The value of floodplain meadows and the issues for restoration

Emma Rothero
Floodplain Meadows Partnership (Outreach) Co-Ordinator
Productive agricultural hay crop
Naturally fertilized by river silts
Critical for stock in winter
Aftermath grazed
Domesday book - High value land use
Hay strip allocation
Lammas Meadows
Lammas Meadows
e.g. Lugg, Upton, North Meadow,
Portholme

Marker posts – complex ownership helped conservation
‘Here at Hereford we are not just looking at an interesting view, or an interesting arrangement of plants. We are looking at an increasingly rare example of an area of land whose management helped to hold together the very fabric of a past society. Without the Lugg Meadows of this world there would have been no Hereford Cathedral, no Mappa Mundi – perhaps not even a Hereford itself’

The History and Natural History of the Lugg Meadow Anthea Brian and Peter Thompson, 2002
40 species m²
Five in UK are Special Area Conservation (SAC)
4 new sub-communities
<1350 ha in UK

**MG4 Alopecurus pratensis – Sanguisorba officinalis** (Meadow foxtail – Great burnet)

**MG4a Dactylis**

**MG4b Typical**

**MG4c Holcus**

**MG4d Agrostis**
MG8 Cynosurus cristatus – Carex panicea - Caltha palustris - (Marsh marigold - carnation sedge grassland)

4 new sub communities

<1160 ha

500 ha other related
Natural Capital

Most sustainable use of a floodplain?

- Productive crop
- Rich biodiversity
- Absorb flood water
- Remove nutrients
- Store carbon
- Inspiration, learning
Floodplain Meadow Fen woodland

Climate - Carbon capture/storage
Meadow - 11 t of c/ha/yr.
Woodland 8 t/c/ha/yr

Biodiversity
40 different plant sp/m².
Wide range of ecological niches

Nutrients
Export up to 6 kg⁻¹ha⁻¹ yr⁻¹ phosphorus in hay crop

Sediments
50 t/ha deposited
- 3 kg/ha of phosphorus
- 53 kg/ha of nitrogen
- 32 kg/ha of potassium

Flood risk mitigation
Well structured soils storage/GW recharge
Improve soil structure, allowing water to infiltrate.

Culture and landscape
95% lost
12,000 people visit fritillaries/year
Consistent for over 1000 years

Agriculture/People
Low-allergy dairy
Omega-3 fatty acids
Sustainable
No inputs

Wide range of ecological niches
<table>
<thead>
<tr>
<th>Land use category (CEH, 2007)</th>
<th>Approx. extent in floodplain (km²)</th>
<th>Substantive agricultural or forestry product</th>
<th>Carbon sequestration and storage</th>
<th>Sediment trapping</th>
<th>Rich biodiversity</th>
<th>Effective flood storage (i.e. ability to hold surface water)</th>
<th>Nutrient management (i.e. net export from riverine system)</th>
<th>Development of permeable soils (i.e. enhanced water storage and filtration)</th>
<th>Prime habitat for pollinating insects</th>
<th>Aesthetic enhancement of landscape and ecotourism</th>
<th>Heritage (social history)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral grassland (e.g. meadows)</td>
<td>200</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>10</td>
</tr>
<tr>
<td>Broadleaved, mixed &amp; yew woodland</td>
<td>450</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>9</td>
</tr>
<tr>
<td>Fen, marsh and swamp</td>
<td>20</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td></td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>7</td>
</tr>
<tr>
<td>Rough low productivity grassland</td>
<td>180</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td></td>
<td></td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>6</td>
</tr>
<tr>
<td>Coniferous woodland</td>
<td>30</td>
<td>Ö</td>
<td>Ö</td>
<td></td>
<td>Ö</td>
<td></td>
<td></td>
<td></td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td>5</td>
</tr>
<tr>
<td>Freshwater</td>
<td>250</td>
<td>Ö</td>
<td>Ö</td>
<td>Ö</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ö</td>
<td>Ö</td>
<td>4</td>
</tr>
<tr>
<td>Arable and horticulture</td>
<td>2,350</td>
<td>Ö</td>
<td></td>
<td>Ö</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ö</td>
<td>Ö</td>
<td>3</td>
</tr>
<tr>
<td>Improved grassland</td>
<td>2,200</td>
<td>Ö</td>
<td></td>
<td>Ö</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ö</td>
<td>Ö</td>
<td>3</td>
</tr>
<tr>
<td>Built up areas and gardens</td>
<td>650</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ö</td>
<td>Ö</td>
<td>2</td>
</tr>
</tbody>
</table>

Floodplain extent\(^1\) in England – 6330 km\(^2\)
Floodplain habitat extent in England – 670 km\(^2\)

\(^1\) = taken from *E-proceedings of the 37th IAHR World Congress August 13 – 18, 2017, Kuala Lumpur, Malaysia* The impact of floodplain degradation on flooding in the UK. George Heritage and Neil Entwistle

\(^2\) = Environment Agency Flood zone 2 polygons (equivalent to the 100 year return period flood), method as outlined in paper above
Species rich floodplain meadows in Herefordshire: existing and potential

Existing: 30 ha: 1 % UK resource

Potential: history + existing meadow. Hollington - reasonably well drained, fragile but has potential.

