

Great Ouse Valley flood plain meadows

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Background

The River Great Ouse is approximately 230km long and runs from Northamptonshire in the west in a roughly north easterly direction, to the Wash. In the upper catchment, although a highly regulated waterway, it largely follows its original course until it reaches Earith. Flood plain meadows are significant features bordering the River Great Ouse and its tributaries. They have provided an important source of hay and pasture for domesticated stock, which may date back a thousand years or more. They seem to have had a diverse flora and fauna, remnants of which survive today. This paper looks at the meadows that lie within the river valley running through Huntingdonshire District between St Neots and Earith (Figure 1). This article seeks to bring together the work already undertaken on assessing the nature conservation importance of meadows within the River Great Ouse Valley, describe what has happened to them and consider their conservation.



Figure 1 River Great Ouse

Introduction

In southern and eastern England, three of the more recent glacial periods helped form the present River Great Ouse valley. The Anglian Glaciation, lasting from approximately 478,000 to 424,000 years ago, covered much of the area with glacial till (boulder clay). Two further glaciations affected Britain. The Wolstonian spanned a period of 245,000 years but only came as far south as Huntingdon about 160,000 years ago, when an 'ice lobe' the 'Tottenham glaciation' projected into the tundra. This may have been key to the final position of the Great Ouse valley with the northerly course of the river being "diverted sharply to the east at Huntingdon, blocked by

the till sheet to the north." (Gibbard et al. 2018). The last significant glaciation, the Devensian, was at its maximum about 27,000 years ago and ended some 12,000 years ago.

Throughout this period cycles of erosion and deposition associated with alternating glacial and interglacial periods, left deposits of sand and gravel in the valley several metres thick. Meltwater from the retreating ice sheets of the last Devensian glaciation eroded previous deposits leaving prominent gravel terraces, including remnants from the Anglian glaciation. Today the legacy from this glacial period can be seen in the extensive gravel pits, which are a prominent feature throughout the area. As the climate warmed vegetation colonised the land eventually forming woodland. From 8,000 years ago, forest clearance released sediments from the hinterland. Washed down by the river, these alluvial deposits filled the valley, covering the older glacial deposits.

The Ordnance Survey (OS) Six Inch maps (1888-1913) show field boundaries in some detail, helping to provide an impression of the extent of meadows along the valley of the River Great Ouse and its tributaries. Although it is not possible to estimate the floristic state of the meadows, it is reasonable to assume that they were as rich as the few remaining unimproved sites such as the Portholme Meadow (Doody 2008). By 1950 gravel pits appear, many noted as "Old Gravel Pits" on the OS 1: 25,000

maps (revised 1938-1950). These show the extent to which during the 1940s, gravel provided ballast for building runways and other developments associated with the many local WW2 airfields and with it, loss of these meadows.

Land use History

Up until the Second World War little changed along the River Great Ouse valley. Inspection of the OS Six Inch Maps, Second Edition, surveyed 1885-1887 (Revised 1902) shows a patchwork of fields, small villages and towns with little or no evidence of gravel extraction. By 1945 gravel pits appear, associated with constructing wartime air fields, which proliferated in the area. However, the rapid expansion of towns, some villages and road building soon resulted in many more. By 2016 tracings from Google satellite imagery show just how extensive these excavations had become (Figure 02).

