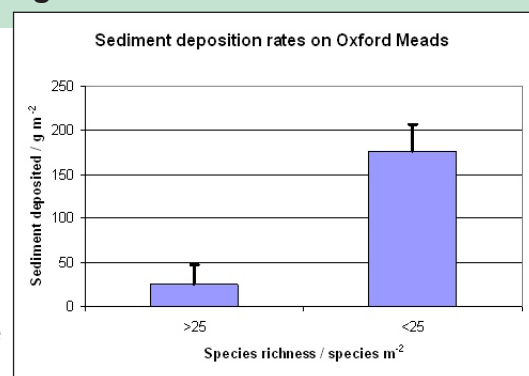


Welcome to the Winter 2012/13 newsletter (no. 10). It has been an incredibly wet year, not great for floodplain meadows with many meadows remaining uncut into the winter.

However, much is still being achieved. Our major feature this newsletter is all about the range of ecosystem services that floodplain meadows provide (including flood storage!), see pages 4-8. Want to get involved in monitoring, data collection and improving your ID skills? See page 2 for a number of activities, events and courses. Finally some staff changes for our project in the short term...see page 3. Fancy a workshop in Russia? Page 3 for more details

What a year!!!

Given that it has been a year of great contrast and extreme weather events, we thought it was worth summarising this in the context of floodplain meadows. Looking at the MET office summary for the year, it is clear that although we started off in January with concerns about an on-going drought, exacerbated by a dry February and March, the heavens then opened and we then embarked on a prolonged wet period lasting most of the rest of the year with April and June being the wettest for England and Wales since 1766. The summer overall (June, July and August) was also recorded as the wettest since 1912 and the rain continued into the autumn, contributing to extensive flooding. The UK annual rainfall was 1331 mm (115% of long term average), making it the second highest since records began in 1910, with only 2000 being higher. England alone had its wettest year on record!



Somewhat surprisingly, the sunshine duration for the year was 99% long term average, although it certainly didn't feel like that for me and the mean temperature for the year was only 0.1oC below the 1981-2010 average....still didn't feel like that to me!

The Environment Agency produce monthly reports for the UK water situation. The Jan 2013 report tells us river levels were normal or higher for the time of year at all indicator sites, but lower than most of the December records. Groundwater levels increased at two thirds of the indicator sites compared with December and continued to be normal or higher than average for the time of year. They also issue predictions for river and ground water level and their January report suggests that river flows are likely to remain normal or higher than average at all modelled sites if rainfall, as predicted is near normal or slightly higher than average.



Floods on Oxford Meadows: Mike Dodd



a million voices for nature



The 29th May 1961
Charitable Trust



So what does this all mean for floodplain meadows? Well in the first instance, many of you won't have been able to take a hay cut last year, bad for farmers, bad for the site. The best method for rectifying any negative impacts as a result of the flooding is to try and take as early a hay cut as possible this year (if weather conditions allow). Aim for the first weather window after the middle of June. This will give you the best chance of a decent hay crop and the best possibility of reducing nutrient levels and maintaining species diversity. The graph on page 1 shows there is a marked spatial pattern across the floodplain that correlates strongly with plant species richness. The higher parts of the floodplain, which avoid the high sediment loads, tend to be the more species rich.

If re-growth in the summer is good then a second cut in September might be desirable to help counterbalance the nutrient input from 2012 floods. If summer conditions are dry and aftermath growth is poor, then grazing from the end of August should suffice to maintain the sward.

We would have liked to have shown some of our own hydrographs here from floodplain meadows around the UK, but it has been so wet that we have been unable to download any of our own data loggers....I think that tells its own story.

References: [MET Office website](http://www.metoffice.gov.uk/climate/uk/2012/annual.html) <http://www.metoffice.gov.uk/climate/uk/2012/annual.html>
[Environment Agency](http://www.environment-agency.gov.uk/static/documents/Research/WSR_Jan2013.pdf) http://www.environment-agency.gov.uk/static/documents/Research/WSR_Jan2013.pdf

GET INVOLVED this year in wildflower counts, scientific research and improving your ID skills. Here are four ways:

1. Come along to our snakeshead fritillary count days. Three opportunities to sit in a meadow counting stunning wildflowers. No previous experience necessary. The dates are:

13th April; Lugg Meadows Herefordshire
21st April Clattinger Farm Wiltshire
23rd April North Meadow, Wiltshire.

