



Conserving Natural Heritage

# Conserving genetic diversity

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## Why is genetic diversity important?

Modern conservation programmes recognise biodiversity at three levels: Habitat, Species and Genetic diversity. The conceptual frameworks for Habitat and Species-based conservation are well established.

But this is not the case for Genetic diversity.

Genetic diversity is important for two main reasons:

- Habitat fragmentation, population isolation and reduced population sizes can reduce genetic diversity and increase homozygosity, leading to a reduction in fitness
- Genetic variation is a pre-requisite for adaptation in the face of environmental change

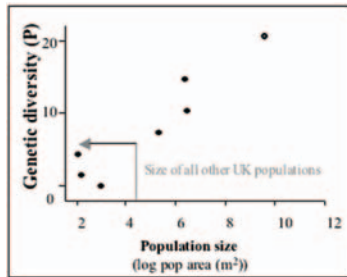


## Do rare plants in Scotland show evidence for genetic isolation and loss of genetic diversity?

The two species below are both on Scottish Natural Heritage's Species for Conservation Action list.



**Melampyrum sylvaticum**  
(Small Cow Wheat)



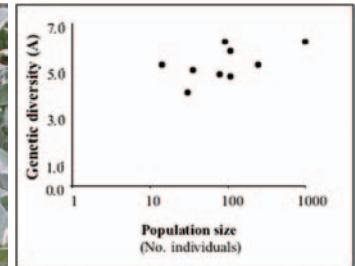
High population differentiation 76% of genetic variation between populations ( $F_{ST} = 0.760$ )

Strong correlation between population size and genetic diversity

Methodology: arbitrary multi-locus fingerprinting



**Salix lanata**  
(Woolly Willow)



Low/medium population differentiation 14% of genetic variation between populations ( $F_{ST} = 0.138$ )

No correlation between population size and genetic diversity

Methodology: Nuclear SSR loci

## Interpretation

*Melampyrum sylvaticum*

- Small populations, geographically and genetically isolated
- Poorly dispersed, outcrossing annual
- Limited seed bank
- Short generation times

-> High risk of genetic problems (no 'anchor')

*Salix lanata*

- Small populations, geographically isolated
- Good dispersal, perennial
- Limited seed bank
- Long generation times

-> 'Anchor' against loss of genetic diversity

## Implications for management and conservation policy

Although we have data from individual species, and a general approximation of the situations in which genetic problems might arise, ongoing work is needed to:

- Obtain a broader understanding of the specific landscape conditions over which populations of different species become genetically isolated and diversity is lost
- Evaluate the fitness consequences of genetic isolation versus population networks in the context of different population sizes and different species attributes
- Use the results of these studies to predict likely responses of different plant species and populations to habitat fragmentation and large scale environmental change, and develop management strategies for mitigation