

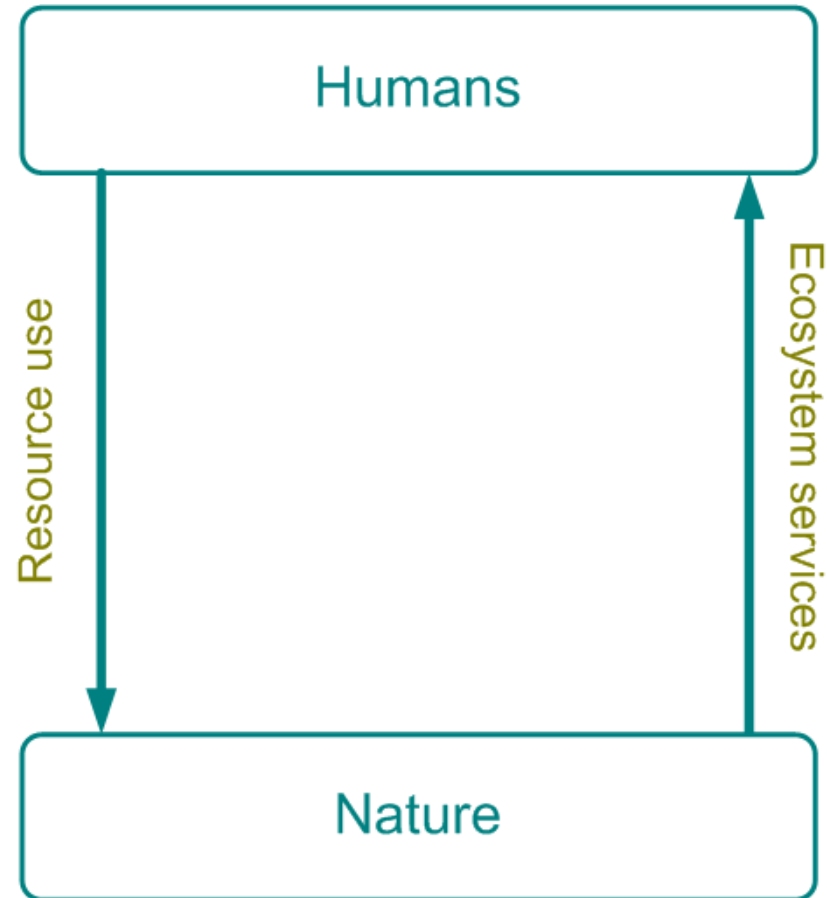
Human behaviour and ecosystem services in agro-ecosystems