2. Get involved in bee surveys at the same sites. Spend the spring and summer walking transects, learning the common species of bee seen in floodplain meadows and understanding Bumblebee Conservation Trust survey methods. See if you can help work out the interaction between bees and fritillaries. More information can be found on our website

3. Could you help with Plantlife's annual Wildflowers Count?

(FSC) and the Botanical Society for the British Isles.

Take a walk through a 1 km grid square which will be allocated within 5 km of your home, and help them to build a picture of where some of our common plants can be found. If you are experienced in plant ID you can let them know about all the plants that you see.

To find out more visit http://www.plantlife.org.uk/things_to_do/wildflowers_count/ or contact Sue Southway at sue.southway@plantlife.org.uk

This part time course has been designed to provide a strong skills base in biological identification and recording in the field. There is a wide range of module choices available making it possible to specialise in a particular recording area, including invertebrates, vertebrates, botany, surveying and National Vegetation Classification, or to choose to cover a wide range of these subjects.

4. Get Certified – Biological Recording and Species ID course

Manchester Metropolitan University (MMU) has some spaces still available on their Certificate in Biological Recording and Species Identification offered in conjunction with Field Studies Council

To find out more about the course please visit: <http://www.sste.mmu.ac.uk/recording/files/ucert-biological-recording-2012-13.pdf>

It is also possible to attend an information day prior to applying for the course. Please contact Emma Hopkisson for details: E.Hopkisson@mmu.ac.uk 01743 355137

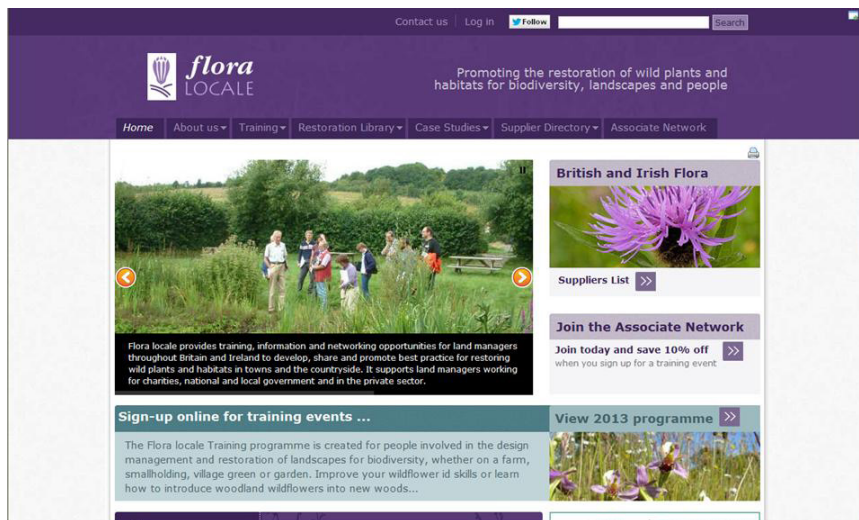
New ecological restoration website announced by Flora locale

Flora locale has unveiled its latest initiative, a new website that provides access to information and resources on all aspects of restoring wild plants and habitats to land and landscapes across Britain and Ireland.

The [new website](http://www.floralocale.org/HomePage) (accessed via <http://www.floralocale.org/HomePage> or www.ecologicalrestoration.org.uk) is designed to help land managers and interested members of the public find information and training that will improve their capability to implement good quality conservation management and ecological restoration projects. This portal will uniquely fulfil a gap in current provision of practical advice to practitioners, by providing a single entry point to the huge quantity of rather dispersed information that is currently available online.

