Purple Moor-grass meadow at Chippenham Fen NNR, Cambridgeshire

15. Purple moor grass and rush pastures

Climate Change Sensitivity: **Medium**

Introduction

Purple moor grass and rush pasture is highly sensitive to changes in agricultural economics. It is largely marginal land and has in the past suffered both from intensification through agricultural improvement or loss due to cultivation and/or abandonment, depending on the economic situation (UK Biodiversity Steering Group 1995). Climate change is likely to increase these pressures, with increased uncertainty and extreme events making it increasingly difficult to manage sites.

In addition, purple moor grass and rush pasture is sensitive to the direct impact of climate change. Being dependant on wet or waterlogged soils, it is sensitive to changes in the water table and flooding, with reduced summer rainfall in particular potentially promoting a transition to drier habitats.

Habitat Description

Purple moor grass and rush pastures occur on infertile, seasonally-waterlogged sites with slowly permeable, humic or peaty gley, as well as peat soils. The pH range for the component types is wide, ranging from 4.7 (acidic) to 7.4 (alkaline). They occur mostly on flat and gently sloping ground, often associated with valley side springs and seepage lines, but also occur on river and lake floodplains. They tend to be dominated by purple moor-grass *Molinia caerulea*, sedges, and/or jointed rush species, and are usually managed as pasture or more rarely as hay meadows. Neglect results in dominance by tall herbaceous species (potentially leading to development of tall-herb fen) and/or invasion by woody species. They may be very small, for example, a few metres square around a discrete spring, or may form part of larger tracts of semi-natural vegetation with habitats including dwarf-shrub heath, bogs, flushes, tall-herb fens and dry grasslands.

In many cases, fen meadows and rush-pasture types occur as isolated, enclosed sites in the farmed lowland landscape, sometimes in association with other grassland types, wetland vegetation including bogs and fens, and wet heath. In the upland fringe and in other areas of high rainfall and impeded drainage, rush-pasture is more frequent and more extensive.

Species particularly associated with purple moor grass and rush pastures include wavy St. Johns-wort *Hypericum undulatum*, meadow thistle *Cirsium dissectum*, marsh hawk's beard *Crepis paludosa*, greater butterfly orchid *Platanthera chlorantha*, lesser butterfly orchid *Platanthera bifolia*, marsh fritillary butterfly *Eurodryas aurinia*, small pearl-bordered fritillary *Boloria selene*, narrow-bordered bee hawkmoth *Hermaris tityus*, curlew *Numenius arquata*, snipe *Gallinago gallinago*, and grasshopper warbler *Locustella naevia*.

Potential climate change impacts

Cause	Consequence	Potential impacts
Higher annual average temperatures	Longer growing season	■ Increased plant growth leading to altered management requirements, such as stocking density and grazing periods. ■ Earlier onset of the growing season may lead to less favourable conditions for ground nesting birds such as Lapwing that require short swards.
Hotter summers	Higher evapotranspiration	■ Reduced water tables (see drier summers).
Drier summers	Increased soil moisture deficit	■ Water stress could lead to the loss of individual species and changes in the plant community composition. ■ Drier conditions in late spring could reduce the suitability for breeding waders such as snipe and redshank. ■ Lower water tables could lead to ground conditions becoming suitable for the intensification of grazing or conversion to arable cropping, leading to a direct loss of habitat.
Wetter winters	Increased risk of winter flooding and increased nutrient loading. Higher winter water table.	■ Increased nutrient inputs from in-washed sediment could lead to the loss of nutrient-poor vegetation types. ■ Higher spring soil moisture levels (combined with higher spring temperatures) may increase total biomass and favour more competitive species. ■ Ensuring appropriate levels of grazing may become more difficult.
More extreme events	Summer and Winter flooding	■ Summer water-logging could result in vegetation dieback and an increased incidence of bare ground, leading to colonisation by ruderal species. ■ More flooding could lead to a shift in species composition to favour those species able to cope with long-term inundation. ■ Increased nutrient input resulting from flooding will benefit those species able to utilise enhanced levels, with the potential loss of nutrient-poor vegetation. ■ More frequent disturbance could increase susceptibility to the spread of invasive species (Knight et al 2013). ■ More frequent flooding will make it more difficult to maintain appropriate grazing levels and will make access for management more difficult.

Adaptation responses

Purple moor grass and rush pasture requires active management through grazing, and ensuring the appropriate level of grazing in the face of changing environmental conditions and the changing economics of agricultural production is likely to remain an important adaptive response on many sites.

Due the susceptibility of the habitat to changes in water levels, actions to ensure an adequate supply of water to sites will also be important. Removing or reducing pressures on wetlands, including groundwater abstraction, drainage and nutrient enrichment, will be of increasing importance. As well as dealing with licensed activities such as abstraction, this may be facilitated by the designation or sympathetic management of larger areas to protect land around wetlands, and improved management of soil and water within catchments.

In many areas, the remaining areas of purple moor grass and rush pasture sites are highly fragmented, and actions to increase ecological connectivity of remaining patches, by increasing the size of existing patches and creating new habitat, will be needed to increase resilience.

