

Response to Beinn Eighe National Nature Reserve Plan Consultation 2009
(http://www.nnr-scotland.org/managing_detail.asp?NNRId=15)

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Overview

This response to the NNR Plan Consultation focuses on two areas of opportunity: (1) the need to develop a clearer understanding of past and present processes which affect ecosystems and biological productivity at Beinn Eighe NNR; and (2) the need to restore higher ecosystem fertility within the reserve, focusing on increasing the natural availability of life-limiting nutrients, primarily phosphorus [P], for the benefit of wildlife populations and people living within the surrounding area.

Beinn Eighe NNR is ideally placed to make an important contribution to national and international efforts aimed at developing and demonstrating ways of reversing ecosystem-degradation processes currently progressing at alarming rates in many other parts of the world. This is a challenge which SNH should invest in: levels of natural productivity over much of Scotland could be, and should, be much higher.

Figure 1: Naturally fertilised 'green knoll' on Beinn Eighe NNR at NGR 201150 862000 approx, March 2007; used by ravens, raptors, pine martens . . . ?



1. Context

1.1 Thank you for the opportunity to comment on 'The Proposals for Beinn Eighe National Nature Reserve 2009-2015'. I work as biologist for Wester Ross Fisheries Trust (www.wrft.org.uk). The purpose of the Trust is '*to maximise and sustain the productivity of wild salmonid fisheries in the rivers and lochs of Wester Ross.*' This submission expresses my personal views which are not necessarily those of Wester Ross Fisheries Trust.

1.2 I am also a 'fledgling' crofter. Although I do not keep animals, I'm particularly interested in the management and productivity of croftland. I've learnt a bit about the history of livestock in Wester Ross. A key issue is the management of fertility. There is growing recognition that there are no entirely 'natural' landscapes in Scotland; uplands have been denuded by grazing animals, and soils degraded affecting livestock production, wildlife populations and wild fish populations.

1.3 Beinn Eighe NNR is a valuable resource in the heart of the WRFT area. I have learnt much whilst exploring the reserve with friends and colleagues (including 'Gairloch Wildlife Group' walks) and have worked alongside NNR staff and SNH volunteers [many of whom have helped with fish survey work; on behalf of WRFT, thank you for support!]

1.4 The two documents are well written and well presented. I welcome and largely support all the proposals.

1.5 However, in addition, Beinn Eighe NNR is also ideally placed to develop and demonstrate management measures needed to restore the ecosystem processes and ultimately the life-support systems upon which people also depend. This is a big challenge. Beinn Eighe NNR, in closer partnership with neighbouring estates and research & education institutions (?Macaulay Institute; ?University of Highlands and Islands) provides opportunities for developing a work programme of local, regional, and, in-keeping with European Diploma and 'Biosphere Reserve' status, of international relevance and vital importance.

1.6 This response focuses on two areas of opportunity:

1. The development of a clearer understanding of how ecosystems operate at Beinn Eighe NNR: what is 'natural' and what is the product of human intervention?
2. The restoration of higher ecosystem fertility: for healthier soils, higher natural productivity, more wildlife and richer biodiversity.

2. Ecosystem development at Beinn Eighe NNR: a 'natural' heritage?

2.1 I'd like to see a clearer expression and explanation of the origin and 'naturalness' of habitats on the reserve and the 'trophic' links between them. The bigger picture, the ecological context of Beinn Eighe NNR within Wester Ross and the rest of the world is not clear. Having been to the Open Meeting in Kinlochewe Village Hall on 15 September 2009, a case could be made that SNH are perpetuating the myth that Beinn Eighe NNR is largely a 'natural' rather than a 'cultural' landscape. The historic role of man in shaping and determining 'nature' at Beinn Eighe NNR needs to be more explicitly acknowledged and remains fundamental to future management.

Please visit <http://www.wrft.org.uk/habitats/home.cfm> for related background information.

