

Impact of heathland restoration and re-creation techniques on soil characteristics and the historical environment

Lowland Heathland is a Priority Habitat for conservation under the UK Biodiversity Action Plan (BAP). This Action Plan aims to arrest loss of lowland heathland habitat, improve the condition of existing heathlands and to create new areas of lowland heathland. Sites to be restored to favourable condition, from dense scrub or bracken cover for example, may require interventions likely to disturb the soil, either just the litter layer or deeper into the mineral soil. Furthermore, a significant percentage of the new HAP target for heathland expansion is likely to come from ex-arable land and conifer plantations, which will require even more drastic intervention, such as top-soil removal or inversion and/or changes in pH.

Under the First Soil Action Plan for England, Natural England has to have regard to the proper management of soil alongside other requirements. However, the conservation and restoration of habitats such as heathlands, also supported and promoted by Natural England, involves widely-used techniques which could potentially pose a risk for the soil and archaeological interest of soils.

What was done

A project was set up in 2007 to define the importance of heathland soil features and their archaeological interest and the risk of damage through current practices. The first step was to provide an analysis of the existing scientific literature on the benefits vs. problems of various existing methods of soil preparation being applied across Europe for heathland restoration and/or re-creation on the soil characteristics and archaeology. Restoration was defined as management to improve the condition of existing heathland; re-creation implied a change in the land use from agriculture or forestry. The methods available to contemporary practitioners were categorised based upon the general broad similarity of methodologies.

The extent to which heathland restoration and re-creation have altered soils, or not, was explored through a questionnaire sent to 66 site managers and advisors. A total of 26 questionnaires were completed covering a wide range of restoration and re-creation projects of varying size in a variety of geographical locations across the UK in the last 10 years.

A best-practice guidance based on the findings is proposed, so future heathland restoration and re-creation projects can be carried out with fewer risks for soils and archaeological remains.

Results and conclusions

Soil preparation techniques were classified into four categories:

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- Surface vegetation management and removal techniques (grazing, cutting, herbicide application and burning);
- Soil acidity and nutrient status amelioration techniques (cropping and acidification with sulphur, bracken/pine litter or peat);
- Surface and below-ground vegetation (trees and shrubs) removal techniques and
- Soil disturbance and soil removal techniques (litter removal, surface disturbance, ploughing, inversion and rotovation).

The potential for damaging impacts was in general inversely related to their effectiveness, although most techniques were used in combination.

The impact of these techniques on carbon sequestration was also considered. Restoration from forestry could decrease carbon stocks if performed by rapid clear felling. Restoration without clear felling could maintain stocks. The stocks could increase when restoring heathland from former agriculturally improved heathland soils.

Discussion

The long-term persistence of acidic podzol soils and seed banks under conifer plantations suggest that this should be the most practical and cost-effective method for restoring lowland *Calluna* heathland. The timber crop can be sold in some cases to offset costs of restoration, and there should be no need to dispose of large volumes of soil. In addition there would be little need to improve the soils. This option would be the less damaging for both soil and the historic environment.

The re-creation of heathland on former arable land can prove more problematic and expensive owing to the presence of soils with a high nutrient status and elevated pH. The wholesale removal or deep ploughing that might be necessary could compromise any archaeology that might have survived the previous agricultural processes and adversely impact on soil functions and the wider environment. In addition, any acidification of the soil using

elemental sulphur in particular, could affect soil processes and archaeological preservation.

In soils confirmed as having particular scientific, and conservation, or other sustainability value, or any archaeological interests, non-disturbance methods are the only option to avoid causing irreversible damage to these features. Methods such as cutting, burning, or herbicide application can be successful in restoring former heathland. Their effectiveness in successfully re-creating heathland can be limited where soil nutrients need to be reduced quickly to meet short term targets. It may be then unpractical or undesirable to consider heathland re-creation on arable land, especially if archaeological interest is suspected. When there is archaeological interest in conifer plantations or secondary woodland, then the use of methods that do not cause mayor disturbance, such as shallow rotovation or burning followed by grazing, has been proven to produce good results.

The questionnaire results suggest that nearly two thirds of heathland restoration practitioners that responded were aware of the need to protect any archaeological interest. However, project management practice did not always incorporate a full archaeological assessment, which could inform the restoration approach or gave the same regard to the intrinsic scientific, and nature conservation and sustainability value of soils.

Recommendations

Consider the outlined guidance for the protection of soils and archaeological interest when restoring or re-creating heathlands. In particular:

- Investigate the initial condition (land use, soil characteristics and potential archaeology) involving relevant experts;
- Evaluate the potential impact of the intervention versus the value of the soils and the habitat to be restored and
- Apply the most appropriate techniques to reduce disturbance and increase efficacy.

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Natural England's view point

Natural England will continue supporting lowland heathland restoration and re-creation, within and outside protected sites, in order to meet the Biodiversity Action Plan targets. However, future projects should have regard to other interests such as the intrinsic soil value and its functions, as well as the potential impact on the historic environment. Natural England experts on those fields can help project officers in designing their approach so the maximum benefit can be obtained.

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Further information

For the full details of the research covered by this information note see Natural England Research Report NERR010 - Impact of heathland restoration and re-creation techniques on soil characteristics and the historical environment.

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