Wild Berwyn or Coy Nature Reserve: A Changing Landscape

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Abstract

The approach taken to conservation of natural and semi-natural habitats is determined by many often conflicting demands. These conflicts often originate with fundamentally different perceptions of environment. Upland heather moorland is commonly perceived as one of Britain's few remaining (semi) natural habitats. In Wales these areas are under particular pressure due to multiple land use demands. This paper uses the conservation issues associated with the Berwyn Mountains in Mid-Wales, UK as an example of the potential conflict between "culturally" and "scientifically" based perceptions which drive conservation policies intended to preserve and maintain these habitats. The need for a multidisciplinary approach is emphasised and the central role of environmental education in protecting against exclusivity between disciplines is presented.

Résumé

L'approche qui préside à la conservation des milieux naturels et semi-naturels obéit à plusieurs besoins, souvent contradictoires. Ces contradictions sont souvent imputables à des conceptions de l'environnement foncièrement différentes les unes des autres. Les plateaux de bruyère du moorland sont communément perçus comme un des rares milieux semi-naturels qui subsistent à ce jour en Grande-Bretagne. Au pays de Galles, ces zones sont particulièrement menacées en raison des nombreuses demandes d'exploitation des sols. Le présent article se sert des questions liées à la conservation des monts Berwyn du centre du pays de Galles pour illustrer le conflit potentiel entre deux optiques, l'une culturelle et l'autre scientifique, à l'origine des politiques de conservation de ces milieux. L'article souligne le besoin d'adopter à cet égard une approche multidisciplinaire et attribue à l'éducation en environnement un rôle primordial dans la prévention du clivage interdisciplinaire.

Many western, developed countries perceive their wild or semi-natural areas as an essential part of their national identity and cultural heritage. Perceptions of environment therefore have a strong influence on which aspects of wilderness are preserved and how wilderness itself is defined by the individual. These perceptions may be inherited as a set of values which guides members of a community in their day to day relationship with their environment, as in the

case of those who derive their livelihoods directly from the natural environment. In such a case the individual's perception of the natural environment is largely subjective, being strongly influenced and informed by personal experience. Alternatively, perceptions of environment may originate from outside personal experience usually through the medium of the educational system. In this case knowledge of the natural environment is derived from a broad range of sources which to a large extent results in objective perceptions of environment. Under these conditions there is a risk of the environment becoming merely an object of study or the focus of exercises in resource utilization. It is important therefore, for environmental education to value a synthesis of the experiences gained from both these sources and promote a holistic approach to environmental awareness.

Currently, environmental education can be associated with two distinct viewpoints of the natural world:

- one which identifies itself with philosophical/metaphysical perspectives on environment which, for the purposes of this paper are defined as 'culturally orientated', in contrast to
- those more mechanistically orientated viewpoints which are identified with the science of the environment perhaps, more appropriately defined as *the environmental sciences*.

The effect of this can be to promote a polarised understanding of the natural world, where science and environmental education are viewed as belonging to separate conceptual frameworks. In an era where conservation and environmental management are largely informed by the environmental and biological sciences it is important to recognise the essential and equally important contribution that the each of these approaches can make to environmental management and conservation. Unfortunately, more often than not, one approach resists the other, demonstrating an underlying mutual distrust. Nabahn & St.Antoine (1993) provide a useful exploration of these intolerances (between Western science and orally transmitted first hand experience) albeit, that the author feels that they should be recognised as being depressingly mutual. In the developed world two significant attitudes towards wilderness and naturalness characterize this duality. The first is characterized by a need to sanitize nature and reduce the potential threat with which wildness or nature is often associated. In contrast with this is the viewpoint which rejects the predictability of our managed environment and desires a return to wildness, and "naturalness." These are of course extreme positions, cited as poles which define a spectrum of stances, with more moderate attitudes lying somewhere in between. Rosenstand (1998) also identifies this polarity, contrasting the 18th century British philosopher David Hume's (1957) characterisation of wilderness as, "defiling an otherwise pastoral idyll with briars and brambles, affording shelter to

wolves and serpents . . .” with Rousseau’s (1954) more Romantic need to be awed by, “. . . torrents, rocks and abysses beside me to make me afraid.” These contrasting views of the natural world have their present day analogues. On the one hand there is the conviction that vast stores of essential natural resources are “locked up” in our remaining nature reserves and wildernesses and that this is their true value. Conversely, their true value may be perceived as being places of environmental and spiritual renewal, the abuse of which may have irretrievable consequences in terms of the long term viability of global ecosystems. The point of view adopted by the individual can be greatly affected by priorities fostered at an early age by educational experiences. The promotion of life long learning within the educational framework extends the influence of these experiences well into mature adulthood. It is therefore important that environmental education gives equal consideration to the relative merits of both the “cultural” and “scientific” approaches (*sensu* this paper, see above) to environmental awareness.

