Refertilising Wester Ross 7th – 9th April 2016 Meeting Report

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With in-kind support from:

This three-day meeting addressed the issue of sustaining the fertility and productivity of the land and freshwaters in Wester Ross. Much of the area covered by the WRFT is underlain by hard, unyielding metamorphic and sedimentary rocks, and is naturally 'oligotrophic': biological production (including that of agriculture, wildlife and fish) is limited by the availability of nutrient, particularly that of phosphorus (P).

The meeting addressed two main questions:

1. *To what extent have human impacts associated with land use affected the fertility of the area?*
2. *Are there opportunities for actions to better manage and restore fertility?*

This report provides a brief summary of the meeting.

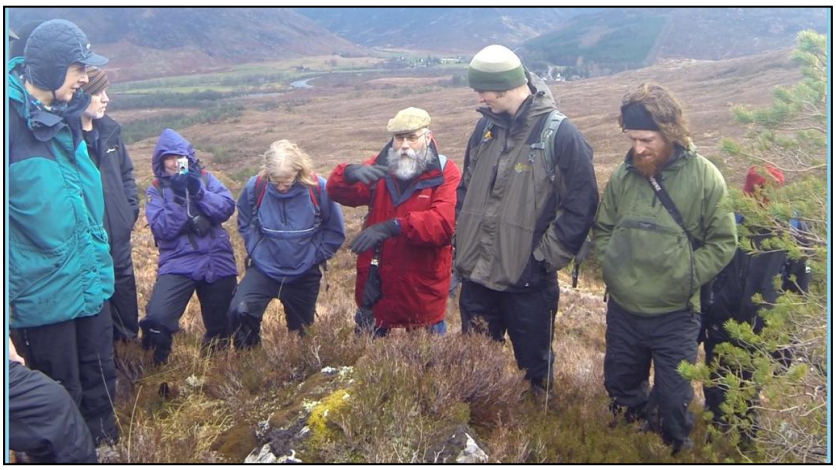
Thursday 7th April 2016: Field trip to Beinn Eighe NNR and Glen Torridon

A more detailed report from this field trip can be found on the WRFT website at: http://www.wrft.org.uk/files/Report%20%20Refertilising%20Wester%20Ross%20Field%20Trip%207th%20April%202016%20for%20webv1.pdf

NNR manager **Peter Duncan** welcomed everyone, outlined long-term NNR management objectives, and summarised progress. Then, after a group photo *(right),* we set off on foot to explore the ground by the side of the Pony Path to the west of the Visitor Centre. Soils underlain by glacial deposits derived from Cambrian quartzite are particularly infertile in this area. The vegetation is generally patchy. Many small pine trees are stunted; Kenneth Knott (FCS) explained how they adapt to nutrient stress.

Group photo by Beinn Eighe NNR Visitor Centre [left to right]: Seamus MacNally (NTS), Scott Newey (The James Hutton Institute), John Holland (SRUC), Patricia Sturrock, Keith Dunbar, Charlie Hill (Beinn Damph Estate), Don O' Driscoll (JMT), Nick Benge, Prof Davy McCracken (SRUC), Dr James Merryweather (SLEF), Ro Scott, Anne Harnden, Roger Harnden, Richard Clarke, David Holmes, Sheila Dunbar, Doug Bartholomew (SNH), Mary Gibson (SNH), Les Bates, Kenneth Knott [hat] (FCS), Diane Gilbert, Peter Duncan (SNH), Donnie Chisholm, Jeremy Fenton, Iona McWhinney, Findlay McWhinney, Jess McWhinney. Also present were Rob Dewar (NTS), and Tom Forrest (WREN).

