UK Biodiversity Action Plan
Priority Habitat Descriptions

Aquifer fed naturally fluctuating water bodies

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Aquifer Fed Naturally Fluctuating Water Bodies

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (https://webarchive.nationalarchives.gov.uk/20110303145908/http://www.ukbap.org.uk/UKPlans.aspx?ID=24), a summary of which appears below.

Physical and chemical status

This habitat category consists of natural water bodies which have an intrinsic regime of extreme fluctuation in water level, with periods of complete or almost complete drying out as part of the natural cycle. They have no inflow or outflow streams at the surface, except at times of very high water level, when temporary out-flows may develop. Instead, they are directly connected to the underlying groundwater system and periodically empty and are recharged via swallow holes or smaller openings in their beds.

There are two known variants of the habitat in the UK: turloughs, found over Carboniferous limestone in Northern Ireland and Wales; and fluctuating meres, which occur over chalk in the Norfolk Breckland. Turloughs are distinguished by winter flooding and a dry floor, apart from small residual pools, in summer. Under one definition, a water body qualifies as a turlough only if winter flooding exceeds a depth of 0.5m. There may be underground connections between neighbouring turloughs. The fluctuating meres of Norfolk do not have a regular annual rhythm of emptying and recharge. Instead, there is a complex pattern of drying out and refilling, sometimes with a stretch of several years during which a mere may remain dry, followed by a prolonged period when water is constantly present, although its depth may vary from a few centimetres to 6m. The water level in both turloughs and meres reflects the height of the water table, which periodically rises above the surface of the bed. The response to groundwater fluctuations in turloughs is rapid, whereas that in the meres is highly lagged, with each mere having an individual periodicity.

This is naturally a very rare habitat, both in the UK and internationally, although the Republic of Ireland has at least 60 unmodified turloughs 10ha or more in extent. Three intact turloughs have so far been found in Co. Fermanagh, Northern Ireland, possibly the most northerly water bodies of this kind in Europe, and a single example (Pant-y-llyn) has been recognised in South Wales. Six fluctuating meres have been identified in the Norfolk Breckland, but some of the smaller pools nearby may also be fluctuating meres. There have been suggestions that aquifer fed naturally fluctuating water bodies may occur elsewhere in the UK, including Scotland, but none has yet been positively identified. Conversely, there are probably a number of aquifer fed water bodies which were once naturally fluctuating but have been deliberately modified and so have lost most of their biological interest.

Taking the area of maximum inundation, the total extent of the nine UK waters at present known to fit the definition of aquifer fed naturally fluctuating water bodies is approximately 10ha in Northern Ireland, 1ha in Wales and 20ha in England.

The nutrient status of these lakes varies from area to area and the water quality reflects that of the groundwater. The water of turloughs and fluctuating meres is hard because the underlying rock is calcareous. The Irish and Welsh turloughs lie naturally in the middle of the trophic range for the UK (mesotrophic) and the Breckland meres are somewhat richer (mildly eutrophic).

Biological status

The concentric zonation of vegetation in these lakes is strikingly obvious, especially when they are in their dry phase. Then their basins are partly or completely occupied by grassland, often with silverweed *Potentilla anserina* abundant, although turloughs in Northern Ireland retain some permanent swampy pools. Water chickweed *Myosoton aquaticum* and stinging

nettle *Urtica dioica* are typical of the damp centre of Breckland mere basins, with a broad band of reed canary grass *Phalaris arundinacea* at a slightly higher level. Woodland and scrub – mainly willow, birch, alder, ash or hazel – grows around the margins of most of the meres and turloughs.

As a result of the fluctuating water levels, aquatic vegetation is absent (or, in Northern Ireland, restricted to residual pools) at some periods in the cycle of these lakes and abundant at others. An element common to both turloughs and meres is the prevalence of aquatic and semi-aquatic mosses such as *Fontinalis antipyretica* and *Cinclidotus fontinaloides*, which are more resistant to desiccation than higher (vascular) aquatic plants. Rare plants of the inundation zone include the moss *Physcomitrium erystomum* in the meres and the rare fen violet *Viola persicifolia* in the turloughs of Northern Ireland. Although some permanent pools in the Northern Irish turloughs support white water lily *Nymphaea alba* and other water plants, in the Breckland meres, where deep flooding can occur for long periods, aquatic vegetation becomes better established and more diverse than in most turloughs. Water plants typical of the meres are shining pondweed *Potamogeton lucens* and various-leaved pondweed *Potamogeton gramineus*, sometimes accompanied by their hybrid, long-leaved pondweed *Potamogeton x zizii*, which is scarce nationally.

The aquatic fauna of these fluctuating water bodies is adapted to intermittent desiccation. Fish are generally absent, but a range of amphibians can be found, including the protected great crested newt *Triturus cristatus* in the Breckland. Invertebrates include many insect species such as dragonflies, water boatmen and diving beetles, which are highly mobile and are therefore able colonisers. Typically, there is also a rich assemblage of micro-crustaceans such as water fleas, which have resting stages that can remain viable in the soil during dry phases. Snails such as the marsh snail *Lymnaea palustris*, which breathe air and can persist during periods of drought under stones and in damp vegetation, are common in both turloughs and meres. Numerous rare invertebrates have been recorded, including the large mussel-shrimp (ostracod) *Cypris bispinosa*, the small diving beetle *Bidessus unistriatus* and the scarce emerald damselfly *Lestes dryas* from the Breckland meres. During their wet phase the meres support breeding coot *Fulica atra*, tufted duck *Aythya fuligula*, mallard *Anas platyrhynchos*, shelduck *Tadorna tadorna*, pochard *Aythya ferina* and gadwall *Anas strepera*.