Frequently, environmental issues and environmental management strategies are defined by directives and recommendations which originate from a global or federal centre which is remote to the specific geographies or cultural considerations of target areas. This has the effect of externalising the environment and removing ourselves from it (Ingold, 2000). The extent to which we view ourselves as an integral part of our immediate surroundings or, view the environment as an external construct (and thus, as something to be manipulated and utilized for its material wealth) is an important consideration for environmental education and environmental management at all levels. This paper considers environmental management in terms of the conservation of wild and semi-natural areas in a broad sense as they relate to the developed world drawing upon studies of the conservation strategies applied to upland heather moorland in the Berwyn Mountains in Mid-Wales, UK (Johnston, 1998). These studies are used to illustrate the need for collaboration between the two approaches to conservation environmental education outlined above.

Conservation of Wilderness and Semi-Natural Areas

From a Western European perspective, true wilderness was lost centuries before the discovery of the “new world” wildernesses which are more accurately defined by this term. In Britain no landscape categories are defined as being wilderness and upland heather moorland (see below) comes closest to what might be defined as a wild landscape. Thus this paper addresses the management and conservation of “wilderness-like” habitats as they relate to the developed and urbanized world. Conservation and management strategies applied to upland heather moorland in Mid-Wales (and elsewhere in the UK) demonstrate the need for management plans to take into account both cultural

and scientific perspectives in their operations. In these and similar contexts environmental education has an important role in providing a foundation for informed debate about the economic, scientific, and ethical considerations which surround such activities.

Properties of the Upland: Moorland Habitat

In the absence of applying specialised vegetation classifications, definitions of the term "moorland" are vague; however, the term may be taken to refer to an upland landform of low relief. In the present context the term "upland" refers to those regions lying above the limit of enclosed cultivation, (*sensu*, Thompson & Brown, 1992). Although this distinction varies with latitude and altitude, these uplands can be sub-divided into two biogeographical areas: a montane zone—that area above the climatic tree line and a sub-montane zone extending below this down to the limits of enclosed agriculture. Originally the majority of mainland Britain was dominated by woodland as far as the upper limits of the tree line. Most of these upland areas now consist of heather-dominated moorland, recognizable as a closed canopy of mainly ericoid, dwarf shrub communities. Of these *Calluna vulgaris* is frequently the dominant species (Gimingham, 1995). The majority of the vegetation in these habitats is in a successional stage (Clements, 1916,1928; Gleason 1927) and without management there would be a progressive transformation into rough grassland and woodland scrub. These habitats are also under threat from the pressures of multiple land use demands such as hill farming, leisure and recreation, and plantation forestry. Management is essential for their continued survival but must also cater for these conflicting land use priorities. Due to these conflicts many management strategies are unbalanced and fail to answer all of these various demands. In this sense a multidisciplinary approach where scientific method supports and is supported by cultural and sociological considerations is essential. The Berwyn Nature Conservancy Review site in Mid-Wales, UK (O.S. Sheet 125, 1:50000: SH 985245) provides a useful example which illustrates the necessity of an interdisciplinary approach towards this kind of management. Although not the largest of its kind (6,500 ha) this region is typical of most of Britain's upland moorlands. These moors are enclosed by plantation forestry and improved grassland. Hill farming and tourism provide the main sources of revenue. These are treeless landscapes which are taken by many to be "natural" when in fact, the Berwyn NCR is very much a landscape shaped by people. Nevertheless, an illusion of wilderness and naturalness persists in these habitats. The management strategies employed to prevent their gradual loss to succession and changing land uses have been the subject of recent vegetation studies which have noted the need for a multidisciplinary approach to be adopted in order to achieve these goals (Johnston, 1998; Thomas & Johnston, 1998).

