



Demonstration Project Case Study

Project title: Re-wetting an area of degraded raised bog at Cors Fochno using low elevation contour bunding

Description

Wide scale drainage of peatland habitats for agricultural and forestry activities has damaged and led to the deterioration of a significant proportion of UK peatlands. Peatlands on the Natural Resources Wales (NRW) estate are currently estimated to be a net source of greenhouse gas emissions (Williamson *et al.*, 2016). The western side of Cors Fochno Special Area of Conservation (SAC) includes an area of degraded raised bog modified by past drainage works and some hand-worked peat cutting. Four large drainage ditches, cut in the 1960's, run west-east towards the centre of the bog. Between these drains are three elongated, upstanding areas with predominantly, primary surface bog dissected by north-south grips, and old, shallow peat cuttings extending across the western end. We have adopted a low-elevation bunding technique to re-wet two of these elongated areas, aiming to counteract accelerated rainfall runoff resulting from peat shrinkage associated with drains and cuttings, and to restore the peat-forming capacity and habitat quality of a significant area of degraded raised bog. Thereby making a significant contribution to both the carbon balance and Favourable Conservation Status of the Cors Fochno SAC.

Background and method

Surface gradient is a key factor determining the quality and peat-forming capacity of raised bog vegetation, influencing the rate of precipitation runoff and therefore the degree of surface waterlogging. In the project area, gradients have been steepened by peat loss and shrinkage related to peat cutting and drainage. Although the large drains have been blocked by a series of large peat dams, hydrological gradients are still relatively steep on adjacent bog. This has impacted the entire intervening bog area causing severe reduction of Sphagnum cover and water retention capacity. This could not be effectively reversed without some form of bunding and the low elevation contour bunding method has proved to be the most cost-effective and environmentally advantageous yet devised. The old peat cuttings add to the surface drying problem by channelling water off the bog. Blocking the cuttings is a pre-requisite to restoring active bog growth across the cut-over area.

The bunding technique adopted (developed by Natural England in Cumbria) is designed to restore surface water logging without the problems associated with larger 'pressure bund' structures (e.g. oxidation and shrinkage of mounded peat, deep water excavations and landscape issues). It has previously been successfully trialled at Cors Fochno in 2015 and 2016.

A total of 3400m of bunding, including short dividing cross bunds, were constructed as follows:

- Prior to construction, the precise position of each bund section was identified, and the route mown (using a low ground pressure machine) to aid efficient construction, levelling and re-turfing of the bund.

>9 ha peatland re-wetted

Emissions avoided through restoration: 47.7 tCO₂e /year

Existing carbon stocks protected

Total project cost: £23,154

Established technique developed by Natural England in Cumbria, also successfully trialled on other areas of Cors Fochno in 2015 and 16

Staff involved:

NRW reserve staff

NRW reserve manager

NRW peatland specialists

Demonstration Project Case Study

- The bunds were constructed with a low ground pressure wide tracked excavator, by first excavating a narrow trench down to wet, undecomposed peat. The trench was then filled with similar un-degraded peat from an adjacent borrow pit, into which the degraded near-surface peat was then moved.
- Turf was then replaced over the bund to increase stability and deter scrub establishment. Bunds were strategically located where gradients start to steepen and follow the contour to achieve maximum re-wetting impact.
- Short cross bunds were used to create elongate U-shaped compartments thereby reducing the risk of flow along the bund and improving conditions for Sphagnum colonisation.
- Careful levelling of the bund crest sought to create even (unchanneled) seepage of backed up rainwater over the bund, to aid even wetting of the downslope areas.
- Each section of bund has raised the water level by 10-18 cm at the bund, creating surface waterlogging or shallow inundation of an approximate 4-5 ha.

Outcomes

This re-wetting work will ultimately restore the peat-forming capacity and habitat quality of over 9 hectares of degraded raised bog. Restoration will be a gradual process, with the project area seeing a reduction in the hydrological gradient, raising and stabilisation of the water table, producing good conditions for rejuvenation and expansion of Sphagnum bog mosses and associated active raised mire species. The current vegetation cover, which is poor quality M18/ M15 will improve in quality and transition from a standstill phase to an active, peat growth and carbon sequestration condition. In more detail we expect to see:

- Water table: stabilised at 20cm above (at the bund) to 10cm below surface, with falls below 30cm occurring rarely.
- Sphagnum cover: showing an increase within 2 years and composing 20% or more ground cover within 5 years.
- Bryophytes:
 - Species expected to increase in abundance: Typical raised mire sphagna, including: *S.cuspidatum*, *S.pulchrum*, *S.capillifolium*, *S.papillosum*, *S.tenellum*.
 - Species expected to show no increase, and decline over time: *Leucobryum glaucum*.
- Vascular plants:
 - Species expected to increase in abundance: *Rhynchospora alba*, *Narthecium ossifragum*.
 - Species expected to show no increase, and decline over time: *Trichophorum cespitosum*, *Molinia caerulea*, *Calluna vulgaris*.

This restoration will protect the existing carbon stocks and environmental archive of the bog from further drying, decomposition and carbon loss, including vulnerability to fire. It is estimated that restoring 9 ha of modified bog to near natural bog will reduce greenhouse gas emissions by an estimated 47.7 tCO₂e / year¹.

¹Estimates are annualised savings over 40 years, assuming that habitats would be in a restored condition for 10 years post restoration and a near natural condition for the next 30 years. Based on emission factors from Williamson *et al.* (2016) and calculations and assumptions in the Carbon Positive Project technical report "Evaluating NRW's Mitigation Options" (NRW, 2018).

Wider benefits

- Habitats restoration will benefit faunal site features including:
 - Birds: Redshank and Snipe expected to benefit from increase in suitable feeding area.
 - Invertebrates: Small red damselfly expected to benefit from increase in shallow Sphagnum pool breeding habitat.

Demonstration Project Case Study

- Ground dwelling invertebrates: hygrophilous species, which are key indicators of active raised mire, expected to benefit.
- Restoration will enhance the resilience of the bog to climate change, including resilience to sea level rise through renewed peat growth and reversion of shrinkage subsidence impacts.

Challenges and learning

Once on site, the initial bunding plans had to be modified due to the risk of the tracked excavator breaking through the fragile bog surface and sinking in one area. An area of modified bog approximately 700m to the north of the main work area was identified as the best alternative bunding site to achieve re-wetting aims.

Although the ground pressure of the 12 ton excavator with wide ‘bogmaster’ tracks was very low, the machine had no other advantages over the smaller 5-6 ton machine used in previous bunding work at Cors Fochno. The width of the tracks limited manoeuvrability and excavation close to the machine and made it more difficult to achieve a neat finish, particularly with the cross dams.

The contractor had difficulty skimming off thin layers of vegetation to turf the bunds. This was particularly difficult where tussocky, long rooted *Molinia* grass was abundant in the vegetation. Most of the bund sections therefore have a relatively thick turf layer and are 10-20cm above the desired height of 25cm.

Evidence and information

Natural Resources Wales (2018) Evaluating NRW’s Mitigation Options. Technical Report. <https://naturalresources.wales/about-us/corporate-information/carbon-positive-project/sharing-our-approach/?lang=en>

Williamson, J.; Burden, A.; Evans, C. (2016) Condition based Estimate of Greenhouse Gas Emissions and Carbon Sequestration for NRW Peatland Habitats. CEH reference NEC05964, Centre for Ecology and Hydrology: Bangor.

Photographs of the project site at Cors Fochno during bund construction and after re-wetting

