



LANDSCAPE-SCALE CONSERVATION IN THE MERES AND MOSSES

Matt Jones

A Government-led landscape-scale initiative aims to create a step change in nature conservation. But what does this mean in practice? Using one of the recently designated Nature Improvement Areas as an example, the author tests the initiative's principles.

In 2010, Professor Sir John Lawton was commissioned by the Government to undertake a review of nature conservation in England. The resultant report, *Making Space for Nature*, concluded that a step change in nature conservation is required, in order to establish 'a coherent and resilient ecological network' of benefit to both wildlife and people.

One of the key recommendations of the report was for the establishment of a series of pilot projects to develop the required step change in important landscapes across England. Through the 2011 *Natural Environment White Paper*, Defra

Aerial view of the Meres and Mosses landscape, demonstrating the clustered yet isolated distribution of sites. John Harding

enacted this recommendation with the creation of twelve Nature Improvement Areas (NIAs), including one in the Meres and Mosses.

Lawton advocates a landscape-scale approach, guided by four key principles, summarised as 'more, bigger, better and joined'. At face value, these principles make perfect sense, but how they apply to specific landscapes needs careful consideration. The purpose of this article is two-fold: to review Lawton's four key principles for landscape-scale conservation in relation to the Meres and Mosses, and, based on the above, to consider what the required step change in nature conservation might entail in a Meres and Mosses context.

The NIAs are a Government-led landscape-scale initiative that sits alongside others driven by the NGO sector (including the RSPB's 'Futurescapes' and the Wildlife Trusts' 'Living Landscapes'). It is expected that the thinking highlighted here, while relating primarily to the Meres and Mosses NIA,

and the broader National Character Area of which it forms a subset, may be useful to others trying to translate Lawton's principles into action.

The Meres and Mosses landscape

The Meres and Mosses form a unique landscape, stretching from the Mersey Estuary in the north to the Black Country in the south, and from the Welsh Marches in the west to the Potteries in the east.

This is a post-glacial wetland landscape created at the end of the last ice age, around 11,500 years ago. Its location marks the southern and eastern extent of the glaciation. The glaciers carried sands and gravels ground from the bedrock beneath, dumping these materials tens of metres deep at the glacial front. As the ice sheets started to melt and retreat, massive blocks of so-called 'dead ice' became detached from the glaciers, falling into the glacial moraine. Eventually, these blocks melted to leave basins called 'kettle holes', filled initially with meltwater and latterly with groundwater.

The deepest of these features survive even today as open waterbodies, known as meres. The mosses formed over thousands of years in the shallower basins, where successional processes were able to take hold. Swamp plants colonised the edges of the

Carpet of *Sphagnum* moss. Matt Jones



basins and, as their remains accumulated, so peat started to form. Over time, fen and wet woodland invaded, accelerating peat formation and filling in the waterbodies. Finally, the peat built above the influence of groundwater, whereupon *Sphagnum* mosses were able to take over, accumulating to form a dome of peat and thus creating lowland raised bog.

Although lacking the definable character possessed by other iconic English landscapes, and little recognised outside conservation circles, ecologically the Meres and Mosses landscape is valued on a par with the Norfolk Broads and the Lake District: more than 2,000 hectares are deemed internationally important and designated as SACs (Special Areas of Conservation) under the EU Habitats Directive or wetlands of international importance under the Ramsar Convention. It is the open water of the meres and lowland raised bogs of the mosses that are the primary habitat interest, although associated swamp, fen and wet-woodland habitats are of secondary significance. These support iconic plant species, including the *Sphagnum* mosses and sundews *Drosera* of the bogs and Floating Water-plantain *Luronium natans*, Shoreweed *Littorella uniflora* and Least Water-lily *Nuphar pumila* of the meres (the last of these now restricted in England to a single site in the Meres and Mosses). Associated invertebrate communities are equally dramatic, including such specialities as the Raft Spider *Dolomedes fimbriatus*, White-faced Darter dragonfly *Leucorrhinia dubia* and Bog Bush-cricket *Metrioptera brachyptera*.

From earliest times, man has exploited the meres and mosses. Historically, such places proved a rich source of food (especially fish and waterfowl); they provided timber, firewood and materials for thatching and basketry; and the peat itself was cut for fuel (and, more recently, commercially mined for the horticultural industry). Land-use demands, in particular agriculture, have meant that many sites have been adversely affected by drainage. As they have formed in basins that have proved impossible to drain completely, however, some semblance of wetland survives at the core of many locations, although 'squeezed' and hydrologically compromised. As agriculture and other land uses have intensified, so the impacts of pollution and enrichment of run-off from land around these relict wetlands have further significantly affected



Round-leaved Sundew growing with *Sphagnum* mosses. Bruce Shortland

the quality of sites and their ability to continue supporting their unique biodiversity.