Richard Clarke, Chairman of Flora locale, says, "At no point in time has the need to restore biodiversity been so great, and the good news is that ecological restoration is now not only being seen as a 'nice' thing to do, but an imperative that will reap benefits for people and the wider environment. It is fantastic that Flora locale is now able to help more people and more projects, by providing this exciting new facility".

Contact Sue Clarke or Claire McCorquodale on 01672 515723, info@floralocale.org for further info, or visit the website!



Post suspension and temporary changes to the Floodplain Meadows Partnership team

Emma Rothero (Floodplain Meadows Outreach Co-ordinator) is due to disappear on maternity leave towards the end of March 2013 and return in January 2014.

Irina Tatarenko (Floodplain Meadows Research Co-Ordinator) will continue in post until July 2013 to oversee the survey programme. All outreach work will cease for this period. The project will still continue to function, it is only the co-ordinator post that is suspended.

David Gowing will be available for advice and the floodplain meadows email address will still be checked routinely. The summer newsletter will not be issued. Instead this one is a little later than normal and we will aim for a Winter 2013 newsletter to be slightly earlier than usual.

An International Workshop on Floodplain Meadows Research and Conservation

Will be held at the National Park "Ugra", Kaluga Province, Russia on 26-28 June 2013.

The following topics are proposed for presentation and discussion:

- 1) long-term vegetation monitoring and modelling,
- 2) classification of the meadow communities
- 3) population ecology of meadow species
- 4) meadow biodiversity
- 5) meadow conservation in a changing economic situation.

The deadline for registration and submission of papers is **22 March 2013**. If you are interested in attending, please contact Dr Irina Tatarenko (irina.tatarenko@open.ac.uk) for more details.

The Ecosystem Services of species rich floodplain meadows: what are they and can we quantify them?

“Ecosystem services” is one of those phrases that has crept into our consciousness over the past 10 years or so as a means of describing the multifunctional uses of nature. Can we quantify why we should be protecting important nature-conservation sites for reasons other than just their simple value for nature? Some would argue that we should not have to, but in this day and age of multifunctional delivery, it is now the way of the world. It is a useful thing to think about. Can these impacts be quantified in terms of impacts/benefits to society and associated financial costs/gains?

The NEA UK National Ecosystem Assessment: Technical Report defines ecosystem services as:

‘the outputs of ecosystems from which people derive benefits. In the UK NEA, ecosystem services are considered under the broad headings of provisioning, supporting, regulating and cultural services. This classification derives from the Millennium Ecosystem Assessment (2005) and is a useful means for distinguishing broad categories of services’

I hope the discussion that follows makes these definitions clearer to understand when put into the context of floodplain meadows.

A species-rich floodplain meadow offers one of the most sustainable uses of a floodplain. The presence of a highly diverse plant community is indicative of well structured soil and a river and a floodplain in good connection. The products of a meadow system include a hay crop and late-summer grazing, which are particularly valuable to livestock owners in dry years such as 2010 and 2011. Therefore these systems can offer a win-win of combining agricultural productivity with outstanding biodiversity.

They can also deliver a range of other ecosystem services when well managed, some linked to hydrology and a result of their position within the landscape (Roquette et al., 2011), including flood defence, water retention, sediment trapping, nutrient cycling, amenity, landscape and cultural heritage on top of agricultural production and biodiversity. However, floodplain meadows are unlikely to deliver their full potential across the range of ecosystem services if not managed appropriately.

The Millennium Ecosystem Assessment and the UK National Ecosystem Assessment each conclude that the ability of ecosystems to deliver services is compromised particularly by loss of biodiversity. The diversity of organisms gives the system resilience. Work in other systems has demonstrated that a much more reliable yield is obtained from grasslands with high species diversity compared to species-poor mixtures.

Using Ecosystem Assessment terminology, the major ecosystem services that apply to floodplain meadows are:

1. provisioning (food, biodiversity)
2. regulating (climate, water; flood reduction, water-retention, carbon sequestration, biodiversity)
3. supporting (nutrient cycling, pollination, biodiversity)
4. cultural (aesthetic values, recreation, spiritual value, heritage, biodiversity).

