The Role of Nature Conservation in Mitigating Climate Change

Alison Colls, Tyndall Centre for Climate Change Research, University of East Anglia

1. Background

- Actions to maximise biodiversity benefits are not always compatible with those aimed at maximising carbon storage, and vice versa.
- UK nature conservation has tended to focus on maintaining early succession open-ground habitats (such as grasslands, heathland and reed beds). The management techniques (burning, cutting, grazing) used to prevent scrub/woodland encroachment will be a variable source of greenhouse gas emissions.
- The aim of my PhD is to examine the role of nature conservation in mitigating climate change by exploring the tradeoffs between biodiversity conservation and carbon storage and identifying synergies or "win-win" solutions (Table 1).

	Greenhouse gas sinks	Greenhouse gas neutral	Greenhouse gas sources
TRADE-OFF	Afforestation with non-native plantations on inorganic soils Neglect/abandonment leading to scrub or woodland succession	Afforestation on organic soils with non-native trees (over 50-100yrs)	Maintaining early succession habitats (grassland, heathland and reed bed) Removal of woodland/scrub to create or restore semi-natural open-ground habitats
SYNERGY	Agri-environmental schemes Restoration of fragmented landscapes Native woodland expansion Restoration/creation of semi-natural habitats on degraded or low conservation-status land	Protecting blanket bogs from exploitation Protecting semi-natural habitats from land use change Preventing peat extraction	Conversion of semi-natural habitats to urban, industrial or some agricultural land uses Overgrazing

Table 1. Tradeoffs and synergies between biodiversity conservation (activities and threats), and climate change mitigation. This is a summary overview based on estimates in the published literature; it should be noted that there is significant uncertainty about the greenhouse gas (GHG) consequences of many of these activities.

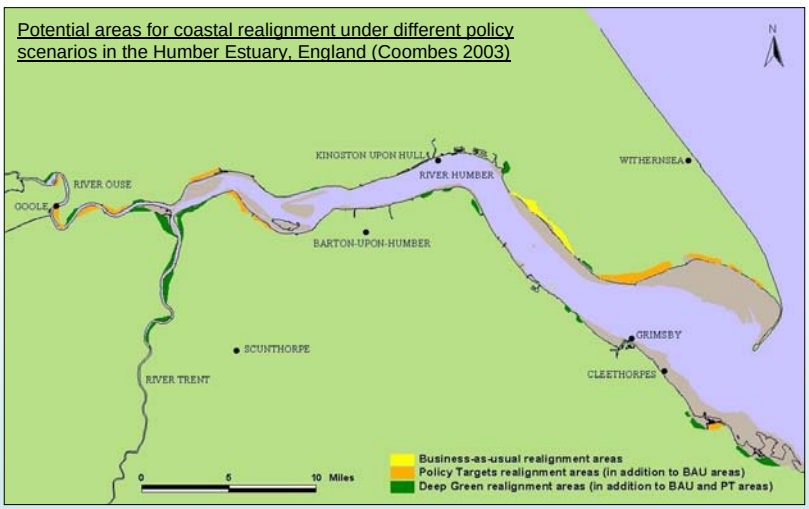
2. Case study approach

- These trade-off issues will be explored in more depth for three to four different case studies. After consultation with the stakeholders funding this research, the decision was made to focus on the consequences of key policies/schemes to create and restore semi-natural habitats.
- Each case study will entail an integrated assessment of existing datasets (land use, soil and vegetation carbon, trace greenhouse gases and various biodiversity indicators).
- The data will be analysed within a Geographical Information System, and with decision support tools such as cost-benefit and multi-criteria analysis.

3. Case Study 1: Intertidal habitat creation

- The creation of new intertidal habitat through coastal realignment is expected to benefit biodiversity and increase carbon storage, as well improve water quality and decrease flood defence costs, and may therefore be an example of a 'win-win' solution.
- However, within an estuarine environment, the optimum location for creating new intertidal habitat may differ significantly depending on whether the objective is to maximise the density and range of intertidal birds or minimise emissions of methane and nitrous oxide.
- I am exploring these potential trade-off issues by examining the biodiversity and greenhouse gas consequences of different coastal realignment scenarios in the Humber Estuary (Table 2).

Potential areas for coastal realignment under different policy scenarios in the Humber Estuary, England (Coombes 2003)



Scenario	Intertidal birds	Invertebrates	Vegetation	Offshore ecosystem quality	C	N_2O	CH_4
Baseline (present)							
B.A.U.							
Policy Targets							
Deep Green							

Table 2: Biodiversity and GHG indicators. The scenarios were developed by Centre for Social and Economic Research on the Global Environment (CSERGE) as part of the EUROCAT project (See Ledoux et al., 2002). The Business as Usual scenario would result in 300.2 ha of new intertidal habitat; Policy Targets would result in 1320.9 ha and the Deep Green Scenario would result in 2332.4 ha (Coombes, 2003).

4. Future case studies

Photo: www.ettrickyarrow.bordernet.co.uk

2. Woodland expansion, restoration and removal

The second case study will examine the greenhouse gas and biodiversity consequences of policies to create new native woodland, restore planted ancient woodland sites, and remove secondary woodland (in order to create or restore other semi-natural habitats).

3. Reduction of grazing in the uplands

The upward expansion of pine forests into montane habitats in some parts of the Scottish Highlands may be attributable to a combination of reduced deer grazing and climate change.

The third case study will explore the effect of such expansion on succession and carbon sequestration, as well as considering the consequences of large-scale reductions in upland sheep grazing.

5. Conclusions

- Carbon storage is now seen as an additional service or function that an ecosystem should provide.
- The most effective response to climate change will be a more dynamic approach to nature conservation that combines adaptation and mitigation in both designated areas and the wider countryside.
- For more information email a.colls@uea.ac.uk

6. Acknowledgements

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References

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