So, how do the four Lawton principles apply to the Meres and Mosses?

Better

Lawton concludes that protection and enhancement of existing sites remain a priority; good-quality sites necessarily form the core of any ecological network. Key sites in suboptimal condition will not support sufficient biodiversity or bioabundance to allow species to remain where they currently occur, let alone colonise the wider landscape. Realistically, the building of a resilient natural environment at a landscape scale will be a medium- to long-term endeavour. In the interim, the retention of as much biodiversity as possible where it currently survives across the Meres and Mosses, particularly that which is characteristic of the landscape, is essential.

In a wetland context, the act of making sites better goes beyond just getting the management of vegetation right. It necessarily includes consideration of water quantity and quality – hydrological regimes, water chemistry and the impact of associated catchments. Against a backdrop of

climate change, increasing demand for water and the required step change in nature conservation, appropriate and good-quality management must be maintained into the long term if sites are to achieve sustainable ecological functioning.

Bigger

In the purest sense of the word, opportunities to increase the size of meres and mosses are limited: for both, their physical extent is determined largely by a specific combination of topography and geology.

In most cases, however, land use around the Meres and Mosses has intensified, 'squeezing' sites to a relict wetland core through drainage and habitat destruction. While it may not be possible to increase the physical size of a mere or moss, we can look to increase size in terms of ecological and hydrological function. First, the management of land adjacent to the relict core needs to change (often raising water levels and increasing areas under 'conservation management'), this bringing the prospect of achieving a more natural hydrological regime at the core and allowing extension and restoration of associated wetland-habitat mosaics. Secondly, greater acknowledgement of the relationship between meres and mosses and the catchments within which they sit, both surface water and groundwater, is required in order to safeguard key wetland areas against external impacts.

Ultimately, this may require the conservation sector to redefine mere and moss sites, to include, for example, the extent of associated peat soils (indicative of the historic extent of wetland habitats), a hydrologically functioning unit, or even a wider catchment.

More

As meres and mosses are the product of specific geological processes, arguably it is not possible to create more in terms of number/area. In the case of meres, creation of some form of surrogate habitat may be possible, for example through restoration after aggregates extraction or pond creation (although these will lack the geological, hydrological and historical associations of the meres themselves, and are therefore likely to be ecologically poorer). For mosses, the specific peat soils and hydrological regime required



Demonstrating the more ambitious approach required, using Chapel Mere SSSI as an example, the map shows the proposed 'functional ecological unit' (in blue) which extends beyond the current SSSI boundary (in red). This can be seen on the ground – with the SSSI to the right, the distinct bank to the left shows the likely historical extent of wetland habitat and thus the boundary of the 'functional ecological unit'. Matt Jones

significantly restrict opportunities for lowland raised-bog creation. Many mosses, however, have been massively degraded and, if we are to achieve a resilient ecological network, more of these sites must be restored to ecologically and hydrologically functioning units as described above.

Associated with the Meres and Mosses is a range of other wetland habitat types (e.g. fen, wet woodland and wet grassland). Subject to obvious restrictions in terms of topography, soil type, hydrology and intensity of existing land use, opportunities for the restoration and creation of these habitat types are more prevalent across the wider Meres and Mosses landscape. As the overriding landscape interest is the meres and mosses themselves, however, the extent to which these opportunities are pursued requires careful consideration in terms of both resource allocation and prioritisation.

Joined (Connectivity)

Based on the origins of the landscape, the concept of connectivity is perhaps less obvious in the Meres and Mosses context than it is in other landscapes.

The first question relates to connectivity of what? Generally, discussion around connectivity

implies that fragmentation has occurred in the landscape: in other words, areas of habitat and physical links across the countryside have been lost, leaving fragments of a historically larger whole. In terms of meres and mosses, while it is true that these are often clustered within the landscape (and a small number of sites, either naturally or through human intervention, are physically linked), they have been isolated geologically and hydrologically from one another for millennia. Thus, it is the case that individual sites have become increasingly compromised (see 'Better' and 'Bigger', above), rather than that extensive areas of linked habitat have been lost. Consequently, targeting direct physical connection of sites is not appropriate in the Meres and Mosses landscape.

Beyond connectivity of habitat, in a wetland context there is a more subtle connectivity between sites and their wider hydrological context. Thus, the quantity and quality of water derived from its catchment can have an impact on the core site (again, see 'Better' and 'Bigger').

