Indicators of biodiversity in plantation forests

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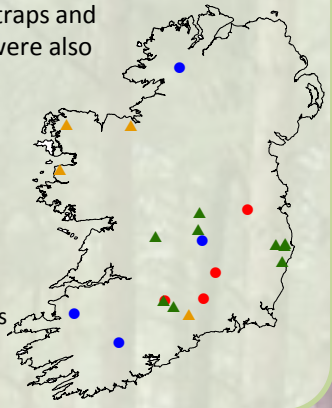
BACKGROUND

In regions where little semi-natural woodland remains, plantations can play an important role in supporting biodiversity. Identification of high biodiversity plantations and management practices which can enhance biodiversity is therefore essential. Since complete biodiversity assessments are rarely possible, there has been increasing interest in using indicators as surrogate measures. Provisional indicators were previously developed for Sitka spruce (*Picea sitchensis*) and ash (*Fraxinus excelsior*) dominated plantations in Ireland at various stages of the commercial forest cycle (Smith *et al.* 2008). We now test these indicators on independent data.

METHODS

A total of 21 forests of four different tree species were studied. Vascular plants and bryophytes were sampled using three 10 m x 10 m plots, spiders in three transects of 5 pitfall traps and birds at 3 to 6 point counts per site. Data were also collected for the structural and functional provisional indicators. Correlation analyses were used to test the indicators against total species richness and the species richness of various subgroups for the four taxonomic groups.



- Scots pine (*Pinus sylvestris*) : 62-79 yrs
- Oak (*Quercus petraea/robur*): 72-75(-151) yrs
- Sitka spruce (*Picea sitchensis*): 30-37 yrs
- Lodgepole pine (*Pinus contorta*): 28-31 yrs

RESULTS

Table 1. Summary of the relationships between the structural and functional variables and the species richness of the taxonomic groups for all species and for forest-associated, open-associated and generalist species for (A) Sitka spruce and ash from Smith *et al.* (2008) and (B) Scots pine, oak, Sitka spruce and lodgepole pine from the current study.

		Bryophytes		Vascular plants		Spiders			Birds		
		All	Forest	All	Forest	All	Open	Forest	All	Generalist	Open
Canopy cover	A	+[a]	+++[a]	- - -	+++[a]		-				
	B	0[a]	0[b]	0	0	- -	0[c]				
Shrub cover	A									++	
	B								++	+	
Field layer cover (11-50 cm)	A						+	- - -			
	B					+	0[c]	+++			
Ground layer cover	A						-	+			
	B						0[c]	0			
Conifer litter cover	A							++			
	B					- -		- - -			
Coarse Woody Debris (CWD) volume	A	++	+++								
	B	0	+								
Distance to forest edge	A								- - -	- -	-[d]
	B								0	0	0
Distance to old woodland (present c.1900)	A		0		- - -						
	B	++	- - -	- - -	0						
Area of old woodland within 1 km	A		0		+++						
	B	-	++	++	0						
Age	A		+++		+++			++	-[e]		-[e]
	B	- -	+++	++	0	+		+++	+++	+++	0
Elevation	A								-		
	B								-	0	0
Available P	A			+[f]							
	B			0							

+ $p \leq 0.05$, ++ $p \leq 0.01$, +++ $p \leq 0.001$, negative relationships indicated similarly, 0 notable lack of relationship

[a] Highest at intermediate levels in conifer forests; [b] negative relationship in conifer forests, [c] few open-associated species recorded; [d] in mature forests; [e] in intermediate forests, [f] in mature Sitka spruce

DISCUSSION & CONCLUSIONS

Shrub cover (positive) and elevation (negative) were confirmed as indicators of bird diversity and CWD (positive) for forest-associated bryophytes. Since Scots pine and oak forests were all older, on/adjacent to old woodland and more easterly, causal relationships for age and old woodland are difficult to establish. Further work will identify additional indicators from the dataset and examine surrogacy among the taxonomic groups.

Smith, G.F., Gittings, T., Wilson, M.W., French, L., Oxbrough, A., O'Donoghue, S., O'Halloran, J., Kelly, D.L., Mitchell, F.J.G., Kelly, T.C., Iremonger, S., McKee, A.-M., Giller, P.S., 2008. Identifying practical indicators of biodiversity for stand-level management of plantation forests. Biodivers. Cons. 17, 991-1015