

Creation and Restoration of Floodplain Meadows on minerals sites

Floodplain Meadows are a type of species-rich grassland. They are cut annually for hay and are usually to be found on permeable, neutral soils in the lowlands. They are almost exclusively found on floodplains in river valleys and are especially important for the range and diversity of the plant species they support, which in turn support large numbers of invertebrate and bird species. Once the major habitat of lowland river floodplains, they are now rare with less than 1500 ha remaining in the UK. Major losses have come through agricultural intensification, minerals extraction, flood alleviation schemes and abstraction, but more recently, extant sites are threatened by inappropriate management.

Floodplain meadows are usually cut for hay in summer, and then grazed in the autumn. Grazing animals are removed in the winter and during the spring and summer, no grazing is allowed to give the hay crop an opportunity to develop. This cycle of cutting and grazing allows a wide diversity of wildflowers and grasses to develop. Characteristic plant species include great burnet, pepper saxifrage, meadow foxtail and meadowsweet. In the best examples, floodplain meadows can support up to 38 different plant species per square metre as well as supporting some rare species, such as snake's head fritillary.



Sweet vernal grass



Great burnet



Snake's head fritillary



Common knapweed



Meadowsweet

Floodplain meadows fall under the UK BAP for Lowland Meadows, and represent the wet component. National Vegetation Classification (NVC) communities that fall within the Lowland Meadows BAP include the Knapweed meadow (MG5), the Burnet floodplain meadow (MG4) and the Kingcup meadow (MG8). Burnet floodplain meadow and Kingcup meadow are both key floodplain-meadow plant communities.

The national target is to restore 2600 ha (720 ha in England) lowland meadow on improved or neglected grassland sites by 2020.



A species rich floodplain meadow

How do Floodplain Meadows function?

Understanding the way these plant communities are supplied with water is crucial in order to understand how to re-create them.

The floodplain-meadow community is typically found on fine-textured, but highly structured, soils. This good structure makes them permeable to water and gives them the ability to store relatively large amounts of water in a form that vegetation can access. As a result, the stored water can meet the demands of the vegetation through the early summer, without its growth becoming limited by soil drying. Many floodplain meadow sites are underlain by river-terrace deposits of coarse sand and gravel and these act as aquifers, supplying water to plant roots during the summer months from the nearby river and facilitating sub-surface drainage in winter, ensuring that the soils do not become waterlogged.

A typical water supply mechanism is found below:

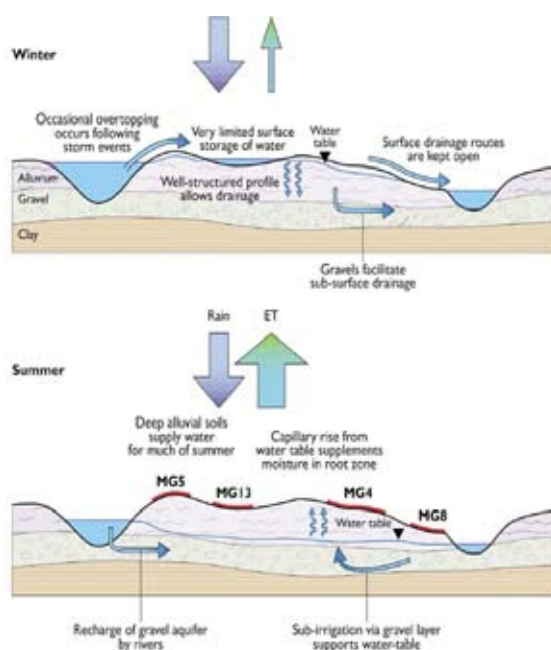


Fig. 1. A typical water supply mechanism for floodplain meadow plant communities.

From B.D. Wheeler, D.J.G. Gowing, S.C. Shaw, J.O. Mountford, and R.P. Money, 2004. *Ecohydrological Guidelines for Lowland Wetland Plant Communities* (Eds. A.W. Brooks, P.V. Jose, and M.I. Whiteman,). Environment Agency (Anglian Region).