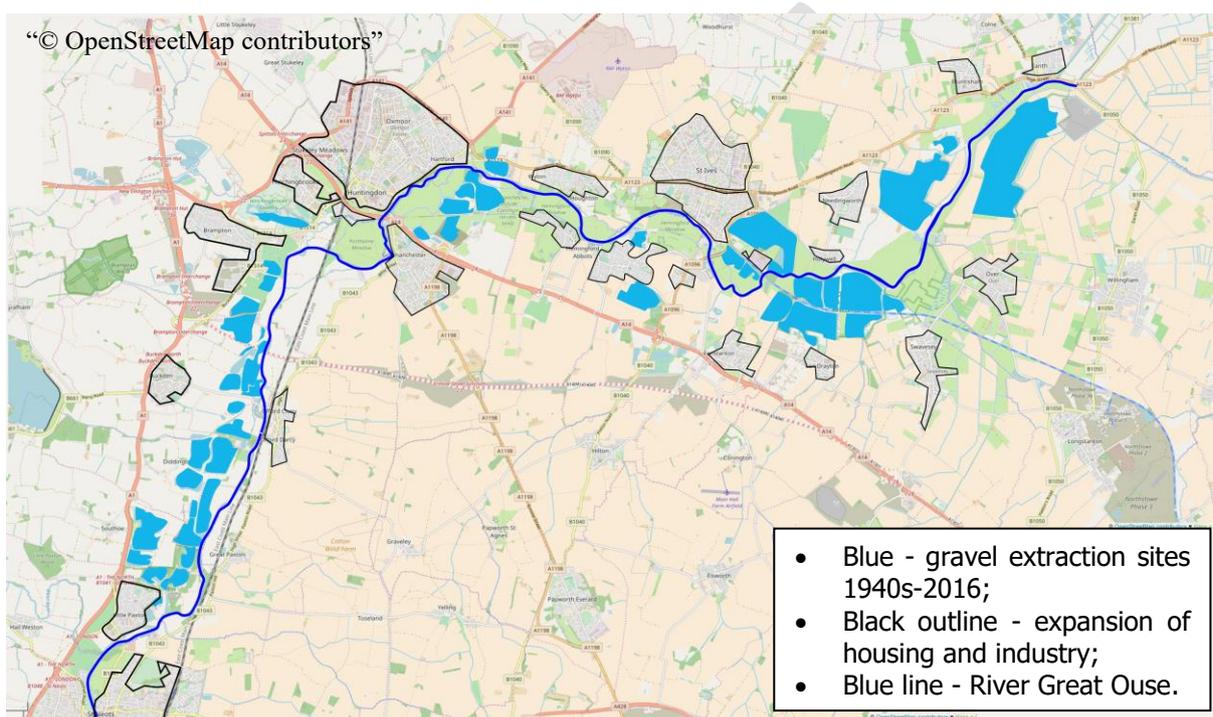


Figure 2 Loss to gravel extraction and the built environment

Meadowlands, especially those within river valleys, have a long association with human activity. From the Iron Age to the 19th Century they may well have been traditionally managed with farmers using scythes to cut the meadows. With the introduction of mechanical mowing between 1860 and 1945 the transition to modern management took place (Peterken 2013). In 1915 the British Government launched a campaign to increase food production. The Board of Agriculture through an executive Department established a War Agricultural Executive Committee in every county. Originally encouraging farmers to increase the output of grain and potatoes, in 1917 powers were taken to improve land husbandry and extend cultivated land (Sheail 1974). A further campaign took place from 1939 when under the Emergency Powers (Defence) Act of 1939, the Minister of Agriculture was empowered “To preserve and maintain agricultural land solely for the production of food, to control, by order the cultivation, management and use of the land in order to secure maximum production from the farms; to terminate any tenancy of agricultural land where it is considered the land is being neglected or badly cultivated” (Emergency Powers Act 1939; p. 256).

Under this Act part of Portholme Meadow a Special Area of Conservation near Huntingdon was subject to an experiment on 5 acres of land, known as “Five Head Acres” (Hunts Post March 1943). Carried out by the Demonstration Sub-Committee of the War Agricultural Executive Committee (W.A.E.C.), it set out to establish whether ploughing, fertiliser treatment and sowing with a grassland

mix would be able to support “grasses of higher quality than those at present growing there”. If so, other river valley flood plain meadowland might be treated in a comparable way. The experiment was extended to 50 acres and between 1944 and 1951 the ‘Requisitioned Land’ was re-seeded, fenced off and heavily grazed; annual applications of fertiliser being applied. “The whole resulting in a highly productive pasture carrying a minimum of 50 head of stock after the initial spring growth had ceased.” Ownership issues proved problematic and the extension of this approach to the entire site failed.

However, the approach was applied to meadows along the valley and in common with meadows elsewhere their biological diversity has diminished. This paper provides an assessment of the changes that have been brought about, based on biological surveys carried out over the last 50 years or so.

Meadow Surveys

From 1967 to 1974, botanical surveys of lowland meadows in Huntingdonshire took place under the auspices of the Nature Conservancy Council by staff located at Monk’s Wood Experimental Station. For each site, plant species record cards were completed for one or more one metre quadrats. Several of these meadows were within the flood plain of the River Great Ouse and give an indication of the botanical status at that time.