The Flits 711k VERNOLDS seasonally wet deep red silty. Reddish till. Slowly permeable seasonally waterlogged reddish silty soils. Some coarse loamy soils with slowly permeable subsoils and slight seasonal waterlogging. Some deep stoneless silty soils in alluvium affected by groundwater.

Potential: quite acidic soil (pH 5.3), might be too acidic for widespread sp. rich meadows.


Potential: Soils are very well drained, look good for species rich meadows here.

“Soils Data © Cranfield University (NSRI) and for the Controller of HMSO [2017].
Floodplain Meadows Restoration Project

2015-2018 – visit restoration sites, survey, small capital fund available

2016 - 52 restoration fields
2017 - 63 restoration fields
2018 – programme still in development

In Herefordshire:

- Any information about restoration sites?
- Chance to survey restoration sites 2018
- Small funds needed to aid restoration? We have a pot (to be spent before end July 2018)
Site management responsibilities for 52 restoration sites in England and Wales.

Management responsibility for numbers of sites with category of restoration progress.

1 - start again
2 - making progress
3 - excellent outcome
4 - not a restoration site
Species richness on sites of different ages and different restoration techniques.

CSM + DH predominantly used in earlier restoration projects (1970s–1990s).
CSM still in use after 2010
GH used most widely after then.
WSM (incl. BH and PP), often locally hand-picked, most enthusiastic managers/owners
AGE is major factor, in general no single method can be said to be best
Primary constraint on success of 31 floodplain meadow restoration fields surveyed in 2016

Waterlogging e.g. flooded after sown

Sub-opt management e.g. sown too deep, insufficient bare earth, not annual hay cut

Sub-opt propagules e.g. some harder to germinate species not germinated

Nutrients e.g. high soil P resulting in dominance of few species
Broad Meadow (7 ha)
Upper Heyford, Northants

Arable field (oil seed rape/artificial fertiliser)

Phosphorus 16 mg/kg

2008 native seed mixture

Benefits

- Removal of artificial fertiliser application
- Hay crop (242 large bales first year) 42 kg/yr P
- Increased storage of carbon in soil - 77 t/ c/ yr
- Sustainable use of P laden silt in River Nene catchment
  - 350 t silt
    - 21 t Phosphorus,
    - 371 kg Nitrogen,
    - 216 kg potassium recycled into hay
- Creation of 7 ha species rich pollinator habitat
- Public access - new permissive path
- Demonstration site (CWS) – 100 ha more meadow

Costs

- Seed: £8,000
- Fencing and new hedges: over £7500
- Ongoing management and creation of new permissive path:
  approx. £2225 per year for 10 years
Swill Brook Meadow 2.86 ha (Clattinger Farm)
Wiltshire Wildlife Trust

- Was species poor grazed
- 2010 HLS: July 2010, hard cut, harrowed and thatch removed
- Green hay cut and baled from nearby meadow
- Transported immediately spread - straw spreader
- Annual hay cut, aftermath grazing

Soil series: 832 KELMSCOTT seasonally wet loam over gravel River terrace drift
Calcareous fine loamy soils over gravel variably affected by groundwater
Benefits
- Increased biodiversity
- Hay crop 17 kg/yr P
- Silt uptake 143 t silt
  - 8.5 kg P
  - 151 kg N
  - 91.5 kg Pot
- Access
- Education

Costs
Minimal
<table>
<thead>
<tr>
<th></th>
<th>Ideal range for restoration/creation</th>
<th>If not…</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soil fertility</strong></td>
<td>5-25 mg/l P</td>
<td>Two hay cuts a year over a number of years will reduce P levels.</td>
</tr>
<tr>
<td><strong>Soil pH</strong></td>
<td>pH &gt; 5.5</td>
<td>Look at flood regime. Look elsewhere.</td>
</tr>
<tr>
<td><strong>Soil water levels and flooding</strong></td>
<td>Roughly matching those described in FMP handbook for (e.g.) MG4 or MG8 type community.</td>
<td>Look at internal drainage grips and management of structures.</td>
</tr>
<tr>
<td><strong>Soil texture and structure</strong></td>
<td>Good soil structure (not compacted), soil profile indicates fluctuating water levels in appropriate zone.</td>
<td>If soil is compacted, may not be worth attempting restoration.</td>
</tr>
</tbody>
</table>
Soil compaction

If evidence (plants) indicates compaction, soil pit.

If compacted – drainage, FYM, sub-soiler, hay cut
emma.rothero@open.ac.uk
01908 655645
07941 486260
www.floodplainmeadows.org.uk
My questions for you

• Does anyone here have a floodplain meadow?
• Has anyone attempted FPM restoration
• Does anyone here farm a floodplain - how do you manage it?
• How do you use your hay? On your own farm/sell it? Is it considered good quality? Is it used for specific purposes? Does hay cutting time affect hay quality?