

Introduction

Floodplain meadows are wildflower meadows in a floodplain – managed through an annual hay cut and typically grazed afterwards. Once widespread in river valleys, flower-rich floodplain meadows are very well adapted to flooding, and hay production. They have been highly prized for centuries because their nutritious hay kept farm animals alive and healthy through the winter. They both recover well after flood events and remain productive during droughts because of their deep alluvial soils and their deep-rooted plants. Nutrient-rich river sediments are deposited by floods and act as a natural fertiliser such that no artificial inputs are required. Each meadow can support a complex ecological system with up to 42 plant species per square metre, which in turn support a wide variety of invertebrate and bird life.

Most traditional flower-rich floodplain meadows have now been built on, excavated for minerals, drained, sprayed, ploughed or reseeded. Britain lost 97% of its flower-rich grasslands during the twentieth century and we estimate about 1,100 ha remain of the classic floodplain-meadow plant community in England and Wales (that's less than the size of Heathrow airport!). In response to this loss, floodplain meadows were designated as a priority habitat under the EU Habitats Directive (1992). Floodplain meadows remain at risk from climate change, development, and a lack of appropriate management.

Floodplain Meadow Plant Communities

The flowers and grasses found in meadows can tell you a lot about the site history, management, type and fertility of soil and levels of water on the site. Species with similar soil moisture and fertility requirements tend to grow together and form recognisable plant communities. Many sites will support a range of plant communities; as the topography and soil nutrient availability vary, so the plant communities will change. [Our plant grid](#) provides more information about different plant communities and their water and nutrient requirements. Those communities most typical of species-rich floodplain meadows are:

Burnet floodplain meadow

The most typical community of moist, but not waterlogged, soils on floodplains is Burnet floodplain meadow (*Sanguisorba officinalis* - *Alopecurus pratensis* grassland - MG4 of the National Vegetation Classification Rodwell, 1992). This is typical of well drained alluvial soil.

Kingcup-carnation sedge meadow

Where the water table is kept higher in the summer (for example on groundwater fed systems) the Kingcup-carnation sedge meadow (*Cynosurus cristatus* - *Caltha palustris* MG8) replaces the MG4. Typical of constantly moist soil.



Current status of floodplains

Extensively altered by river engineering and land drainage, 42% of floodplains in England have been separated from their river (Maltby et al. 2011) and are no longer able to store, clean and distribute water across the landscape. Just 14% of English rivers currently meet the criteria for good ecological status (Bevan 2020), primarily because of physical alterations and diffuse pollution. Current estimates of floodplain land use in England and Wales indicate that nearly 70% is under intensive agricultural use (arable and horticultural crops, or intensive grassland), whilst a mere 11% supports semi-natural habitats.

Targets:

- **25% of floodplain area should be low input grassland** (which equates to almost 200,000 ha in England) within 25 years – this is based on our knowledge of restoration potential and the scale we believe is necessary for functionality.
- **74,000 ha of this area to be species-rich floodplain meadow** in [Favourable Conservation Status](#) – to deliver high-nature-value floodplains and to export nutrients from riverine systems in sufficient quantity to allow natural processes to recover.

Recommendation from the Environmental Audit Committee (EAC, 2021): “*Tree planting should not occur on peat soils and **floodplains would be better used for restoring floodplain meadows rather than afforestation projects.***”

Benefits of Floodplain Meadows

We are increasingly aware of how useful these habitats are because of the many benefits they provide:

- **Self-sustaining systems producing healthy meat and hay without the need for chemicals**
Restoration of species-rich floodplain meadows at a landscape scale could help in the drive to achieve net zero, support the green economy and provide jobs by extending a naturally regenerative agricultural system that requires no chemical inputs yet recovers well after floods and remains productive during droughts. The animals that graze such meadows and consume the hay require less imported feed, have better nutrition and therefore produce healthier meat for human consumption (Shellswell 2017)
- **Storing floodwater and drought resilience**
Floodplain soils tend to be highly permeable, often with underlying deposits of sand and gravel, allowing water to replenish the aquifers below and support low summer river flows, buffering rivers against drought. Conversely, because seasonally inundated floodplain soils are very vulnerable to compaction when wet, and to erosion when left bare over winter, arable crops such as maize are particularly damaging in floodplains.
- **Storing carbon**
Regular replenishment during floods ensures floodplain soils are constantly accreting, and maintain their fertility, in stark contrast to the widespread compaction and erosion found in other lowland agricultural landscapes.