Between 2003 and 2005, a widespread survey of the meadows in the River Great Ouse valley took place between St Neots and Earith, Huntingdonshire. Carried out by staff from the Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire (led by Martin Baker), this was a major part of the Ouse Valley Wet Woodland and Wet Meadows Project (Wildlife Trust BCN, 2005).

The 2003/5 survey were assessed the grasslands as being unimproved (NG), semi-improved (SNG), species-poor semi-improved (SI) or improved (I), in accordance with the NCC phase 1 habitat methodology. Where feasible the survey included identifying meadows according to their vegetation type, based on the National Vegetation Survey (Rodwell 1992). Seven types of Mesotrophic Grassland (MG), were identified in the 2003/05 survey. An overall assessment identified two major groupings:

Meadows of “low conservation value”:

- MG1 *Arrhenatherum elatius* grassland. Coarse, generally tall species-poor communities of neglected meadows;
- MG6 *Lolium perenne* - *Cynosurus cristatus* grassland. Agriculturally improved grassland. The major permanent pasture type, often resulting from the use of fertilisers, herbicides and drainage. Continues to be used for silage or hay-making;
- MG7 *Lolium perenne* leys and related grasslands. Reseeded grassland, used for silage or hay-making;
- MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland. Damp meadows where *D. cespitosa* invades due to the impedance of drainage;
- MG13 *Agrostis stolonifera* – *Alopecurus geniculatus* inundation grassland. Area of prolonged spring flooding and poor drainage, often along margins of the river.

Meadows of “high conservation value”:

- MG4 - *Alopecurus pratensis*-*Sanguisorba officinalis* floodplain meadow. Seasonally-flooded land in the river flood plain, largely agriculturally unimproved;
- MG5 - *Cynosurus cristatus*-*Centaurea nigra* grassland, MG5. This species-rich community covers a wide range of soil types in the valley.

Note these communities are not mutually exclusive as patches of MG1, MG6, MG7, MG9 and MG13 can occur within species-rich agriculturally unimproved meadows. Similarly, remnants of the richer communities survive, especially on the margins of species-poor, agriculturally improved meadows.

Recognising the loss of species diversity to agricultural intensification the project developed through a partnership between Huntingdonshire District Council, Forestry Commission, English Nature, Environment Agency, the local Wildlife Trust and Farming and Wildlife Advisory Group (FWAG). The work included developing a strategy for species-rich floodplain grassland creation and restoration. Twenty five locations were given a high priority for action.

In 2017/18 a re-examination of some of the meadows along the Great Ouse took place by the first author to assess more recent change. The methodology was similar to the 2003/5 survey but less intensive. Fields that could be accessed by public footpaths, tracks and roadways were included but less accessible areas were not. Historical records together with these more recent records help elucidate the status of the meadows over time.

The Meadows - Status

The floodplain meadows in the valley occur on well-drained soils that undergo seasonal flooding. The species composition reflects variations in soil type and depth, and the length of time the meadows remain flooded. Cutting for hay, grazing, herbicide and fertiliser application modify the plant composition. Floodplain meadows also support many associated animals including breeding waders such as Snipe and Redshank, which were formally widespread along river valleys. Aquatic species occupy drainage ditches and backwaters including dragonflies, Otter and Water Vole, Sedge Warbler and Reed Warbler. Today ornithological interest also includes the large numbers of wintering birds that frequent the meadows, especially when flooded.

Some early accounts of the river valley give a tantalising glimpse into its landscape and botanical richness. William Camden writing in 1607 refers to the River Ouse in Huntingdonshire as being “bedecketh with flowers” and commenting on a view of Portholme from Castle Hills, Huntingdon, “whereof in the spring time this may be truly said:

*The pleasant Spring faire floures doth yeeld,
Of divers colours, in this field.”* (Camden 1607)

In 1622 Michael Drayton in his *Poly-Olbion*, describing the River Great Ouse, refers to Portholme, as “*her Flowry bosome*”. The accompanying map shows a ‘cherub’ holding a bunch of flowers (Drayton 1622). In 1724 the popular writer Daniel Defoe wrote “Here are the most beautiful meadows on the banks of the River Ouse, that are to be seen in any part of England” referring to the meadows near Huntingdon (Defoe 1724).

