

Investigation of the historic extent of floodplain meadows in three Welsh catchments: Dee, Usk, and Teifi

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Wett Meadows (6,7) and Cunstablas Meade (1,2,3) at Tretower on the Rhiangoll, tributary of the River Usk. Survey of the manors of Crickhowell and Tretower, Robert Johnson, 1587. f. 68v. and 69r. Llyfrgell Genedlaethol Cymru – The National Library of Wales.

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Contents

About Natural Resources Wales.....	2
Evidence at Natural Resources Wales.....	2
Distribution List (electronic).....	3
Recommended citation for this volume:	3
Contents	4
List of Figures	5
List of Tables	6
Crynodeb Gweithredol	7
Executive summary	8
1. Introduction.....	9
2. Background	9
3. Methodology	10
3.1. Outline	10
3.2. Identification, Mapping and Recording	11
3.3. Sources	13
3.4. Place Names	14
4. Results.....	18
4.1. Overview	18
4.2. Afon Dyfrdwy/River Dee	19
4.3. Afon Wysg/River Usk.....	22
4.4. Afon Teifi/River Teifi	25
5. Discussion	28
5.1. Evidence for Common Meadows.....	29
5.2. Evidence for funnels and droves	33
5.3. River dynamics and floodplain meadows	34
5.4. Floodplain meadows and changing landuse.....	35
5.5. Floodplain meadows with historic sites.....	36

6. Conclusion and Recommendations	37
7. References	39
Appendices	40
Data Archive Appendix.....	40

List of Figures

Figure 1 Distribution of selected floodplain meadows along the River Dee.	20
Figure 2 Distribution of selected floodplain meadows along the River Usk.	23
Figure 3 Distribution of selected floodplain meadows along the River Teifi	26
Figure 4 Earliest maps showing FPM 6033 Common floodplain meadow at Lampeter. To the left is Emanuel Brown's 1766 map, A New and Accurate Map of South Wales showing Dol Gwrddon (highlighted in green) and Thomas Budgen's 1811 OS Survey Drawing of Lampeter.....	30
Figure 5 Floodplain meadows alongside of the River Teifi at Lampeter.	31
Figure 6 FPM 6012 Floodplain Meadows at Llandrillo, Merioneth	32
Figure 7 FPM 6012 Floodplain Meadows at Llandrillo, Merioneth shown on the 1840 tithe map of Landrillo, showing the location of quillets (yellow) and plots either recorded as meadow or with meadow related names.....	33
Figure 8 FPM 6019 Floodplain meadow at Llanvihangel nigh Usk, showing the former river channel and the modern flood risk.....	35
Figure 9 Robert Johnson's 1587 Survey of the manors of Crickhowell and Tretower. The orientation of this map is with the north to the bottom: the original map covers a larger area in which the Usk is located in the upper left-hand corner (not visible here). Llyfrgell Genedlaethol Cymru – The National Library of Wales.	36
Figure 10 FPM 6003 directly north of Bangor. The orange areas show where medieval ridge and furrow has survived. (Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights reserved.)	37

List of Tables

Table 1 Count of selected floodplain meadows on Rivers Dee, Usk, and Teifi	18
Table 2: Summary count of meadows withing each criterion	19
Table 3: Summary count of floodplain meadows where Welsh meadow-related terms were found in the tithe	19
Table 4 Summary information on selected floodplain meadows on the River Dee	21
Table 5 Summary information on selected floodplain meadows on the River Usk.....	24
Table 6 Summary information on selected floodplain meadows on the River Teifi	27
Table 7 Count of common floodplain meadows by river.	29
Table 8 Table summarising the distribution of floodplain meadows with funnel-shaped entrances across the three rivers.....	34

Crynodeb Gweithredol

Comisiynodd CNC Fjordr Ltd. i gynnal asesiad cychwynnol o ddolydd gorlifdir yng Nghymru. Mae dolydd gorlifdir sy'n gyfoethog eu rhywogaethau yn bwysig yn genedlaethol ac yn rhyngwladol, ond ychydig mwy na 10 ha o'r cymunedau glaswelltir hyn sy'n hysbys ledled Cymru gyfan, sy'n golygu eu bod yn hynod brin. Fodd bynnag, mae'n debygol bod dolydd gorlifdir yn gorchuddio llawer mwy o Gymru cyn yr ugeinfed ganrif: mae gwaith diweddar ar Afon Gwy Uchaf gan Fjordr Ltd. ar ran y Bartneriaeth Dolydd Gorlifdir wedi nodi, mapio a chofnodi nifer o hen ddolydd.

Un o amcanion y prosiect oedd nodi, mapio a chofnodi enghreifftiau hanesyddol o ddolydd gorlifdir ar Afonydd Dyfrdwy, Wysg a Theifi, gan ddadansoddi eu presenoldeb a'u dosbarthiad, argaeledd ffynonellau addas, a chymhwysedd y fethodoleg a ddatblygwyd gan Fjordr mewn dalgylchoedd eraill.

