Story Board 6: Carbon Storehouses

Fiona Cawkwell

Peatlands around the World

Peatlands are one of planet Earth's most important ecosystems, covering over 4 million km^2 and representing about a third of the estimated area of the world's wetlands. Peat is made up of the decaying remains of plant roots, leaves and even tree trunks, but it is also in a state of permanent saturation with typically 95% of its volume being water. Peatland formation and distribution is primarily a function of climate and topography, favouring wetter conditions with poorly drained soils, which encourages slow decomposition. Fens are often the precursor to peat bogs, forming in areas such as lake margins, where there is a good supply of mineral-rich ground water. Where there are moderate levels of rainfall, more material may accumulate in the fen, gradually building it up to a dome-shaped surface, or raised bog, which may be tens of metres deep. The living top layers of the bog are raised above the mineral-rich ground water source and depend on rainfall to extract nutrients. In some midland counties of Ireland these nutrient-poor raised bogs occupy former lake basins that drained away after the last Ice Age. Blanket bogs are much shallower, and typically extend over greater areas, often at higher elevation and where there is greater rainfall – for example, along the west coast of Ireland.

Peatlands in Ireland

Peatlands are estimated to cover more than 17% of the land surface of the Republic of Ireland. From the air, it is possible to appreciate their extent across the country – only Finland, Canada and Indonesia have a greater percentage of their national landmass covered by peatlands! Satellite imagery is also useful for mapping the extent of different types of peatland. Figure SB6.1, part of an image acquired by the *IKONOS* satellite, shows an area of the Irish midlands where there has been considerable harvesting of peat for fuel (the dark browns and red browns), but also afforestation of previously stripped areas (the dark greens).

Figure SB6.1. Part of an IKONOS image of the Irish midlands from 18 March 2009.

Partly as a consequence of the introduction of large-scale mechanised turf extraction, afforestation programmes and intensification of agriculture over the last 40 years, much of the original diversity of peatlands, and the habitats associated with them, have been lost.

Peatlands form over hundreds to thousands of years (indeed, the oldest bogs in Ireland pre-date human settlement in the country), and they react slowly to disturbance. In their natural state they are unique environments that support a wide variety of plants, some of which have adapted to a low nutrient, and frequently waterlogged soil. Bog cotton, with its white fluffy heads, is one of the most recognisable plants in the late spring and summer (Fig. SB6.2). Some plants, such as the Sundew and Butterwort, overcome the lack of ground nutrients by capturing and digesting insects, whereas mosses have the capacity to absorb up to 20 times their own weight of water. In their natural state, peatlands are less hospitable to birds and animals, due to limited food-bearing vegetation, waterlogged ground and lack of trees; however, this provides safe roosting and nesting sites for ground-loving birds such as the Meadow Pipit.

Figure SB6.2. Typical early summer vegetation of Irish peatland in its natural state (photo: © Fiona Cawkwell).

SB6

The Value of Peatlands

The low-nutrient water-logged environment of peatlands makes them unique in terms of biodiversity. They are also important in regulating the hydrological cycle as they retain and filter water. They act as an efficient terrestrial ecosystem for storing carbon, with twice as much carbon in global peatlands as in the global forest biomass. Significantly, they are also the most important long-term carbon store, locking it away for thousands of years and thereby playing an important role in global greenhouse gas balances. By sequestering atmospheric carbon, peatlands have contributed to cooling the Earth, but small changes in their ecology and hydrology can lead to very significant emissions of carbon dioxide (CO_2) and methane (CH_4). Peat extraction has an obvious and direct impact on the flora and fauna of peatlands, and clearing, draining and burning of peatlands globally is estimated to release more than 3 billion tonnes of CO_2 per annum into the atmosphere – equivalent to more than 10% of all global emissions from fossil fuels.

The Future of Peatlands

Peatland distribution has a strong relationship to climate, and with future climatic changes there will inevitably be impacts on peatland health and status. In particular, rising temperatures and changes in the amount, intensity and seasonal distribution of rainfall will affect the decay rates of vegetation, accumulation of peat, gas exchange and erosion. Ongoing draining, extraction, burning and afforestation are causing significant degradation of peatlands globally. Sustainable management of existing undrained peatlands demonstrate benefits for conservation of biodiversity and regulation of surface water flows as well as maintaining carbon storage and sequestration capabilities. Moreover, restoring peatlands and rewetting them can be a very cost-effective approach to mitigating greenhouse gas emissions due to human activities and sustaining the long-term health of not just the immediate peatland environment, but planet Earth.

Further Information

Black, K., O'Brien, P., Redmond, J., Barrett, F. and Twomey, M. (2009) The extent of peatland afforestation in Ireland, *Irish Forestry,* Vol. 65, pp. 61–71.

Parish, F., Sirin, A., Charman, D., Joosten, H., Minayeva, T., Silvius, M. and Stringer, L. (eds.) (2008) *Assessment on Peatlands, Biodiversity and Climate Change: Main Report,* Global Environment Centre, Kuala Lumpur and Wetlands International, Wageningen.

Bord na Móna, a semi-state company that owns over 80,000 Ha of peatlands: http://www.bordnamona.ie/

Irish Peatland Conservation Council: http://www.ipcc.ie/

The EPA-funded Bogland project on sustainable peatland management: http://www.ucd.ie/bogland/