topography, soils, geology, land classification
- Assessed environmental envelope of four representative species / subspecies
- Assessed the variation within the species / subspecies

Montane Specialists

Dwarf willow

Dwarf juniper

Montane Generalists

Tea-leaved willow

Common juniper

Findings

- Large environmental overlaps between the species with key individual distinctions
- Soil characteristics and altitude most influential drivers
- Two to three ecotypes apparent within each species / subspecies
- These populations appear to differ from elsewhere

2. Field survey of Juniper

Characterised microsite preferences for juniper in northern England

- Gathered microsite field data – *site characteristics, exposure, tree measurements, plant community, soil attributes*
- Compared subspecies
- Compared open spaces with canopy spaces
- Compared these findings with the findings of my first study

Findings

Must submit plant lists to CBDC!

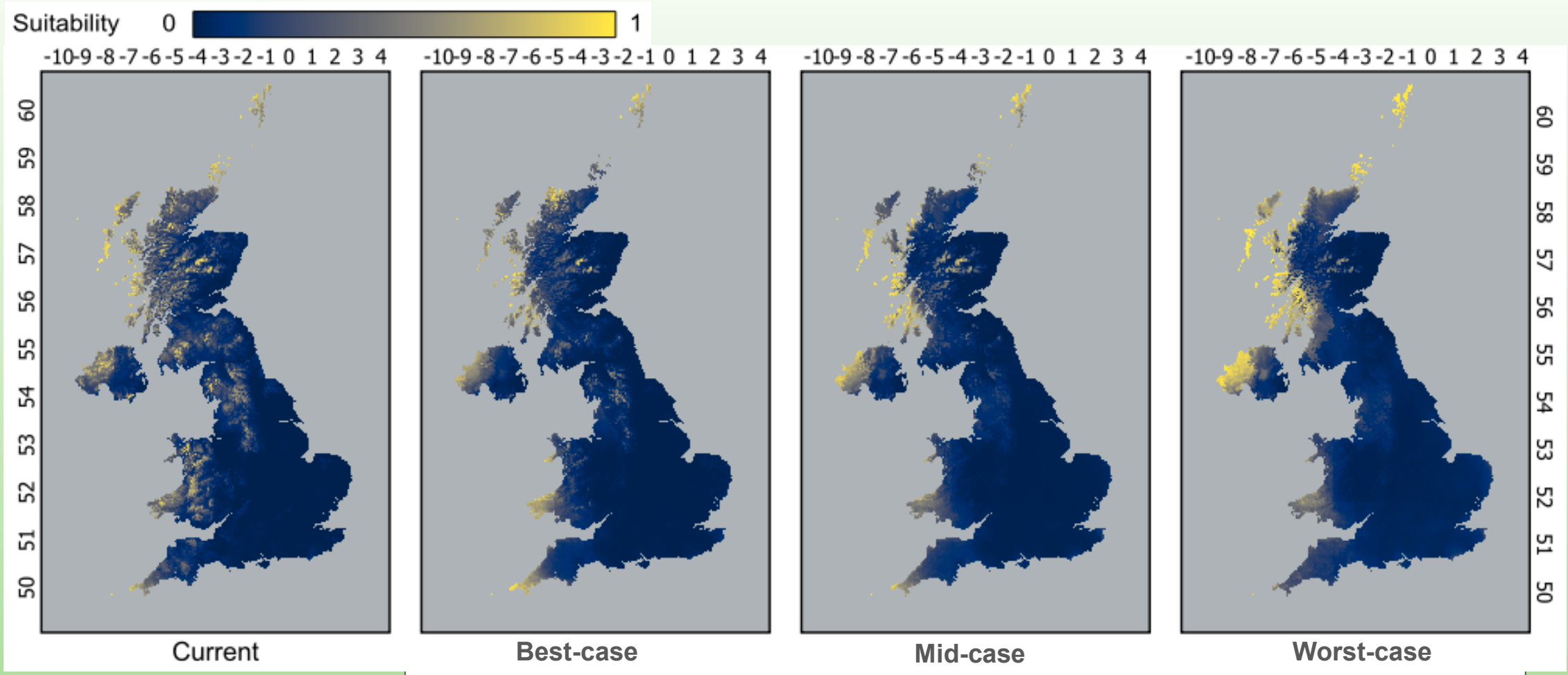
Image © C Hedges 2024

- Distinctive soil types and plant communities between the subspecies
- Commonalities for rocky/boulder sites and shallow soils
- Distinctions between English and Scottish populations
- Open spaces – trend for opposing microsites & new variables: soil classification, soil depth, microsite topography to consider in regeneration studies
- Cannot rely on remote data alone – soils in particular!
- Guidance is not currently entirely useful

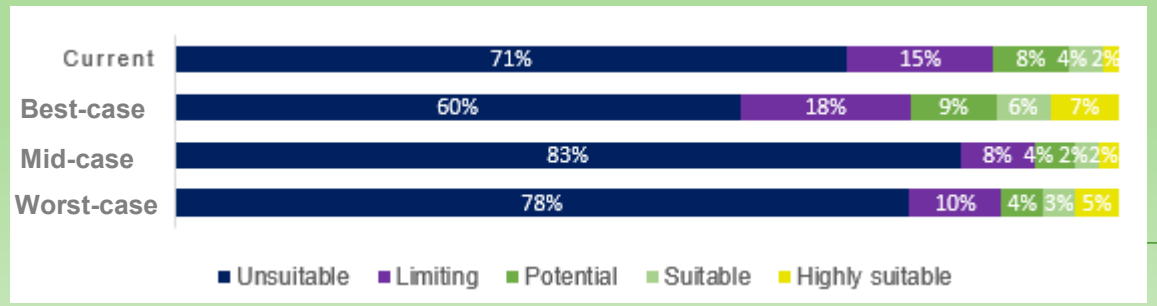
3. Opportunities and the future

Predicted potential distributions of montane scrub species in the UK and under the impacts of climate change

- Assessed juniper subspecies UK distributions using altitude and climate data – suggesting environmental ranges of suitability and high-level drivers of distributions