Three to five times more carbon is stored in soils than in vegetation such as trees (Anderson 2021). The deep rooting strategies of meadow plants (Bowskill and Tatarenko, 2021) enhance the ability of floodplain soils to sequester and securely store significant quantities of carbon throughout the soil profile. Organic carbon within the top 10 cm of soil at North Meadow in Wiltshire was recorded as 109 tC·ha⁻¹ (FMP newsletter, 2018) and within the top 50 cm, as over 200 t/ha (unpublished, but imminent), a much higher value than reported for neutral grasslands in Gregg et al. (2021). Recently published research (Yang et al. 2019) showed that higher species richness increases the sequestration rate in grasslands.

Floodplain Meadows in LNRS

Key facts and background

- **Reducing siltation and pollution in rivers.**

The ability of floodplain meadows to trap sediments and export nutrients such as phosphorus through the annual hay cut is vitally important to the restoration of good ecological status to rivers. Hay meadows are a nutrient pump removing phosphorus from river systems, which is important beyond Nutrient Neutrality – it is a key stage in restoring natural processes. A single hectare of meadow can export 5 kg of elemental phosphorus from a river system every year through the hay crop, highlighting their potential as a nature-based solution to eutrophication (Rothero et al. 2016).

- **Pollinator services**

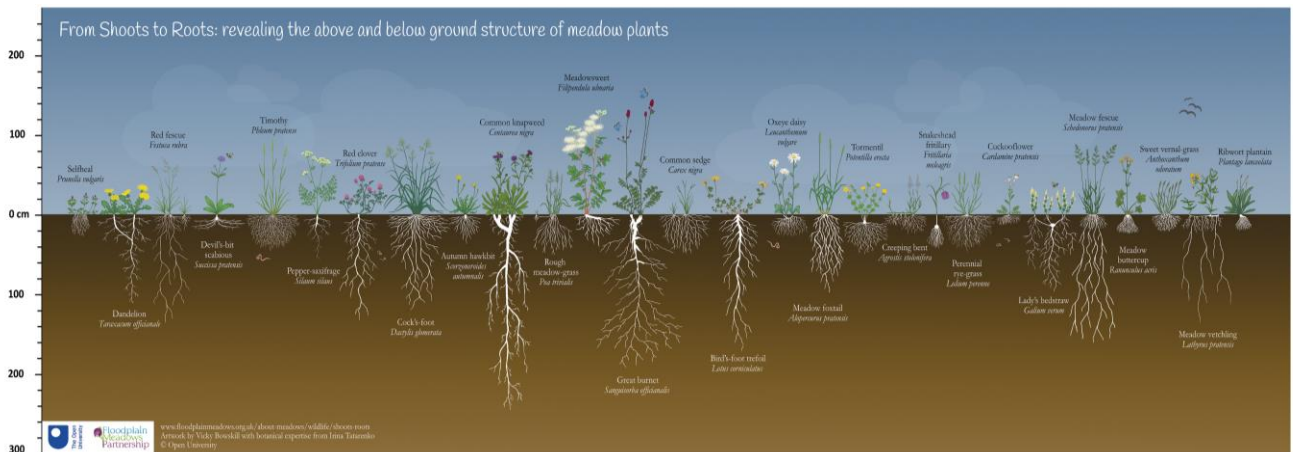
Widely recognised that species-rich meadows provide important nectar sources. For floodplain meadows in particular, some key points to note:

Some early flowering, localised species are very important for emerging bumblebees e.g. snake's-head fritillary.

Floodplain meadows tend to be cut in June or early July, allowing time for re-flowering, which provides end of season nectar sources.