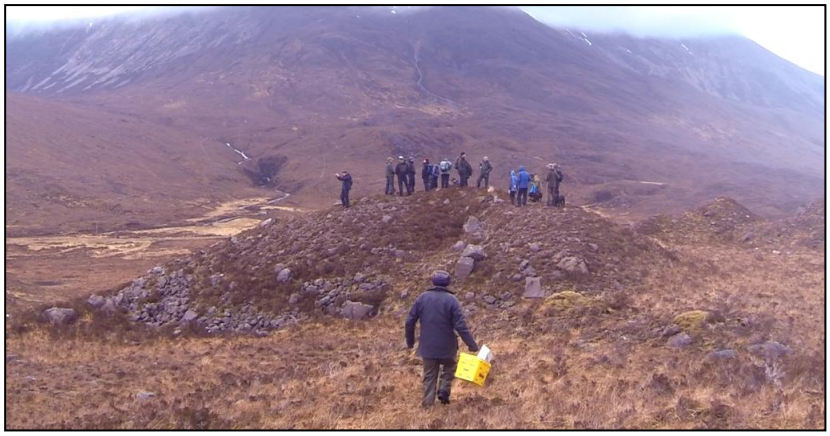
We looked at the hummocks where soils and vegetation tends to be thicker. Plants such as blaeberry and bearberry were found together with mosses, lichens and bushier heather. We considered the extent to which bird and animal droppings affect the fertility of these 'green knolls'; and what this tells us in terms of understanding the fertility of the whole nature reserve. To what extend have wildfires (before the NNR was designated), grazing pressure and continued export of deer carcasses from the reserve depleted the fertility of the area?



Dr James Merryweather explaining why mycorrhiza are so important.

After lunch at the SNH Anancaun Field station / by Kinlochewe, we met at the car park in Glen Torridon opposite Loch an Iasgair at just after 2:30pm. We discussed moor burning, and whether or not it was beneficial as a management tool in this area. To the contrary, it was suggested that frequent burning can damage heather which may be replaced by less palatable grasses, with an overall decline in fertility.

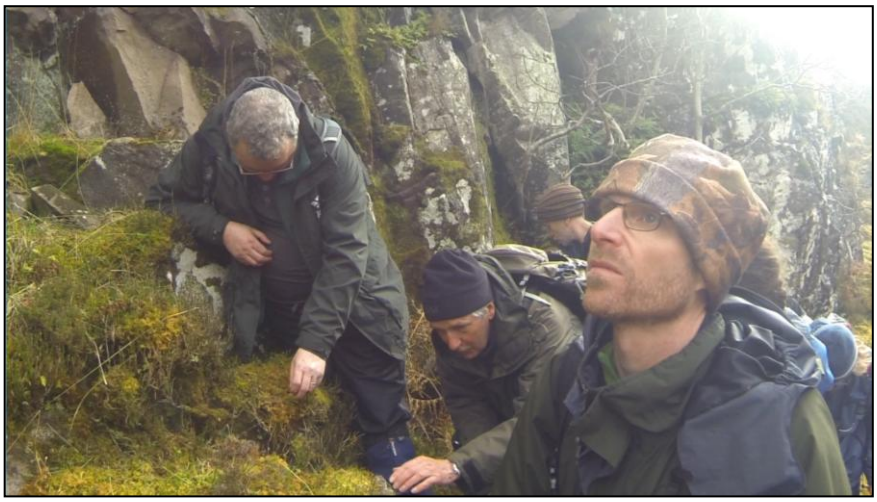
Some suggested that agricultural advice (e.g. the Scottish Government's muirburn code) was inappropriate or unworkable in the west coast situation. Prof Davy McCracken reminded everyone that the same difficult issues regarding burning are met with in many other parts of the world.



From this hummock we looked west over Loch an Iasgair and down the Torridon River valley.

From the road bridge, we looked towards an unsuccessful woodland scheme in a gorge further upstream, then investigated soils a by a ruined cottage where black-headed earthworms were found.

We followed a footpath over a sea trout spawning stream, climbed onto a ridge (glacial moraine primarily composed of Torridonian sandstone) finding signs of pine marten and mice on / in vegetation on a hummock; then descended to looked at the trees (aspen, birch, holly & rowan) and associated flora growing on a crag out of reach of grazing animals and fire. We also noted that there was a small birch tree growing on the island in a lochan as we passed.



