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Woodland creation and management to maximise biodiversity

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Environment Policy Advisor

Integrating trees into a farm or croft can help business to grow and become more resilient. That comes from positive impacts they can have on a farm business, such as:

- Shelter and shade for livestock
- Generating income from timber and carbon credits
- Getting value from less productive land
- Supporting your soil
- Flood prevention and improved water quality
- Supporting biodiversity

www.forestry.gov.scot/getting-started-farm-woodlands

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Maximising Biodiversity Benefit of New Woodland on Farms

1. **Site Selection and Design**
- Connect habitats: Plant woodland near or between existing habitats (e.g. hedgerows, wetlands, old woodlands) to create wildlife corridors.
- Avoid high-value habitats: Don't plant over species-rich grasslands, wetlands, or archaeological features.

2. **Species Selection**
- Native species: Use a diverse mix of native trees and shrubs suited to local soil and climate. This supports more native insects, birds, and fungi.
- Include fruit- and nut-bearing species, such as hawthorn, blackthorn, rowan, and hazel to provide food for wildlife.
- Non-native trees have value for biodiversity!

3. **Edge and Transitional Habitats**
- Create soft edges: Gradual transitions from woodland to grassland or scrub support more species than hard boundaries.

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Small woods = biodiversity hotspot!
Support invertebrates not found on farmland.
Refuges for bank voles/wood mice.
Nesting places for raptors and passerines.
Connect to other woodlands.
Bigger is better.
Riparian woodland = crucial for river ecosystem
Moderates water temperatures.
Increases nutrient input – supports invertebrates etc.
Important dispersal corridor for range of species.
Trees and hedgerows = habitat and dispersal routes
Nesting places for a range of passerines.
Important habitats for spiders, beetles, pollinators etc.
Dispersal routes for a range of taxa.
But waders…….

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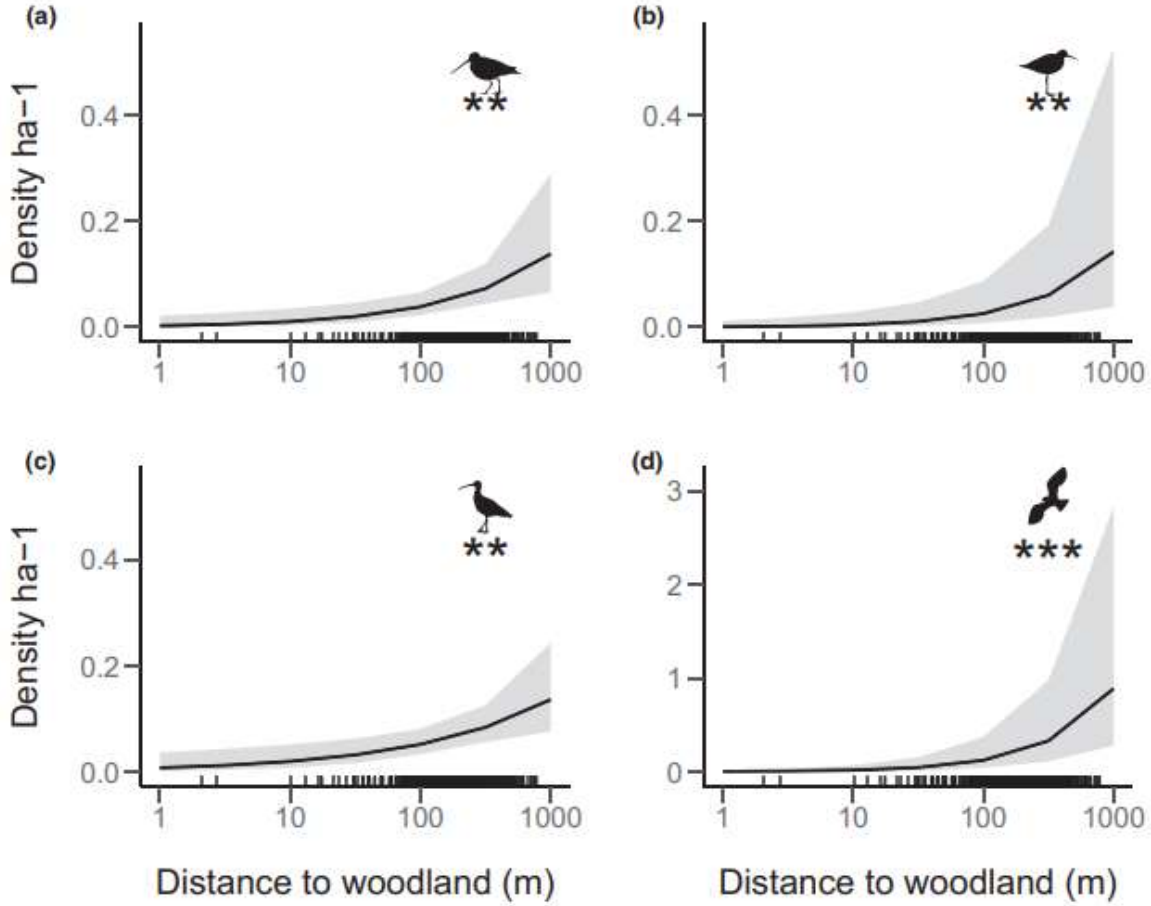

