50 years of vegetation change in the Sheffield region

In 1965 an extensive survey of vegetation was carried out in and around the Peak District National Park. Although the majority of people won't know anything about it, for ecologists it is a very famous survey. The survey, led by Professors Philip Grime and Phillip Lloyd, formed the basis for several books including ‘An Ecological Atlas of Grassland Plants’ and ‘Comparative Plant Ecology’ and contributed a great deal to the formation of plant competition theory by Professor Grime.

Images from the 1960’s survey showing Phil Grime and Phillip Lloyd conducting quadrat surveys (top) and John Hodgson, who also participated in this survey, on his way to collect data (above). Photographs courtesy of J.P. Grime.
In this study we revisited 455 sampling points in acidic and calcareous grasslands to assess how vegetation has changed in the region and what might be driving those changes. Acidic grasslands are those found on acid soils and bedrock, in the Sheffield region this is Millstone grit and sandstone. Calcareous grasslands are those found on basic soils and bedrock (limestone), those with a high pH. The Sheffield region contains some very good examples of these valuable and diverse grasslands.

Between the surveys conducted in 1965 and 2012 and 2013 four sites were converted to different land uses – in this case they were ploughed up and replanted with agricultural crops, and three sites were heavily fertilised. This rate of conversion is much lower than has been observed over similar time periods in other parts of the country and is most likely to be as a result of the protection the National Park provides.

Although sites had been kept as grasslands there were some very clear changes that could be seen in the species composition of the grasslands. In the acid grasslands we observed declines in the species diversity of grasslands and an increase in the proportion of species that were typical of nutrient rich habitats. Bracken (*Pteridium aquilinum*) had increased considerably in some of the survey sites and at some sites had become very dominant. In calcareous grasslands we saw declines in the number of species found in the grasslands and in particular declines in the species we would typically expect to see in this grassland type. A number of calcareous grasslands showed signs of scrub invasion as a consequence of insufficient management.

The changes we saw in vegetation were analysed together with environmental changes that have occurred over the time between the two surveys including climate, grazing and air pollution. The results showed that grazing and the atmospheric deposition of pollutant nitrogen were both important drivers of the spatial and temporal patterns observed in acidic grasslands whereas in calcareous grasslands climate and soil pH were the most important factors.

*Images from the 2012 and 2013 surveys showing bracken growth in acid grasslands where it can be easy to lose field assistants (left) and bracken and shrub growth in calcareous grasslands (right).*

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The above is a summary of a paper published by the T-BESS grasslands project:

*Drivers of vegetation change in grasslands of the Sheffield region, northern England, between 1965 and 2012/13*

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