

Back to the future: historical legacies and future implications

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Introduction

In recent centuries the Scottish uplands have experienced such marked shifts in attitude and values that they appear to suffer from an identity crisis: during the late-18th and 19th centuries they were either an unproductive 'wasteland' to be improved or, to those with Romantic Ossianic inclinations, a sublime Highland 'wilderness' in which the 'Balmorality' factor played a crucial role in influencing perceptions after Queen Victoria purchased her new *schloss* in rural Aberdeenshire. During the 20th century they have been described by many as a 'degraded countryside', but now take pride of place as a 'wild land'. We may be happy to view past attitudes as a reflection of changing times, but are modern approaches to upland management and conservation really less influenced by perception and value judgements? Do our current perceptions and standards have any greater claim to lasting relevance than those of the past?

This presentation aims to question whether current management choices are underpinned by secure ecological knowledge and why particular habitats are valued above others. Specifically, we question why 'natural' heritage, biodiversity and processes take precedence over human interactions with the uplands, and we also question the marked division between 'natural' and 'anthropogenic' influences and processes. This will be done by presenting case studies from collaborative palaeoecological-historical research into the mutual interactions between agricultural communities and the upland environment over the last c.400 years. Here, we focus on the last 250 years: a period of change and intensification of resource exploitation. Recent centuries, rather than distant millennia, are also of most direct relevance for understanding the current status of the uplands.

Methods

A brief overview of our methods is provided to indicate how the data were generated. The main aim of the research was to investigate the interactions between changes in land-use and Scottish upland ecology over the last c.400 years, up to the present day. The main disciplines in the research were documentary history and fine-resolution palaeoecology, supplemented with economics to help analyse the causal factors driving ecological change, and ecology to set the sites into their current land-use, conservation and biodiversity context. The econometric techniques and results are not discussed here, as this paper deals with changing plant communities, management practices and perceptions.

Our study sites were distributed across the Scottish uplands to capture a broad spectrum of biogeographical diversity, tempered by the reality of finding sufficiently detailed and continuous historical archives and intact peat deposits close to former settlement and grazing areas (Figure 1). Historical research was carried out from primary sources, mainly held at the National Archives of Scotland (Edinburgh). The level of detail and temporal

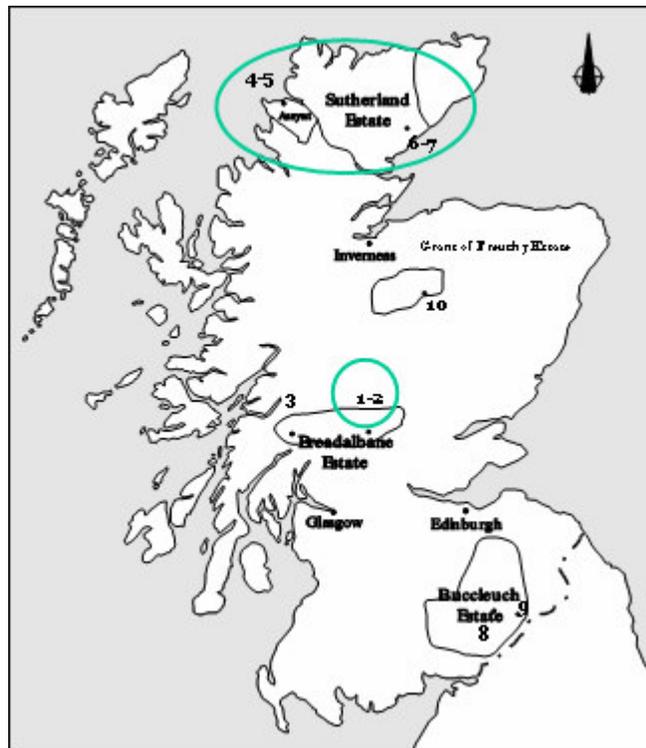
coverage varied between periods and land holdings (estates), but generally, these sources provided a varied range of evidence for past resource regulation, stocking and sowing practices, information regarding disputes and infringements, changes in tenancy and land management through the last 400 years. As these archival sources largely disappear by the end of the 19th century, a combination of parish-level Agricultural Census information and interviews with current land owners and tenants were used to understand 20th century land-use. Sediment cores were obtained from small peat basins (flushes and small mires) located within or immediately adjacent to the fields and grazings belonging to our chosen farms or shielings. This provides records of vegetation dynamics which are sensitive to changes in the management of these areas (Davies and Tipping 2004). Pollen analysis was carried out at approximately 20 year intervals, as far as possible, to derive records of ecological change on a timescale of human generations. This was done using a combination of radiocarbon and lead-210 dating techniques. The palynological data also provide a proxy for plant diversity, which reflects a combination of changes in plant richness and vegetation heterogeneity (Birks and Line 1992). Phase 1 NVC surveys were carried out around each of the pollen sites, up to a radius of c.500 metres, since this represents the dominant source area from which the pollen originates. The NVC data provided an indication of the heterogeneity, diversity and current conservation value or status of the sites. We recognise that this is not a random or representative sample of current ecological conditions, since the sites were selected to fulfil broader temporal and spatial aims.