FIGURE 4 Predicted wader density ha^{-1} for year 2015 shown in solid black line with shaded 95% CI at the field scale as a function of distance to woodland (holding non-focal variables constant at 30% rush cover, 30% water cover and 0.0 enclosure score to capture recommended management for waders. The reference level 'Bare' and 'None' were used for Vegetation height and Livestock, respectively) for (a) Snipe; (b) Redshank; (c) Curlew; and (d) Lapwing. Distribution of the raw data covariate shown as rugs. Significance of variable denoted by *'s: ***$p < 0.001$; **$p < 0.01$. Please note difference in y-axis scale between plots.

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The value of different tree and shrub species to wildlife

The quality and quantity of species assemblages associated with the widespread trees and shrubs of the British countryside

A single asterisk indicates an estimated low value to wildlife, while five asterisks indicate relatively high value. Trees and shrubs are listed in taxonomic order (Preston et al. 2002) to facilitate comparison of close species. Most tree species are ectomycorrhizal; the exceptions are indicated as G (glomalean endomycorrhizal).

Tree type	Mycorrhizal fungi	Wood-decay fungi	Wood-decay inverts	Foliage inverts	Biomass of foliage inverts	Leaf litter	Blossom for pollen and nectar	Fruits and seeds	Epiphyte communities
Pinaceae									
Norway Spruce	*****	**	***	***	***	*	*	****	*
European Larch	*****	**	*	**	***	*	*	****	*
Scots Pine	*****	***	****	****	****	*	*	****	*
Taxaceae									
Yew	***G	**	*	*	**	*	*	****	*
Platanaceae									
London Plane	***G	**				*			*
Ulmaceae									
Elms	***G	****	***	***	***	****	*	*	*****
Juglandaceae									
Walnut	***G	**				***			*
Fagaceae									
Beech	*****	*****	*****	***	*	*	*	*****	*****
Sweet Chestnut	***	***	***	*	*	*	*	*****	*
Turkey Oak	*	***	****			***			*
Holm Oak	***	***	*	*	*	*	*	*****	*
Native oaks	*****	*****	*****	*****	*****	***	*	*****	*****
Betulaceae									
Birches	*****	****	****	*****	****	***	*	****	****
Alder	***	***	**	*	****	***	*	****	**
Hazel	**	***	***	***	***	****	*	***	****
Hornbeam	***	**	**	**	*	***	*	***	**
Tiliaceae									
Limes	****	***	**	**	***	****	****	*	**
Salicaceae									
Poplars	***	***	***	****	***	***	*	*	*
Goat and Grey Willows	***	***	***	*****	***	***	*****	*	****
Crack, White and other rough-barked willows	****	***	***	****	***	***	*****	*	*
Rosaceae									
Cherries	***G	**	*	***	**	****	****	*****	*
Plum	***G	**	***	***	***	****	****	****	*
Pear	***G	**	***	****	***	****	****	***	***
Apple	***G	**	***	****	***	****	****	****	***
Rowan and whitebeams	***G	**	*	*	*	****	****	****	***
Hawthorns	***G	**	***	****	***	*****	*****	****	*
Fabaceae									
False-acacia	***G	**	***	*	*	***	****	*	*
Aquifoliaceae									
Holly	***G	*	*	*	**	*	*****	****	**
Hippocastanaceae									
Horse-chestnut	***G	**	***	*	*	**	****	*	*
Aceraceae									
Field Maple	***G	**	**	**	*	***	****	*	***
Sycamore	***G	***	***	**	*****	*****	****	*	*****
Oleaceae									
Ash	***G	***	*****	***	*	*****	*	*	*****

The value of different tree and shrub species to wildlife. Alexander, K.; Butler, J.; Green, T. British Wildlife 18(1): 18-28. 2006. ISSN/ISBN: 0958-0956.