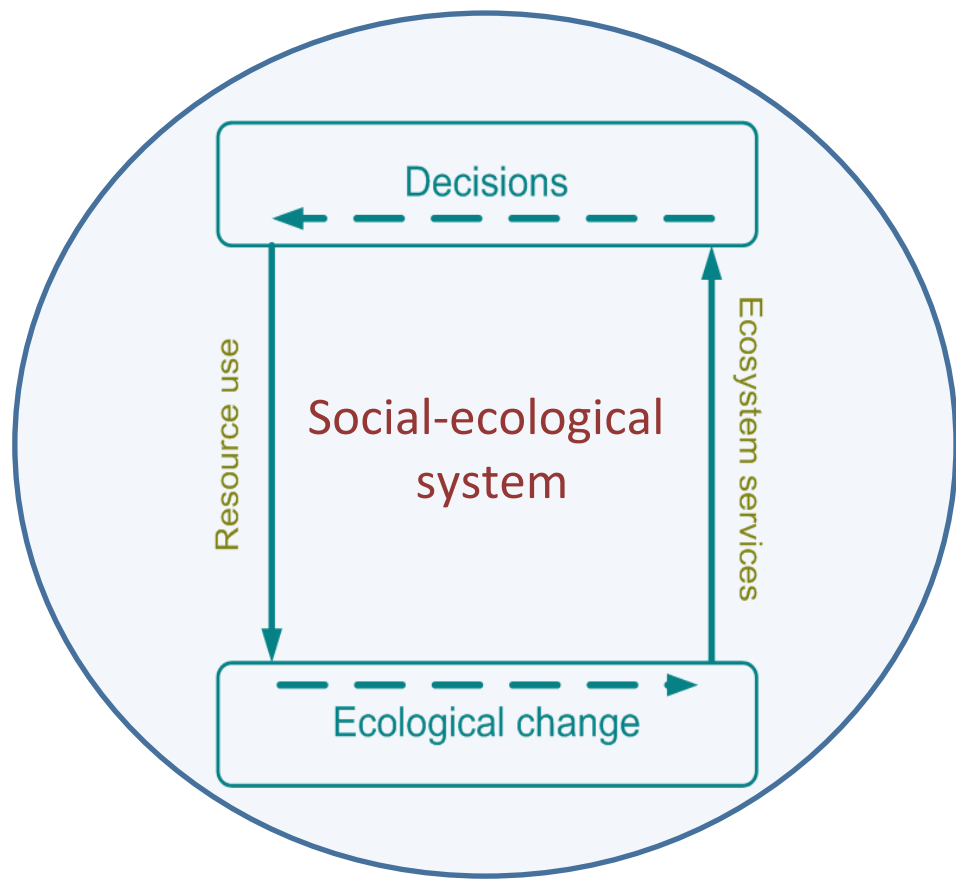
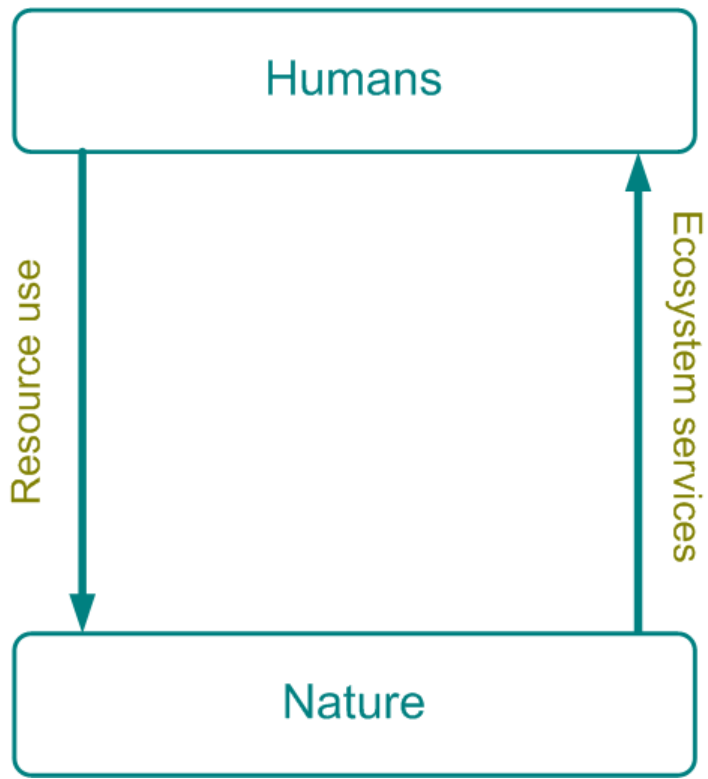
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The research gap

- There is a lot of work done on human impacts on the environment in agro-ecosystems
- And a growing interest in the effect of changing ES provision or biodiversity change on wellbeing
- But much less on the dynamic interactions and indirect feedbacks between them, set within a broader context





Key questions

- Whose wellbeing, who are the users of ES?
- How do these users relate to decision-makers who actually change the system, at different spatio-temporal scales?
- What decisions do these people make in response to the complex and dynamic set of incentives and circumstances they find themselves in?
- And how do the decisions made in response to changing environment and changing external circumstances then feed back to affect the ecological systems we focus on, and further through to changed wellbeing?



