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Lowland Raised Bog restoration

Restoration of degraded peat surfaces and cut peat faces. Glasson Moss SSSI. 2007

Location

Glasson Moss SSSI - part of South Solway Mosses

North Cumbria

SAC and NNR.
SAC: 1962ha
SSSI: 224.5ha
NNR: 167.75ha

Overview

The South Solway Mosses SAC is a Lowland Raised Bog (LRB), designated for Active Raised Bogs and Degraded raised bog still capable of natural regeneration. The LRB originally extended to around 2500ha, but now only 2000ha remains which make up the SAC. There is about 640ha of primary active M18 *Erica tetralix – Sphagnum papillosum* raised mire surface, and the remainder has been modified through cutting for domestic peat, commercially extracted by machine (cut and milled) and drained and improved for agricultural purposes. There is almost no lagg remaining and the majority of the four bogs are surrounded by deep maintained drains, of which 50% are probably modified lagg streams.

Project

Restoration of cut over degraded peat surfaces and cut peat faces covering 1.3ha.

Issues:

- Modified lagg stream (maintained drain). Has led to the loss of the lagg and an increased hydraulic gradient between the drain and the remaining peat mass leading to a rapid drying out and degrading of the former ombrotrophic peat mass.
- Drainage of the peat mass - drains have been cut to aid the drying and extraction of peat. This has led to rapid removal of water. This has led to rapid removal of water from the bog surface leading to a free draining degraded peat layer.
- Peat extraction - peat surface left at a variety of different levels and the active M18 vegetation replaced by Purple moor grass (*Molinia caerulea*) and/or Heather (*Calluna vulgaris*) and Silver Birch (*Betula pendula*). This vegetation was exacerbating the degradation of the top 50- 75cm of the remaining 1-2m of peat through rainfall interception, transpiration and the development of flow paths associated with root systems.
- Peat face. 2m high cut face. Exposure to air leads to drying and degrading of the

ombrotrophic peat. This effect extends to up to 40m onto the active M18 surface causing a change to Heather dominated communities.

Specification:

The specification for this project covered:

1. Removal of birch scrub.
2. Raising the water table on the cut over area to between -25 and +10cms of the current ground level, in order to provide suitable conditions for Sphagnum regeneration.
3. Minimising the effects of wind/wave action.
4. Reduction of the angle of the cut face to attempt to bring the water table to as near ground level as possible.
5. Ensuring that no bare peat was left that could further dry out.

Contractor:

Tenders were invited for a design and build contract. The contract was awarded to Dinsdale Moorland Ltd.

Equipment

7 and 8 tonne Hitachi excavators with 800mm wide track pads on each side were used. Overall width of the machine with track pads is 2.7m and the track carriage length was under 3m. The machines have a reach of just over 5m from the centre of the turret. Machine weight is 9 tons due to the extra weight of the track pads and guides.

Work:

Area 1.

0.8ha of cut over peat surface, 260m x 2m cut face. Vegetation - heather dominated with Silver Birch.

Silver Birch

Cut and chip, chip used to fill former drains.

Cut face

- Remove turf in large sections.
- Re-profile cut edge to around 30^{o}, replace turf.
- Construct an almost water tight bund (berm) of 500mm height above Ground Leval (before turf added) at the base of the newly profiled slope and a 250mm high bund (before turf added), at the top of the slope.
  (See bund construction below).

Cut over peat surface

Chess board paddy field construction.

- Construct water tight cells of $400m^2$ by building bunds 500mm above ground level which are capped with turf.
- Each cell is higher than the previous until they butt into the bund built at the bottom of the cut face. This gives a 'Paddy field' effect (when viewed from above)
  (See bund construction below).

Bund construction

The purpose of the bunds is to slow the movement of below and above ground water off the bog and retain as much of it as possible on the bog.

Each bund acts as a water control mechanism – there are no pipes to block or bend, instead the water is held in the cell by the creation of an almost impermeable bund of 'clay like' ombrotrophic peat. The water level is dictated by the height of the 'clay like' peat mound. The turf acts as permeable membrane but protects the bund from drying out and eroding.

The bunds were built 500mm high as it was expected that they would degrade/pack down and slump to around 200/250mm high.

Cells size is deemed to be important and they were kept small in order to prevent wave erosion of the bunds and to create a microclimate for vegetation colonisation.

- Dig a trench by removing 1200mm wide turf.
- Degraded peat and tree roots removed.
- Dig down a further metre into good 'clay like' ombrotrophic peat. Turn this peat over and squash back into trench – this blocks all cracks/fissures as well as cutting through roots.
- Create a borrow pit on the uphill side, remove turf and degraded peat then extract 'clay like peat and use this to fill the trench to ground level and then raise to appropriate height.
- Cover 'clay like' peat mound with turf.
- Any tree roots, degraded peat placed into borrow pit and covered with turf.