The Cultural Perspective

The vegetation typical of upland moorland habitats is thought to have arisen spontaneously in the wake of woodland clearance; however, their continued existence has been due to the prevention of woodland regeneration by domestic grazing and the active conservation of *Calluna vulgaris* (common heather) for fodder, thatching and cladding, for dyes and the making of honey (Pearsall, 1971; Gimingham & De Smidt, 1983). In this sense these are cultural environments with their origins in subsistence agriculture. As such their nature has influenced and been influenced by the people whose homes they were. In the Victorian era many were valued as game estates for red grouse and red deer. However, in recent years cultural influences on moorland management in Britain have changed to the extent that their greater value is as a resource for many leisure and recreation pursuits in the form of outdoor sports instead of as dynamic environments where people live out their lives and work. An indication of present day expectations of this environment can be gained from Mackay's survey of public perceptions of heather moorland (Mackay, 1995). In response to the question: *What words do you associate with heather moorland?* Table 1 summarizes the responses from 46 street interviews in Perth, Scotland. (A similar survey specific to the Berwyn NCR in undergoing analysis at the time of publication).

The responses cited here are not presented as statistically objective findings and are provided solely as anecdotal evidence of changing public perceptions of these habitats. Work in progress aims to identify their wider significance in relation to the Berwyn study area. However, initial impressions are that the data obtained from the Perth survey correspond in broad terms with those obtained from the 2001 Berwyn NCR survey.

Benign Features	Neutral	Averse Features
Freedom / away from it all	Wild / empty / solitude	Bleak / desolate / barren
Peaceful	Awesome	Lonely / deserted
Time to think	Timeless	Boring
In tune with nature / romantic	Empty	Bleak / hostile

Table 1. Responses to the question:
"What words to you associate with heather moorland?"

It would appear then that "culture of the land" has changed with the identities of the people who use it and this has had a great influence on the habitat. As recently as 60 years ago moorland management was associated with a way of life centred on improved grassland for grazing and a landscape mosaic suitable for large and small game species. These include red grouse, *Lagopus lagopus*, throughout UK uplands, and red deer, *Cervus elaphus scoticus*, limited in the main to the Scottish uplands. These habitats were largely developed by

and for the benefit of those people living on the land. Currently, these habitats are managed in such a way as to meet a demand for leisure and recreation which has geographically remote origins. Perceptions such as those identified in Table 1 drive many of the management strategies used in the conservation of these habitats (Thompson, MacDonald, Marsden, & Galbraith, 1995; Walker, pers. comm., Feb., 1996). The result of such management is the creation of a habitat which attempts to accommodate these perceptions of wildness and naturalness. Consequently, this produces a synthetic ecosystem, ill-equipped to sustain itself. Ecologically authentic wilderness/natural ecosystems might be expected to be self-sustaining whereas, moorland in this heavily managed condition is a highly unstable habitat reliant on many artificial energy inputs to support its flora and fauna. An important issue therefore is whether these habitats can be managed in order to fulfil these new *cultural* demands without irreversibly depleting their long term viability as self-sustaining ecosystems (for interesting perspectives on this see Elliot, 1997). In natural and semi-natural habitats already under pressure in the "developed" regions of the world this approach clearly has its place, preserving some connection between urban populations and the natural world. However, the suitability of this approach is questionable when applied to untouched wilderness or remote ecosystems since inevitably this will lead to the debilitation and fragmentation of truly wild ecosystems. It is argued that the suitability of the management strategies being applied and the subsequent long term viability of the ecosystems being managed is of greater importance than the short term demands. For both these conditions to be fulfilled careful and exact monitoring of the outcomes of management is required. While [environmental] science may be accused (with some justification) of the mathematization of the natural environment (Abram, 1996) it is also capable of revealing underlying trends which are better understood sooner rather than later.