The earlier (1967-1972) records suggest that the meadows were still relatively rich in herbs. Of the sites within the river valley the number of species ranged from a low of 10 to a high of 42 species, with an average of 27 per 1m² quadrat. This compares favourably with the average 28 species from a much larger, 4m² quadrat cited by Rodwell (1992) as indicative of a species-rich lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) Mesotrophic Grassland MG4. Perhaps as significant was the proportion of herbs in the records. These ranged from 50% to a high of 77%, well within the 40-90% range suggested as a “Primary attribute” in the assessment of the nature conservation status of lowland meadows (Joint Nature Conservation Committee 2004).

Of more than 150 individual meadows or fields, totalling 1,209ha visited between 2003 and 2005 along the Huntingdonshire section of the River Great Ouse valley only 12% had species-rich, unimproved grassland. A further 18% were relatively species-rich, semi-improved grassland. Almost all the species of old meadows have disappeared from the other sites: 21% classified as species-poor semi-improved grassland, whilst of the rest, 41% were agriculturally improved by re-seeding, increasing use of artificial fertilisers and herbicides; conversion to arable production accounted for the remaining 8%, (original data provided by the Cambridge and Peterborough Environmental Records Centre).

The distribution of the meadows is shown in Figure 3. A set of three photographs accompanies the Figure giving a visual expression of their status from ‘unimproved’ traditionally management with high nature conservation value outlined in red (P1); agriculturally ‘semi-improved’ some nature conservation value outlined in orange (P2); agriculturally ‘improved’ meadows with low nature conservation value outlined in blue (P3).