Mae'r dull yn defnyddio amrywiaeth o ffynonellau hanesyddol sydd ar gael yn rhwydd i greu un haen GIS sy'n cynnwys polygonau, pob un yn cynrychioli dehongliad o faint dól gorlifdir, ynghyd â nodweddion strwythuredig. Mae'r haen yn addas i'w defnyddio ochr yn ochr â haenau eraill a ddefnyddir yn gyffredin o fewn gwaith rheoli dalgylchoedd a gall rheolwyr ei defnyddio'n annibynnol tra'n cadw cyfeiriadau at y deunyddiau ffynhonnell.

Nododd, mapiodd a chofnododd y prosiect 47 o ddolydd gorlifdir, gan ddangos yn glir bresenoldeb dolydd gorlifdir ar Afonydd Dyfrdwy, Wysg, a Theifi, gan gynnwys yn eu rhannau isaf, canol ac uchaf. Roedd dolydd gorlifdir ar yr afonydd hyn yn dangos yr un priodoleddau a nodweddion diagnostig a ganfuwyd mewn dolydd a nodwyd mewn astudiaethau eraill, gan ddefnyddio'r un ffynonellau cymharol hygyrch a'r un dulliau.

Roedd y prosiect cychwynnol hwn yn ddetholus, ond mae'r ffynonellau a'r dulliau'n awgrymu y câi gorlifdiroedd Afonydd Wysg, Teifi, a Dyfrdwy eu defnyddio'n helaeth ar gyfer dolydd gorlifdir, yn ôl pob tebyg o'r cyfnod canoloesol cynnar hyd at ddechrau'r bedwaredd ganrif ar bymtheg. O roi'r dull hwn ar waith yn eang, gallai ddarparu llinell sylfaen ar gyfer mesur faint o ddolydd gorlifdir a gollwyd, gan hefyd gefnogi'r potensial ar gyfer eu hadfer yn eu lleoliadau blaenorol.

Er na archwiliwyd yr agwedd hon yn yr astudiaeth gychwynnol hon, mae gan y canlyniadau hefyd y potensial i ysgogi diddordeb yn y rôl a chwaraeai dolydd gorlifdir nid yn unig yn amgylchedd Cymru, ond hefyd yn hanes ffermio a chymdeithas wledig Cymru. Gall hyn fod yn bwysig wrth adeiladu'r achos dros ffermio adfywiol ac er mwyn cynyddu diddordeb ymhlith ffermwyr, rheolwyr tir a'r cyhoedd ynglŷn â'r posibilïadau y mae'n eu cyflwyno.

Diolch yn fawr i Dr James January-McCann o CBHC am adolygu a chynghori ar y rhestr o enwau lleoedd Cymraeg uchod sy'n ymwneud â dolydd.

Executive summary

NRW commissioned Fjordr Ltd. to carry out an initial assessment of floodplain meadows in Wales. Species-rich floodplain meadows are important nationally and internationally, but little more than 10 ha of these grassland communities are known across the whole of Wales, making them extremely rare. However, it is likely that floodplain meadows were much more extensive in Wales prior to the twentieth century: recent work on the Upper Wye by Fjordr Ltd. for the Floodplain Meadow Partnership has identified, mapped and recorded numerous former meadows.

The project sought to identify, map and record historic examples of floodplain meadows on the Rivers Dee, Usk and Teifi, testing their presence and distribution, the availability of suitable sources, and the applicability of the methodology developed by Fjordr in other catchments.

The method draws on a range of readily available historic sources to create a single GIS layer containing polygons each representing the interpreted extent a floodplain meadow (FPM), accompanied by structured attributes. The layer is suitable for use alongside other layers commonly used within catchment management and can be used independently by managers whilst retaining references to the source materials.

The project identified, mapped and recorded 47 floodplain meadows, clearly demonstrating the presence of floodplain meadows on the Rivers Dee, Usk, and Teifi, including in their lower, middle, and upper sections. Floodplain meadows on these rivers displayed the same traits and diagnostic features found in meadows identified in other studies, using the same relatively accessible sources and the same methods.

This initial project was selective, but the sources and methods suggest that the floodplains of the Rivers Usk, Teifi, and Dee were used extensively for floodplain meadows, probably from the early medieval period to the early nineteenth century. Applied comprehensively, this approach could provide a baseline for gauging the amount of loss, whilst also supporting the potential for restoration in their former locations.

Although not explored in this initial study, the results also have the potential to stimulate interest in the role that floodplain meadows played not only in the Welsh environment, but also in the history of Welsh farming and rural society. This may be important in building the case for regenerative farming and for increasing interest among farmers, land managers and the public about the possibilities it presents.

Thanks are due to Dr James January-McCann from RCAHMW who kindly reviewed and advised on the list of Welsh meadow-related place names above.

1. Introduction

This brief report summarises a project commissioned by Cyfoeth Naturiol Cymru/Natural Resources Wales (NRW) to investigate the historic presence and distribution of floodplain meadows in the catchments of three Welsh rivers: the Dee, Usk, and Teifi. This investigation provides an initial assessment of whether meadows can be detected mainly from historic data sources in upper, middle and lower parts of each catchment.

This report accompanies a shapefile – Histmead Floodplain Meadows.shp – that is the principal output of the project.

The results provide key background information to facilitate the targeting of ground truthing of potential grassland restoration sites within these catchments. It is also anticipated that the data will be made available to the Floodplain Meadows Partnership to add to its online Map of Historic Sites¹.