The Scientific Perspective

Cultural perspectives on environment and human relationships with it are most commonly and effectively studied by the philosopher/anthropologist (Cronon,1989; Næss, 1989; Abram, 1996; Ingold 2000. These are essential investigations, exploring understanding of our fundamental relationships with nature; however, the role of science is often marginalized in these approaches and sometimes even demonized. Much of this antipathy can be attributed to a confusion between science and the application of the technology which it has given rise to in order to maximize resource utilization. In this respect it is scientists and not science which must develop a conscience. The positive role of science in conservation studies is demonstrated by the Berwyn vegetation studies (Johnston, 1998). These studies revealed evidence that use of traditional management meth-

ods (such as burning) were capable of producing results counter to those aimed for. The results of these studies are summarised below.

Berwyn Vegetation Studies

It has been noted above that management is essential for the continued existence of *Calluna* dominated moorland. Senescent stands of *Calluna vulgaris* are easily out-competed by moorland grasses before younger plants re-establish dominance (Scandrett, 1991). For the past 300 years, management designed to prevent the competitive exclusion of *Calluna* by other moorland species has concentrated on the removal of senescent stands of the plant by burning the above ground stem and leaf parts. This produces vigorous regenerative growth from the unaffected stumps which is more resistant to competition. However, it has been found that the ash produced from burning produces a nutrient flush (nitrates and phosphates) which favours the dominance of moorland grasses. Recently on the Berwyn NCR, mowing has been used on sensitive tracts of land in order to avoid this and also to create a mosaic of differently aged stands more suitable as habitat for ground nesting moorland birds. Although the short term effects of such management appear to be favourable, in the longer term other influences become apparent. However, over time, increased nutrient supply from the decomposition of the litter produced by mowing has also been noted to favour the moorland grasses thus, defeating management aims (Johnston 1998). Too much grazing or burning moves moorland towards grassland whereas, too little allows woodland scrub to develop with both successional pathways leading to the loss of heather as the dominant species.

Long term vegetation studies suffer from the brevity of human life spans in comparison to the longevity of the vegetation being studied. It is easy therefore to assume that, in the short term, the goals of management have been achieved when in fact this is merely an intermediate stage. Numerical methods of data analysis were applied to vegetation data obtained from chronosequences on the Berwyn NCR spanning 25 years. Chronosequences are sites spatially separate but temporally sequential over a given time span and these can be used to identify long term changes in natural phenomena (in this case vegetation, succession) (Pickett, 1988). In the Berwyn studies, a series of differently aged sites representative of different management regimes (each containing 10 samples) allowed for a chronosequence to be used to infer temporal trends in vegetation pattern (Johnston, 1998). The vegetation data were associated with different management types using methods of numerical classification[1] (Two Way Indicator Species Analysis, Hill, 1979). These numerical methods provide a way of ordering multivariate data into a meaningful array which is not immediately apparent by visual or intuitive methods. The results of part of this study shown below in graphical form.

Berwyn Results

Figures 1 - 3 summarise the results of numerical classification of the intermediate section of the chronosequence (1990 - 1991) which was managed by burning in 1990, mowing with litter left in 1991, and mowing with litter removed in 1991. These show evidence of different floristic communities associated with different management types. Figure 1 shows that conditions produced by burning favour the growth of moorland grasses, limiting the extent of canopy cover by *Calluna* to 22.4%. Figure 2 shows evidence of a similarly favourable environment for moorland grasses and considerably more favourable conditions for moorland mosses (24.3%) than in burnt areas, created by management by mowing without removal of the litter produced.

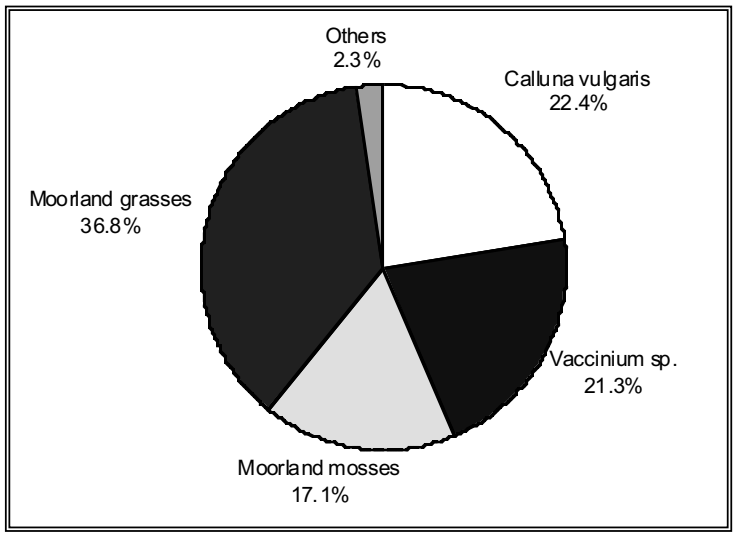

Figure 1. Percentage floristic composition of vegetation at chronosequence stages managed by burning 1990. (Age at date of survey 5 years).