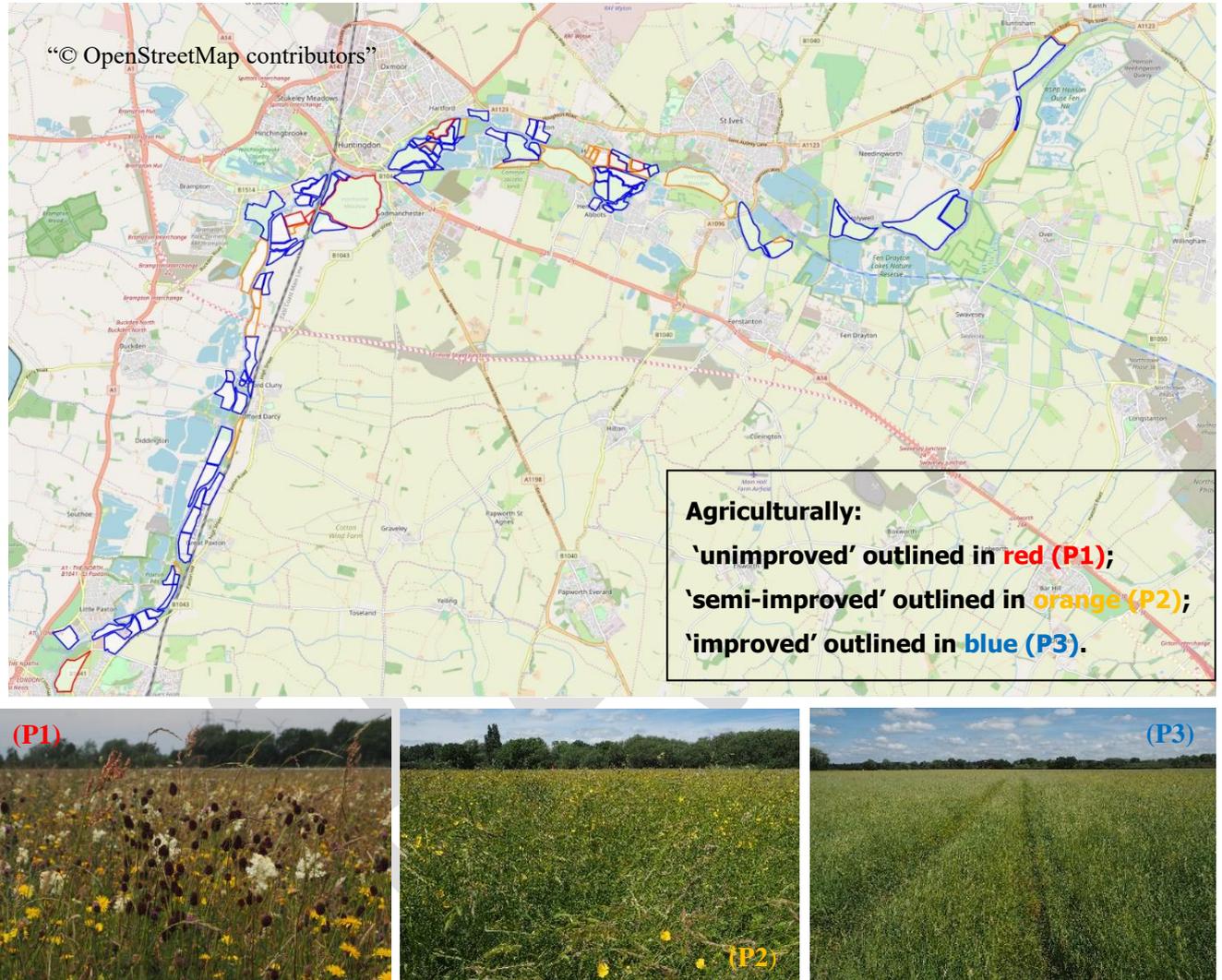


Figure 3 Distribution and status of Wet Meadows along River Great Ouse valley, Huntingdonshire, surveyed in June and July 2003/4/5 using unpublished surveys from 1987 and 1996.

Based on the surveys in 2017/8 the first author assessed the status i.e. the extent to which the intensity of land use had increased or decreased the biodiversity (notably plant diversity) of the sward. The meadows were classified using the presence of herbs as an indicator of their botanical status.

Meadow changes in status

Floodplain meadow is a subset of the Priority Habitat ‘Lowland Meadows’ under the UK Biodiversity Action Plan (BAP). There has been a dramatic and continuing decline in these species-rich meadows over the past half century with about 97% being lost (Maddock 2008). Losses have been through agricultural intensification, including conversion to arable crops, treatment with broad-leaved herbicides and artificial fertilisers. Mirroring national trends, the nature conservation status of the meadows in the Great Ouse valley is much less than in former years. In addition to the major impact of agricultural intensification and gravel workings, industrial development, housing and roads (Figure

2 above) have also had an impact. Other factors such as river management, which alters natural hydrological regimes, flood protection measures and diffuse pollution are also important.

Along the River Great Ouse (west) prior to the 2003/5 survey conversion of a series of ‘rushy pastures’ to create a golf course (GC) was witnessed by the first author. One site was lost to gravel extraction and further scheduled to be excavated in the next few years. Since the 2003/5 there has been a continuing loss of plant species diversity in many meadows. Of those surveyed in 2017/18 ten have shown signs of further deterioration. This has largely been the result of continued use of herbicides and artificial fertiliser. One County Wildlife Site (Brampton Meadows) serves to illustrate the change. The Ouse Valley Wet Woodland and Wet Meadows Project identified the meadows as a “Mixture of unimproved, species-rich semi-improved and species-poor grassland”. The surveyor (Sharon Brown) commenting on their biodiversity said “All the meadows have been semi-improved and are less species-rich than when visited in 1987. In recent years management has become unfavourable with cutting taking place too early.”. An assessment by the first author more recently (Doody 2016) confirmed the loss of herbs and again in 2017 continuing use of broad-leaved herbicides. Herbs are now limited to a very few small areas on the margins of the site where overhanging hedgerows protect plants from herbicide spray.

Two other sites have suffered through lack of grazing, one of which has a current application for housing development. Six meadows showed a general improvement in their status, largely as a result of Stewardship agreements. Two arable fields have been re-sown to grassland and four have shown a general improvement in plant diversity. Between St Neots and Huntingdon two meadows are nature reserves and have retained or improved their interest (St Neots Meadow and Paxton Pits). Figure 4 provides a summary of these changes.