2. Background

Species-rich floodplain meadows are important nationally and internationally, but little more than 10 ha of these grassland communities are known across the whole of Wales (Steven et al. 2010), making them extremely rare. However, it is likely that floodplain meadows were much more extensive in Wales prior to the twentieth century: recent work on the Upper Wye by Fjodr Ltd. for the Floodplain Meadow Partnership (Firth and Firth 2024) has identified, mapped and recorded numerous former meadows.

This initial assessment tests whether floodplain meadows in forms seen elsewhere were once present across Wales; and whether suitable sources are available to enable more comprehensive mapping both in the selected catchments and in others. The assessment prioritises the Rivers Dee in the north east, Usk in the south east, and Teifi in the west. In each catchment, the project seeks to identify historic floodplain meadows in the upper, middle and lower reaches.

Identifying, mapping and recording historic floodplain meadows has the following benefits:

- It provides evidence of the previous extent and distribution of these now rare habitats;
- It helps identify opportunities for floodplain meadow restoration that works with the grain of the historic landscape;
- It informs catchment restoration programmes; and
- It supports discussion with landowners, managers and the wider public about the potential contribution of floodplain meadow restoration to nature recovery, flood alleviation, and carbon sequestration.

¹ <https://floodplainmeadows.org.uk/discover/learn/history/historic-sites-map>.

This initial assessment may serve as a prelude to more comprehensive investigation in future.

3. Methodology

3.1. Outline

The project provides an initial assessment of the historic presence and distribution of floodplain meadows across Wales based on an existing methodology for identifying, mapping, and recording floodplain meadows. Previously, this methodology has been applied to provide comprehensive identification of all floodplain meadows within a catchment or study area. As this project is an initial assessment, it applies the same methods and standards but only selected examples of floodplain meadows to test their presence and distribution, and the availability of suitable sources, rather than providing comprehensive mapping and recording of all identifiable floodplain meadows.

The method draws on a range of readily available sources, discussed below, to create a single GIS layer containing polygons each representing the interpreted extent a floodplain meadow (FPM), accompanied by structured attributes. The layer is suitable for use alongside other layers commonly used within catchment management and can be used independently by managers whilst retaining references to the source materials.

The methodology was developed by Fjordr Ltd. for a project on the historic extent of floodplain meadows on the Dorset Stour and Thames Tributaries, set out in Firth and Firth 2020. In turn, the methodology for floodplain meadows was based on an approach to the character of historic watercourses piloted on the Dorset Stour (Firth and Firth 2022).

The floodplain meadow methodology has been applied and developed through subsequent investigations on the Severn and Avon Vales (Gloucestershire, England); the Swale, Ure and Ouse (Yorkshire, England); and the Windrush (Thames, England). Floodplain meadows have also been identified in the course of wider historic watercourse studies on the Dorset Stour, the River Culm (Devon, England), the River Eden and its tributaries in Cumbria (England), and the River Sow and River Trent in Staffordshire (England). As noted, the methodology has been applied successfully to the Upper Wye (Powys). Successful application on the Upper Wye and experience of its application to different catchments across England provides confidence about its use to identify floodplain meadows more widely in Wales.

The project encompasses the catchments of the Rivers Dee, Usk, and Teifi, focussing on the main channel of each river, not their tributaries. The extent of upper, middle and lower reaches is based on the boundaries of Water Framework Directive (WFD) Operational Catchments (Cycle 3)².

² https://datamap.gov.wales/layers/geonode:nrw_wfd_operational_catchments_c3.

3.2. Identification, Mapping and Recording

The form of each floodplain meadow record is intentionally simple, comprising a single layer in a flat-file format, so that it can be readily included within third-party workspaces/GIS projects.

Identification of floodplain meadows is based the presence of certain diagnostic features that, in combination, indicate floodplain meadows formerly managed as commons:

- The floodplain meadow is situated mostly in the modern floodplain.
- The floodplain meadow has one or more funnel-shaped entrances, usually coming off a drove-way or a trackway leading from a settlement.
- One of its boundaries (usually the longest) is bounded by the river, while two sides flare out from the funnel-shaped entrance.
- On tithe maps, the floodplain meadow may be subdivided into strips (doles) that respect the irregular nature of the boundaries of the floodplain meadow but are themselves regular in shape and size.
- Where there are enclosed fields within the extent of the floodplain meadow, these fields are in strip form (reflecting individual or multiple doles).
- The ‘state of cultivation’ recorded in tithe apportionments is usually either meadow or pasture, but very rarely arable.
- In tithe apportionments and other documentary sources the fields have plot names associated with meadows.

Individual polygons are mapped directly from georeferenced historic sources. In some cases, there may be inaccuracies in mapping from these early sources due to the methods used in historic surveys not being as accurate as in later maps. Georeferencing can also be problematic for old maps, which may not align with their modern counterparts. Where field boundaries or rivers on earlier maps are recognisable on later maps, corrections can be made accordingly, and the most appropriate boundary for a floodplain meadow will have been mapped in the GIS.

Where the river provides the boundary to a floodplain meadow, this boundary is mapped from historic maps rather than from the modern river course: the modern course does not offer an appropriate boundary where river courses have altered since the historic maps from which floodplain meadows have been identified.

