TALK 3: Mires

Richard Lindsay, Sustainability Research Institute, University of East London.
R.Lindsay@uel.ac.uk

Introduction

Of all the terrestrial habitats in the UK, peatlands are perhaps the most invisible. This invisibility is all the more remarkable when one considers that peatlands are the world's most extensive type of wetland, being found on all continents and ranging from the arctic to the tropics. So often they are defined as something other than peatland – usually dry heath, wet heath or moorland – but closer investigation, as was undertaken during negotiations by the former Nature Conservancy Council to purchase Fenn's and Whixall Moss on the Clwyd/Shropshire border, reveals that areas thought of as heathland on thin peat, or as dry moorland, are in fact damaged examples of very deep peat. Managing such areas as anything other than peatland is likely to be un-sustainable and lead to a steady degradation of all those ecosystems services which are provided by peatlands, such as long-term carbon storage, flood storage, water quality-control and a distinctive range of biodiversity.

Definition

Peat is the accumulated remains of partly-decomposed plant material laid down in situ, with waterlogging the responsible agent limiting the degree of decomposition. If a peatland is waterlogged it will tend to accumulate peat. If a peatland is no longer waterlogged, most commonly because of human action, it will tend to lose peat as the plant material oxidises and the stored carbon is thus returned back to the atmosphere as CO_2. Some peat deposits are more than 60-70 metres deep, but anything with at least 30 cm of peat can be classed as a peatland. Globally, there is at least 1760 Gt of carbon stored in the world's peatlands, which is around three times the amount stored in all the world's vegetation and one and a half times the amount of carbon in the atmosphere. Peatlands, and their continued maintenance as systems which store and sequester carbon for millennia, are therefore of considerable significance in terms of greenhouse gas budgets.

In the UK, the most extensive tracts of peatland are found in the uplands of England and Wales and in the north and west of Scotland. These are mostly blanket mire landscapes ('mire' is a wetland with at least some vegetation which is normally peat forming) often rather inaccurately or inadequately described as 'moorlands' – inadequate because the term embraces drier mineral ground as well, and 'moorland management' is generally geared to techniques appropriate for the areas of mineral soil yet is applied equally (and disastrously) to the often-extensive tracts of peatland within such landscapes. Peat is not just restricted to the uplands, however. There may once have been more than 1 million

hectares of lowland peatland, embracing the vast East Anglian Fenlands, the Somerset Levels and the Lancashire lowland plain, but almost all of this resource has been converted to various forms of dry-land use, particularly traditional 'dry-land' farming. We have turned our back on the few remaining fragments of this habitat which survives in the lowlands, using them as dumping grounds or barriers to productive use and regarding them as 'waste' land.

Types of peatland

There are two fundamentally different types of peatland: fens and bogs. Fens, or 'minerotrophic mires', are waterlogged by groundwater or because they lie in an area of surface-water collection. Their characteristics and management requirements are very well covered in The Fen Management Handbook, published by Scottish Natural Heritage (McBride, A. *et al.* 2011). Essentially, fens can be characterized by their type of water supply and their associated landform morphology. Open-water transition mires are formed where a basin of water in-fills with peat-forming vegetation. Spring mires arise where groundwater emerges at the ground surface because of an impermeable layer, or because of artesian pressure. Valley mires are formed in valleys which are either flat-bottomed or which have become flat-bottomed because of peat accumulation. Water seeps into the valley from the head of the valley and from the valley sides, but never in sufficient quantity to create a river; a valley mire instead has a diffuse central water-track and may be so poor in dissolved ions that it resembles an acidic bog, but it is nonetheless a fen system. Consequently for this type of fen, and also for open-water transition fens, activities in the catchment can have a substantial impact, particularly in the form of diffuse of point-source pollution. Loss of the White-faced Darter dragonfly *Leuchorrhinia dubia* from Thursley NNR valley mire may be due to point-source pollution from a rumoured 'night-soil' field, or may be due to diffuse pollution resulting from dog-walking. Changes in water supply are also of major significance for these mires and for spring mires. Indeed the invisibility of the water supply for spring mires can disguise the fact that changes have occurred in the supply, leading site managers to look for more visible reasons to explain signs of change and ignore the more fundamental issue of water supply.

Perhaps surprisingly, one of the most serious threats to lowland fen system is *lack* of management. Many of the most biodiverse fen systems in the UK developed originally as a result of traditional fenland management which had operated over long periods of time - perhaps even millennia. Abandonment of such management traditions with the collapse of many rural economic practices has led to loss of substantial areas to wet woodland as a result of succession.

Burning is also an activity engaged in with some enthusiasm on peatlands of all types, both lowland and upland. Indeed there is considerable and heated debate at present between those who wish to manage our upland blanket mire landscapes as heathlands – and

therefore burn them regularly – and those who wish to manage and restore our damaged blanket mires to a state of peat-forming vigour and resilience. Personally, the only justifiable and sustainable role for fire in relation to peatlands that I can see is for high-productivity fen vegetation from the lowlands to be used as a biofuel.

Another key form of peatland found in the lowlands is lowland raised bog, which forms over an in-filled open-water transition mire and then continues accumulating peat to rise in a low dome as much as 10 metres above the surrounding landscape because *Sphagnum* bog moss dominates the vegetation and is so remarkably good at retaining direct precipitation. Being raised above the underlying mineral ground-water table, bogs are wholly dependent upon direct precipitation inputs (unlike acidic valley mires and spring mires) and are thus termed ombrotrophic mires. As such, they are independent from the nature of the mineral ground-water table, but as they depend on this to act as the foundation for the perched bog water-table, if the groundwater is lowered then this can place significant hydrological stresses on the raised bog system. Raised bogs represent the densest concentrations of soil carbon in the lowland landscape, but we have dug them away for domestic fuel and to turn them into agricultural fields, we have mined them for horticultural growing media, and we have planted them with trees which cannot match the carbon density of the original bog. All-in-all this has pattern of land use has fallen some way short of being sustainable, with only around 6% of the area that was present in the 1840s still supporting a semi-natural bog vegetation today.

The most extensive form of lowland mire was once undoubtedly flood-plain fen, but this has suffered more dramatic losses than any other form of mire system, not just in the UK but across Europe. The once-extensive fens which dominated all wide river flood-plains have been almost universally converted to ‘dry-land’ agricultural production, or to urban development (many major cities sit on flood-plains). The consequences have been considerable, with the former wetland soils shrinking as they dry, being washed or blown away by wind and rain, and resulting in wholesale on-going subsidence of 1-2 cm per year. The Holme Fen Post in Cambridgeshire shows that the ground has subsided by around 4 metres in 150 years, and it continues to subside. The ground surface here is now more than 3 metres below sea level – a sobering thought given rising sea levels and the expected increase in storm surges.

Indeed across Europe, the growing costs of flood events involving former flood-plain fens is driving the insurance industry to question the wisdom and economic sustainability of continuing to support ‘dry-land’ activities on former flood-plain fens. There are increasingly widespread trials looking at ‘new’ ways to manage such land using old but long-abandoned ways of managing these areas as wetland, harvesting the fenland materials from these highly-productive ecosystems to create new products and new markets – the new mantra being ‘sustainable management of our peatlands and peat soils’.

References

McBride A, Diack, I, Droy, N, Hamill, B, Jones, P, Schutten, J, Skinner, A & Street, M (2011) *The Fen Management Handbook*. SNH.