

# Can spruce-dominated plantations support biodiversity equivalent to semi-natural woodland?



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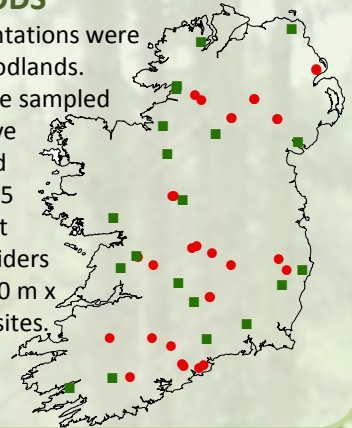
## BACKGROUND

In regions where little semi-natural woodland remains, the biodiversity supported by forest plantations may be particularly important. In Ireland, semi-natural woodland makes up about 1% of the total forest cover and non-native spruce (*Picea* spp.) plantations are the dominant forest type. Here we compare the diversity and community composition of plants, invertebrates and birds in Sitka spruce- (*P. sitchensis*) and Norway spruce- (*P. abies*) dominated plantations with that of oak- (*Quercus petraea*) and ash- (*Fraxinus excelsior*) dominated semi-natural woodlands.

## METHODS

A total of 30 spruce-dominated plantations were compared with 20 semi-natural woodlands. Vascular plants and bryophytes were sampled using three 10 m x 10 m plots, active ground-dwelling spiders and carabid beetles in two or three transects of 5 pitfall traps and birds at 4 to 6 point counts per site. Canopy-dwelling spiders and beetles were sampled in one 10 m x 10 m fogging plot at a subset of 30 sites.

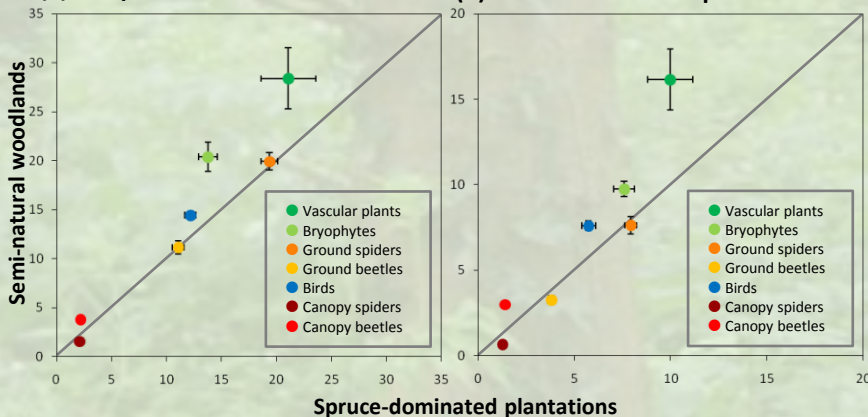
- Spruce-dominated plantations
- Semi-natural woodlands



## RESULTS & DISCUSSION

Bryophytes, birds and canopy beetles had significantly higher species richness and, along with vascular plants, significantly higher forest-associated species richness in semi-natural woodlands (Figure 1). Higher light levels in semi-natural woodlands increased plant diversity and understorey structure, which is important for birds. The presence of broadleaved trees was important for canopy beetles, as there are few native conifer feeding species in Ireland. Canopy spiders had significantly higher forest-associated species richness in spruce plantations. These species were mainly small bodied sheet web spinners, which can utilise the small spaces between coniferous needles. The diversity of some spruce plantations was as high or higher than that of semi-natural woodlands. Aspects of the structure of these forests (e.g. diverse understorey layers) often resembled that of semi-natural woodlands.

Figure 1. Species richness (mean +/- SE) of the different taxonomic groups



Note: Canopy invertebrate richness rarefied to the lowest invertebrate abundance at any site (15).

Community composition differed significantly between spruce plantations and semi-natural woodlands for all groups with the exception of ground beetles (Table 1). This group was composed of generalists whose occurrence was more influenced by geographic location.

Table 1. Permutational multivariate analysis of variance (PERMANOVA) of the community composition between spruce-dominated plantations and semi-natural woodlands.

| Taxonomic group | F-value | p-value |
|-----------------|---------|---------|
| Vascular plant  | 6.67    | 0.0001  |
| Bryophyte       | 8.98    | 0.0001  |
| Ground Spider   | 6.63    | 0.0001  |
| Ground Beetle   | 2.19    | 0.07    |
| Bird            | 13.48   | 0.0001  |
| Canopy Spider   | 5.61    | 0.0003  |
| Canopy Beetle   | 3.46    | 0.0001  |



## CONCLUSIONS

The species richness of spruce plantations can be as high as is found in semi-natural woodlands but the two forest types support different communities. Given that spruce plantations are the main forest type in Ireland, both the preservation or extension of existing semi-natural woodlands and the management of spruce plantations to encourage semi-natural woodland characteristics are needed to support and enhance forest biodiversity.