The second question relates to connectivity for what? Ecology is about habitats, the populations of species which they support and, at a landscape scale, the ability of those species to move through the countryside. Clearly, this ability differs dramati-

cally for different species – for example, contrast the Otter *Lutra lutra* with Desmoulin's Whorl Snail *Vertigo moulinsiana*. Generally, however, wetland species tend to disperse better than other groups (having evolved to colonise isolated or ephemeral habitat niches), with the success of dispersal correlated with the proximity of sites. Given the distinct clustering of the meres and mosses, if all extant sites were in good condition (in terms of quality and size), and therefore able to support robust populations of species and act as effective sources and/or receptors

for species' movement and establishment of meta-populations, this would arguably provide sufficient connectivity across the landscape to support an effective ecological network. While these principles generally hold true, we do need to understand dispersal mechanisms and the historical distribution, particularly of the more specialist species, to ensure that we are realistic about our vision for the future and how this is achieved. For example, how many sites did the Least Water-lily ever occupy historically? And even if we achieve a 'connected' landscape, are the dispersal mechanisms of some species so limited that further intervention (e.g. translocation) is warranted?

If the meres and mosses themselves are at the core of this landscape, where the focus is on quality and size, the question then arises as to what, if anything, we should be looking to achieve in the 'white space' (i.e. the lower-priority land) between them. Because of its geology, much of the land between the meres and mosses is incapable of supporting wetland habitat, being sand/gravel-based moraine of inappropriate topography. Where wetland restoration or creation is possible, there is potential for the creation of 'stepping stones' of habitat to increase the proximity of wetlands. In circumstances in which economic resources are limited, however, there must be careful reflection over whether these 'stepping stones' are of relevance to the core importance of the landscape: for example, an area of wet grassland may support some generalist wetland species, but will



Bog Bush-cricket, one of the specialities of the Meres and Mosses. Cisca Castellijns/Minden Pictures/FLPA

not provide conditions suitable for colonisation by specialist lowland-raised-bog species. Arguably, the main focus of activity in the 'white space' should therefore be on protecting core sites, either directly, through extension or immediate physical safeguarding, or more indirectly, for example by improving the quality of water arising from their catchments.

It must be borne in mind that other drivers operate within the 'white space' of the Meres and Mosses landscape. In terms of nature conservation, there are extensive areas of river-valley peatland (e.g. Baggy Moor, on the River Perry in north-west Shropshire) where a different, although potentially complimentary, wetland landscape may be envisaged. There are also areas of value for farmland-bird assemblages and other declining but widespread species. Given the overriding international importance of the meres and mosses themselves, however, these other habitat types and species groups should remain of secondary importance in this area. This is not to say that activity to benefit these interests should not be undertaken, but that any such activity must be subject to suitably robust consideration: locally, regionally or even nationally, is this the most appropriate location for action and use of resources and, in line with Lawton's four principles, what are the targets that the conservation sector is endeavouring to achieve?

The other notable driver in the 'white space' will be potential delivery of ecosystem services (above

and beyond what might be delivered by the core sites). Habitat restoration and creation, whether wetland or otherwise, may be appropriate where it provides food or materials, improved water quality, flood protection or enhanced human wellbeing.

Implications for the Meres and Mosses

Bringing all this together, in terms of Lawton's principles for landscape-scale conservation, it is considered that the focus for the Meres and Mosses should be around 'better' and 'bigger', rather than 'more' and 'joined'.

The Meres and Mosses landscape has been a priority for significant conservation action over recent decades, but, in line with Lawton's findings, the current approach is not enough. Overall, sites continue to deteriorate and species continue to be lost. But if future work in this landscape is about 'better' and 'bigger', what is the step change in nature conservation required in order to reverse trends, and how does this differ from what has been done before?

In simple terms, the answer lies in scale of ambition. While it may not be possible to create the extensive areas of habitat envisaged by ventures such as the Great Fen Project, it is considered that the Meres and Mosses can be restored to a coherent and resilient ecological whole.

At the centre of this a redefinition of 'sites' is required. No longer should we be thinking about

the delineated extent of remaining habitat, or a boundary drawn for designation purposes. Instead we should be thinking about what might be called 'functional ecological units'. Defined on the basis of topography, hydrology and, to a lesser extent, the peat-soil resource, these units should comprise two elements:

At the core should be a high-quality wetland mosaic: not just a mere or moss, but also the full range of associated wetland habitats that might be expected around the central feature. As large as practicable, the hydrology should be stable, allowing natural processes (e.g. peat formation) to occur where possible, and habitats and ecological niches to be sustained.

This 'core' then needs to be put into the context of the landscape, relating primarily to the catchment (surface water and groundwater) that feeds the wetland mosaic. While intensive land use between the meres and mosses is likely to continue, its impact, particularly in terms of water quality, must be mitigated to safeguard the core.