Results

Three case studies will be used here, since they are representative of wider patterns of land-use change:

- i. Leadour farm [1 on Figure 1] & shieling [2] (south side of Loch Tay): converted to extensive sheep farm in 1780-90s, abandoned early 20th century;
- ii. Glenleraig township [4] & shieling [5] (Assynt): tenants evicted (cleared) to create extensive 'sheep walk' in 1812;

Figure 1. Locations of study sites, encompassing a range of upland biogeographical zones. The black outlines show the approximate extent of the estates worked on, and the blue outlines show the sites discussed in this paper.

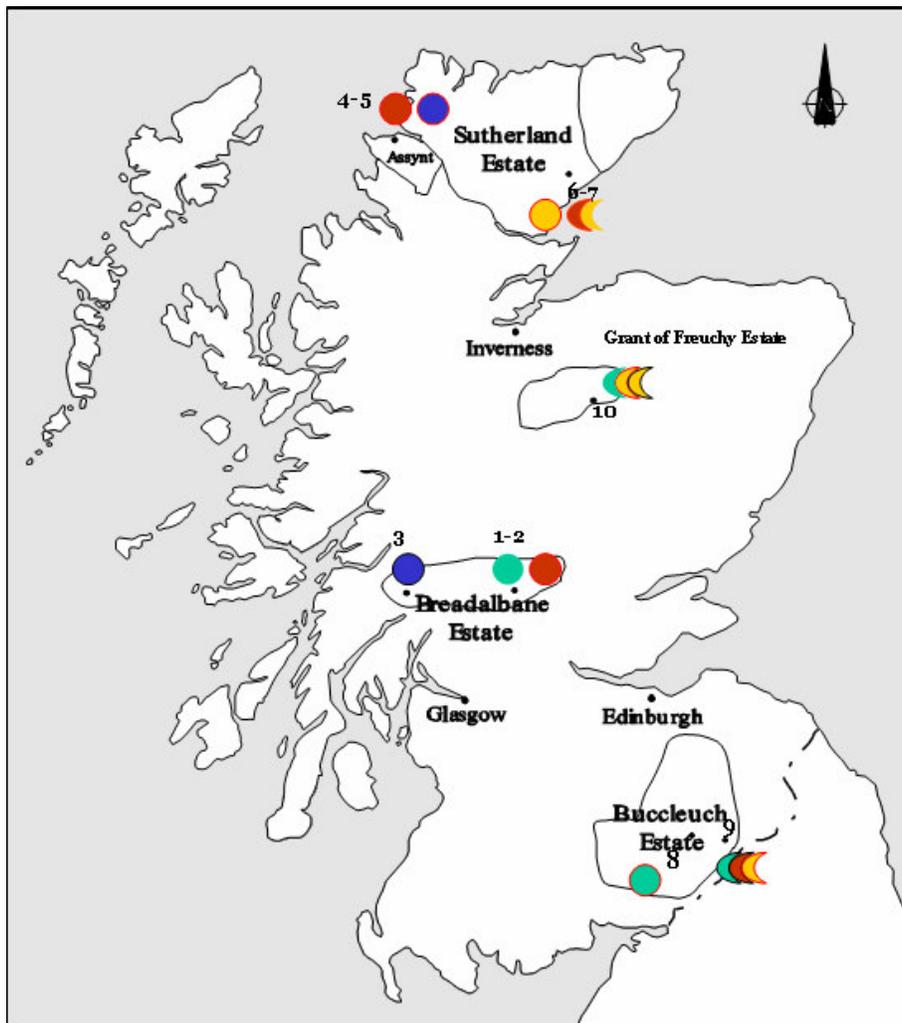