Examining vegetation below crag with isolated 'woodland'.

Please click here or on the link at top of this report for a more detailed report from this field excursion.

Friday 8th April 2016: Refertilising Wester Ross Workshop, Gairloch Community Hall

The meeting was attended by over 40 people including representatives of a range of government and non-government organisations, independent ecologists, land managers, farmers and crofters, and wildlife enthusiasts from near and far.

Chairman **Prof Dave Barclay** welcomed everyone, then **Peter Cunningham** presented an introduction to fertility in Wester Ross. Peter outlined how in areas where underlying bedrocks are unyielding, fertility is largely dependent on ecosystem processes. Peter explained how phosphorus is a limiting nutrient, and introduced the concept of 'ecosystem fertility' where nutrients are recycled through biota above and below the ground. Human impacts (extinction of top predators, deforestation, fire, overgrazing, changes in human settlement and sanitation) had greatly altered the ecology of Wester Ross, greatly affecting the processes responsible for the mosaic of fertility we see within the landscape today. There is a need to develop appropriate strategies for 'ecological refertilisation' to raise levels of productivity of wildlife (including deer and fish), livestock and to enhance biodiversity. Higher biological productivity would also help to support livelihoods especially in fragile crofting communities. Peter's presentation can be found on the WRFT website at: http://www.wrft.org.uk/files/RefertilisingWesterRoss8Apr2016forweb.pdf

Dr James Merryweather (SLEF) focussed on the importance of understanding mycorrhiza. Almost all higher plants depend upon mycorrhiza (fungus + root) networks to obtain phosphorus to sustain growth. In return, plants provide carbohydrate to nourish the underground networks of mycorrhizal fungi. Ploughing, upheaval, and / or application of fertilizer can destroy mycorrhiza. There are very many different kinds of mycorrhiza. Trees grow much better if they are planted where appropriate mycorrhizal fungi are already present within the soil, than if they are planted far from mycorrhizal fungal sources; hence one reason for the contrasting outcome of woodland schemes. James's presentation can be found at: http://www.wrft.org.uk/files/James%20Merryweather%20Refertilising%20Wester%20Ross%20v2.pdf

Dr Scott Newey (The James Hutton Institute) provided an overview of some of the results of deer carcass placement trials. The practice of leaving deer carcasses on the hill is controversial; some favoured the practice as a means of providing food for wildlife and ensuring nutrient cycles are not broken; others felt it was inappropriate for ethical and land management reasons. Carcasses placed in areas where predator control was practiced tended to take a lot longer to decompose than carcasses placed in areas where there was little predator control. Using trap cameras (and many volunteers to sort through over 2 million photos!) a wide range of animals was recorded scavenging carcasses. Patterns of nitrogen enrichment around carcasses were described. Scott's presentation can be found at: http://www.wrft.org.uk/files/ScottNewey_v5.pdf

Dr Adam Smith (GWCT) summarised a study which invetigated the relationship between red grouse production and heather quality. The red grouse bag from a moor near Ralia (near A9) declined from over 2000 birds in the 1920s to zero by the mid 1990s. After considering other explanations, attention focussed on the positive correlation between spring grouse abundance and phosphorus content of heather. Other studies showed that red grouse are able to select heather of higher nutritional content. An experiment to investigate the outcome of fertilising grouse moor with NPK was carried out; this demonstrated that chick production could be increased where the nutritional quality of heather was higher as a result of the improved condition of the mother grouse (and her eggs). However GWCT does not advise using fertiliser on grouse moors, as fertilised heather moorland can be replaced by grassland; and high nitrogen levels were associated increased damage to heather associated by the heather beetle. Adam's presentation can be found at: http://www.wrft.org.uk/files/Wild%20Grouse%20Chase.pdf

Simon McKelvey (Cromarty FT) explained how Atlantic Salmon deliver marine nutrients to headwater streams in upland areas. Most salmon die after spawning and their carcasses provide a source of food for associated wildlife.