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Routemap to Resilience has a **shortlist of future productive species** chosen on criteria such as climate suitability and risk susceptibility.

Broadleaves	**Conifers**
Alder - Common *(Alnus glutinosa)*	Cedar - Japanese (*Cryptomeria japonica*)
Aspen *(Populus tremula)* and Hybrid *(Populus tremula x tremuloides)*	Cedar - Western Red *(Thuja plicata)*
Beech *(Fagus sylvatica)*	Fir - Douglas *(Pseudotsuga menziesii)*
Birch - Downy *(Betula pubescens)*	Fir - European Silver (*Abies alba*)
Birch - Silver *(Betula pendula)*	Fir - Grand (*Abies grandis)*
Chestnut – *Sweet (Castanea sativa)*	Fir - Noble *(Abies procera)*
Gean *(Prunus avium)*	Fir - Pacific Silver *(Abies amabilis)*
Hornbeam *(Carpinus betulus*)	Hemlock - Western *(Tsuga heterophylla)*
Lime – Small-Leaved *(Tilia Cordata)*	Pine - Lodgepole *(Pinus contorta var. latifolia)*
Maple - Norway *(Acer platanoides)*	Pine - Macedonian *(Pinus peuce)*
Oak - Pedunculate *(Quercus robur)*	Pine - Scots *(Pinus sylvestris)*
Oak - Red *(Quercus rubra)*	Redwood - Coast *(Sequoia sempervirens)*
Oak - Sessile (*Quercus petraea)*	Spruce - Norway *(Picea abies)*
Sycamore *(Acer pseudoplatanus)*	Spruce - Sitka *(Picea sitchensis)*

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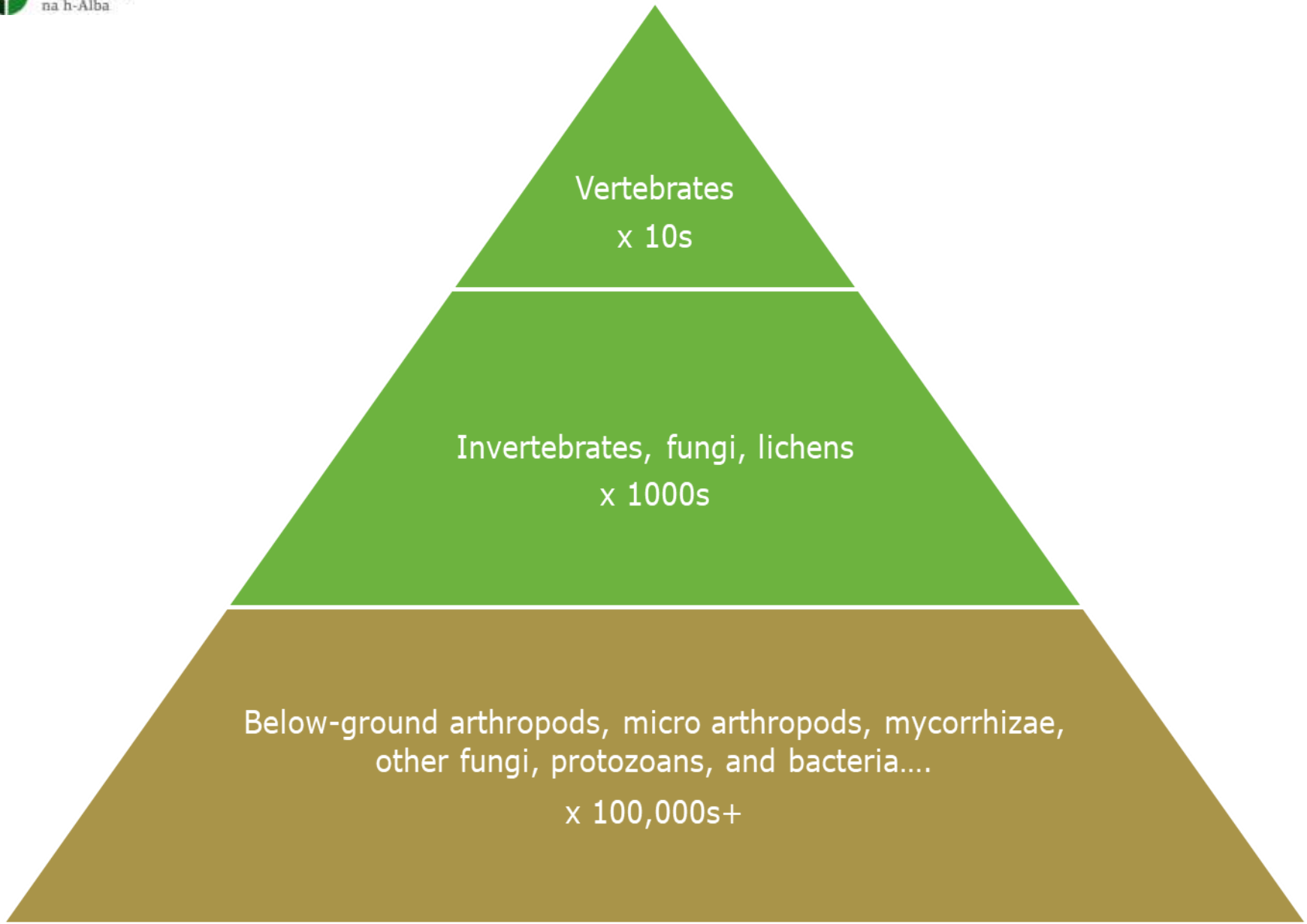