- iii. Rogart township/crofts (Stath Fleet): part cleared for sheep in 1819, but Rogart Park [6] grazed estate stock until 1880s, still crofted.

The palynological richness or diversity measures are used to indicate patterns of change in the uplands, and provide a basis for discussing the relationship between perceptions and management practice.

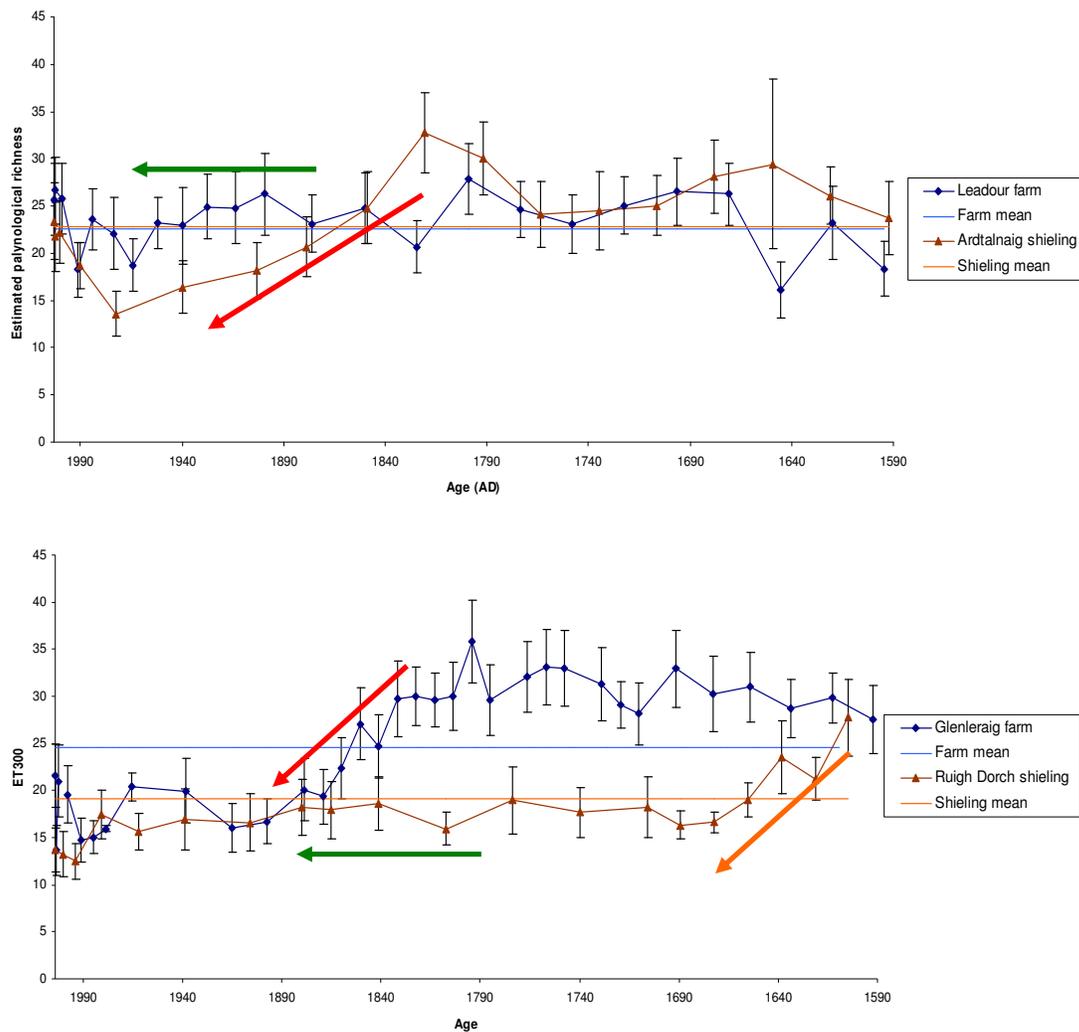
We suggest that human impact has been, as it continues to be, a major determinant of change and biodiversity across the uplands. In relation to sheep grazing, the most commonly held cause of upland 'degradation', it is clear that there is no simple or universal diversity decline across the uplands (Figure 2).