- Projected those 'favoured areas' across the UK – *current picture*
- Projected those 'favoured areas' under 3 future climate scenarios – *future picture*



2081 – 2100 scenarios



Dwarf juniper

Findings

- Most influential drivers of distribution
  - **Common juniper**: temperature (up to 25°C but not if extremely wet or dry), elevation
  - **Dwarf juniper**: Oceanicity, cool temperatures and higher summer precipitation
- Many populations are located outside of their optimal ranges
- Future = downslope and lower latitudinal opportunities
- Sweeping loss of suitable sites for dwarf juniper across Lake District peaks
- High phenotypic plasticity exploited
- Q. Should we assist migration to areas currently unoccupied but highly-suitable (e.g., western tips of Wales) ?

Outcomes and next steps…

- Created species profiles for North England populations (*J. communis subsp.*, *S. Herb*, *S. Phylicifolia*)
- Suggest addendums to the Scottish guidance to include the impacts of climate change
- Suggest incorporating targeted information into the Forest Research ESC tool (species, NVC H15, establishment guidelines)
- Outlined management guidance

Key take homes…

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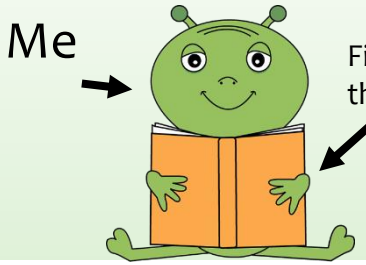
- **Soils are important** – terrain is also important, work with your local climate and environment

- **Resilience is not futile** – but we need MS species in areas they are currently missing. Enable local adaptation to occur: These pioneering, refugia species have high genetic and phenotypic plasticity



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Thank you!

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