The decline in salmon runs and loss of trees from headwater areas has led to a nutrient deficit. Earlier studies had demonstrated that placement of salmon carcasses in salmon nursery streams (to mimic natural process) contributed to production of higher numbers of juvenile salmon. However salmon carcasses are difficult to obtain in the quantities required for practical management purposes, and are not pleasant to work with! Instead, trials in collaboration with Glasgow University using specially formulated 'salmon carcass analogue' pellets are about to commence, adapting a methodology devised in North America. It is important to protect and restore riparian woodlands, as in addition to many other benefits for fish and other wildlife, trees and woody debris help to snag and retain salmon carcasses in nursery streams. Simon's presentation can be found at: http://www.wrft.org.uk/files/Salmon%20and%20the%20Marine%20Nutrient%20Pump.pdf

Prof Davy McCracken (SRUC) explained how much could be gained in terms of safeguarding agriculture, wildlife populations and rural communities in upland areas by combining different land management objectives and policy. The majority of agricultural land in Scotland is non-arable. Very little is known about what happens in common grazing areas, despite their importance to the long-term viability of farming. Many of the indicators for the health and productivity of upland areas have been in decline, including agricultural output, ground nesting birds, native woodland. To secure viable economic units, support payments should focus more on the development of management where agriculture, sporting interests and wildlife conservation ('high nature value' systems) were integrated. Financial support systems should be geared much more to addressing these issues. For political reasons, it has been difficult for incentive payments to change in ways that will bring about the most useful long-term benefits. Davy's presentation can be found at: http://www.wrft.org.uk/files/McCracken%20Uplands%20April%202016.pdf

Workshop session

After an entertaining play about how soil was brought by boat from Germany to Dry Island (by Badachro) in the past, by Iona McWhinney, her mum Jess and little brother Findlay (age <1), the meeting split up into 3 discussion groups.

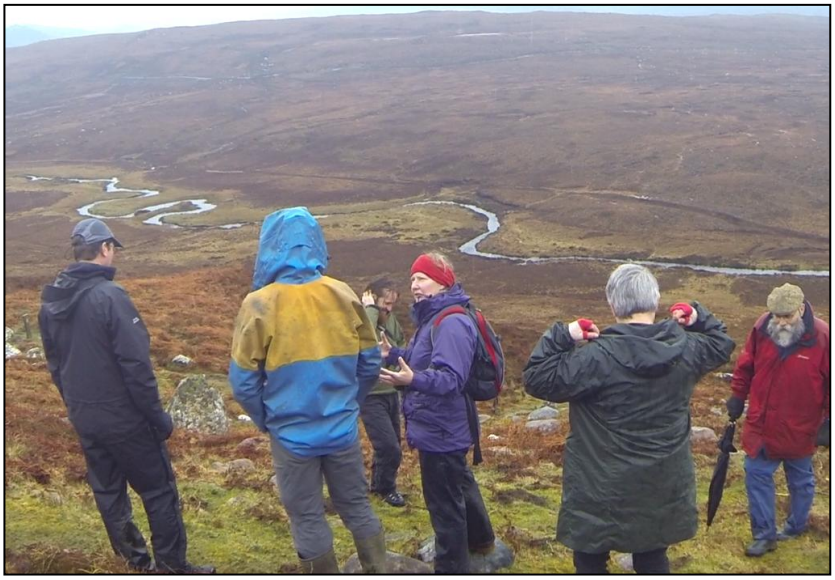
The practicality of **leaving carcasses on hill** to recycle nutrients depended on land management objectives; there were mixed views. Diverse views were also expressed regarding the desirability of establishing **riparian woodlands** in areas which had not been wooded for thousands of years; and providing supplementary fertiliser. However, it was generally agreed by the third group that there is a need to change the **subsidy system** to provide greater support for active younger people and for a much wider range of services provided by crofting and other forms of upland land management than under the current system . . .

It was also generally agreed that there should be a greater emphasis on understanding and supporting natural nutrient recycling processes in upland areas, and addressing long-term nutrient deficits.

Prof Davy MacCracken summarises the main points from the workshop to discuss the need for changes to the rural subsidy system.

