

Innovation in Peatland Restoration with Peatland ACTION



Scottish Natural Heritage
Dualchas Nàdair na h-Alba

**Peatland
ACTION** Restoring
Scotland's
peatlands

Innovation in Peatland Restoration with Peatland ACTION

- (i) Setting the context - Some of the challenges of restoring Scottish peatlands**
- (ii) Ditch-blocking**
- (iii) Gully and bare peat restoration**
- (iv) Forest-to-bog restoration**
- (V) Workshop discussion**



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Ath-stèidheachadh
talamh mònach
na h-Alba

Some of the challenges of restoring Scottish peatlands

- Huge altitudinal range of projects (from sea level to 1000m)
- Considerable variation in rainfall across country (average 800mm - 3000mm per year)
- Extremely short growing season at majority of upland sites, relative to programming of works
- Upland sites exposed to extreme weathering – rain, wind, frost etc.
- Significant areas of erosion and bare peat e.g. oxidised bare peat pans
- Extensive range of erosion features and drain types found
- Overgrazing by sheep & deer. Sheep (≤ 0.06 LU/ha) and deer densities (≤ 10 deer/km²) must be low enough to support restoration
- Burning / fire impacts



Ditch-blocking



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➤ **Ditch-blocking**

- Materials
- Techniques
- Sustainability
- Limitations – machine access, depth/quality of peat, width of channel, working on slopes, peat slide risk etc.



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➤ Ditch-blocking - Wave dams



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Ditch-blocking - Wave dams



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➤ Ditch-blocking - Composite dams using recycled glass



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Gully and bare peat restoration



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➤ **Gully and bare peat restoration**

Main objectives:-

- Stabilise erosion features
- Block / divert erosion pathways
- Promote recovery of natural water table
- Promote water retention and reduce active flow
- Promote re-vegetation / stabilisation of bare peat
- Promote re-vegetation / re-establishment of peat-forming vegetation

➤ Gully restoration



Gully bund on Shetland comprising salmon smolt net rolled-up, keyed into peat and pegged-in



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➤ Gully restoration



Net dam after 1 year



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➤ Gully restoration



Peat-filled sisal dam after 3 years (Shetland)



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➤ Gully restoration – Salmon farm pipes



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➤ Gully restoration - Mineral dams



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➤ Bare peat restoration – Plug planting



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Cotton grass plugs collected using bulb planter

➤ **Bare peat restoration – Salmon smolt nets for stabilisation**



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- **Bare peat restoration – Using waste from spinning mill as seed source combined with smolt net**



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➤ Bare peat restoration - Use of brash / mulch



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Subsequent effective treatment of bare peat following
thicker application of living mulch (6mths after treatment)

Living mulch failure - Inshriach, 260m altitude



Dec 2014



Oct 2017



Mulch spread 1
bag=64m², no
lime/fertiliser,
pH3.2



Solutions to mulch failure

- Thicker mulch: 1 bag covers 30m²
- Soil testing for pH – add lime if below pH4.0
- Phosphate fertiliser
- Water table management
 - turf bunds
 - Coir logs/heather bale bunds
 - Stone dams



Abernethy Estate, 740m after 6 months:
lime, fertiliser and mulch at 1bag/30m²

Whole Turfing of bare peat – Glenfeshie, altitude 720m

Before



After



Whole turfing of bare peat

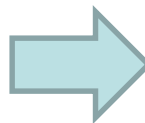
Before



After



Whole turfing bare peat



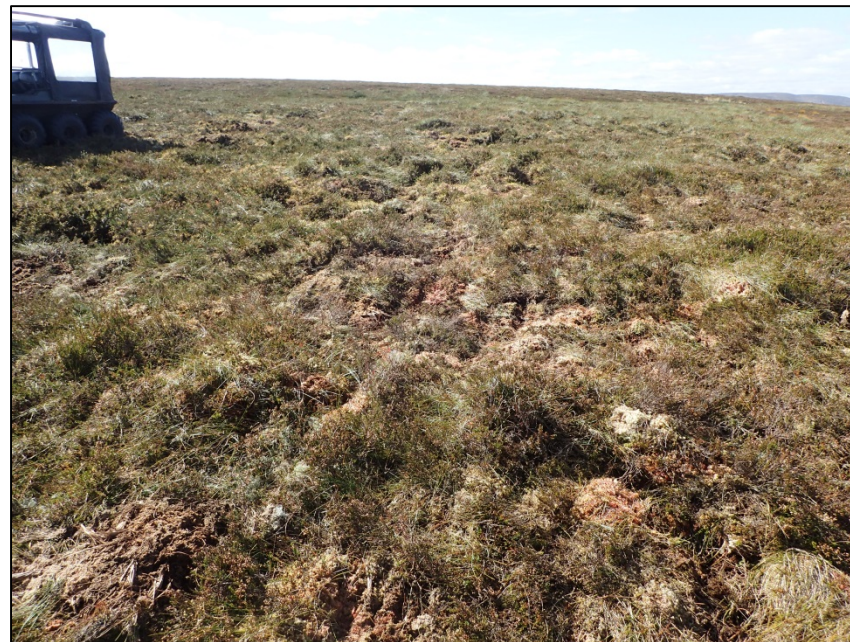
Whole turfing gully systems



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Donor site after taking turves