Area 2:

0.5ha cut over peat. 140m of 2m high cut peat face. Vegetation predominantly Purple moor grass and Silver Birch.

The approach to this area was exactly the same as for area 1. The only difference was that it was decided that the Purple moor grass was not the most appropriate turf to cover the bunds as the root mass was incredibly thick. Instead the contractor decided to use a Geojute mat to cover the bunds.

Cost at 2007 prices:

Cut face re-profiling, bund at top and bottom	£12/m
500mm bunded cells $400m^2$ turf cover.	£6.5/m £6500/ha
500mm bunded cells $400m^2$ Geojute covered.	£13.5/m £13500/ha

Results.

Almost immediately both areas filled up with water. This was because water flow through drains, root pipes and degraded peat was impeded. All cells filled up within four weeks (without rainfall).

Within three years *Sphagnum cuspidatum* was filling the cells (despite water depth exceeding 250mm) and *Sphagnum papillosum, capillifolium* and *magellanicum* were colonising the bunds including the Geojute covered ones – along with round leaved sundew (*Drosera anglica*). Both varieties of cotton

grass (*Eriophorum vaginatum* and *angustifolium*) colonised the edges of the cells and the bunds

Problems

The bunds were built at 500mm above ground level (before turf/Geojute added) were expected to shrink/degrade to around 250mm or less based on previous experience. This would have provided an appropriate depth of water for S.cuspidatum to thrive. Instead the bunds did not shrink and so water depths of around 500mm is common. Despite this *S.cuspidatum* and other Sphagna and higher plants have colonised and thrived.

Building 400m^2 cells with 500mm high bunds required a lot of peat. This meant that there was very little undisturbed peat left in the centre of the cells.

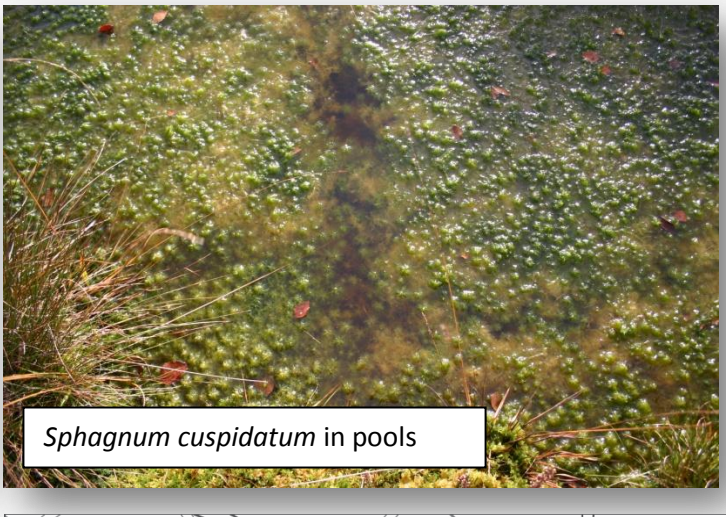
2003 Aerial – pre works

2010 Aerial showing bunding pattern

April 2007

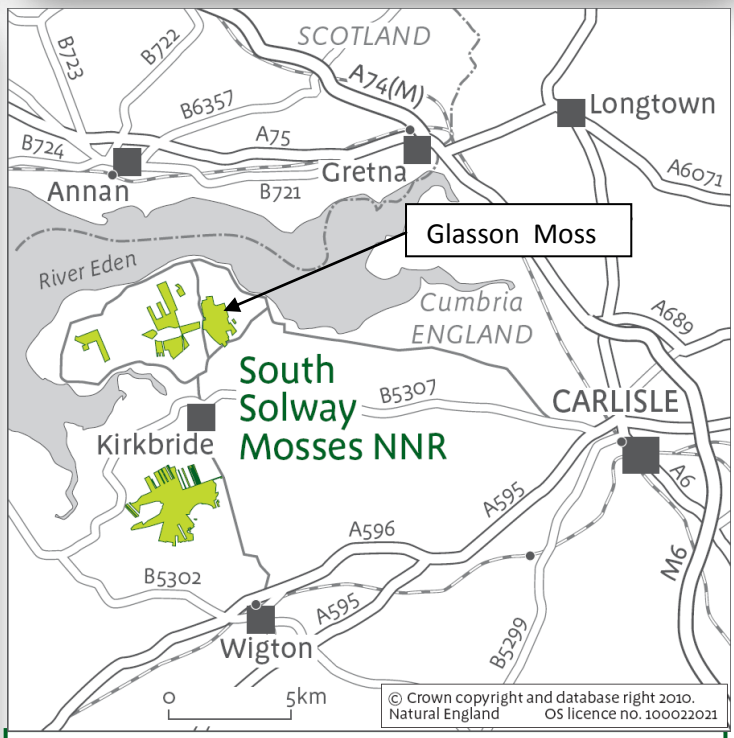
June 2007

Geojute covered bunds



Sphagnum cuspidatum in pools

Sphagnum spp on Geojute



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