Figure 3 shows that the most favourable management regime for *Calluna vulgaris* (common heather) is where mowing has been accompanied by the removal of the litter produced. Co-dominant species under burning and mowing with litter left regimes (Figs. 1 & 2) such as *Vaccinium sp.*, (bilberry) appear to be suppressed by the comparative success of *Calluna* (Fig. 3, 63.3%) when the litter is removed.

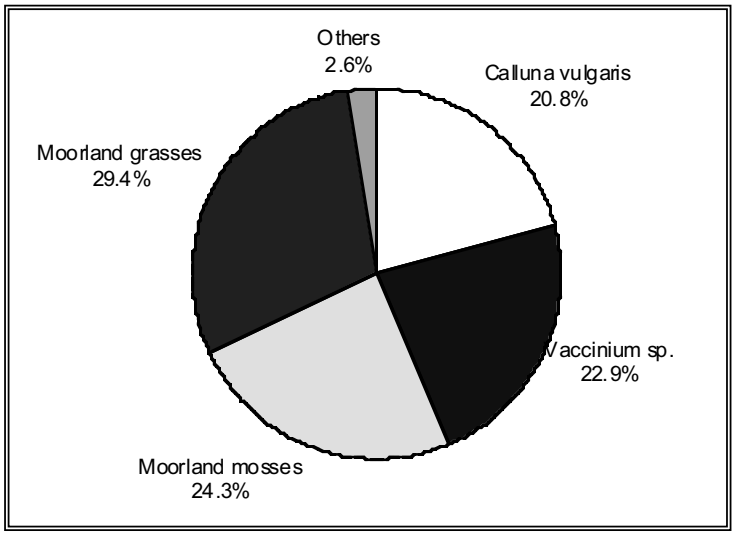

Figure 2. Percentage floristic composition of vegetation at chronosequence stages managed by mowing with litter removed 1991. (Age at date of survey 5 years).

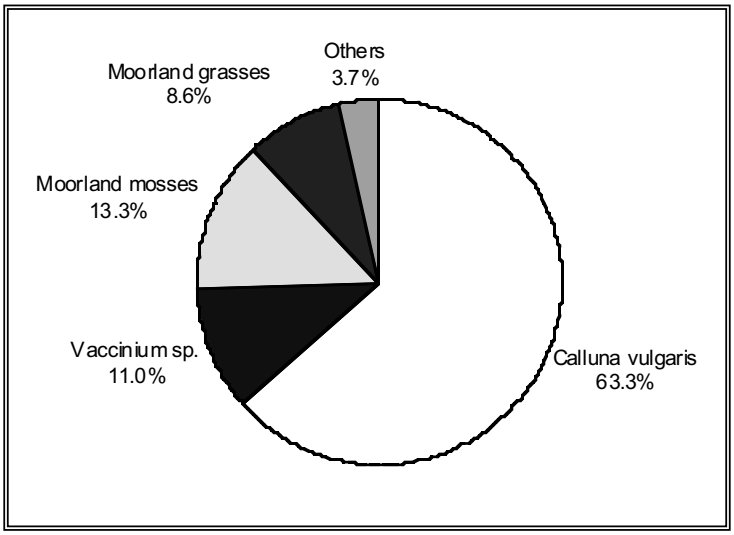

Figure 3. Percentage floristic composition of vegetation at chronosequence stages managed by mowing with litter removed 1991. (Age at date of survey 5 years).

Although the use of pie charts to illustrate these results is effective, numerical classification of the vegetation data allowed for specific floristic communities to be identified within a large data set. Subsequent analysis to determine the nutrient status of soil samples drawn from each management regime were numerically associated with floristic data using correspondence analysis.[2] These analyses revealed that fluxes in nutrient status associated with each management type were significantly related to these trends in vegetation pattern (Johnston, 1998). While these studies merit further discussion in their own right, their inclusion here is to demonstrate how numerical analyses and scientific method can be invaluable in revealing underlying trends which are not immediately apparent by other means.