Forest-to-bog restoration



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➤ **Ground-smoothing to facilitate forest-to-bog restoration**



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➤ **Bare peat restoration - Ground-smoothing**

- Fell to waste – Use of forestry mulch (2.5cm - 7cm diameter chips) and/or brash - Pack and progressively back-fill furrows to ridge height as peat dams are installed along furrow. Track over furrows to compact material
- Flipping / inverting old stumps and regeneration into furrow and track over to compact
- Compression & compaction – mining and flattening ridges into furrows and tracking over. Similar technique can be applied to old extraction sites to remove ridge/baulk topography
- Blocking of receptor drains and installation of silt traps should be carried out prior to commencing ground-smoothing techniques
- An appropriate width of vegetated buffer must be retained between bare peat surface and any adjacent watercourses (minimum width 5m)



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- (iv) Forest-to-bog restoration**
- (v) Deer**
- (vi) Future challenges**



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Ditch-blocking



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➤ **Ditch-blocking**

- Materials
- Techniques
- Sustainability
- Limitations – machine access, depth/quality of peat, width of channel, working on slopes, peat slide risk etc.
- Emerging technology?



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Ditch blocking and re-profiling

Before



After



➤ Ditch-blocking - Wave dams



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Wave Dams



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➤ Ditch-blocking - Composite dams using recycled glass



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➤ Ditch-blocking - Mineral dams



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➤ Ditch-blocking - Mineral dams



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Gully and bare peat restoration



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➤ Gully and bare peat restoration

Main objectives:-

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Gully bund on Shetland comprising salmon smolt net rolled-up, keyed into peat and pegged-in



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➤ Gully restoration



Net dam after 1 year



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➤ Gully restoration



Peat-filled sisal dams (Shetland)



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➤ Gully restoration



Peat-filled sisal dam after 3 years (Shetland)



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Gully blocking – stone dams

Mulch and dams



Dam keyed in with re-profiling



Gully blocking – stone dams

After 1 week



After 15 months – filled in



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Gully blocking – turf dams



Gully blocking – turf dams

Too much water retention?



Erosion forming after 6 months



Gully blocking – Coir logs



Gully blocking – Straw bales



Gully blocking – Straw bales

Damage by Mountain hares & Red deer



Too attractive to herbivores? Breaks down too quickly?



Mar Estate – gully restoration

Before – December
2014



After – July 2015



➤ Bare peat restoration – Plug planting



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Cotton grass plugs collected using bulb planter

➤ Bare peat restoration - Use of brash / mulch



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Subsequent effective treatment of bare peat following
thicker application of living mulch (6mths after treatment)

Living mulch failure - Inshriach, 260m altitude



Dec 2014



Oct 2017



Mulch spread 1
bag=64m², no
lime/fertiliser,
pH3.2

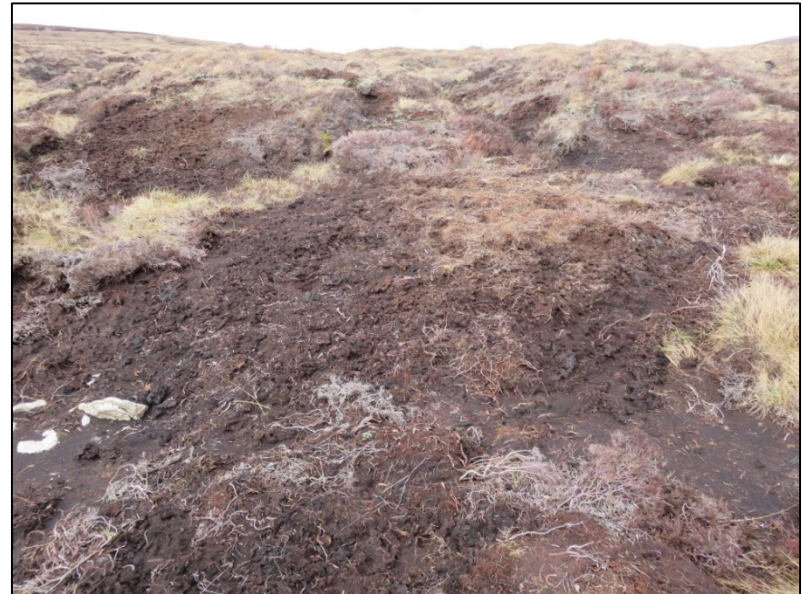


Mulch failure - Mar estate, 710m altitude

- July 2015



- May 2017



1 bag of mulch covered 64m², no
lime/fertiliser, pH3.3

Candacraig Estate mulch after 18 months, altitude 640m



Solutions to mulch failure

- Thicker mulch: 1 bag covers 30m²
- Soil testing for pH – add lime if below 4.0pH
- Phosphate fertiliser
- Water table management
 - turf bunds
 - Coir logs/heather bale bunds
 - Stone dams