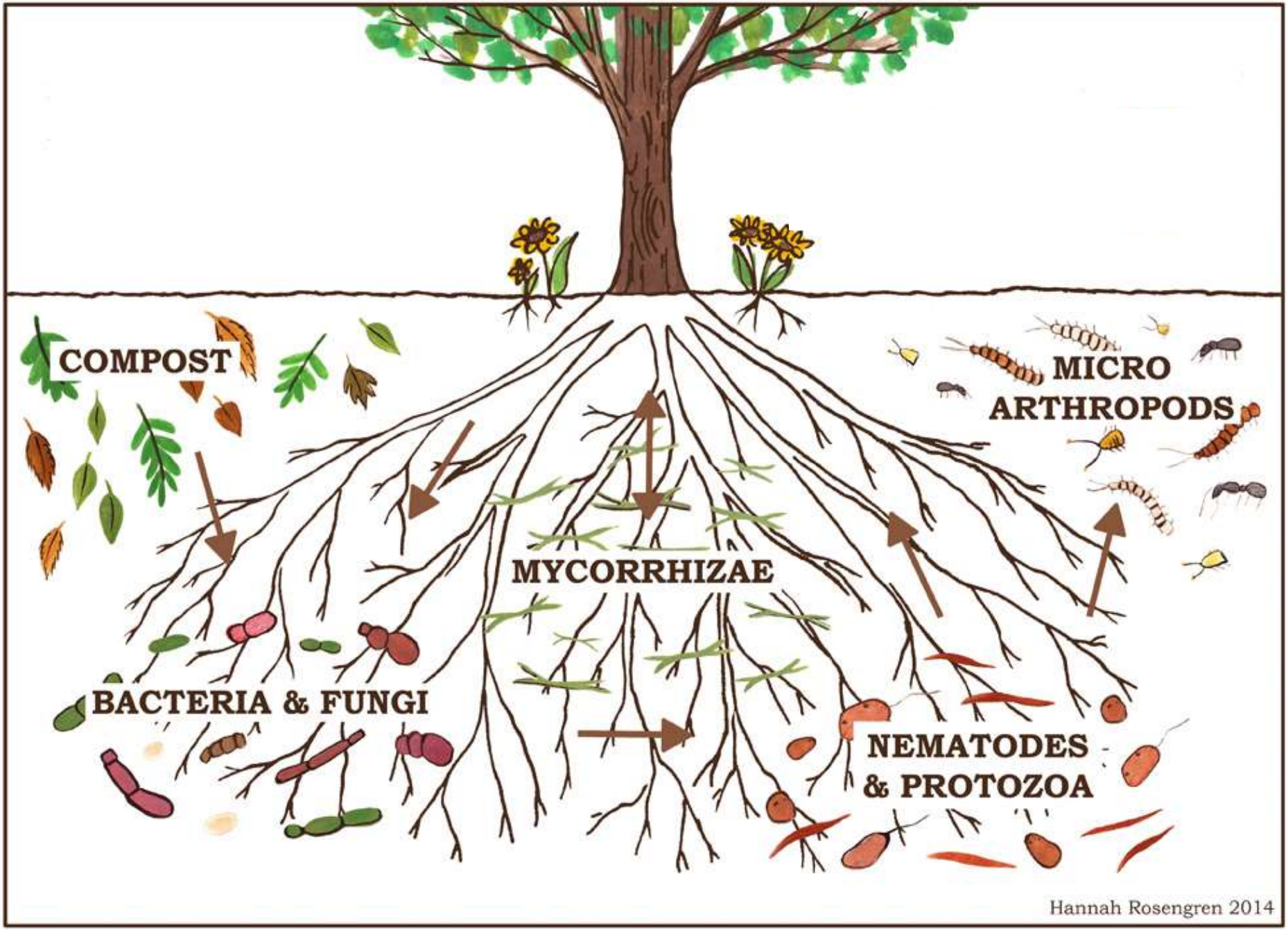

Norwegian forest soil had over 4000 independent genomes of bacteria per gram of soil (Torsvik *et al*. 1990).