One consequence of this defining of 'functional ecological units' is that, in order to reflect the new ambition, the conservation sector's targets and objectives will need to be upgraded. In addition, the aspiration for enhanced size and quality of sites, how these sites will interact to deliver an effective network, and what is required of their wider catchments needs to be much more clearly visualised. Largely generic vision statements must

Merefest, an annual celebration of the Meres and Mosses, is an important means of increasing community awareness of and meaningful engagement in a landscape that otherwise suffers from a low public profile.

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Aerial view of Wem Moss, showing how intensification of land use has resulted in the 'squeezing' of sites to a relict core. John Harding

be replaced by more meaningful communication of what an ecological network in the Meres and Mosses might look like and what it might deliver for society (particularly if buy-in from other sectors such as agriculture, business or local communities is to be secured). All of this needs to be considered over timescales measured in decades, rather than in years or short-term Parliamentary and funding cycles.

Inevitably, this brings challenges. Perhaps most pressing is climate change, which is likely to have a profound impact on the wetland environment. Projected changes in rainfall patterns, temperatures and therefore water budgets may influence what habitats and species can realistically be sustained at given locations across the landscape in the long term. In particular, the mosses lie at the edge of the 'climate envelope' for lowland-raised-bog formation, raising questions about the long-term survival of existing sites, and the restoration targets for currently degraded sites. Achieving an ecological network will require both management of existing

sites and restoration of degraded ones, but this will have to be directed towards habitat mosaics which, we are confident, can be sustained in the long term. The new approach will also test our understanding of ecological processes (e.g. species' dispersal) as they operate at a landscape scale. We shall also need to ask how best to prioritise activity, not only in terms of conservation, but also in relation to other land uses, notably agriculture: with increasing demand for food, how do we maintain a viable farming sector that has a benign impact on the wider environment?

Delivery of this more ambitious vision for the Meres and Mosses landscape will require new and innovative ways of working.

There is a need to work in more effective, potentially different, and sustained partnerships. These partnerships will need to extend beyond the 'usual suspects' (increasing involvement from outside conservation, notably the agriculture, business and community sectors) and engender far greater political buy-in and policy support at all levels.

The clear visualisation of an ecologically coherent landscape will be key to communicating ideas and aspirations, and securing the collaboration inevitably required for its delivery.

Particularly important in the Meres and Mosses landscape, given its low public profile, is increased community awareness and meaningful engagement. Only when people understand and value this special landscape, and are provided with opportunities to experience it, will they more fully support its restoration.

Embracing the ecosystem-services agenda, where appropriate, using it as a tool to engage support and secure resources. We must not, however, lose sight of the intrinsic value of the Meres and Mosses landscape and its biodiversity; and we must fully understand the multiple ecosystem-service benefits that it might bring to society, and be realistic in their valuation. Rather than blithely talking about carbon sequestration or flood mitigation, for example, we need to appreciate the habitat conditions under which sequestration occurs or that populations downstream of sites are actually at risk of flooding.

The proposed 'functional ecological unit' should be better able to sustain ecological niches, avoiding the need for micro-management and the 'boom and bust' management cycles that have historically been seen in the Meres and Mosses. Where continued intervention is required in order to maintain habitats and species, greater emphasis needs to be given to its justification, its quality, and its ability to be cost-effectively sustained in the long term. This may require making challenging decisions about management, the adoption of new approaches, and the employment of novel techniques and new technologies.

Finally, as traditional sources of funding become stretched, so the resources required to realise a revitalised landscape in the long term will need to be sought from new sources. Mechanisms might include increased direct funding from commerce and business (e.g. through corporate social responsibility); valuation of the ecosystem-services benefits provided by the Meres and Mosses and



A Raft Spider rests on plastic sheet piling installed as part of a moss-restoration project. Matt Jones

securing payment for them; and, although in their infancy and not supported by all, biodiversity and carbon-offsetting mechanisms.

Conclusion

Eleven thousand years ago, a specific set of circumstances resulted in the creation of the Meres and Mosses landscape. It is an internationally important landscape, but one to which ideas around habitat connectivity and substantial recreation are difficult to apply. Necessarily, the focus of conservation activity has to be on maximising the size and quality of extant sites. While it may have stemmed declines in habitats and the loss of species, conservation action to date has not reversed these trends. Achieving the 'coherent and resilient ecological network' advocated by Lawton in *Making Space for Nature* requires a step change in nature conservation and an upscaling of ambition for the unique and fascinating landscape that is the Meres and Mosses.

Reference

Lawton, J. H., et al. 2010. *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra.

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