Abernethy Estate, 740m after 6 months:
lime, fertiliser and mulch at 1bag/30m²



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Invercauld Estate, 630m

Mulch (30m² per bag) lime, fertiliser, coir logs, turf bunds and stone dams plus Sphagnum clumps



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Whole Turfing of bare peat – Glenfeshie, altitude 720m

Before



After



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Whole turfing of bare peat

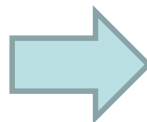
Before



After



Whole turfing bare peat



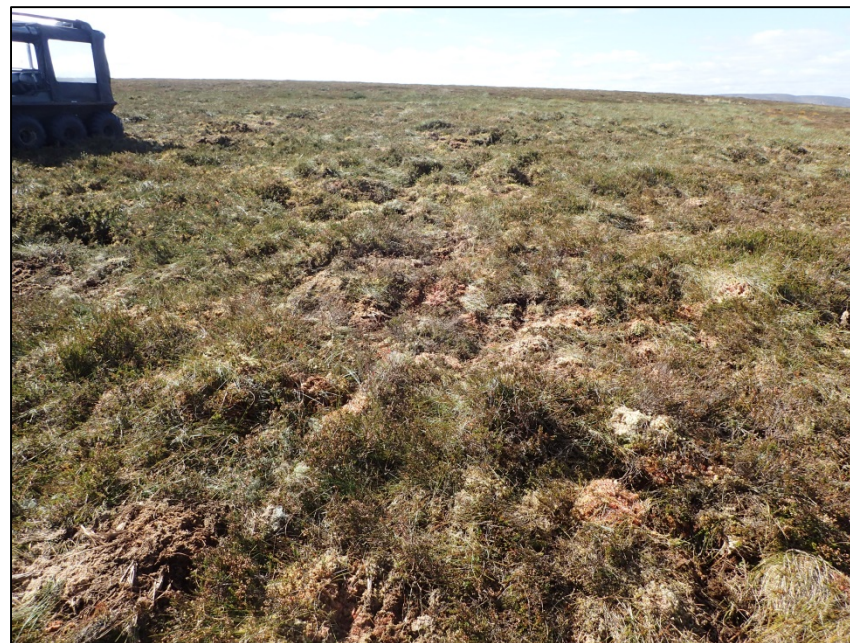
Whole turfing gully systems



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Donor site after taking turfs



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Forest-to-bog restoration



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➤ **Ground-smoothing to facilitate forest-to-bog restoration**



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➤ **Bare peat restoration - Ground-smoothing**

- Fell to waste – Use of forestry mulch (2.5cm - 7cm diameter chips) and/or brash - Pack and progressively back-fill furrows to ridge height as peat dams are installed along furrow. Track over furrows to compact material
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Red deer



Future challenges: Cairngorms Moine Mhor +1000m 25% bare peat



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Forest to Bog restoration

Innovation in peatland restoration

4th October 2018

Ian McKee, Open Habitat Ecologist

National Forest Estate (NFE)

- Over 600,000ha on NFE
- 180,000ha has deep peat
- 100,000ha of afforested deep peat
- A proportion of this will be restored (LRB strategy and Blanket Bog Strategy in draft)
- Progress of enhancement: 5371.6ha in total, **3301.6ha since 2014**
- Progress of restoration (deforestation): 4000ha total, **1500ha since 2014**

objective

- To restore priority habitats that resemble and function in the same way as near natural deep peat habitats do

Principles (lessons learned)

- Restoration is a process
- Identify modifications then determine treatments to counteract (ploughing, drainage, peat cracking)
- Interventions should not be over-designed, but enough and no more to set restoration in desired direction
- First re-wetting is a first pass, follow up work will usually be required
- Monitoring – ensure past interventions are working, and establish a trend
- Stump flipping and ground smoothing – developed by Scottish Power Renewables (Peter Robson)

Limited interest from merchants and contractors in doing anything different.



Tiger Cat – cost c£400k
-weighs between 30 and 35 tonnes.

John Deere 1910e – cost c£250k
- unladen weight 21.5 tonnes.

