Predicting the Effects of Management on Upland Birds, Economy and Employment

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The XX International Grassland Congress took place in Ireland and the UK in June-July 2005. The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.

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Introduction Livestock farming systems play a significant role in the economy and conservation of the UK uplands and rely heavily upon public financial support. Changes in that support could have far-reaching impacts on the wildlife interest and socio-economics of upland areas. Predicting the impacts of such changes is difficult, since they arise from responses to new economic circumstances. The effect of management change is also influenced by natural variation, such as the mosaic of plant communities, already present in the upland landscape. This paper sets out an approach that integrates theoretical models with field studies to investigate the effects of management change on birds, economics and employment in the UK uplands.

Methods The approach combines outputs from separate models of bio-economics, vegetation dynamics and bird abundance. The bio-economic model uses livestock energy demands and thresholds together with standard costs and assumptions, to trigger economic costs and output changes. The vegetation model uses a grid-based modelling approach in which vegetation change is driven by plant competition, spatial distribution, growth and management. Field data characterising the plant communities present on a site, their distribution, composition, growth phases and management, are used as input data. The bird models were derived from field data collected from 85 2-km^2 plots in southern Scotland. Generalised Linear Models were used to identify variables that significantly affect the abundance of bird species, and incorporated both site and management effects, and variables describing vegetation composition and structure. To determine the effect of management change on bird abundance and farm economics, different grazing regimes were simulated within the vegetation dynamics model, the outputs of which were used in the bio-economic and appropriate bird (red grouse and meadow pipit) abundance models. The scenario analysed was a 200 ha wet heath mosaic of *Calluna, Molinia, Nardus,* sedges and rushes. The regimes were: all-year high sheep grazing (4.5 ewes/ha), zero grazing and all-year mixed sheep grazing (0.66 ewes/ha) with 0.75 cattle/ha during June-August. Vegetation simulations were run for 10 years.

Results and discussion Economic modelling predicted a financial turnover of £71,576, £53,549 and zero, for the high, mixed and zero grazing regimes respectively. The first two regimes included CAP area payments of £7878 whilst farm labour units employed were 0.80, 0.54 and zero respectively. Calluna cover was predicted to rise under each regime and drove the predicted increases in red grouse abundance (Figure 1). The effect was greatest under the mixed and no grazing regimes. Fine-leaved grasses and sedges were predicted to decline under each grazing regime, with the smallest decline occurring under mixed grazing. Meadow pipit numbers were predicted to decline, but faired best under the mixed-grazing regime, potentially reflecting changes in the balance of Calluna to fine-leaved grasses and the declines in sedge cover compared to the starting year. By linking field data to theoretical models, changes in management practice, arising from external economic or policy decisions, can be analysed in relation to their direct and indirect effects on economy, employment and biodiversity. These models can indicate the magnitude and direction of expected change and thus inform decisions about sustainable land management.

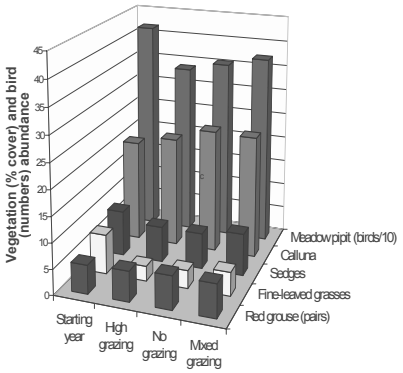

Figure 1 Predicted effect of grazing regime on specific plant and bird species (after 10 yrs)

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