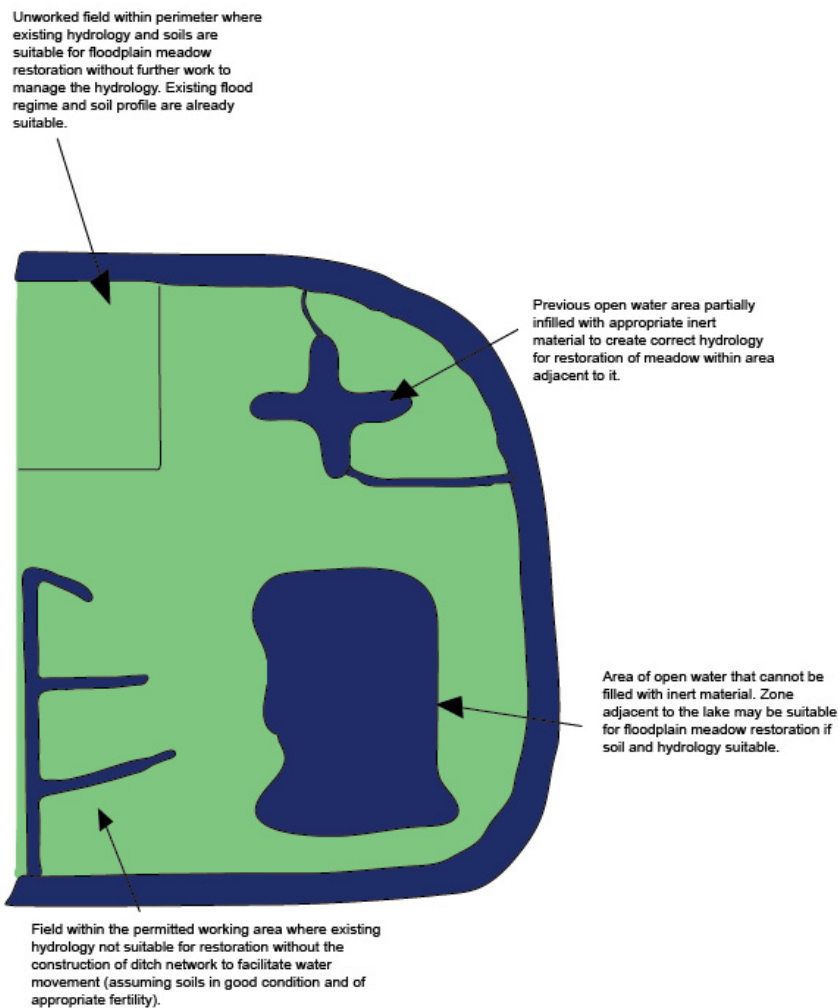
Before you undertake any restoration projects, it is a good idea to understand the hydrology and nature of the soil and any remaining gravel of the site and its environs. This may include the collection of data through installation of dipwells to record the water-table regime and perhaps taking soil samples to investigate its nutrient status and its water holding properties. One vital factor during the extraction and restoration processes is that the soil's structure should be protected; use of vehicles on site should be regulated to minimise damage.

Potential offered by mineral sites

A recent study by the RSPB 'Nature after Minerals' estimated that the total area of mineral extractions that could potentially be restored to Lowland Meadow was 24,800 ha, greatly enhancing the national current resource. However, of this only 830 ha is adjacent to existing lowland meadows and much of it may not be hydrologically suited to creation of species-rich floodplain meadow.

Aggregates restoration schemes allow careful planning of the end habitats that the site will be restored to, as well as the surrounding landscaping and any potential buffer or mitigation land within the permitted area. There are also a number of different areas within an extraction site that could be considered for floodplain-meadow restoration.

Fig. 2. Areas within an extraction site that could be considered for floodplain meadow restoration.



There are two main areas within an extraction site that can be considered for restoration.

1. Extracted site
2. Un-worked margins or fields within permitted area.

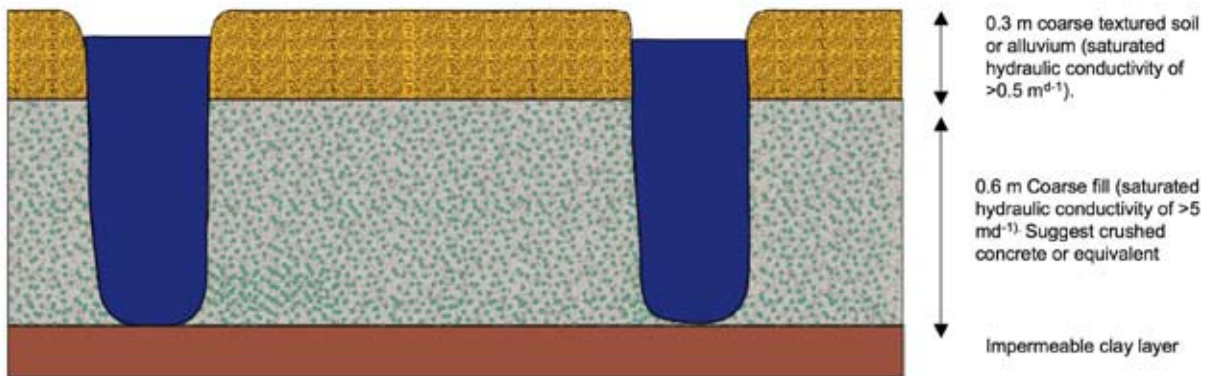
These areas are addressed in turn.