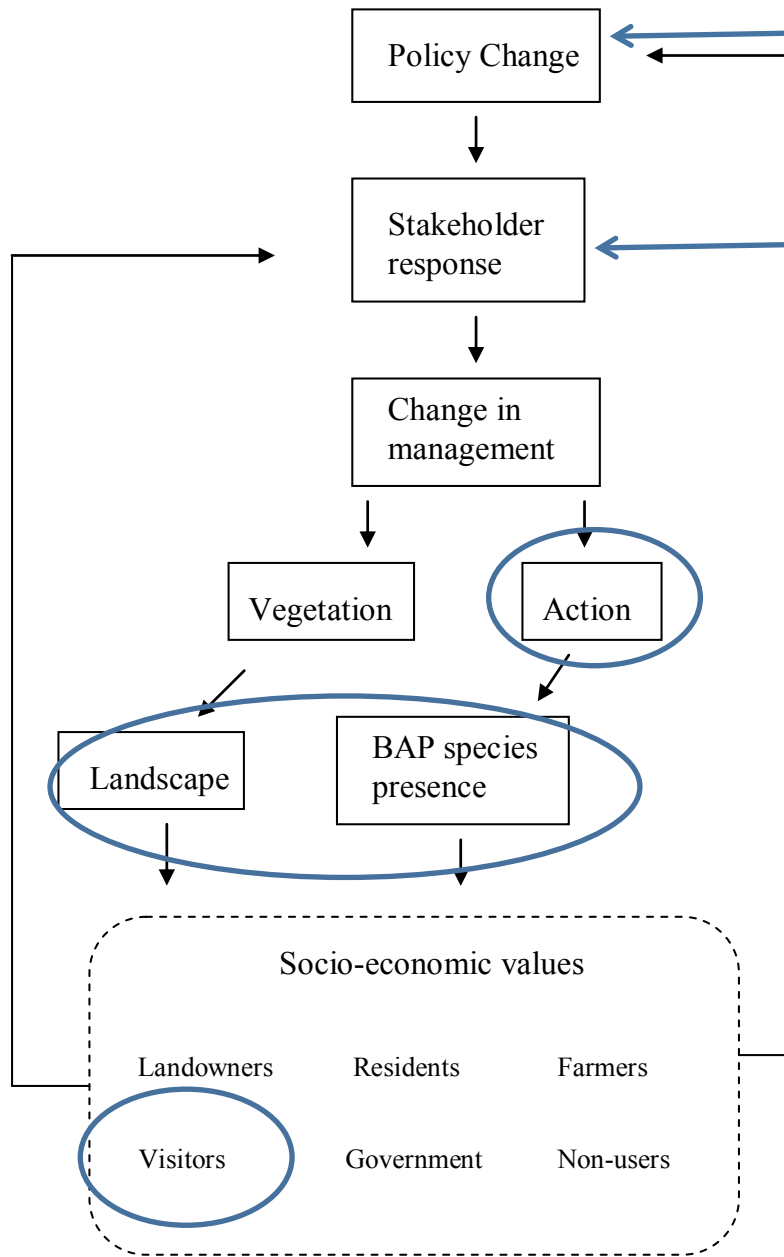
An example – UK uplands



- We track through from scenarios of policy change to effect on landowner decisions to ecological change to user wellbeing
- Unusual because we look at policy change affecting landscape mediated by individual decisions, rather than directly
- The decisions are elicited and based on many different factors, not just assumed to be optimal or profit-maximising
- We link this to ecological change through habitat use models
- And use values elicited from a particular user group for different landscape and biodiversity combinations
- (but not back up to landowner/policy response)

Work by Julie Black (with support from Susana Mourato, Nick Sotherton, E.J. Milner-Gulland)

These feedback loops are key but not modelled in this study



Scenarios of change, e.g. consistent low income from grouse shooting

Reported likely response, e.g. turn moors over to rough grazing

Actions that increase conservation value of land, e.g. pond construction, burning, nest guarding