The following attributes are recorded for each floodplain meadow in the shapefile attribute table:

Field name	Description of Field
ID_HistFPM	Identifying number for each FPM.
FPM_name	Defined by the area where the FPM is located, limited to 254 characters or specific name if one recorded on a source.
County	County in which FPM is located.

Field name	Description of Field
Parish	Parish FPM is within. This is the modern parish the floodplain meadow is in. This may differ to the historic parish, which will be named in the tithe map field. In Wales, communities are the lowest tier of local government, equating to parishes, hence community names are recorded in this field.
River	Name of the river on which the FPM is located.
ModLanduse	Modern land use as seen on the most recent satellite imagery.
FPMNotes	Description of the FPM – limited to 254 characters so necessarily concise.
Lammas	Reference to Lammas in sources. Yes/No field.
Funnel	Does FPM have a characteristic funnel-shaped entrance? Yes/No field.
Doles	Reference to doles, either in descriptions or visible on map sources such as tithe maps. Yes/No field.
Drove	Drove or lanes which connects a settlement to a meadow, often via a funnel-shaped entrance to the meadow. Yes/No field.
Common	Reference to Common in sources. Yes/No field.
Drainage	Reference to drainage in sources. Yes/No field.
Placenames	Reference to specific placenames associated with FPM in sources such as ham, mead, common, lots, allotments, doles.
Domesday	Whether there is a Domesday settlement with recorded acreage associated with the settlement in this parish. Obtained from Open Domesday ³ . The Domesday survey did not encompass Wales, so recorded as n/a for this project.
Tithe_Ref	National Archives tithe apportionment or tithe map reference. The original Welsh parish name may differ to its modern community name recorded under the Parish field.
OS_Map_Ref	Historic OS Map reference.
OSSurvey_Ref	Historic OS Survey Drawing reference.
OtherMap	Any other historic map sources, such as estate maps, which reference the FPM.
Rep_link	Report or other reference material where the FPM is identified and if available, the link to the report or reference material.

³ <https://opendomesday.org>.

Field name	Description of Field
Confidence	Confidence level in the identification of the FPM, with 1 being low and 5 being high. Confidence reflects the amount of information available about the FPM. A high confidence is assigned to an FPM when there are multiple sources and a high number of criteria about the meadow can be recorded. For example, a meadow that appears on several maps, has a funnel-shaped entrance, doles mapped on the tithe map and named as a common in the tithe apportionment records. A low confidence meadow might be an FPM where only the boundaries within the floodplain indicate the presence of a meadow but there is no other evidence available.
Compileby	Name of person who created the record.
Compiledate	Date record created.

3.3. Sources

Floodplain meadows have been identified, mapped and recorded in each river based on the interpretation of multiple sources relating to the historic environment, including the following:

Historic Ordnance Survey Six-inch maps available in the project GIS via a WMS link to National Library of Scotland Map Images. Generally, the earliest edition, Epoch 1 (publishing date range 1854 to 1901), was the most used.

Historic Ordnance Survey 25-inch 1st Edition (1868-1895) maps available online⁴.

Ordnance Surveyors' Drawings made between 1780s and 1840 in preparation for the first edition of one-inch OS. The following OS Survey drawings were available online:

- OS Survey Drawing 1819, Chester
- OS Survey Drawing Abergavenny, 1813
- OS Survey Drawing Aberystwyth 13, 1820
- OS Survey Drawing Bala, 1818
- OS Survey Drawing Baulit, 1817
- OS Survey Drawing Capel Bettws, 1819
- OS Survey Drawing Cardigan, 1810
- OS Survey Drawing Cyn y Brain, 1835
- OS Survey Drawing Hafod, 1820
- OS Survey Drawing Lampeter, 1811
- OS Survey Drawing Llandovery, 3 1813
- OS Survey Drawing Llangollen, 1832
- OS Survey Drawing Newport, 21 1811
- OS Survey Drawing Ruthin, 1819

⁴ <https://www.peoplescollection.wales/locate>.

- OS Survey Drawing Usk, 1813
- OS Survey Newcastle-in-Emlyn Drawing, 1811
- OS Survey Newport, 1811

The drawings were accessed via the British Library Georeferencer page⁵.

Tithe maps dating from c.1840 were accessed from either The Genealogist website⁶ where the tithe map and its apportionment records can be viewed for a subscription; or from The National Library of Wales⁷ which enables the tithe to be accessed via a mapviewer for free. Local record offices also hold copies of the tithe maps, though this study has only used online sources.

Google Satellite imagery available online using Google Earth was used to record the current landuse of the floodplain meadow.

Lidar available from Welsh Government DataMap Wales was accessed via a WMS link⁸.

Background mapping included Open Street Map; WFD Operational Catchments (Cycle 3); river centrelines from NRW Main Rivers⁹; surface water area (showing the modern extent of watercourses) from OS OpenMap Local (OML)¹⁰; and flood risk from rivers (indicating the extent of the modern floodplain) from NRW Flood Risk Assessment Wales¹¹.

Please note that third party IPR in data (e.g. data, images, maps) used in the project is retained by these third parties.