Biodiversity falls within a number of services and delivers across a range of levels. Different studies have classified it in variable ways. The UK NEA discusses it in a range of contexts:

It is important for the basic ecosystem processes that underpin ecosystem services.- it delivers resilience to pests, or environmental change and is influenced by species interactions (e.g. grazing animals influence plant community composition and therefore biomass and species composition).

Therefore it could fall within regulating services. It provides diversity of the genetic pool, giving potential for future medicinal use and exploitation of plant traits, so could be classified in provisioning and cultural services. Finally, biodiversity is valued by people for aesthetic, cultural, inspirational and educational reasons and therefore it also fits within the cultural services.

Biodiversity

Species-rich floodplain meadows are one of the most botanically diverse habitats in the UK, with some of the best sites containing 35-40 different plant species per square metre. These rich plant assemblages are a direct reflection of the mix of varied hydrological regime, fluctuating nutrition and management as a hay meadow. The biodiversity is therefore dependent on the continually changing environment that is characteristic of a floodplain. The soil-invertebrate fauna associated with these diverse plant assemblages and well structured soils and the above-ground invertebrates associated with plant diversity is rich, supporting a wide range of species at higher trophic levels including several important birds and mammals. We should not forget the importance of this ecosystem service, and it should remain a priority for delivery.

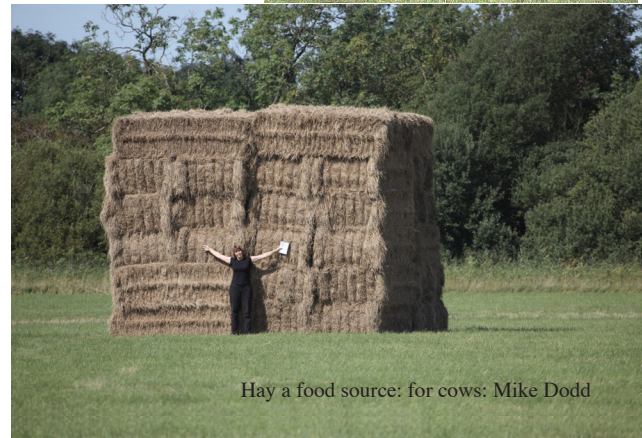
Provisioning: Food production

Floodplain meadows are one of the few wetland habitats that offer commercial levels of food production as an ecosystem service. Hay from floodplain meadows is a very valuable agricultural product if taken from a well managed meadow and can yield 6 tonnes/ha/year in addition to five months worth of grazing. The productivity from these diverse meadows has been shown to be more resilient than species-poor stands and therefore species-rich floodplain meadows are likely to be more reliable in a changing climate than species-poor ones.



Cows: a food source: Mike Dodd

Floodplain meadows developed as a result of the need to grow hay to keep stock over the winter. Hay produced from these meadows is still regarded as being of high quality and of great value, but only if it is taken at the right time of year. Often, meadows managed for a later cut produce a lower value product, because they are cut after the peak in standing crop, when much of the nutritive value is lost through protein either being stored below ground or dropped with the seeds.



Hay a food source: for cows: Mike Dodd

There is therefore a perception in some quarters that floodplain meadows do not provide quality hay with a subsequent decreasing interest amongst stakeholders in both growing and buying it. Therefore the degree to which this service delivers is dependent on the detail of the site management.

Regulating (flood reduction)

Given their position in the landscape floodplain meadows are able to provide 'natural hazard regulation' by reducing flood risk (Acreman et al., 2011)

Ecosystems are able to modulate the effects of extreme events (MEA, 2005), and floodplain meadows are able to store water and attenuate floods by absorbing run-off peaks (Acreman et al., 2011) thereby preventing or reducing flooding. This may become increasingly important as an increase in extreme events is predicted with climate change.

Floodplain meadows slow drainage of water into the river channel; reduce its velocity once out of bank and provide storage capacity for flood peaks. The presence of a species-rich plant community demonstrates that the soil is well structured and therefore able to absorb more water than a damaged/compacted/poorly-drained soil (and a correspondingly poor plant community).

