

# **Biodiversity indicators for measuring the impact of reduced grazing in the uplands**

Meg Pollock, John Holland, Claire Morgan-Davies & Tony Waterhouse

*SAC Hill & Mountain Research Centre, Kirkton, Crianlarich, Perthshire, FK20 8RU*

## **Introduction**

The concept 'biodiversity' means different things to different people, and it is not possible to measure biodiversity in its totality. Variables used in the past as surrogates of biodiversity tend to have been individual species or groups of species (Eisworth & Haney, 2001; Prendergast, 1987). For a study of the impacts of reduced grazing in the Scottish uplands, we need to find and use biodiversity indicators that reflect the impact of this change. The indicators need to be meaningful and easy to measure, so we are working towards structural variables that can be used as surrogates of biodiversity.

Here we outline the process we are using to decide on the indicators.

## **Methods**

At a workshop, we invited stakeholder participants to suggest variables that could be measured to indicate changes in biodiversity in the context of the uplands. We reduced their long-list into a short-list (Table 1) and asked experts, including those at the workshop, to categorise the variables as (1) – Essential, (2) - Useful if time available, and (3) - Not Useful, again in the context of our proposed study.

Table 1. Variables short-listed as potential biodiversity indicators. Variables in **bold** have been selected for piloting.

---

### **Variable**

---

#### **Mosaic-iness – index reflecting species & structural diversity**

Voles – population estimates

#### **Bare ground – frequency**

Birds – population estimates

#### **Vegetation height**

#### **Flowering (forbs) – frequency**

#### **Thatch – frequency**

Vegetation density

Ticks – population estimates

---

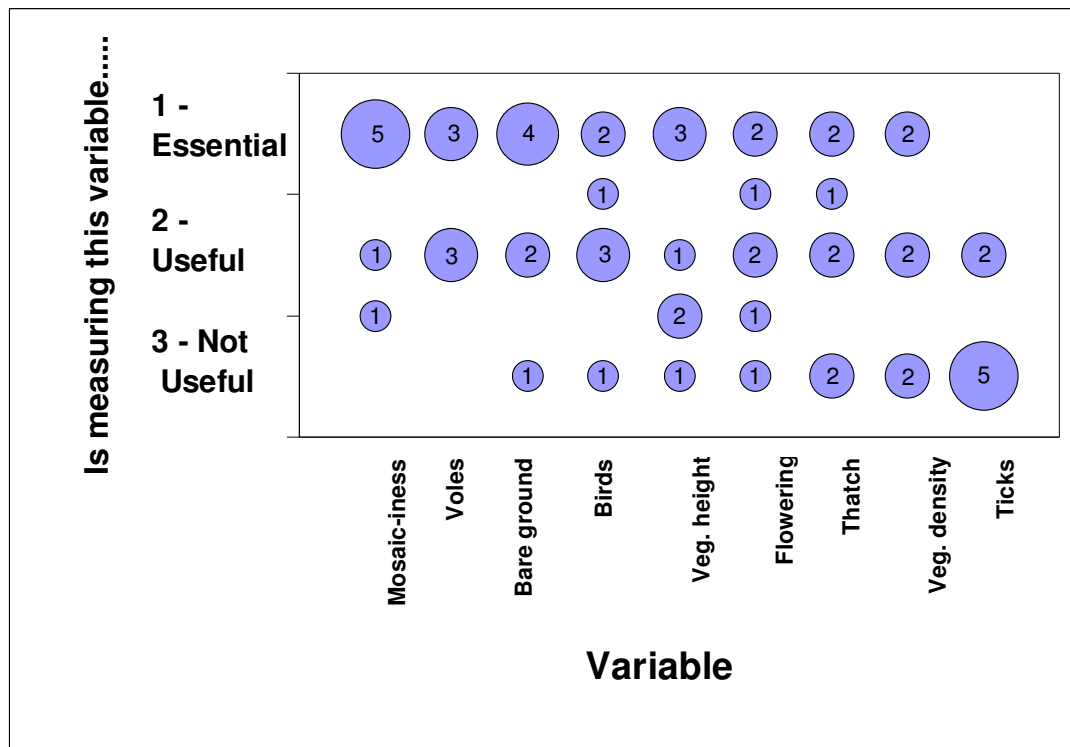
## **Results**

A small number of experts have assessed the variables to date. There was some consensus among experts, with most people stating that mosaic-iness and voles are essential or useful to measure, and that ticks are not a useful biodiversity indicator

(Figure 1). However, there was considerable variation between the experts in the way they categorised the other variables (Figure 1).

Our plan is to measure the variables highlighted in bold in Table 1.

Figure 1. Experts' assessments of the utility of the potential biodiversity indicators. The size of each circle is proportional to the number of experts putting a variable in each category, the number within is the number of experts. A total of seven experts have done the exercise so far.



## Discussion

It is not unusual to find a lack of consensus between experts (for example Pollock *et al.*, submitted). The limited consensus found so far on appropriate biodiversity indicators highlights the issues facing policy makers, who need to design agri-environment schemes to support biodiversity. If consensus cannot be reached about ideal habitat condition, one approach might be to tailor conservation management prescriptions to local areas or even individual farms (Morgan-Davies *et al.*, 2006)

## Site search

We are also looking for pairs of sites (precise criteria in Table 2) where one site has continued sheep grazing and the other has reduced grazing. If you know of any suitable sites, please get in touch (meg.pollock@sac.ac.uk). We're looking for information on the name and grid reference of the sites, and if known, the manager or owner's name, and when sheep grazing was reduced.

Table 2. Criteria for study sites.

Criteria	Description
Management:	Comparable adjacent (or nearby) hirsels <sup>1</sup> , <b>one</b> with continued <b>sheep grazing</b> at ' <b>normal</b> ' rate, <b>one</b> with sheep grazing <b>reduced or removed</b> in the last <b>2 – 15 years</b> .
Geographical area:	Scottish uplands.
Location:	Un-enclosed hill ground.
Vegetation:	At least one of: <i>Nardus</i> dominated grassland, <i>Molinia</i> dominated acid grassland, wet heath, dry heath.
Deer:	Not excluded.
Cattle:	Absent.

<sup>1</sup>area of 400+ ha, currently or formerly grazed by a flock of sheep.

## Conclusions

- Biodiversity indicators are required to measure the impact of reduced grazing.
- From a small sample of experts, there is a wide range of opinion about the utility of the different indicators. However, vegetation mosaic-iness is generally agreed to be a useful indicator.
- Further expert opinions are required.

## References

- Eiswerth, M.E. & Haney, J.C. (2001) Maximizing conserved biodiversity: why ecosystem indicators and thresholds matter. *Ecological Economics*, **38**, 259-274.
- Morgan-Davies, C., Waterhouse, A., Pollock, M.L. & Smyth, K. (2005) Local area farming plans – a common reality for farmers and conservationists in the Scottish Highlands? *Scottish Geographical Journal*, **121**, 385-400.
- Prendergast, J.R. (1997) Species richness covariance in higher taxa: Empirical tests of the biodiversity indicator concept. *Ecography*, **20**, 210-216.
- Pollock, M.L., Legg, C.J., Holland, J.P. & Theobald, C.M. (submitted to *Rangeland Ecology & Management*) Assessment of expert opinion: seasonal sheep preference and plant response to grazing.

## Acknowledgements

SAC receives financial support from SEERAD.