Purple moor grass and rush pasture communities will alter under climate change, and the extent to which change is accepted and managed will need careful consideration in each location, taking account of the particular circumstances.

There are various existing initiatives to improve the availability of water and water quality, including the Water Framework Directive and the Environment Agency's Restoring Sustainable Abstraction programme. It is critical that any risks from climate change are considered in the context of these, and that actions to improve resilience as well as current status are identified and included in relevant programmes and plans, particularly the WFD River Basin Management Plans, which are updated at five-year intervals, and the Water Companies Asset Management Programme (AMP), associated with the five yearly price review.

The requirement for a flexible management regime of grazing and or cutting that is able to adjust to seasonal variation in rainfall is also important. This will remain a challenge due to the low financial return management of these habitats provides.

Climate change interactions with nutrient enrichment from atmospheric deposition may accelerate negative change. Efforts to reduce nutrient enrichment from this source will continue to be necessary to maintain or restore favourable condition. Restoring natural hydrological processes on and around wetland sites is likely to improve the resilience of features. This may not always be appropriate, eg on sites that have been created and sustained wholly by human intervention, but in most circumstances it should be seriously considered. This, in the first instance, will involve being very clear about site function, existing pressures, and anthropogenic modifications to the wetland. For example, many sites retain artificial drainage networks which have been perpetuated for no reason other than because they have 'always been there'. Consideration should be given to removing these drainage functions unless they are critical to protecting very high value features, infrastructure or property.

Some of the potential adaptation options for this habitat are outlined below.

- Establish an ecohydrological characterisation for the site that considers all aspects of the water regime, reference hydrological state, existing state, pressures and threats, and the feasibility of restoration options, to ensure that any interventions are carried out with full knowledge of the value and function of the site.
- Ensure appropriate management through extensive grazing combined, where required, with scrub management or cutting to ensure that habitats do not develop into rank grassland, scrub or woodland or conversely are over-grazed.
- Ensure management is sufficiently flexible to provide appropriate management under a range of growing conditions, for example by making sure alternative land is available for grazing in years when the land is flooded.
- Expand the resource through the restoration of semi-improved pasture and re-creation on improved grassland/arable land. Target this to ensure expansion and linkage of existing sites.
- Increase the heterogeneity of habitats on larger sites by varying the timing and range of management regimes to produce a range of vegetation structures and, where possible, a mosaic of habitat types.
- Where long term water availability is unlikely to be maintained, revise the objectives for the site and determine the most effective management options to facilitate change. For example, manage the site through grazing to facilitate a transition towards species rich lowland meadow type habitat.
- Locations for the restoration or creation of fen habitats should be identified at the planning stage of flood management schemes within river floodplains.
- Restore natural hydrological processes where this would enhance resilience of habitats.

Snipe in boggy pasture

Relevant Environmental Stewardship options

Maintenance of species-rich, semi-natural grassland (HK06)

This option is targeted at the maintenance and protection of areas of species-rich grassland.

Restoration of species-rich, semi-natural grassland (HK07)

This option is targeted at grasslands that are potentially rich in plant and associated animal life. They are often on difficult ground and may have suffered from management neglect or they may have been selected for agricultural improvement. The botanical diversity of such grassland may be enhanced by simply amending existing management practices. However, on many sites pro-active restoration management will be required involving the introduction of seeds and the creation of gaps for their establishment. Substantial changes of livestock type, timing of grazing or control of dominant species may also be required. The option can also contribute to protecting valued landscapes and archaeology, and the promotion of good soil conditions.

Wetland grazing (HQ12) - £200/Ha

The aim of this supplement is to support a grazing regime where this is the most appropriate form of management for the habitat.

Further information and advice

Centre for Ecology & Hydrology Wetland toolkit for Climate Change
The Wetland Toolkit for Climate Change guides the user in the application of tools developed to assess how climate change in the 2050s (2041-2070) might impact on wetland ecohydrology in England and Wales. The guidance and the tools are designed to be used by anyone concerned with the impacts of climate change on wetlands. It is anticipated that the main users will be site managers concerned with the status of their wetlands.

Scottish Natural Heritage (2011) The Fen Management Handbook
This handbook produced by Scottish Natural Heritage aims to improve managers understanding of fens and how they function, to explain why fens need management and to provide best practice guidance.

Environment Agency A Wetland Framework for Impact Assessment at Statutory Sites in England and Wales.

Environment Agency (2004) Protecting and enhancing wetlands: Ecohydrological Guidelines for Lowland Wetland Plant Communities and (2010) Fens and Mires update.

JNCC (2008) UK BAP habitat description Purple moor grass and rush pastures

Key evidence documents

Carey PD. (2013). 5. Impacts of Climate Change on Terrestrial Habitats and Vegetation Communities of the UK in the 21st Century. Terrestrial Biodiversity climate change report card technical paper.

UK Biodiversity Steering Group (1995).Biodiversity: the UK Steering Group Report, Vol II: Action Plans. HMSO, London.