Of course the amount of water that can actually be accommodated depends on how wet the site is to start with. If soils are already saturated and ditches full, the degree to which further benefit can be gained is limited. This will be influenced by prevailing weather conditions and management practise.

Regulating (carbon storage)

Carbon is naturally cycled between the atmosphere, oceans and terrestrial ecosystems (soils and vegetation), which therefore act as major pools of carbon. The amount of carbon stored in soils is much larger than that stored in vegetation (95% estimated to be stored in soils (Ostle et al, 2009)).

Carbon accumulation in soils is dependent on the rate of input balanced by losses in decomposition, leaching and other soil processes such as erosion. The type of vegetation, management and climate will affect these inputs to the soil while soil moisture, soil temperature, oxygen availability and clay content are key factors in controlling decomposition and the loss of carbon from soils.

Grasslands store a significant amount of carbon and where arable land is converted to grassland, carbon can be locked up. The LULUCF report (CEH 2009; an annual inventory and projection of UK emissions by sources and removals by sinks due to land use, land use change and forestry) estimated that the soil carbon density in the top 30 cm of soil under grassland in the UK was 8.3 kg C m⁻² compared with 6.7 kg C m⁻² for cropland; estimates that are very similar to those found in Bradley (2005). The soils under floodplain meadows may be particularly important in this regard as they were built up from alluvium that often has a significant carbon content and because the water regime may slow decompositional processes.

Using the soil carbon densities from a number of studies it is likely that the carbon pool of species-rich floodplain meadows will be between 80-120 t C ha⁻¹ (in the top 30 cm of soil).

The extension of the floodplain meadow network, in particular from previously arable land, would contribute towards carbon sequestration. However, there is little current data to enable us to quantify the potential benefits of meadow maintenance and restoration.

To try and understand whether the amount of carbon stored in a floodplain meadow is affected by soil wetness, we have undertaken a small pilot soil carbon survey this winter, taking samples from 4 UK floodplain meadows. Within each site, we took samples from dry, medium and wet areas and at different depths down to 50 cm below ground. Soil samples are currently being processed in the labs to determine labile carbon content (recent plant exudate etc.) against carbon stored on a longer-term basis. We will report in due course. This work was funded by the Environment Agency.

Supporting (nutrient cycling)

The increasing use of fertilizers in agriculture over the past seventy years has resulted in increased levels of both nitrogen and phosphorus in watercourses and concerns over water quality. Nitrate is readily lost from soil through leaching and phosphorus by the loss of soil through erosion. Floodplain meadows may be able to improve water quality through the deposition of sediment-bound phosphorus and the removal of nitrogen (Cook, 2007), as regular doses of phosphorus (P) and nitrogen (N) can be absorbed by floodplain meadows and turned into an economically valuable agricultural crop.

In this way, excess N and P can be removed from the catchment and forage produced for animals without the need for artificial fertilizers. This is a very sustainable system and an excellent method of reducing unwanted nutrients, ultimately resulting in improvements in downstream water quality.



Sediment deposition Mike Dodd



However, many existing meadows are not managed to maximise the hay yield (and therefore the removal of N and P) but instead are cut late in an effort to deliver a range of conservation objectives rather than agricultural ones. A better understanding of the system may reveal that the two objectives do not necessarily conflict; after all the meadows have developed as a result of centuries of agricultural management. To exploit the nutrient-cycling functions of floodplain meadows, informed meadow management is required. The same principle applies as to the production of hay as a food crop. Nutrient removal will only be effective from a catchment if the hay is cut at an appropriate time and managed as an agricultural crop.

Supporting: pollinating services

Species-rich wildflower meadows provide important sources of nectar and pollen for bumblebees, honeybees, hoverflies, butterflies, moths and other pollinating insects during the growing season. Different species of flower may have different pollinators, and conversely, some pollinators will pollinate many different types of flower with the pollination process often being critical to the survival of a species. Pollinators are vitally important for the success of many crops, in particular oilseed rape, orchard fruit, soft fruit and field beans. They are also important in pollinating wild species, ensuring seed production, which provides food for a range of seed eating birds and mammals.