3.4. Place Names

The tithe apportionments for parishes/communities include a mix of English and Welsh terms, with field names often recorded in Welsh. Welsh terms relating to meadows or which suggest meadow locations differ from the terms used in English as identified in previous floodplain meadow studies. For this study, the following terms were found to be associated with plots that were frequently (although not exclusively) recorded with

⁵ <http://britishlibrary.georeferencer.com/start>.

⁶ <https://www.thegenealogist.co.uk/tithe/>.

⁷ <https://places.library.wales>.

⁸ <https://datamap.gov.wales/maps/lidar-viewer/>.

⁹ https://datamap.gov.wales/layers/inspire-nrw:NRW_MAIN_RIVERS.

¹⁰ <https://www.ordnancesurvey.co.uk/products/os-open-map-local>.

¹¹ <https://datamap.gov.wales/layergroups/inspire-nrw:FloodRiskAssessmentWales>.

meadows. Reference was also made to the RCAHMW List of Historic Placenames of Wales¹²:

Welsh term	English translation
Cae <i>nm</i>	field/enclosed piece of land
Cae-mawr or Cae Mawr	big field
clas	tract of land appropriated chiefly to church or abbey land
clas-dir	glebe land
clun <i>nm</i>	meadow
comin <i>nm</i>	common ground
dol, dôl <i>nf</i> (dolydd, dolau, doliau <i>pl</i>)	Welsh for a meadow, river meadow
ddol	Mutated form of dol
Ddol Fadog	Beamond (2017 458): Maddog's Meadow
Dol bont fach	bont is bridge, fach is small
Dol Dderwen	oak meadow
Dol ddwnog	??ddwnog drowsy
Dol fach	fach little, little meadow
Dol fawr or Dolfor	fawr – big, big meadow
Dol ganol	middle meadow, ganol middle
Dol ochor	side meadow
Dol ochor draw'r afon	meadow on the other side of the river
Dol ucha	upper meadow
Dol y drainllwyn	??drainllwyn hawthorn
Dol y grove	??meadow by the grove
Dolfronog	See Beamond (2017 452): Hilly, undulating, field. Mr. Richard Morgan (personal communication) writes 'Probably dôl + brwynog, ie. Dolfrwynog, Dolfrwnog, "water-meadow abounding in rushes". The Welsh w was often a wider sound than English "oo", more like "oe" in "toe"'.

¹² <https://historicplacenames.rcahmw.gov.uk/>; <https://historicplacenames.rcahmw.gov.uk/glossary>.

Welsh term	English translation
Dolfryn	possibly a type of catchwork water meadow? See Beamond (2017 458): Loosely, 'Field on the bank'. Mr. Richard Morgan (personal communication) writes 'dôl qualifies bryn, Dolfryn: "hill at a watermeadow, hill possessing a water-meadow"'.
fawr (also mawr)	Big
gwaun <i>nf</i> (also gwaun) (gweunydd <i>pl</i>)	moor, meadow, heath
gweirglodd <i>nf</i> (gweirgloddiau <i>pl</i>)	meadow, hay meadow, water meadow
gwerni (gwernydd <i>pl</i>)	associated with alder, alder grove, swamp or meadow, swamp or grove
isaf	lower
maes <i>nm</i>	open field
medd <i>nm</i>	mead
pentre(f) <i>nm</i>	village or hamlet
quillet	English term, also used in Wales, for a strip of land which with others like it formed a large field. Not exclusive to meadows.
rhos <i>nf</i> (rhosydd <i>pl</i>)	moor, heath, plain)
slang	strip of common ground (Slater 2013)
tir comin	common land
tyddyn/ty'n <i>nm</i>	farmstead/homestead
tyno	plain, meadow
ucha(f)	upper
waun (and see gwaun)	a field maintained for making hay (Lake and Hale 2023 Appendix 1)
wern	Gwern derives from the Welsh for alder tree grown in Wales for the production of clogs. Used also where ground is marshy
ynys (also ynis) <i>nf</i> ynysoedd <i>pl</i>	island, holm, river meadow
ystrad <i>nm</i>	valley or vale, river meadow, holm

On the basis that the term/name *Dol* is Welsh for meadow, plots noted on the tithe apportionment with the prefix '*Dol*'/'*Ddol*' and situated within the modern floodplain were considered to be former floodplain meadows, irrespective of whether their cultivation type recorded in the tithe was arable, pasture or meadow. Plots with meadow related fieldnames or meadow cultivation that lay outside of the floodplain were not mapped.

Many of the floodplain meadows were located close to named settlements or farmsteads. Generally, unless there was a modern name in the near vicinity to the floodplain meadow, either the farm name recorded on the tithe or the closest farmstead name appearing on the OS 25 Inch Epoch 1 maps was used for the FPM name.

4. Results

4.1. Overview

As noted above, this initial assessment selected examples of floodplain meadows on the Dee, Usk and Teifi to test their presence and distribution, and the availability of suitable sources. Accordingly, the results do not present a comprehensive identification of all floodplain meadows in these catchments. Also, as noted, the assessment focussed on the main channel of each river, not their tributaries. The selection of examples addressed the upper, middle and lower parts of each catchment based on the boundaries of Water Framework Directive (WFD) Operational Catchments (Cycle 3). The main channel of the River Teifi is encompassed a single Operational Catchment so upper, middle and lower have been distinguished by this project by reference to tributaries.