Contractors heavily invested in conventional equipment - not well suited to working on soft ground



Problems associated with this way of working



Large amounts of brash and produce left on site to keep machines afloat making **open habitat restoration difficult and more expensive.**



Merchants harvest what they can access and then walk away. Left with no access to these parts of the site the FD's only option is mulching or fell to recycle

Problems with mulching and fell to recycle



1. Very expensive - £3-5k/ha
2. Wasteful – timber lost to market
3. Potential impact on water quality
4. Fell to recycle usually involves chainsaws - potentially dangerous

So what's changed?

- Demand – growing competition for woodfuel means energy plants are having to look at brash as a means of securing long term fuel supplies.
- Price – high price of round-wood making brash and whole tree extraction more attractive.
- Open habitat restoration process – subsequent treatments are made easier if trees and brash can be removed.

Crask-Peatland Restoration Site-Autumn 2017

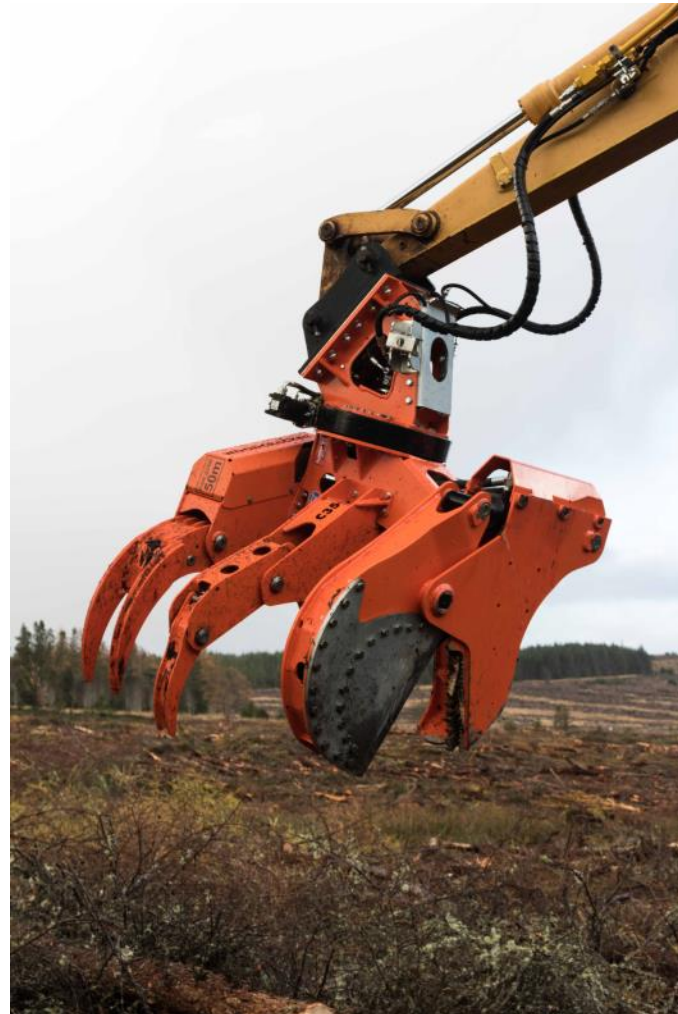


39ha site – mix of old research plots and windblown LP

Worked with local contractor to explore other options.

Eventually used combination of excavator mounted shears, excavator mounted harvester and small forwarder to cut and extract 3,400 tonnes

Tree shears on wide tracked excavator



Adapted
Doosan
Excavator
equipped
with
1.9m tracks
and
Woodcracker
Tree shears

Machines used all simple and low cost



Straightforward efficient harvesting system

Same site – March 18



Windblow and research plots cleared.

Brash concentrated in wide spaced brash rows.

No ground damage.

Sensitive water course protected.

Ideal conditions for peatland restoration

South Corries – June 18



Brash extraction and chipping



Crask Aug 18
Brash recovery
trial



Soft ground extraction



Need to develop better equipment and techniques for whole tree extraction

On site chipping and haulage



Current barriers –

Walking floor bulk lorries not well suited for use in the forest.

Suitable facilities for chipping operations – needs a lot of space

Summary- Fibre recovery

- Timber recovery makes revenue, making whole operation look attractive when compared to mulching
- Clean sites - potential for reduced re-wetting costs?
- Clean, lower nutrient loss, obstruction free site for open habitat restoration.



Workshop discussion



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Peatland ACTION

On the road to restoring Scotland's peatlands
for our future

Benefits of healthy peatlands



Carbon store



Livestock grazing



Clear fresh drinking water



Grouse / game



Store water and help to maintain
steady flow rates



Healthy fisheries



Biodiversity / unique habitat



Natural defence against wild fire



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For more information on how to apply for peatland restoration funding
visit www.nature.scot/peatlandaction