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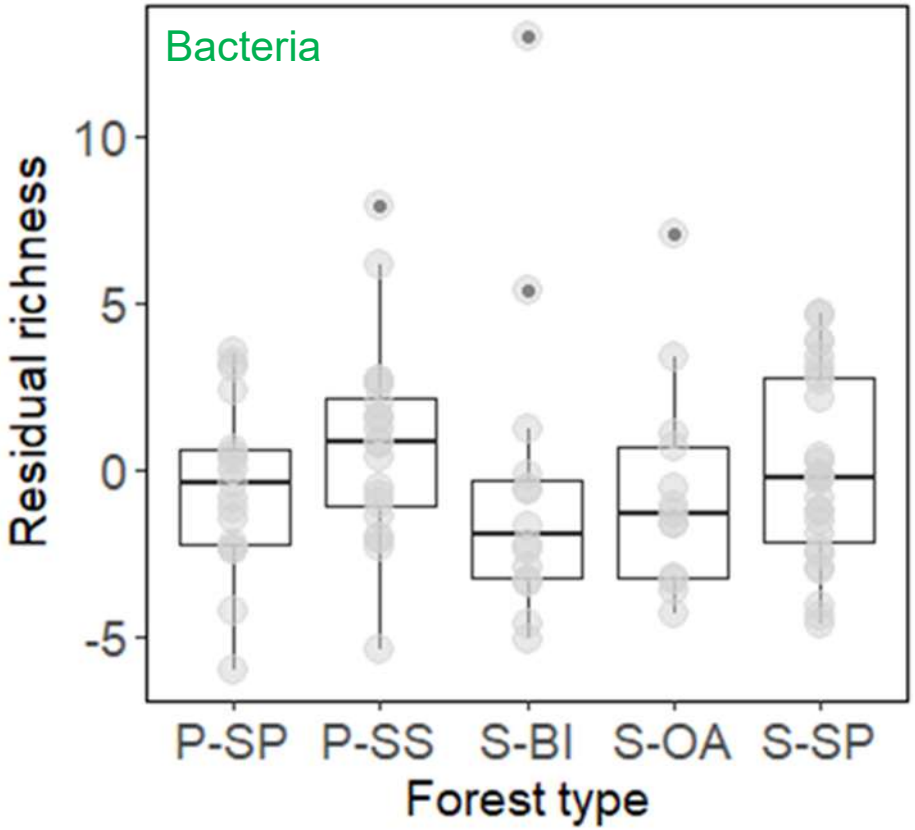
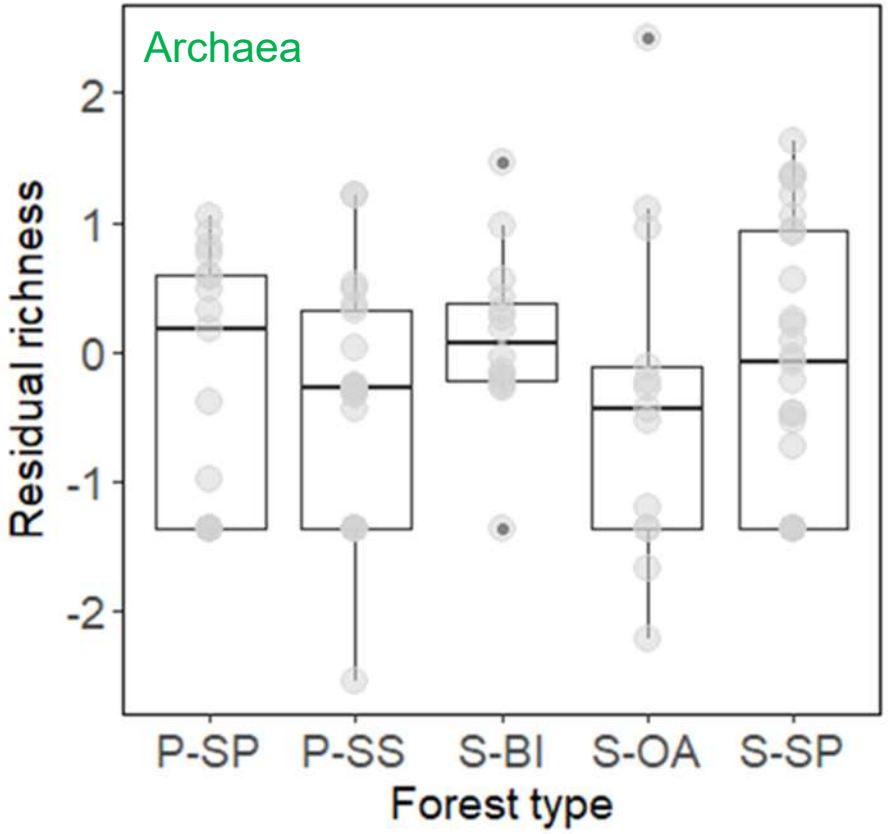
Scottish Forest Soil Biodiversity Survey





