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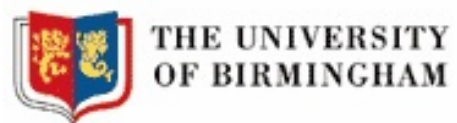
Systematic Review No. 2

Does burning of UK sub-montane, dry dwarf-shrub heath maintain vegetation diversity?

Summary of Report

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July 2004

This review should be cited as: Stewart, G.B., Coles, C.F., Pullin, A.S. (2004) Does burning of UK sub-montane, dry dwarf-shrub heath maintain vegetation diversity? Systematic Review No. 2. Centre for Evidence-Based Conservation.

SUMMARY

Background

Burning is a common vegetation management practice in upland UK, principally used to stimulate new growth of grasses or heather. Regular burning is used to maintain heather in the young, highly productive age-class and to create a mosaic of vegetation of different ages, composition and structure, particularly on grouse moors which tend to be burnt on an eight- to fifteen-year cycle. Burning is known to alter the vegetation composition, pattern, physical and age structure, nutrient status and carrying capacity for herbivores, as well as the associated fauna. However, from a conservation perspective, the effects of burning on species diversity in sub-montane dry dwarf shrub heath have not been systematically evaluated.

Objective

To assess the effectiveness of burning in conserving diversity of sub-montane dry dwarf-shrub vegetation communities.

Search Strategy

The following computerised English language databases were searched: English Nature's "Wildlink", JSTOR, ISI Web of Knowledge (comprising BIOSIS previews, CAB Abstracts, Derwent Innovations Index, INSPEC, ISI Current Contents, ISI Proceedings, ISI Web of Science), Index to Theses Online. Additionally, the reference lists of articles were searched and selected authors, recognised experts and current practitioners in the field of upland ecology were contacted for further references.

Selection Criteria

Primary, quantitative studies of burning on sub-montane dry dwarf-shrub heaths in Great Britain and Ireland (NVC types: H9, H10, H12, H16, H18, H21 & H22) with appropriate controls or other unburnt comparators. The outcome was any change in floristic composition.

Data collection and analysis

Inclusion decisions, quality assessment and data extraction were duplicated, and consensus achieved by discussion or a third party. Some authors were contacted for missing data. The primary measure of effect was the difference in mean species richness between the treatment and control groups. Simpson's index (1-D) provided a measure of evenness. Random effects meta-analyses weighted by variance, were performed where data could be pooled. Potential sources of heterogeneity were examined in meta-regression analyses.

Main Results

Seven articles were included. Five of these articles contributed data for meta-analysis (involving 13 datasets for species richness and 12 datasets for Simpson's index, four of which were not independent). The pooled weighted mean difference ranged from (95% CI, p): 1.16 (-2.90 to 5.23; p = 0.5755) to 0.30 (-2.58 to 1.98; p = 0.7959) for species richness and -0.04 (-0.12 to 0.04; p = 0.3005) to -0.05 (-0.10 to 0.005; p = 0.0771) for Simpson's index.

There was heterogeneity in all meta-analyses. Regression analyses found significant associations between effect size and stand age at time of burning for species richness and Simpson's index although species richness was not statistically significant in the multivariate regression model. Post burn time and data quality were not significantly associated with effect size. Funnel plots of the datasets and statistical tests for asymmetry indicated that there was no relationship between effect size and study precision.

Conclusions

The available evidence is mainly based upon short-term data sets. The only study designed to sample more than one burning rotation suggests the effects of serial burning on floristic diversity vary according to stand age at time of burning and the time elapsed since the last burn. There is some evidence that serial burning reduces diversity in old stands but insufficient evidence exists with which to make firm conclusions regarding the effectiveness of rotational burning in maintaining vegetation diversity of sub-montane dry dwarf-shrub heaths.

The effects of single burning cycles are also variable. There is evidence that burning old stands can reduce diversity, therefore land managers should beware of burning old stands where the maintenance of species diversity is the objective. This suggests that a juxtaposition of stands burnt prior to the degenerate stage and unburnt stands is required to maximise floristic diversity in a dry heath moorland mosaic at a landscape scale. More research is required to provide evidence concerning site-specific factors and burning-grazing-moisture interactions for the delivery of site specific management.