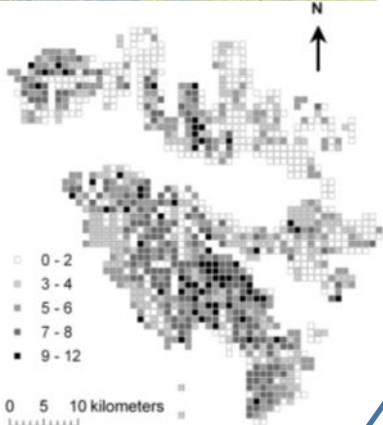
Two components of value – the look of the landscape and the presence of species of conservation concern

This study only looked at visitor value, based on WTP for access [Black et al. (2010) *Env. Cons.*]

Approach

- Map the decision-making structure on the landscape, for different production components
- Collate species records from a range of sources for BAP species, and build habitat suitability models in Maxent based on different habitat types which map onto the landowners' decision-making land types
- Ask decision-makers for their land use change decisions in different plausible scenarios of policy/external change
- Re-run the HSMs based on this new configuration of land use and assess change in species distributions
- For one of the scenarios, we have WTP for a user group, based on landscape and biodiversity change, which we can relate to these outcomes

Scenario:
Consistently low
income from
grouse



Maxent Habitat
Suitability model
for 15 BAP species

Response: 10%
Convert to grazing
10% Alt income
80% Do nothing



Update Maxent
model: changes in
sp distribn

Survey of WTP for
landscape &
species among
visitors to AONB

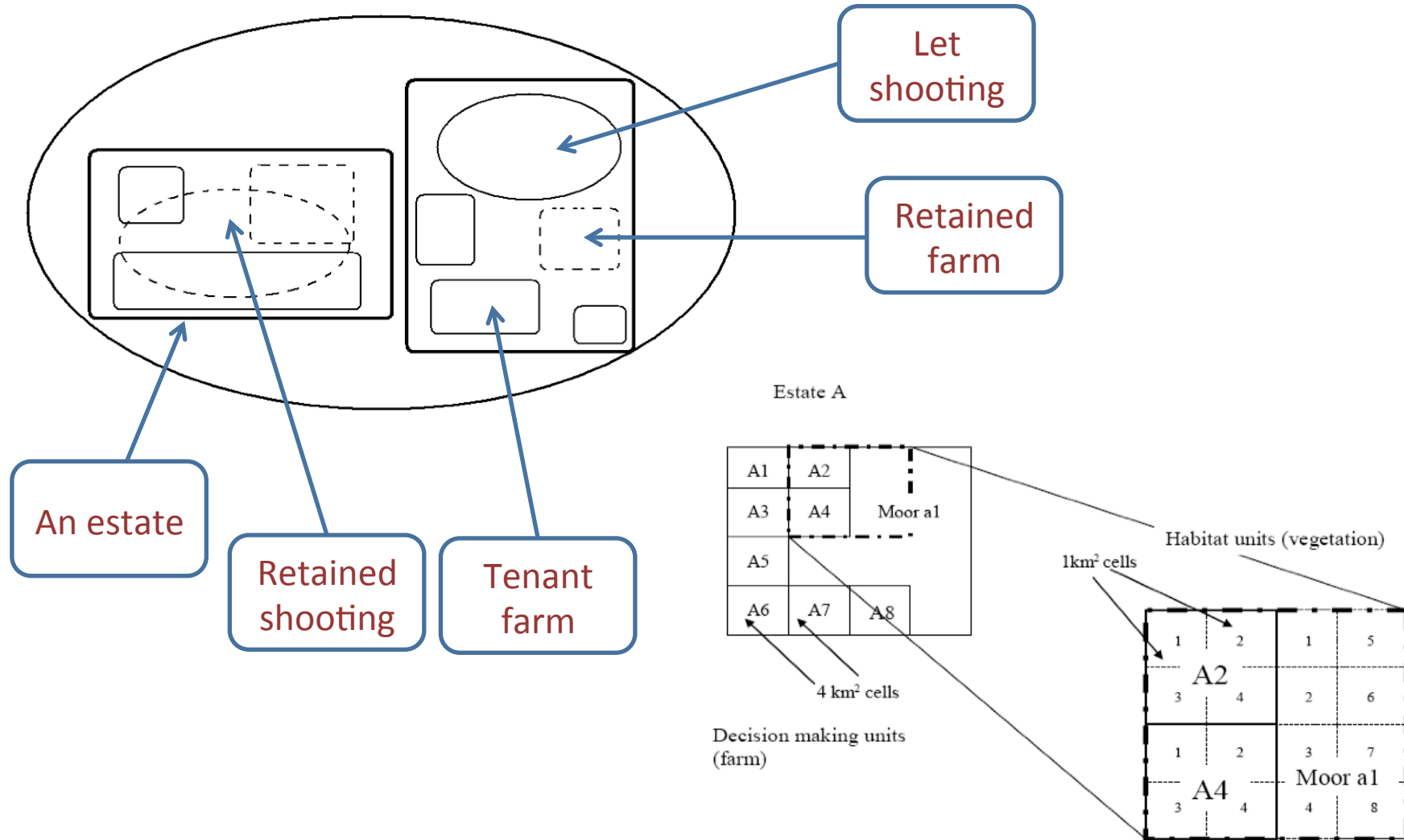
Landscape effect:
7% decr in bog, 10%
incr in grass, 3%
decr in heath