2.2 Growth, carrying capacity and production of almost all plants and animals at Beinn Eighe are limited by the availability of phosphorus. Over past millennia, the ecological processes which sustain fertility (at macro and micro scales) were disrupted by the following:

- **Phase 1: Forest clearance by man.** This is widely acknowledged in SNH reports and elsewhere. As in other 'rainforest' areas, loss of vegetation cover leads to loss of fertility as key nutrients, especially phosphorus, are leached or eroded from soils.
- **Phase 2: Loss of Wolf and Brown Bear.** The role of wolves in controlling populations of large herbivores is also well documented. More recently, studies at Yellowstone National Park have highlighted wider ecosystem benefits from the reintroduction of wolves, as a consequence of changes in patterns of grazing. However, the role of large predators as redistributors and recyclers of life-limiting nutrients, specifically phosphorus which becomes concentrated in the bones of large herbivores, remains poorly researched. Wolves, bears, and other large predators of herbivores ingest and recycle bone, maintaining nutrient cycles. To what extent do large carnivores play a vital role in maintaining soil fertility?
- **Phase 3: Export of nutrients associated with heavy grazing by livestock and burning.** From the mid 19th century, much of upland Scotland was heavily grazed: cattle and sheep were reared in upland pastures; nutrients were lost with the export of carcasses outwith the system. How much of the available nutrient (phosphorus) was cropped from Beinn Eighe? How much nutrient continues to be lost from other areas where sheep, cattle and deer are grazed (kg per ha per year)?

2.3 In the global context, ecosystem degradation continues with loss of forest cover, loss of large carnivores, overgrazing of cleared land, loss of fertility and falling production (e.g. SE Asia, sub-Saharan Africa, Amazonia . . .). One of mankind's greatest challenges is to reverse the destructive processes which people in Scotland 'pioneered' from 2,000++ years ago.

2.4 Opportunities for ecosystem studies at Beinn Eighe:

1. **Develop a clearer understanding of phosphorus transfer and availability.** Where are the nutrient 'hot spots'? Study and map the 'green knolls' where extant animals defecate and deposit animal remains. In terms of biodiversity, these may be some of the 'richer' mini-habitats within the NNR. They can be found on prominent places: there are many good examples not far from the Pony Path. What animals use them? What plants and animals do they support?
2. **Model nutrient pathways at Beinn Eighe, present and past.** This requires an improved understanding of the way in which nutrients are cycled and transferred within a landscape by herbivores, predators and scavengers, and knowledge from other parts of the world where large carnivores are still present at 'natural' population densities in the wild (?North America). What are the differences between now and then? How would this affect overall levels of soil and ecosystem fertility?
3. **Revisit fertilised plots.** In the 1950s & 60s, Donald McVean demonstrated that the primary nutrient limiting growth of plants including tree seedlings on the peaty soils of Beinn Eighe NNR is phosphorus (P). What animals and plants are now found in areas that were fertilised back then? To what extent have these plots become 'naturalised'? To what extent do they resemble the green knolls?

Figure 2: One of Donald McVean's plots fertilised in the ?1950s by the Pony Path at NGR 200500 862100 approx, March 2007.



3. Can 'ecosystem fertility' be restored at Beinn Eighe NNR?

3.1 Over the years since the reserve was established, opinions have diverged regarding the best ways to restore 'natural woodlands' at Beinn Eighe (Laughton-Johnston and Balharry, 2001). The 'what is natural?' debate is far from concluded, the 'ecosystem fertility' debate in its early days! Until trophic pathways associated with large carnivores are more clearly understood, it is not possible to be precisely prescriptive about how to go about this in a way which mimics what is (or was) 'natural'.

3.2 From a background of palaeoecology, I envisage a range of 'natural' states in the development of soil, plant and animal associations at Beinn Eighe at different points in time following the last period of glaciation. I suspect that man has always had some degree of influence on 'ecological integrity' even though local evidence may be lacking.

3.3 Reserve managers have a choice. At one end of the continuum there is a 'natural' state of freshly exposed rock surfaces and glacial deposits prior to colonisation by plants and animals, and the development of vegetation cover. Large areas of Beinn Eighe NNR and surrounding upland areas have no soil or vegetation cover, and thus currently look little different from when the ice retreated.

