Peatland Restoration (NFM relevant context)

There are extensive additional ecosystem services provided by improving the quality of the habitat which MFFP has played a key role in identifying (Bonn *et al*, 2009). A summary of the highest priority ones are:

Provisioning services:

- Peat and plastic dams create pools and may thereby increase access to water by livestock.
- In addition, activities proposed will help to improve water quality.

Regulating services:

- Gully blocks reduce erosion by breaking and slowing the flow of water, and (particularly in the case of permeable dams) trapping sediment before it is lost from the hill (Buckler *et al*., 2013; Whitley, 2010).
- The biggest impact of these works for regulating climate change is reducing avoided losses of stored carbon. The peatlands of the Dark Peak are amongst the oldest in the UK, with up to 7000 years of stored carbon. However, as well as reducing losses of stored carbon, maintaining a high water table height and re-establishment of sphagnum will both allow the re-starting of carbon sequestration and hence further improve climate regulation.
- Revegetation of the gullies and their associated catchments reduces the amount of particulate organic carbon (POC) in gully flow (by 90% in the Making Space for Water project; Pilkington and Crouch, 2015). This has a significant impact on the loss of stored carbon, as well as reducing the levels of associated heavy metals, which are reasons for failure of various waterbodies downstream.
- Natural Flood Management (NFM).

Cultural services:

- Reduction of eroded land is likely to be perceived in a positive light, and chains of peat dams (and pools) may also appear more pleasing than eroded channels.
- The increase in biodiversity associated with gully blocking (see below) is also likely to be well received, particularly by nature enthusiasts.
- Peat and stone dams and heather bales can support body weight and make it easier for walkers to cross gullies.

Supporting services:

- Drain blocking has been associated with increased abundance of crane flies, which are important herbivores and a food source for breeding birds (Carroll *et al*., 2011).
- Pools behind impermeable dams provide a habitat for amphibians and aquatic insect larvae.

Regulations relevant to gully blocking

Construction of gully blocks is subject to:

- Ordinary Watercourse Consent – obtained through the relevant Local Authority.
- Construction (Design and Management) Regulations (CDM 2015)

Construction of gully blocks is not subject to planning permission.

MFFP has extensive experience of delivering gully blocking and the relevant permissions and regulations. Under CDM 2015, MFFP assumes the role of Principal Designer and often undertakes the duties of the Client. It has produced Designer Risk Assessments for each type of constructed dam and risk assessments for the operations surrounding their construction are produced at the pre-construction and construction phases of work. On completion of the works, MFFP provides the landowner and Client with a site file comprising the as-built data, pre-construction information and construction phase plan. Our methods for gully blocking require no decommissioning or maintenance on the part of the landowner.

Sphagnum inoculation

Benefits

Revegetation of bare peat has been shown to have a significant decrease in depth to water table and an increase in the prevalence of hillslope overland flow production as well as significantly longer lag times (106% increase relative to the control), reduced peak flows (27% decrease relative to the control) (Shuttleworth et al. (2019). An increase in surface roughness will retard overland flow, thereby increasing lag times and decreasing peak flow during precipitation events. Holden *et al*. (2008) demonstrated that Sphagnum provides a significantly greater surface roughness than other moorland surface types. Dadson *et al*. (2017) projected that the greatest benefit to flood peak reduction would be derived by planting the Sphagnum along more gentle gradient slopes and near watercourses, as opposed to the same density of planting elsewhere in the catchment.

Therefore, even on vegetated moorland, (either revegetated former bare peat or intact cover), further benefits can be gained by introducing Sphagnum.

Projections by MFFP based on the available data has shown that vegetation reintroduction and/or diversification, using sphagnum in conjunction with gully blocking will have a 'slow the flow' effect:

- *150%* **increase** *in 'slow the flow' following peat revegetation / gully blocking / diversification using sphagnum in inactive blanket bog in areas of extensive dunes of bare peat in 15 years.*

- *240% increase in 'slow the flow' following bare peat revegetation / gully blocking* ***/*** **diversification** *using sphagnum in inactive blanket bog in areas of extensive gully systems, unhealthy vegetation, extensive bare peat in 15 years.*

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