Cultural: recreation

Floodplain meadows are important open spaces for recreational activities. Many of the meadows (e.g. Portholme, Upton Ham, Cricklade) have public access and are used by the local population on a daily basis.

Cultural: heritage

Floodplain meadow plant communities represent hundreds of years of rural history, with extensive archive data, in many instances demonstrating the importance of the sites to the local community, and their economic value. The plant communities found on them are a living record of their history, and are subtly different between sites depending on the local management system.

Some floodplain meadows have been actively managed for a thousand years. The amount of time and effort devoted to the management of a large meadow over this period may be greater than that invested in building Hadrian's wall. They are therefore an important resource for historians and those with an interest in protecting historic sites.

Cultural: aesthetic values

On many floodplain meadows, marker stones are still visible demonstrating the allocation of hay lots to different families and runes, patterns and methods of marking out hay lots on the ground (cut into the soil using a knife, marked into apples, dock leaves or other living things) acting as evidence that a particular family had been given entitlement over a hay allocation show fascinating insights into history.

Floodplain meadows and their traditional hay meadow management play an important role in both supporting and directly delivering ecosystem services on which we depend. Care however must be taken in managing a site for one ecosystem service rather than another as it cannot be assumed that

focussing on one particular service will automatically deliver benefits to others (e.g. focussing on flood storage may be detrimental to the delivery of biodiversity if managed inappropriately, or focusing on agricultural production may be detrimental to limiting greenhouse gas emissions or water quality, depending on the intensity). Some studies have attempted to quantify the multiple ecosystem services on sites and the various benefits they deliver, including the development of tools to help understand the process.

Attempts are currently being made to quantify ecosystem-service delivery in the Nene Valley NIA, where a project aims to:

- Identify, analyse and map key ES within the NIA demonstrating interdependencies between biodiversity, ES and their beneficiaries
- Identify the current and projected ES needs of people and the economy within the NIA
- Quantify current and potential ES capacity within the NIA aligned to habitat opportunity maps
- Develop biodiversity threshold measures for at least 3 key ES within the Nene Valley NIA and the development of a health check protocol for each.
- ES design guide for planners and developers as an extension to the current Biodiversity Supplementary Planning Document.
- Establish at least one working model of an ES payment scheme for the Nene Valley NIA

See [link](http://www.nenevalleynia.org/what-are-we-doing/ecosystem-services) (<http://www.nenevalleynia.org/what-are-we-doing/ecosystem-services>) for more information. If anyone else is running similar projects that will involve quantifying the ecosystem services of floodplain meadows, we would be very interested to hear. [There is a link to references used in writing this article here.](#)

Preserving Historic Water Meadows

English Heritage is seeking to give better protection to the historic remains of artificially irrigated, or 'floated', water meadows. Although floated water meadows played an important role in English agriculture for 300 years, they became increasingly uneconomical, and began to fall out of use, from the late 19th century onwards. Since then their remains have been lost at an alarming rate, mostly due to urban development and reversion to arable. In the 1950s and 1960s the Ministry of Agriculture, Fisheries and Food (MAFF) provided grants for levelling water meadows as part of the drive for more efficient food production

At the same time the Rivers Authorities sought to improve land drainage and so old sluices were removed. Today only a handful of water meadows continue to be 'floated' in the tradition way, assisted by grants and supported by volunteers. Many others have reverted to a semi-natural state, their derelict channels and dry ridges providing a wide variety of habitats and supporting rich biodiversity. These 'non-functioning' water meadows are often protected by natural environment designations and many are managed primarily for their wildlife value. Because of this, English Heritage has launched a new initiative to highlight the importance of their fragile archaeological and historical features.

One result of this will be a free booklet providing information and advice on how to recognise and conserve historic water meadow features. It will be particularly useful to anyone undertaking habitat restoration on old water meadows or managing old water meadows primarily for their wildlife. The Floodplain Meadows Partnership has agreed to comment on the draft of the booklet and the final version will be available later this year.