Change in visitor
valuation
(-£201,500 p.a.)



Decision making is not straightforward



Current black grouse distribution

- Based on 91 records from BTO and others
- Maxent models based on EN raw vegetation, broad veg types, patchiness & management (shooting, AES, grazing level)



Image c. BBC

Scenarios

- Consistently low income from grouse
- Natural England burning guidelines enforced
- Back to Nature subsidies
- Free market in agricultural products
- Increased visitor densities
- Pay per nest scheme



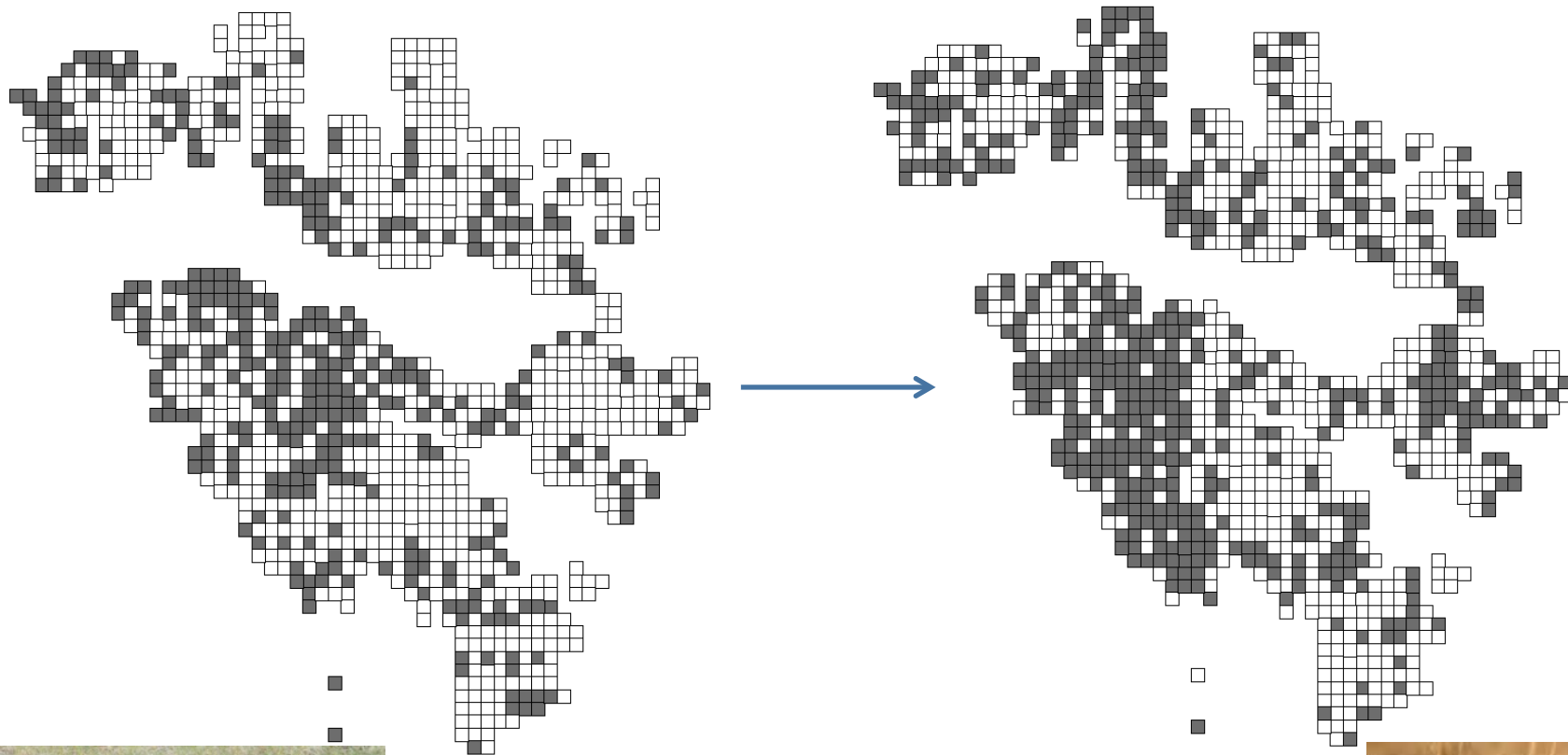
Example scenario responses: consistently low income from grouse