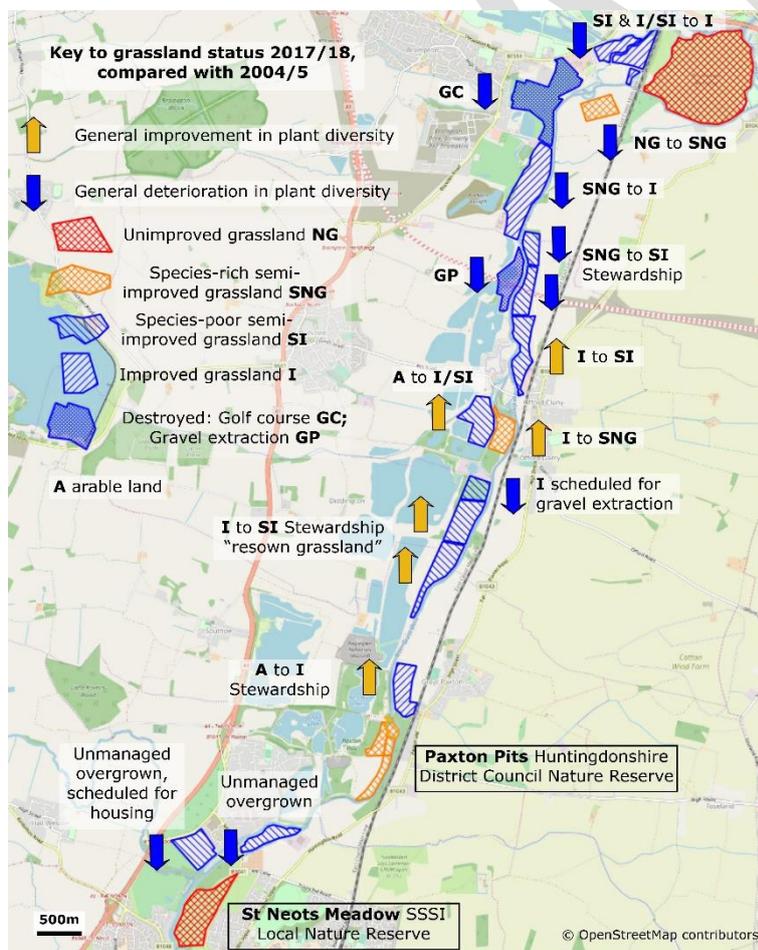


Figure 4 Change in status of Great Ouse valley meadows (west)

A similar story is recognised for the section of the river from Huntingdon to Earith (east). Here there are eight sites where continued use of herbicides and artificial fertilisers has changed their status from agriculturally ‘Semi-improved’ to ‘Improved’. Stewardship agreements have helped reverse this trend for two meadows. Notable are a series of meadows at Berry Fen, former arable fields have been rewetted and now form part on an extended RSPB nature reserve. Subject to regular flooding they became uneconomic and were sold to the RSPB. The remaining sites include three Sites of Special Scientific Interest (Portholme Meadow, Houghton Meadows and Berry Fen). There are several other meadows where traditional

management by hay making and aftermath grazing with little or no artificial fertilisers or herbicide use is carried out (including Hemingford Meadows 1 and 2). Figure 5 provides a summary of these changes.