Figure 2. Summary of main spatial and temporal patterns of changes in past vegetation composition and pollen diversity, where blue = 17th century, green = 18th century, brown = 19th century, and yellow = 20th century. Red outlines indicate a marked decline in diversity at this time, black outlines indicate increased diversity, and no outline indicates no significant change in diversity, despite shifts in vegetation composition.



Reductions in palynological diversity occur at some sites after the introduction of extensive sheep farming (Glenlerraig farm c.1830, Leadour shieling, c.1820), as occurred in the Cheviots (Tipping 2000, Davies and Dixon in press), but other sites continued either unaltered into the twentieth century (Glenlerraig shieling, Rogart), or with changes in species composition rather than richness (Leadour farm, c.1760) (Figure 3).

Figure 3. Pollen diversity trends since AD c.1550 at four paired sites. Top: Leadour farm and shieling (Loch Tay) and below: Glenlerraig farm and shieling (Sutherland), with both shielings located c.2 km from the farms. The sites show a combination of strong trends and spatial variability. Note the strong declines (red arrows) in pollen diversity at Leadour shieling (AD c.1820) as sheep grazing intensified during the late 18th to early 19th century, and at Glenlerraig farm (AD c.1830) after tenants were evicted in 1812. These contrast with the more stable patterns (green arrows) recorded at Leadour farm and Glenlerraig shieling, which shows a marked fall in diversity during the 17th century AD (orange arrow) as woodland was cleared and grazing intensified, tentatively associated with the rise in cattle droving.



However, the Glenleraig data show that sheep grazing is only a partial explanation for diversity loss since the *abandonment* of the township, with the removal of 24 families (and associated disturbance and nutrient enrichment) to make way for sheep in 1812, was highly influential. Similarly, the *declining* intensity (*i.e.* level of care and attention) of management at Rogart during the mid-twentieth century contributed to species loss. Human activities, particularly small-scale farming, created a landscape mosaic which thus established and maintained upland diversity.

Our case studies were targeted at known land-use sites, but the results are not just relevant to areas around visible fields or buildings: we know that little of the upland landscape was unused, yet many past practices have left few surface traces. Partly, this may be due to the fact that many estate owners tidied up their lands during the course of the 19th century, removing the unsightly traces of abandoned human habitation and associated economic activities. In doing so, their estates gained an increased 'wilderness factor', something greatly sought-after by the landed classes in Victorian Britain. Land-use history thus has implications for the perception and management of surrounding habitats including the SSSI Atlantic oak and birch wood to the south and west of Glenleraig, for example. What ecological changes are desirable or acceptable in a woodland which may be distinctive in a modern context, but which is by no means natural, as it is highly unlikely to have escaped grazing and cutting in a previously densely populated landscape?

Discussion

Given such complex and varying long-term and site specific trajectories of change, we suggest that short-term ecological perspectives do not provide a sufficiently secure foundation for assessing the diversity and dynamics of upland ecosystems. This applies in particular where conservation management is often aimed towards (re)creating a more 'natural' state – a condition for which we may have very little ecological information, such as lack of realistic baseline information to help identify targets or define 'good condition' in a habitat, particularly when 'natural' conditions have not existed in the historical past, at least. Moreover, the past provides no simple baselines from more 'natural' conditions, since change, rather than stasis or stability, are a feature of past plant communities throughout the millennia, and any baseline thus needs to encompass both variations in time and spatial heterogeneity. We therefore emphasise the importance of cultural (as well as natural) factors in shaping dynamic upland habitats. Former settlement and land-use across the uplands was far more extensive than is currently recognised or visible simply on the ground, and the results thus have implications for the ecological status of the wider Scottish uplands.