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Thank you

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Rural Payments and Services

Woodland Creation – Small or Farm Woodland

Composition of small or farm woodland			
Item	**Minimum (per cent)**	**Maximum (per cent)**	**Minimum stocking density on the planted area at year five (per hectare)**
Broadleaves suitable for timber production	0	60	2,500
Diverse conifer [1]	20	60	2,500
Native broadleaves or shrubs [2]	5	30	1,100
Designed open ground [3]	0	10	n/a

[1] Up to 10 per cent of the 'diverse conifer' species area can be Sitka spruce if the applicant can clearly demonstrate that it will provide shelter or other benefits to aid the establishment of the diverse conifers.
[2] Up to 20 per cent of the native broadleaves can be native woody shrubs.
[3] You must refer to the designed open ground guidance on the general Woodland Creation page to see how designed open ground will apply to your application. For example additional open ground, in excess of the specified percentage, may be permissible depending on the specifics of the site, but will not be eligible for grant support.

This table highlights the key differences between Archaea and Bacteria across various biological features.

Feature	Archaea	Bacteria
Domain	Archaea	Bacteria
Cell Wall Composition	No peptidoglycan; may have pseudopeptidoglycan	Contains peptidoglycan
Membrane Lipids	Ether-linked lipids	Ester-linked lipids
Ribosomal RNA (rRNA)	More similar to eukaryotes	Distinct from both archaea and eukaryotes
Habitat	Often extreme environments (hot, salty, acidic)	Wide range, including soil, water, organisms
Pathogenicity	No known pathogens	Many pathogenic species
Reproduction	Asexual (binary fission)	Asexual (binary fission)
Genetic Machinery	Similar to eukaryotes (e.g., transcription)	Simpler, distinct from eukaryotes
Examples	Methanogens, halophiles, thermophiles	E. coli, Streptococcus, Cyanobacteria