A total of 47 floodplain meadows were identified, which were mapped and recorded in the shapefile Histmead.shp. The count of selected floodplain meadows in each section of each river is summarised in Table 1.

	Lower	Middle	Upper	Total
Dee Lower Chester Weir to Ceiriog				
Dee Middle Ceiriog to Alwen	6	5	3	14
Dee Upper above Alwen				
Usk below Abergavenny				
Usk Brecon to Abergavenny	5	4	4	13
Usk above Brecon				
Teifi (lower – below Afon Tyweli)				
Teifi (middle – Afon Tyweli to Afon Brefi)	5	11	4	20
Teifi (upper – above Afon Brefi)				
Total				47

Table 1 Count of selected floodplain meadows on Rivers Dee, Usk, and Teifi

The study has clearly demonstrated the presence of floodplain meadows on each of these three rivers, including in their lower, middle, and upper sections. It is perhaps notable that floodplain meadows were identified quite high in the headwaters of each river (see figures below). These floodplain meadows are identifiable from the same characteristics that are apparent on other rivers, using the same relatively accessible sources.

The criteria and placenames recorded for floodplain meadows are summarised in Table 2 and Table 3:

Criteria	Yes	No	Possible
Lammas	0	47	0
Common	7	34	6

Criteria	Yes	No	Possible
Funnel	23	16	8
Doles	7	40	0
Droves	18	24	23
Drainage	22	25	0
Domesday	0	0	0

Table 2: Summary count of meadows withing each criterion

Placename	Count of floodplain meadows
ddol	24
common	1
gweirglodd	3
gwaun	1
mawr	1
quillet	7
slang	1
waun	1
ynys/ynis	7

Table 3: Summary count of floodplain meadows where Welsh meadow-related terms were found in the tithe

Funnel shapes and droves, and meadow place names (ddol; ynys) predominate, but it should be borne in mind that the purpose of this assessment has been to test presence and methodology rather than develop comprehensive mapping of all identifiable floodplain meadows. This information from selected floodplain meadows is, therefore, only indicative. Accordingly, the sections below on each river are brief as the results are selective: detailed results of recording each floodplain meadow are included in the accompanying shapefile and some overall perspectives are presented in the discussion that follows.

4.2. Afon Dyfrdwy/River Dee

Fourteen floodplain meadows were identified along the River Dee, as show in Figure 1 with summary information from the shapefile in Middle floodplain meadows – Afon Dyfrdwy/River Dee

ID	Name	Notes
6006	Floodplain meadow plots at Ty-maen, Denbigh	Plots 644 (Ddol and Wate) and 643 (Meadow at Tymaen, Chirk) are accessed from Ty-Maen via a possible funnel-shaped entrance south of plot 643. The adjoining plot is recorded as waste and not in the floodplain. OS Survey Drawing shows an open area.
6007	Floodplain meadow near Aber-caregan, Chirk	Tithe Plots 17 (Long Meadow) and 21 (Pembren Meadow). Two northern plots were arable but may have been former meadows. 'Slang' refers to common ground, suggesting the meadow might have been common meadow.
6008	Floodplain Mead at Trevor Ucha, Llangollen	Small area of meadow, comprising plots 282 Dol and 280 Wengrew Gweirglodd. This area has been affected by railway construction, so the full extent of the meadow is not known. However, the floodplain is fairly constricted here.
6009	Floodplain meadow south of Caer Drewyn	This area contains multiple small plots with meadow-related names like Ddol and Weirglodd, and a plot named quillet. Other unnamed plots are believed to have originally been meadows. The meadow has a funnel-shaped entrance and a drove.
6010	Floodplain meadow at Corwen	Tithe plots include Ddol, Dol, and Weirglodd. Groups of Quillets are shown on the tithe map, and the OS 6-inch shows stones in one of these areas (seen on other meadows). Three roads/droves lead into different areas, each with funnel-shaped entrances.

Upper floodplain meadows – Afon Dyfrdwy/River Dee

ID	Name	Notes
6011	Floodplain meadow at Cynwyd	This area features meadow-named plots like Ddol, Weirglodd, and quillets. Two funnel-shaped entrances and three drains (Cynwyd Drain and two tributaries) cross the meadow. To the south lies plot 247 Yard and Stackyard, likely used for hay storage.

6012	Floodplain meadows at Llandrillow, Merioneth	This meadow has numerous small plots named Ddol and Weirglodd. Near the edge of the Dee, quilletts are recorded as meadows, suggesting it was once common meadowland. Two funnel-shaped entrances open onto droves.
6013	Floodplain meadows at Bala	Meadows adjacent to Bala include Plot 44, Bala Meadow, and Plot 2071, Quillet. There is a funnel-shaped entrance from the village into Plot 42, Bala Parish. OS Survey Drawing shows the area as open before the meadow was bisected by the railway.

Table 4. It is worth noting that there is a further catchment downstream of Dee Lower – Dee Estuary – which did not form part of this study: areas subject to regular tidal inundation by salty or brackish water would not have been suitable as meadows and were likely managed for saltmarsh grazing; and have also been subject to extensive reclamation that will have obscured earlier land management patterns.