1. Extracted site

The extracted site is probably the most challenging of areas within which to try and recreate floodplain-meadow habitat as it relies on the import of appropriate material to at least partly fill the void. The material used must fit certain criteria in order to allow the movement of water between the meadow soil and surrounding water features to achieve the desired regime.

The cross section of any pit being restored for meadow should be along the following lines:

Fig. 3. Cross section of soil profile required for restoration to achieve appropriate hydrological regime



The coarse textured soil could be a mix of medium coarse sand and low fertility (low available phosphorus) topsoil. The coarse fill could be crushed concrete or similar.

Suggested void restoration options are shown below in plan form (Figs 4 and 5). Both these arrangements ensure water is available in the soil at the correct amounts throughout the year in the area shaded green, providing the fill material and hydrology has been implemented according to the cross section diagram above (Fig 3):

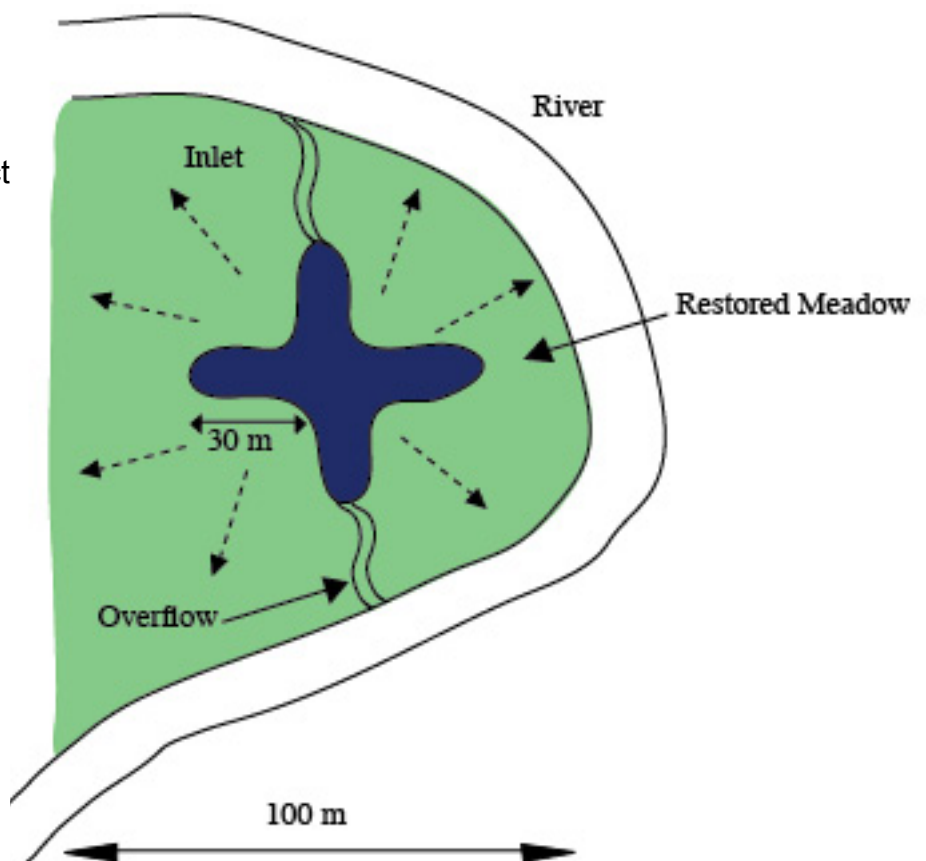
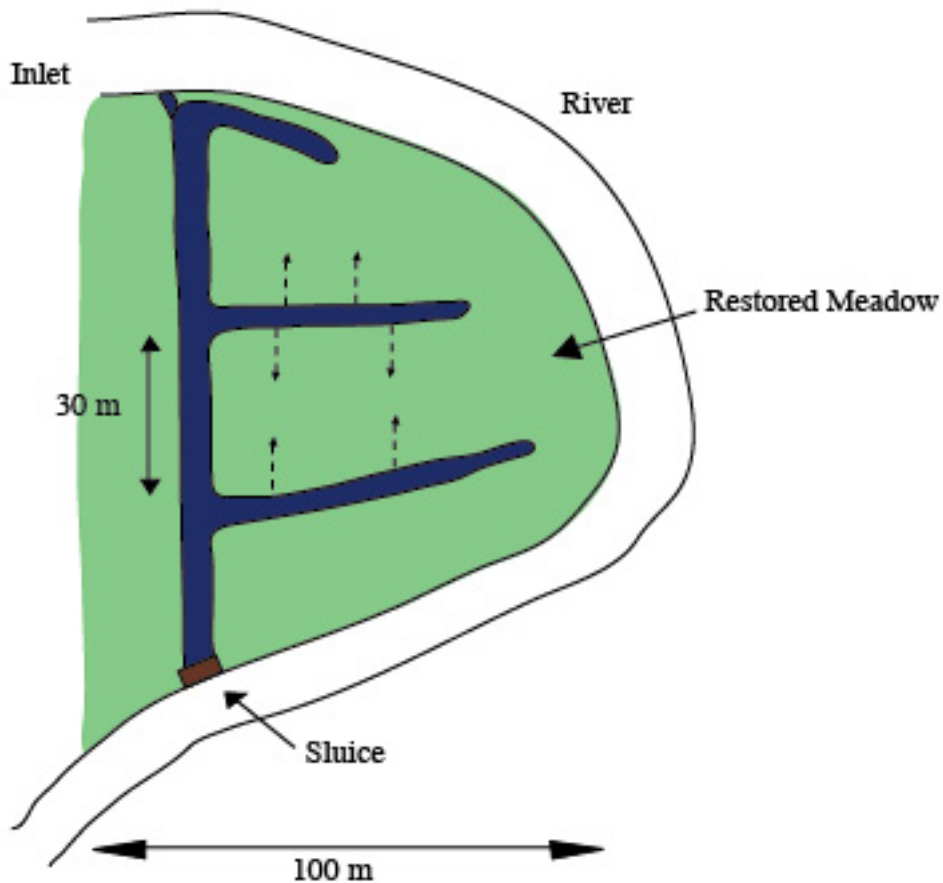