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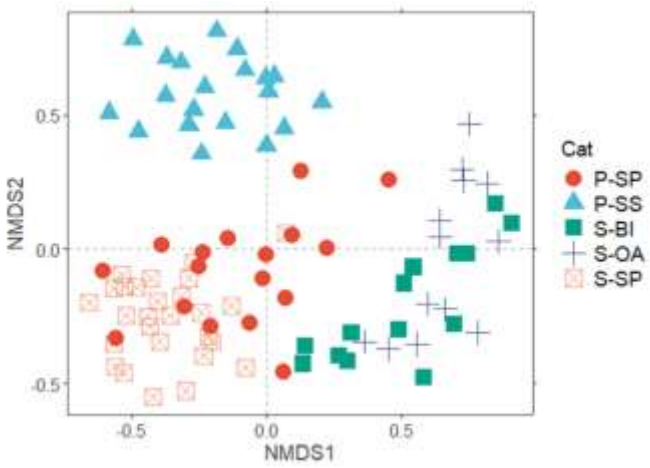
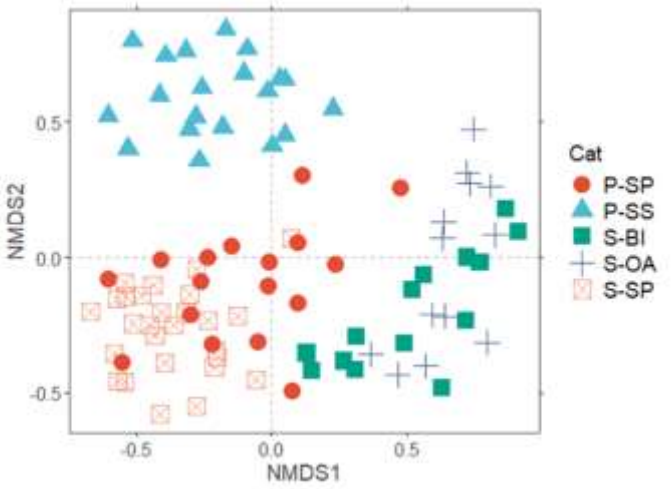
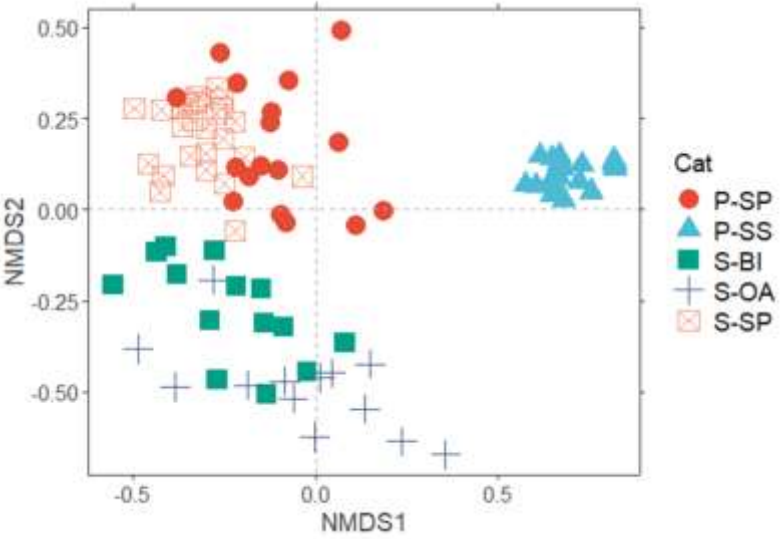


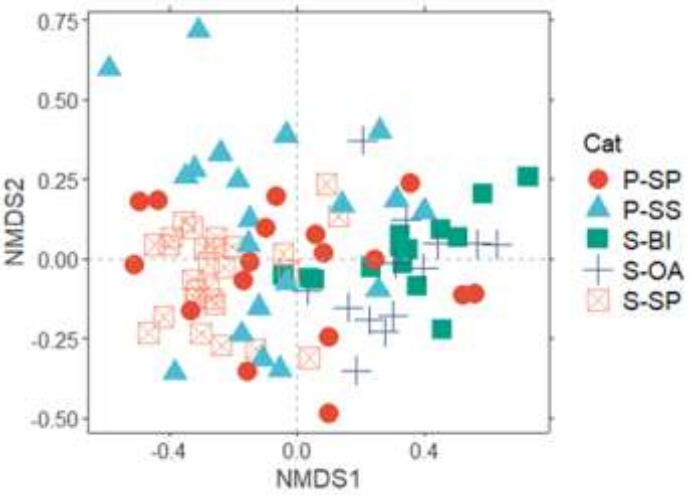
ITS fungi



18s Fungi



18s Plantae



16s Bacteria

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