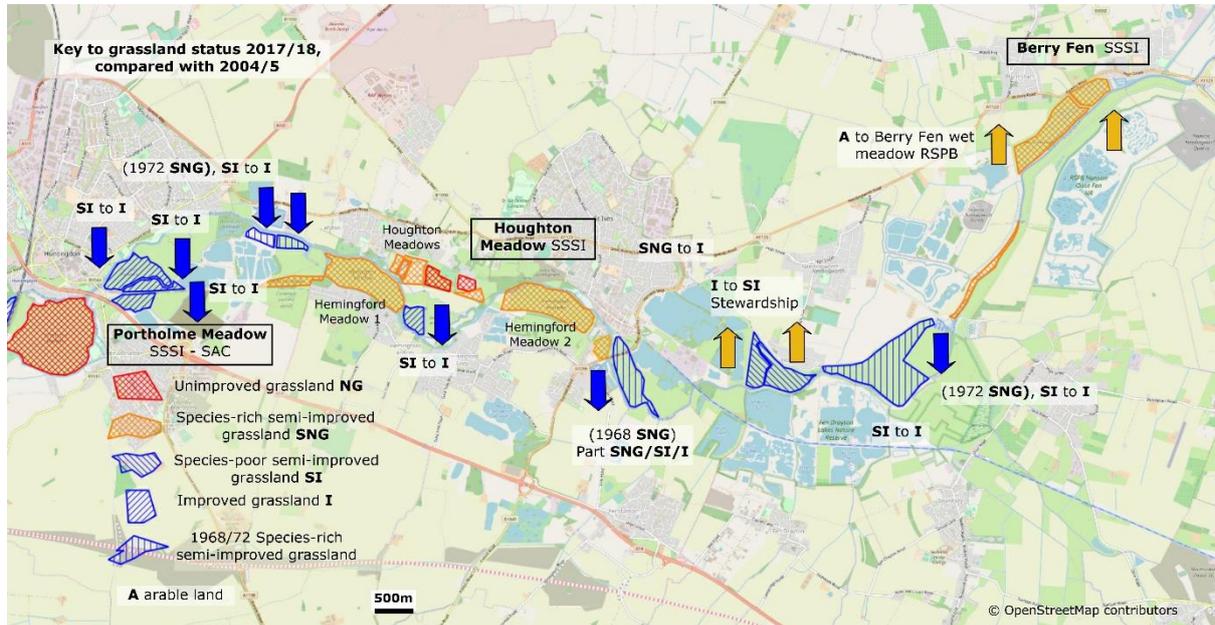


Figure 5 Change in status of Great Ouse valley meadows (east)

Retention and restoration

As the maps (Figures 4 & 5) show, there are a relatively small number of sites retaining semi-natural habitat and nature conservation interest. Portholme Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) under the EU Habitat Directive is the most important of these. It has diverse plant communities associated with grassland type MG 4. It is the largest and one of the best floodplain meadows of its type in England. Portholme has 7% of the total GB resource and fully justifies its nature conservation statutory protection. Not only does it have a diverse flora and fauna, it also has a rich history. Auctioning hay ‘Lots’ today is based on a pattern of ownership shown on a “Survey and Plan” dated 1772. This was drawn up as part of the Enclosure Review for the Parish of Brampton. Aftermath grazing for the whole site is auctioned at the same time. Income from this, together with a Higher Level Stewardship payments, help to support the management regime (Doody 2008). The few remaining sites with species-rich semi-improved vegetation lie within sites where traditional cropping for hay with aftermath grazing management takes place. For most of these sites, continuation of traditional management and absence of herbicide use and treatment with artificial fertiliser, is appropriate to retain their interest.

Within the valley major loss of meadows through gravel extraction and infrastructure development has largely taken place. The construction of the new six-lane A14 crosses the valley, bisecting one field. There are significant issues for the conservation of the remaining meadows, which are of low or intermediate nature conservation value. Sites where there is continuing input of artificial fertilisers and use of herbicides will probably remain species-poor. Restoration of those meadows that have been agriculturally ‘improved’ but still retain areas with a reasonable selection of herbs at the margins of the site may improve if there is a reduction or elimination of herbicide or artificial fertiliser. On Portholme and to a limited extent on the nearby Brampton Racecourse Site of Special Scientific Interest, for example, areas of low-quality vegetation have recovered. The former 50 acres ploughed, reseeded, treated with artificial fertiliser and heavily grazed after a hay crop was taken in the 1940s, had significant herbs by 2018. These included some of the less common species such as Great Burnet (*Sanguisorba officinalis*) and Fine-leaved Water Dropwort (*Oenanthe fistulosa*). In the latter Green-winged Orchid (*Anacamptis morio*) spread into a species poor area of agriculturally ‘improved’

grassland. It appears, therefore, that given long enough 'natural' spread of herbs can occur from areas where richer vegetation occurs.

Organised by the local Farming and Wildlife Advisory Group, Wildlife Trust and District Council, discussions were held as part of a general attempt to follow up the conclusions from the Wet Meadow survey. The original Countryside Stewardship Scheme targeted riverside landscapes and included many types of grassland along the Great Ouse valley. *The scheme run by DEFRA has two tiers, Entry Level Stewardship and Higher Level Stewardship. Incorporating elements of the old Countryside Stewardship Scheme and Environmentally Sensitive Area enhancement.* Targeted sites, with a 'low input option' under Higher Level Stewardship has improved the herb content of some meadows, as described above. As part of this ongoing initiative, trials using mineral licks sown with wildflower seeds have commenced and shown some potential, with appearance of wildflowers in the recipient meadows.

Today there remain permanent or semi-permanent grassland, where management only supports the restoration or enhancement of species-rich grassland to a limited extent. Lack of appropriate management, including the absence of either hay cutting and/or aftermath grazing is also an issue at some sites e.g. Brampton Meadow Site of Special Scientific Interest (Doody 2016). However, the floodplain meadows along the River Great Ouse represent a significant feature in the landscape. Despite the loss of botanical diversity, their use for hay and aftermath grazing continues on many sites, helping to ensure the survival of this aspect of their value. There is also great potential to restore some of their former botanical glory, but we need to act quickly to fully realise this potential.

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