Fig. 4. The pond or scrape

In the pond/scrape arrangement, water is stored in a central depression that is left when the extraction pit is filled. The water may be topped up by floods or by letting water flow or seep from an upstream reach of the river. Excess water (e.g. after heavy rain) can flow back to the river downstream via an overflow channel. In a restoration area as depicted in the figure, it should be possible to create the hydrological conditions for floodplain meadow plants to survive in the area shaded green. This arrangement would require slightly less fill than the ditch arrangement.

Fig. 5. Ditch arrangement



In this arrangement, ditches are used to convey water around the site, and the dimensions indicated mean the area shaded green should have sufficient water in the soil to support the floodplain meadow plant community.

2. Un-worked margins and unworked fields within permitted area

The conditions described above would allow the restoration of unworked margins. Understanding the hydrology of land adjacent to water filled voids would enable you to understand whether the soils were suitable.

The unworked margins and fields are probably the easier areas within an extraction site to consider restoration of floodplain meadows provided the water regime, soil fertility and soil structure are suitable. They are likely to have an underlying aquifer and the original substrate, less likely to have been compacted through works. They may also provide the largest areas. However as with other areas described, finding out the appropriate information following guidance below is essential before attempting to carry out restoration techniques. It is also essential to determine whether adjacent extraction is likely to affect their existing hydrology.

You need to;

- Establish the water regime through dipwell monitoring (as above). Further advice can be found here www.floodplainmeadows.org.uk/content/how-set-cheap-and-easy-monitoring.
- Understand the zone adjacent to the void (presumably filled with water) that would be likely to support the required water regime.
- Be clear about future gravel winning on adjacent areas as further work is likely to affect the hydrology around the whole site. Identification of areas not likely to be impacted hydrologically would be sensible.
- Take soil samples to determine whether your soil was of the appropriate fertility and pH.
- Dig a soil pit to determine whether the soil has suffered compaction. If so, remedial measures may be required. Ideally the structure of the soil should be protected and compaction avoided by controlling traffic in these areas during extraction
- Ensure that the physical arrangement of the area can facilitate movement of hay cutting machinery and animals if required. If areas are very small or there is no access for machinery, then creation of meadow might not be possible. The meadow will not develop or survive without the annual hay cut, therefore the long term management must be in place to allow this to happen.
- Once you have identified the area most appropriate to support the floodplain meadow community, restoration of grassland using green hay from a nearby species rich meadow, or seed from a seed supplier would be appropriate methods to try. See guidance located here www.floodplainmeadows.org.uk/content/how-start-restoration-project

How do I decide which areas are appropriate for restoration of floodplain meadows?