3.4 At the other end of the continuum there is a 'natural' state following centuries of ecological succession, where vegetation, including upland heaths, scrub forest and pine woodlands have become established, together with associated soils and fauna. In Alaska, Milner *et al* 2000 documented how life becomes established following the retreat of glaciers; in some systems salmon provided key nutrients of marine origin which (via bears and wolves) fertilise riparian areas becoming incorporated throughout terrestrial biota.

3.5 Salmon and sea trout still spawn in the streams which run off Beinn Eighe NNR. However, populations are much reduced: we can only speculate on levels of marine nutrient transfer in earlier millennia. Could the NNR ecological management unit be extended to the river banks (Kinlochewe River / A'Ghairbhe) and Loch Maree?

3.6 Which 'natural' state is best?

- Current management proposals will perpetuate a landscape where soil and vegetation is patchy or absent from very large parts of the reserve, and where large parts of the Beinn itself remain denuded. The culling of deer may help to reduce rates of nutrient loss, though in itself will put back nothing in terms of fertility. Many 'keystone species' (salmon, wolves and bears) are either absent or, for wild salmon, present at much reduced population levels. Therefore, the proposed management policy, without a clear focus on fertility restoration, will maintain the reserve in a barren, culturally oligotrophied state.
- Alternatively, the reserve could be managed more clearly to show how a landscape which has suffered ecological devastation by man over millennia can be actively managed to support higher 'natural' productivity, higher biodiversity, and larger populations of wildlife (including iconic birds and mammals).

4. Restoring fertility and wildlife populations at Beinn Eighe NNR

4.1 Learning from the work of McVean, a programme of patch fertilisation to revive and restore soils, vegetation cover and animal populations is one way forward. Such a programme, guided and modified as the understanding of related ecosystem processes becomes clearer, would aim to develop a mosaic of habitat areas of varied fertility, mimicking natural mosaics.

4.2 A programme of 'before–after' monitoring to include vegetation cover, soil fauna, and higher animals (e.g. grouse, hares, eagles . . .) could be developed. This could provide exciting 'project' opportunities for participants of all ages. Such a programme would complement other initiatives to extend understanding and awareness.

4.3 A fertility (biodiversity and wildlife) restoration programme would complement the other main 'Natural Heritage Management' proposals outlined in the Proposals document.

4.4 Such a programme would be of greater interest and value to managers of surrounding lands; and could have relevance at the global scale. Concerns may be expressed by 'specialists' for some species that are only found in the most oligotrophic areas. Such concerns could be addressed by a programme of parallel research to establish 'nutrient' boundaries for different habitats, perhaps following a reappraisal of some as to whether they are really 'natural' habitats or simply unusual habitats that owe their origin to interventions by man (as outlined in 2.2 above). The restored Baile Mor woodland WGS scheme (Gairloch Estate) also provides opportunities for assessing ecological impacts of fertiliser application.

4.5 For those within SNH whose knowledge of the consequences of fertiliser application is largely based on eutrophied agricultural or urban areas, please note that there are differences in rates and methods of nutrient application for different purposes!

4.6 The precautionary principle can be taken too far if based on ignorance or fear. To an outsider, it's easy to see how 'not interfering' appears to be the SNH fallback position where consequences are not precisely understood, perhaps especially where there are possible career risks for individuals involved!

4.7 Rather than being seen as (at best) an irrelevance by neighbouring landowners, Beinn Eighe NNR could generate greater interest and support from land managers across a large part of the area, and in the context of river catchment management, fisheries managers. This would improve prospects of maintaining and progressing 'Biosphere Reserve' status and extending better (?best) land management practices more widely. In terms of 'natural' assets, Scotland 'PLC' would be a much wealthier place.

4.8 I would welcome any opportunity to participate further should proposals along the lines of those outlined above be considered for inclusion in subsequent action plans and management practices at Beinn Eighe NNR. Good luck!.

Yours sincerely,

Peter Cunningham

References:

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