Saturday 9th April: Field trip to the Sands Archaeology Trail and 'the place of the oaks'

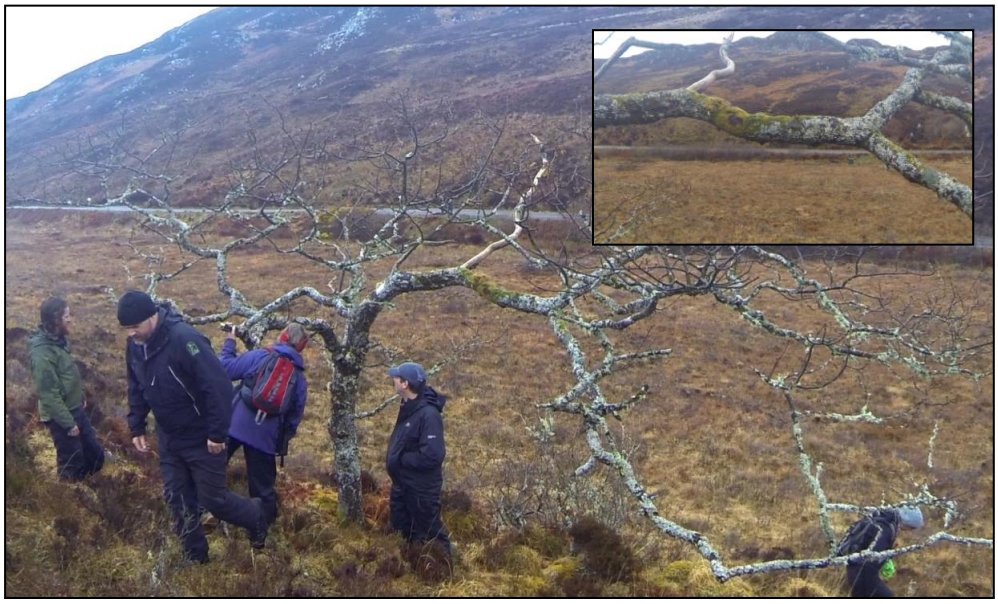
Local farmer James Cameron from Sands Caravan and Camping very kindly took time out from busy weekend duties to join us on this excursion. We gathered by the remains of an ancient roundhouse on the side of the hill above the Sand River *(below left).* The surrounding ground is grassy and relatively fertile, with earthworms and molehills; later in the year bracken grows up. Higher up the ridge the knolls are used by crows and pine martens. They are surrounded by relatively fertile short-cropped sheep-grazed greens. By a boulder overlooking the Sand Loch, James Merryweather picked up an otolith, or ear bone, from a fish; we contemplated its marine origin as a great skua flew by.



Discussing how land use affects fertility and vegetation by the roundhouse overlooking the Sand River

Despite grazing by neighbouring crofters' sheep and cattle, the hill side below the Sand loch supports a mix of plants including hazel, willow, rowan and oak trees. After being battered by salt spray from winter storms, the oak trees struggle, and in some years only produce a few leaves. The burn below the loch is marked on the map as the 'Allt Glac na Daraich'(the burn of the place of the oaks); the soil on the north side of the road is more fertile, as the rock is a sort of 'diorite' which weathers to form a slightly richer soil than elsewhere in the surrounding area.

On the south side of the burn, an isolated oak tree has managed to survive and grow, away from the fertile soils on the north side of the road *(below right).* About 2.5m above the ground, there is a horizontal bough which provides a perch for crows and buzzard. As the only big tree on that side of the valley, the ground below the perch may gain just enough bird droppings to provide the additional supplement of nutrients needed to keep it alive.



The isolated oak tree, with (inset) mossy perch where crows and buzzards may roost, providing additional source of nutrients to sustain the tree.

The tree is only a few hundred metres from the Sands Archaeology Trails car park; have a wee look for yourself and see what you think?

Thank you to everyone for contribution and support for this meeting. Please contact me at info@wrft.org.uk if you have anything to add or if any changes are required to this report.