- **Cultural value**

Floodplain Meadows have a strong cultural value, reflecting more than 1000 years of management. Archive evidence shows that because of its natural fertility, floodplain meadows were highly valued as they produced consistent crops without inputs. Floodplain meadows were one of the most expensive land use types in the Domesday Book and throughout lowland England, most of the floodplain would have been managed in this way. Archive and historic map research shows that floodplain meadows were the dominant land-use in floodplains prior to the invention of artificial fertilisers.



A Strategic approach through LNRS

The restoration target for floodplain meadows for England is 74,000 ha and there is a new Stewardship option specifically for floodplain meadows with a payment rate of £1070/ha to be launched in Summer 2024. These habitats will deliver their ecosystem-service benefits much more effectively if restored at scale.

Local Nature Recovery Strategies are key to guiding agreements between local stakeholders regarding the aspirations for floodplain restoration. An increasing number of projects show how restoration can have many benefits, often at relatively low cost by kick-starting natural processes. Working effectively together, through the Local Nature Recovery Strategies (LNRS), it is vital to ensure the right habitats are restored or created in the best places on floodplains to make the most of the different states of floodplain soils.

Management and restoration of floodplain meadows have already been included for example, within two LNRS pilot studies (Cumbria and Buckinghamshire) as priority habitats, recognising their value both for biodiversity and other ecosystem services.

Achieving the optimum balance will require careful planning to avoid conflicts between, for example, food production, government tree-planting targets and the drive for net zero. Species-rich floodplain meadows are an extremely cost-effective “no regrets” high-nature-value farming systems that provide multiple benefits, maintaining agricultural productivity whilst helping to meet the ambitions of the 25 Year Environment Plan using Lawton principles (more, bigger, better and joined). The restoration/creation of species-rich grasslands is a stepping stone towards achieving more dynamic natural systems and restoring natural processes in floodplains, without stopping farming altogether in what is a very productive landscape.

Useful information

To take a strategic approach to floodplain meadow restoration across a catchment and/or county, the following information is useful:

- Flood zone 2 or 3 of the Environment Agency flood map and maps showing Groundwater Dependent Terrestrial Ecosystems (GWDTE). Land within these areas is a candidate for floodplain meadow restoration.
- Identify the extent of existing priority habitat. Floodplain meadows are found within the Lowland Meadows Priority Habitat definition and the locations can be found on [Defra's MAGIC Map](#). Add new PHI sites to the NE inventory by emailing survey data to HabitatInventories@naturalengland.org.uk. Check how up-to-date the inventory is by referencing some of your own data against it. There is no guarantee that this is comprehensive. New botanical surveys may be advisable.
- Check the FMP inventory which is available on our [meadow map here](#). This also needs updating. Let us know if missing info.

How to develop a more detailed strategy for floodplain meadow restoration at a catchment scale.

- Use [botanical data](#) (ideally collected as quadrats with cover values) to provide information on soils, water regime and management at a whole floodplain scale across as many farms as possible. Some LNRS are undertaking desk studies and identifying where new botanical surveys are required county wide e.g. <https://www.worcestershire.gov.uk/council-services/planning-and-developments/environmental-policy/worcestershire-local-nature> check under evidence base for grassland survey report in Worcestershire
- Identify physical limitations e.g. [HOST class/drainage](#)
- [Try and establish historic landuse](#)
- Understand landowner priorities. Ideally working with a [Farmer Cluster](#) will help identify the interest and objectives of the farming community at the early stages of the process. Floodplain meadows enable farming to be maintained whilst delivering all the above ecosystem services. Using language in LNRS plans similar to that used in the Government's Environmental Land Management (ELM) scheme will help align the strategy with future ELM applications.

Using this information you can develop a strategic approach to what is suitable for restoring and where, based on existing value, physical restrictions, landowner objectives and historic extent. Some of this may require collection of new data.