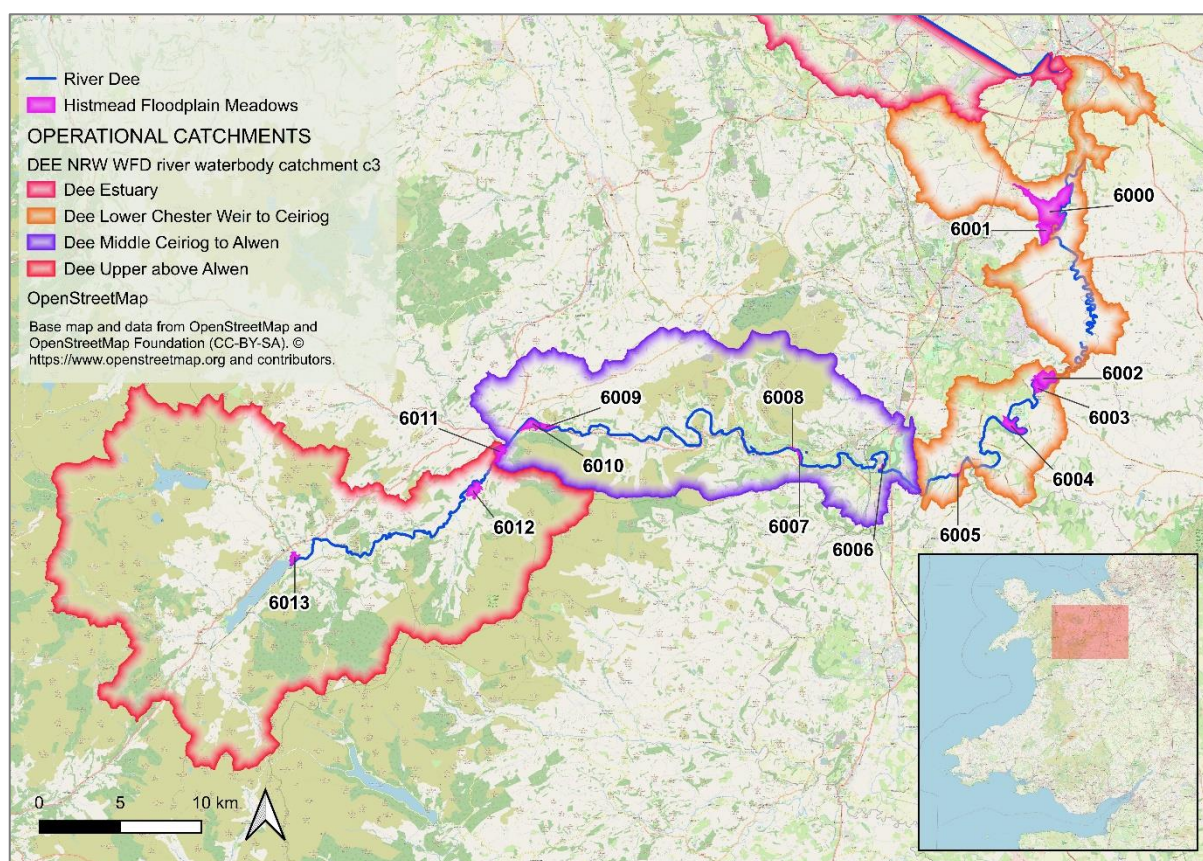


Figure 1 Distribution of selected floodplain meadows along the River Dee.

Lower floodplain meadows – Afon Dyfrdwy/River Dee

ID	Name	Notes
6000	Trevalyn Meadows, Allington	The OS 25 and OS Six Inch maps mark a large area as Trevlyn Meadows. Meadowhouse Farm is situated in the northeast of the meadow. The OS Survey Drawing shows it as one large area, but later maps reveal enclosures within the meadow.
6001	Floodplain Meadows at Allington	Large area with multiple plots having meadow-related names, including two recorded as quilletts. OS Survey Drawing shows this as one large plot with no boundaries, a back drain, and a possible entrance from Pickhill Old Hall.
6002	Pickhill Meadow	Large area with multiple plots having meadow-related names, including two recorded as quilletts. OS Survey Drawing shows this as one large plot with no boundaries, a back drain, and a possible entrance from Pickhill Old Hall.
6003	Bangor Meadow	Most plots in this region are identified as Bangor Meadow. Some areas feature medieval ridge and furrow, but the southwest part lacks these, suggesting it might be a medieval floodplain meadow.
6004	Ddol Eyton at Bangor	Plots 6-11 Ddol, Plot 9 Altheny Meadow. OS Survey Drawing shows an open area with no boundaries. Access may be via plot 5 from Eyton Hall. Lidar shows faint traces of medieval ridge and furrow, and former river channels.
6005	Long Meadow near Graig Farm, Ruabon, Wrexham	Plot 6, Ddol Bannadle (arable), and Plot 9, Long Meadow (meadow). There is a trackway to the meadow from Graig Farm, but it is not shown as a funnel entrance on the tithe.

Middle floodplain meadows – Afon Dyfrdwy/River Dee

ID	Name	Notes
6006	Floodplain meadow plots at Ty-maen, Denbigh	Plots 644 (Ddol and Wate) and 643 (Meadow at Tymaen, Chirk) are accessed from Ty-Maen via a possible funnel-shaped entrance south of plot 643. The adjoining plot is recorded as waste and not in the floodplain. OS Survey Drawing shows an open area.
6007	Floodplain meadow near Aber-caregan, Chirk	Tithe Plots 17 (Long Meadow) and 21 (Pembren Meadow). Two northern plots were arable but may have been former meadows. 'Slang' refers to common ground, suggesting the meadow might have been common meadow.

