

Managing Peatland Systems to Mitigate Carbon Release and Flooding

The North Pennines Area of Outstanding Natural Beauty (AONB) Partnership's *Peatscapes* project is working to secure a sustainable future for peat in the AONB. *Peatscapes* is a 3 year collaborative project that aims to conserve and enhance the internationally important peatland resource within the North Pennines AONB.

The objectives of *Peatscapes* are:

- **Restoration:** Supporting restoration and management work through the promotion of existing agri-environment and through sourcing new funds;
- **Research:** Supporting and disseminating new and existing research into peatland processes, ecology and management;
- **Celebration:** Raising the level of understanding and appreciation of the significance of the resource;
- **Promoting best practice:** Supporting the provision of management advice on upland peatland to form the basis of practical management works.

Importance of Peatlands

Peatlands play an important role in climate change mitigation and watershed management. Healthy peat is a versatile substance that provides a range of environmental benefits including carbon storage, flood risk amelioration, improved water quality, biodiversity improvement, economic opportunities (shooting, tourism) and the preservation of the historical record. With such a wide spectrum of benefits that cut across many government and private sector policy priorities, peatland conservation demands attention in terms of environmental profile and financial resourcing.

Carbon Store

The amount of carbon stored in peat in the United Kingdom is larger than the amount of carbon stored in all the forests of France and the UK combined. The amount of carbon potentially lost from oxidising and eroding peat is enormous. Estimates vary but recent calculations show that volumes equivalent to approximately 20 years of industrial carbon dioxide emissions are stored in UK peatlands. How that land is managed plays a significant role as to whether peat becomes a source of carbon, a store or a sequester of new carbon. The use of peatlands as a carbon management technique is important, as they can be a successful, cost effective, natural, long term solution to mitigate climate change.

The North Pennines AONB has some of England's finest, wettest, intact peat ecosystems. There are approximately 90,000 hectares of SSSI peat in the AONB (27% of England's resource). If we estimate an average of 2,500 tonnes of carbon per hectare of peat, the carbon store/release potential of the AONB's peat equates to about 823 million tonnes of carbon dioxide. In comparison, Drax the UK's largest power station in terms of electricity production and carbon dioxide emissions, releases 22.8 million tonnes of carbon dioxide each year. So the carbon store of the North Pennines AONB's peat is equal to about 36 years of Drax emissions. Given that 27% of the peat based carbon store of England is locked in North Pennines peat there is a need to ensure that land management and restoration efforts are timely and adequately resourced.

Water Management

Peatlands are a type of wetland and their key characteristic is water. How water gets into the system, how water leaves the system and what water does while it is in the system is of critical importance. At a time when droughts, floods and more extreme weather events are increasingly being documented, the role of peatlands in water management is even more important. Again peatlands emerge as a natural system that can provide a series of services for society. Healthy wet peat plays a role in managing water quality and quantity. Drying, oxidising and eroding peat adds sediment and colour to the water which has to be removed at tap or dredged at the harbour, costing millions each year. Water companies are looking at peatland management as a proactive investment in water supply quality.

The link between peatlands and reducing flood risk has been debated for decades. The North Pennines AONB is the source for four of England's major rivers (Tyne, Eden, Tees, Wear) and the peatlands that feed these rivers are of considerable interest in the science of flood risk. The Environment Agency, as part of their flood risk management strategy, provided core funding to the AONB Partnership's *Peatscapes* project to examine this relationship in more detail through a series of restoration and monitoring projects. Through these projects, *Peatscapes* is contributing to the evidence base as to the hydrological benefits of restoration.

Land Management Threats

The three main threats to peatlands in the North Pennines are inappropriate heather burning, over grazing and drainage. *Peatscapes* is focusing on the drainage issue as policy measures are in place to mitigate burning and overgrazing. Industrial scale drainage of the peatlands is an ongoing threat to their carbon storage system and hydrological integrity. The legacy of land management from the 20th century is still an obvious feature of the landscape; drainage ditches (grips) (Figure 1) cut into the peat over the last 50 years are still in place in most instances and are lowering the water table of peatland areas. This drainage leads to degraded peatlands and a host of hydrological problems, as well as the release of large quantities of carbon. As peat dries it releases CO₂ and thus impacts on the rate and severity of climate change.

Drainage in the North Pennines

In 2007 AONB Partnership commissioned a survey to determine the extent of moorland drainage grips in the North Pennines. After a comprehensive AONB-wide survey which involved grips being identified and digitised manually from ortho-rectified air photos, a clearer picture of the areas drainage situation emerged. This survey identified almost 60,000 individual grips with a combined total length of 9,400 km, clearly illustrating that the North Pennines peat is the most heavily drained in England. (Figure 2) We now know for the first time the extent of the peatland drainage in the North Pennines and it is possible to prioritise restoration efforts on a landscape scale. Using a GIS based starting point combined with ground truthing the *Peatscapes* project has identified priority areas for restoration work which will begin this winter.

Grip Blocking

Grip blocking using peat plugs is a simple, cost effective method that can be used to mitigate the negative effects of peatland drainage. Specialist contractors are hired to restore a series of grips in a specific area (grip field). The process involves a digger

with low impact tracks cutting large peat plugs or dams along an area adjacent to the grip and the plug is then placed in the grip, effectively blocking it with a small peat dam. (Figure 3) This process is repeated every 7-15 metres until a series of peat dams block the grip. This process is again repeated in the entire grip field resulting in an area being re-wetted. Within a few days water builds up behind the peat dam creating small still pools (Figure 4) which over time allows vegetation to re-colonise on the bare peat and in-fill the pools and sections between the dams. Within a few years the grips are 'healed' and become inactive.

Benefits

Areas of peat that have been restored via grip blocking become wetter, with higher water tables and subsequent positive vegetation recovery. Blocked grips slow down the water that would otherwise flow quickly through the bare peat of the grips, which in turn reduces the energy of the water and its capacity to erode, carry sediment and generate water colour. With water staying on the peat longer there is an expected flood risk benefit for that specific area. In terms of benefits to the carbon store, again wetter is better. Wet, intact peat is ideal for keeping the carbon locked in and under the right conditions areas with the peat-forming species of sphagnum grasses will capture new carbon.

Action

Using the detailed spatial information derived from the 2007 survey the AONB Partnership has begun to identify priority areas for blocking. We have secured agreements from landowners in the AONB to undertake 200 km of grip blocking work this winter. This work will occur on 6 sites and will be completed by April 2008. We also have other agreements in principle for a further 300 km and are currently seeking funds to support this work for next winter.

Monitoring equipment has been installed on two sites on which restoration work will take place. A full year of 'before' data is being collected, followed by the grip blocking work and then long-term monitoring work will occur. Working with our partners at The Environment Agency, Natural England and RSPB, it is anticipated this will allow a better understanding of the effects of restoration work on water table recovery, water flow, water colour, sediment loading and DOC export.

More information on the Peatscapes project can be found on the North Pennines AONB Partnership website <http://www.northpennines.org.uk/>

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