Management and Restoration

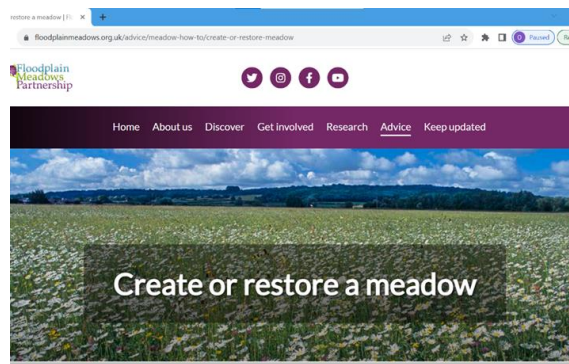
The Floodplain Meadows Partnership can provide evidence-based best practice for conserving and restoring these precious meadows. See our website for [useful resources and advice](#) and landowner guidance notes for management and restoration:

[Management of floodplain meadows](#)

[Restoration of floodplain meadows](#)

Monitoring

[Collecting information](#) about your LNRS strategy and whole catchment floodplain over time will help you to understand your plans, track any changes, and address any problems which may arise. This information can also help you secure funding for management and restoration and report to funders such as the ELM scheme, BNG, funding programmes such as FIPL, charitable Trusts, Lottery Fund etc



Links to other themes in the LNRS:

Where do floodplain meadows sit in the LNRS?

They may be wetlands, or grasslands, or both. Which is a bit annoying as for example in Cumbria, we are sitting on both these groups. The danger is that they fall between these two groups and get forgotten about/neglected, so be aware.

Natural processes/Stage Zero.

This tends to be where the river is allowed to spread across the floodplain, having had the main channel filled in, or diverted out into the fields adjacent, allowing the water to take on the management. It generally removes the space out of agricultural production, and is more likely to be successful higher up in catchments where rivers have more energy and are less restricted in terms of urban and other land-uses. LNRS could help to strategize this process and take a view that more naturalising of floodplains is appropriate in headwaters, whilst lower down catchments, habitats like floodplain meadows are more appropriate. Where a river system has high nutrient status, using floodplain meadows as a nutrient pump is an important stage in the process or re-establishing natural processes.

River restoration

Re-wiggling and re-wilding of rivers is quite common and can be done in tandem with a change in adjacent land use to floodplain meadows. Encourage the river restorers to think outside the scrape-creation box and look at more interesting and beneficial land-use change. Things like scrapes and bunds aren't great for soil protection and carbon storage.

1. Providing a soil carbon study to determine how floodplain meadows could be restored at scale across Worcestershire.

We were asked to try to make an assessment of the potential for soil-carbon storage if more of the county's floodplains were managed as meadows. The study was in part to underpin the LNRS for Worcestershire [Worcestershire Local Nature Recovery Strategy | Worcestershire County Council](#)

Three key maps were produced – showing the extent of existing floodplain meadows, extent of arable land in the floodplain and extent of permanent grassland, excluding species-rich floodplain meadow. Our estimates for soil carbon suggest that if all the arable and permanent species-poor grassland were converted to floodplain meadow, we would see an increase of between 1 and 2 million tonnes of carbon stored in the long term, with an estimated cost for restoration of £18-23 million. The full report can be read here [Assessment of floodplain \(worcestershire.gov.uk\)](#)

2. Producing a 20-year strategy for the restoration of floodplain meadows in the Windrush valley

Working with North-East Farmer Cluster and FWAG-SW, we carried out a data collection exercise over 12 months including both desk based and field data. We collected botanical information, soil carbon data, sediment deposition and undertook an historic land-use assessment. We also collated the other data already available for the catchment e.g. bird data etc. These data are being collated into a strategy to inform longer term restoration, primarily based on what is physically possible at each location, but with floodplain meadows as the target habitat. Where physical conditions are not suitable for restoration of floodplain meadows, other habitats should be considered.

This approach could be more widely applied even where floodplain meadows are not the primary target, using a 'what is physically possible' approach based on data. It is possible to define target habitat physical requirements in advance and strategically. For example there is no point targeting ponds as a restoration priority if land is very free draining and won't hold water, or floodplain meadows if land is heavily compacted and permanently wet.



References

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