Discussion

The case studies discussed above serve to highlight some of the problems which need to be addressed in the practice of conservation in general and wild-life habitat in particular. The first of these is an awareness of the many ways in which natural habitat is perceived and therefore defined. Traditional (usually culturally inspired) methods of land management are currently popular with conservation agencies but are not always the most suitable for (semi) natural habitat since these often originate from a need to exploit natural resources of one kind or another to their fullest. Rather, it should be the capacity of the managed ecosystem to be self-sustaining which advises the nature of management. In the case of the Berwyn NCR this is clearly not a true wilderness and it is currently managed to the point of extreme dependence on high management inputs. This tends to produce a landscape moulded by the influence of contemporary cultural perceptions of nature and wildness. Instead the cultural needs here are those which the surrounding urbanized environment cannot meet and thus these needs define the conservation priorities of the region.

The examples discussed above owe much to the experimental design and the analysis of numerical data and thus, scientific method. Scientific method relies upon hard evidence to produce an informed understanding of the long term goals and consequences of environmental management and yet many culturally orientated environmentalists forswear the value of such studies representing them as an unworthy or incomprehensible mathematization of the natural world. Equally, the scientifically orientated practitioners should be sensitive to the value of traditional attitudes towards environment which may reveal intuitive mechanisms for balanced resource utilization and environmental husbandry. In view of the polarised nature of perceptions of environment it is suggested that a necessary objective of environmental education should be the promotion of an interdisciplinary approach to environmental issues and conservation strategies which recognize relative strengths and weaknesses.

As well as fulfilling an important role in raising and maintaining environmental awareness in general it is proposed that environmental education has a important role to play in informing those strategies applied to the protection and conservation of natural and semi-developed natural areas. This outlook progresses environmental education beyond the younger sections of society and expands its influence into the domain of adult education and life-long learning. Biogeography, ecology, landscape ecology, environmental impact assessment, and many of the social sciences are quantitative in their approach and are effective tools for all those with an interest in environmental issues. Even a glancing knowledge of these provides an additional dimension to environmental care. With the exception of the Earth and Environmental sciences, discrete and well recognized subject areas in education do not as a general rule include environmental considerations in their curricula. Therefore, the responsibility lies with practitioners of environmental education to be discerning but also open-minded in their examination of disciplines in order to provide a broad base of understanding which can inform well balanced approaches towards environmental awareness and management.

In this context then, it seems appropriate that a major consideration of environmental educators should be to nurture such goals by embracing the sum of our perceptions, be they scientifically or culturally orientated. To do otherwise is to foster a climate of antipathy between cultural and scientific perceptions of the environment to the detriment of both.

1 Two Way Indicator Species Analysis is a method of numerical classification used for the description of multivariate data. As well as a numerical output it can be represented as a dendrogram defining specific communities. In this paper these outputs have been summarised using pie charts to provide the essential data only. Full results from the vegetation analyses are contained in Johnston, 1998.

2 Direct gradient analysis using Canonical Correspondence Analysis (ter Braak 1987) was used to integrate vegetation data and the results of the chemical analysis of soils to reveal underlying trends in vegetation succession on the Berwyn NCR which were associated with nutrient gradients and with different types of management. The results of the direct gradient analysis are not included since these were not considered germane to this paper.

Notes on Contributor

Ronald Johnston teaches undergraduate and post graduate courses at the University of Wales College Newport, UK. He is an associate researcher and PhD supervisor with the SCARAB (Study of Culture, Archaeology, Religions and

Biogeography) research centre at the same institute. His PhD is in Community (Plant) Ecology. His research in the fields of Environmental Science and Biogeography includes the plant/soil relationships of the heather moorland of the Berwyn Mountains in Mid-Wales and vegetation succession on oil-shale spoil heaps in Mid Lothian, Scotland. The importance of environmental education across all age groups has become an increasingly important element of this research. This article is based on paper which was presented at the 2001 EECOM conference held at Whitehorse College Yukon 2001 entitled "Wild Berwyn or coy nature reserve, can we preserve our wildernesses without taming them?"

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