Use type	Proportion	Action	Outcome	Implementation
Moor	0.1	Convert to grazing	Replacement of heather moor/bog by rough grazing	50% bog to grass, 50% heather to grass
Moor	0.1	Find complementary income (consn payments?)	Burning guidelines, controlled grazing to promote regeneration	20% grass to heath, 5% heath to bog
Moor	0.8	No action, not sure	No change	No change

Effects on overall vegetation cover of these responses

Scenario	Broad vegetation type			
	Woodland	Blanket bog	Rough grassland	Heather moorland
Consistently low grouse bags	0.00 (0.00)	-7.08 (0.8)	10.37 (0.91)	-3.29 (0.75)
NE burning guidelines enforced	0.00 (0.00)	1.05 (1.1)	-1.15 (0.21)	0.10 (0.03)
Back to nature subsidies	3.21 (0.10)	4.74 (1.3)	-11.95 (1.03)	4.00 (0.08)
Free market situation	7.59 (1.40)	-4.61 (1.19)	-0.82 (0.05)	-2.17 (1.14)
Increased visitor densities	3.33 (0.06)	-3.42 (0.7)	2.14 (0.32)	-2.04 (0.74)
Pay per nest scheme	2.06 (0.07)	9.07 (1.8)	0.10 (0.05)	-11.13 (1.08)