We support measures for the conservation of rare habitats and species, but it is the wider (mostly unsaid) assumption that we are aiming for something which is justifiably more 'natural' that we wish to challenge. We would like to see a fuller discourse on *why* particular habitats/species are valued above others and greater recognition of the value judgments and preconceptions which are involved. Here we suggest some scope for further discussion.

Why do we always want more trees?

- Tree cover was largely a victim of prehistoric climatic change, not human destruction (Bennett 1995, Tipping *et al.* 2006); many 'ancient' woodlands owe their present structure and composition to former management and c.100-150 years of 'natural' processes/abandonment (Sansum 2004) – a short period in terms of woodland development.
- This preoccupation also creates conflict between groups desiring forest expansion and conservation of other habitats (*e.g.* heathlands), which is counter-productive for integrated understanding of the uplands and management needs.

Why 'natural' heritage, 'natural' ecological processes & minimal human intervention?

- Humans have been part of the landscape for at least 9000 years, relying on and managing upland resources for agriculture for c.4000 years.
- The exclusion of people reflects an underestimation of the value and spatial extent of past cultural impacts, particularly the *positive* effects of land-use on biodiversity.
- Assumptions regarding universal upland 'degradation' and the notion of 'wild land' are exaggerated or perceptual rather than real, and have much in common with Victorian cultural values and (re-)constructions of nature, from which they could be said to stem largely (see also Midgley 2006).
- There is no single story of degradation or change across the uplands – results can be very site-specific.
- Does cultural heritage have little value in conservation and management, outside ring-fenced monuments?
- Is mimicking natural processes in current management plans really 'natural' or simply the current form of culture-based value judgement (*e.g.* Midgley 2006)?

Why is increased biodiversity always best?

- The results presented suggest that 'natural' processes are likely to increase homogeneity (at a fine scale), perhaps leading to decreased biodiversity.
- Is a single value-based criterion (*e.g.* biodiversity) sufficient for establishing priorities? Are there alternative measures of value?
- Can we integrate biological measures with social, cultural and even economic measures, as some social scientists and environmental economists are now attempting to do?

At a broader scale, palynology has frequently been presented at ecological conferences (*e.g.* Birks 1981, Bennett 1995, Stevenson and Birks 1995, Froyd and Bennett 2006, Tipping *et al.* 2006), but has all too frequently been used as little more than a millennial-scale prelude to the discussion of current issues, with little interaction between the two. However, interdisciplinary studies such as this show that the past can provide contributions which are of direct relevance to the present.

Conclusions

We are not suggesting that the past provides solutions to these questions, but an appreciation of historical legacies can lend to the debate about these issues. Bearing in mind the issues we have raised, the following are questions that all involved in biodiversity, conservation and agriculture in the uplands should be aware of:

At a strategic scale:

- Why is effort/money directed at certain habitats?
- Why do we value certain vegetation development stages above others?
- What was the role of humans in developing such habitats, and what might our role be in maintaining them?
- What are we aiming to 'sustain' in so-called wild landscapes?

At a management scale:

- What habitats are possible in any one area, why choose one over others?
- Is there an argument to intensify human impact in places?
- Is there an argument to change the types of impact in places?
- What spatial scales (grain size) are appropriate for management: landscape, landform or habitat scale? Past cultural diversity operated at much finer spatial scales than landscape approaches and frequently also at finer scales than current management is carried out, whether for agriculture or conservation.
- Goals or targets imply a static endpoint, yet change has been a characteristic of all habitats. We need to build in options for future change and monitoring via strategic planning.

We suggest that no single value-based criterion is sufficient for establishing conservation plans: different criteria often lead to different answers, depending on the choice of measure and values held by individuals. Perhaps we should view the uplands with a fresh eye, looking beyond simple species richness to include measures such as how threatened they are, habitat diversity, cultural diversity, management diversity, heterogeneity at different spatial and temporal scales, as well as incorporating a greater historical appreciation and understanding.

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