Back to nature scenario: change in black grouse distribution



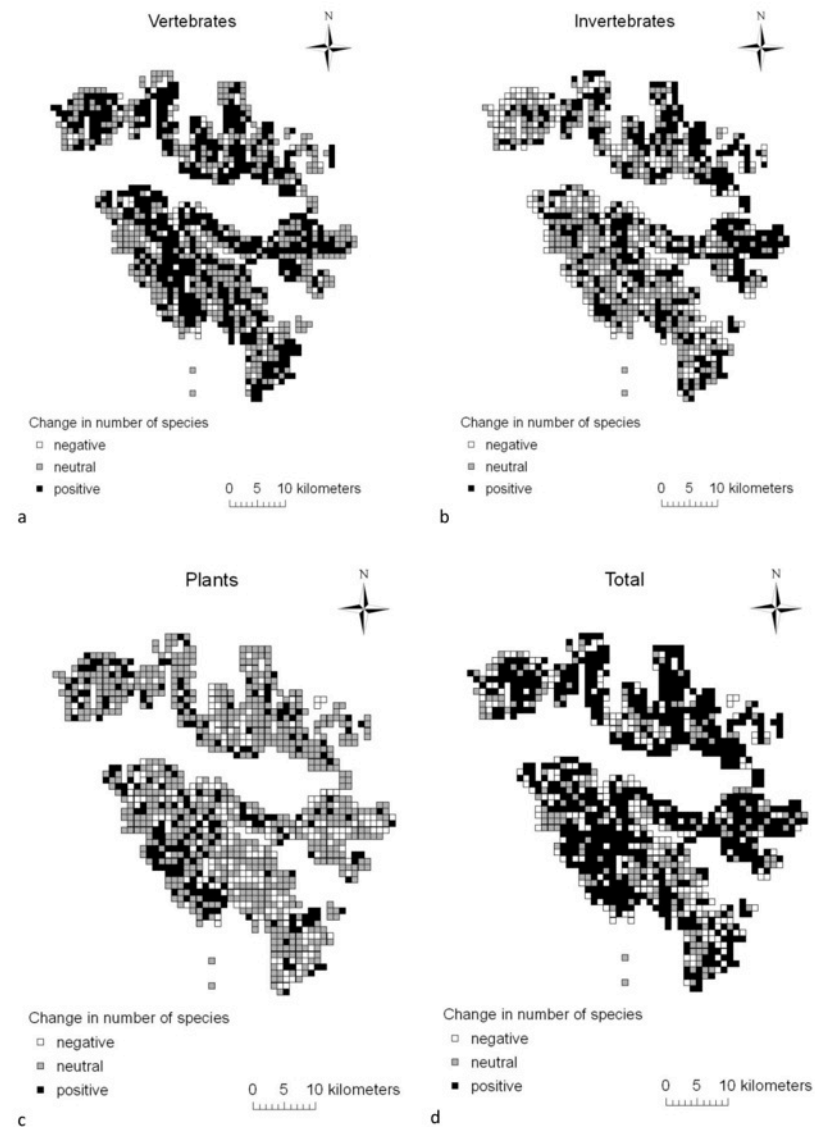
Predictor variables' effects vary by species






Variable	Total positive	Total negative	Total neither	Average % importance
Woodland	5	4	6	21.6
Blanket bog	4	2	9	19.4
Shooting	5	3	7	16.5
Grassland	3	4	8	14.7
CSS	4	3	8	10.7
No. vegetation types	4	0	11	4.2
Heather	2	2	11	3.4
Patchiness	2	3	10	2.7
Grazing	1	3	11	2.7







Predicted effect of removing government subsidies, by taxonomic group



Predicting visitor wellbeing (WTP) for consistent low incomes from grouse shooting scenario

Biodiversity element		Change
Important plants		Little effect
Important birds and mammals		Little effect
Important insects and spiders		↑

Landscape element		Change
Change in area of rough grassland		↑
Change in area of heather cover		↓
Change in area of blanket bog cover		↓
Change in area of mixed and broadleaved woodlands		No change

Visitors to North Pennines asked what they would be WTP to achieve or prevent this landscape and biodiversity outcome = net WTP of £201,481 to prevent (relative to the status quo)



What next?

- This is uni-directional and there's a need for a more nuanced understanding of how changes in landscape and biodiversity would feed back through to decision-makers (policy makers and land managers)
- But it does capture private landowners' decisions and feeds them through into scenarios of on the ground change in landscape and biodiversity and thence to changes in WTP for a different user group
- This needs translating also into wellbeing change for different groups (including land managers)

Widely applicable issues

- Not just UK but e.g. ESPA
- Important for those who intervene in social-ecological systems to think about the knock-on effects of their actions as part of the system not apart from it



Thank you for listening, and to our funders...



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