6008	Floodplain Mead at Trevor Ucha, Llangollen	Small area of meadow, comprising plots 282 Dol and 280 Wengrew Gweirglodd. This area has been affected by railway construction, so the full extent of the meadow is not known. However, the floodplain is fairly constricted here.
6009	Floodplain meadow south of Caer Drewyn	This area contains multiple small plots with meadow-related names like Ddol and Weirglodd, and a plot named quillet. Other unnamed plots are believed to have originally been meadows. The meadow has a funnel-shaped entrance and a drove.
6010	Floodplain meadow at Corwen	Tithe plots include Ddol, Dol, and Weirglodd. Groups of Quillets are shown on the tithe map, and the OS 6-inch shows stones in one of these areas (seen on other meadows). Three roads/droves lead into different areas, each with funnel-shaped entrances.

Upper floodplain meadows – Afon Dyfrdwy/River Dee

ID	Name	Notes
6011	Floodplain meadow at Cynwyd	This area features meadow-named plots like Ddol, Weirglodd, and quillets. Two funnel-shaped entrances and three drains (Cynwyd Drain and two tributaries) cross the meadow. To the south lies plot 247 Yard and Stackyard, likely used for hay storage.
6012	Floodplain meadows at Llandrillow, Merioneth	This meadow has numerous small plots named Ddol and Weirglodd. Near the edge of the Dee, quillets are recorded as meadows, suggesting it was once common meadowland. Two funnel-shaped entrances open onto droves.
6013	Floodplain meadows at Bala	Meadows adjacent to Bala include Plot 44, Bala Meadow, and Plot 2071, Quillet. There is a funnel-shaped entrance from the village into Plot 42, Bala Parish. OS Survey Drawing shows the area as open before the meadow was bisected by the railway.

Table 4 Summary information on selected floodplain meadows on the River Dee

4.3. Afon Wysg/River Usk

Eleven meadows were identified along the catchment of the River Usk, illustrated in Figure 2, with summary information from the shapefile in

Middle floodplain meadows – Afon Wysg/River Usk

ID	Name	Notes
6045	Wett Meadow at Tretower, St Michael, Cwmdru	The meadow is mapped on a 1587 survey map of Chrughoel and Tretowre, which is part of the Badminton Collection. The map shows a plot named 'Wett Meadowes', coloured in purple. Later tithe records show that this area is pasture.
6046	Constables Mead, Tretower, St Michael, Cwmdru	The meadow is mapped on a 1587 survey map of Chrughoel and Tretowre, which is part of the Badminton Collection. The map shows a plot named 'Constables Meadow' and it is coloured in green. Later tithe records plot 1989 as wood and 1954 as pasture.
6018	Floodplain meadow at Crickhowell	Meadows south of Crickhowell's medieval castle. Accessed via a lane off Bridge Street (shown on OS Survey Drawing) into plot 387, Bridge Common. Other plots include 457 Big Meadow, 101 Middle Meadow, 103 Lower Meadow, and 101 Beaufort's Meadow.
6019	The Castle Meadow, Abergavenny, Monmouthshire	Tithe plot 45, The Castle Meadow, lies south of Abergavenny Castle (11th Century) and Abergavenny Roman Fort. The meadow was likely in use during both periods. There are two funnel entrances and a leat (on tithe) that is no longer in situ.

Lower floodplain meadows – Afon Wysg/River Usk

ID	Name	Notes
6020	Floodplain meadow near Castle Arnold at Llangattock, Monmouth	Tithe plots 356 Big Ynis, 305 The Upper Meadow, and 304/302 The Lower Meadow adjacent to the medieval site of Castle Arnold. There are arable plots within this area as well. Funnel-shaped entrance near the gravel pit (OS Survey Drawing).
6021	Floodplain meadow at Llanvihangle the County of Monmouth	Three meadow plots located near the Old Toll House at Llanvihangle. There is the remnant of a possible former funnel-shaped entrance at Ty Corner, which is marked on the OS six-inch map, which also shows a footpath (possibly a former drove).
6022	Floodplain meadows at Rhadyr	Tithe plots 556, 51, 560, 597, 598, 549 are all meadow, 549 being part of Brioras Mill. There is a entrance at the mill, but not clear if this would have been for all the meadows. There is a back drain and stream along one boundary.

6023	Floodplain meadow adjacent to Kemeys Inferior Mound and Bailey Castle	Tithe records show plots 3, 12, 13, 15, 23, and 24 as meadow. Plot 3 is adjacent to Kemeys Inferior Mound and Bailey Castle (medieval), suggesting the meadow could date back to the medieval period. Possible entrance near the church (plot 25).
6024	Floodplain meadow at Caerleon, Gwent	Tithe plots recorded as meadows adjacent to Caerleon. Meadows feature drainage systems. A funnel-shaped entrance from Broadway, Caerleon (shown on OS Survey). Area marked 'Burghs Land' suggests common meadow (Morgans map 1763).

Table 5.

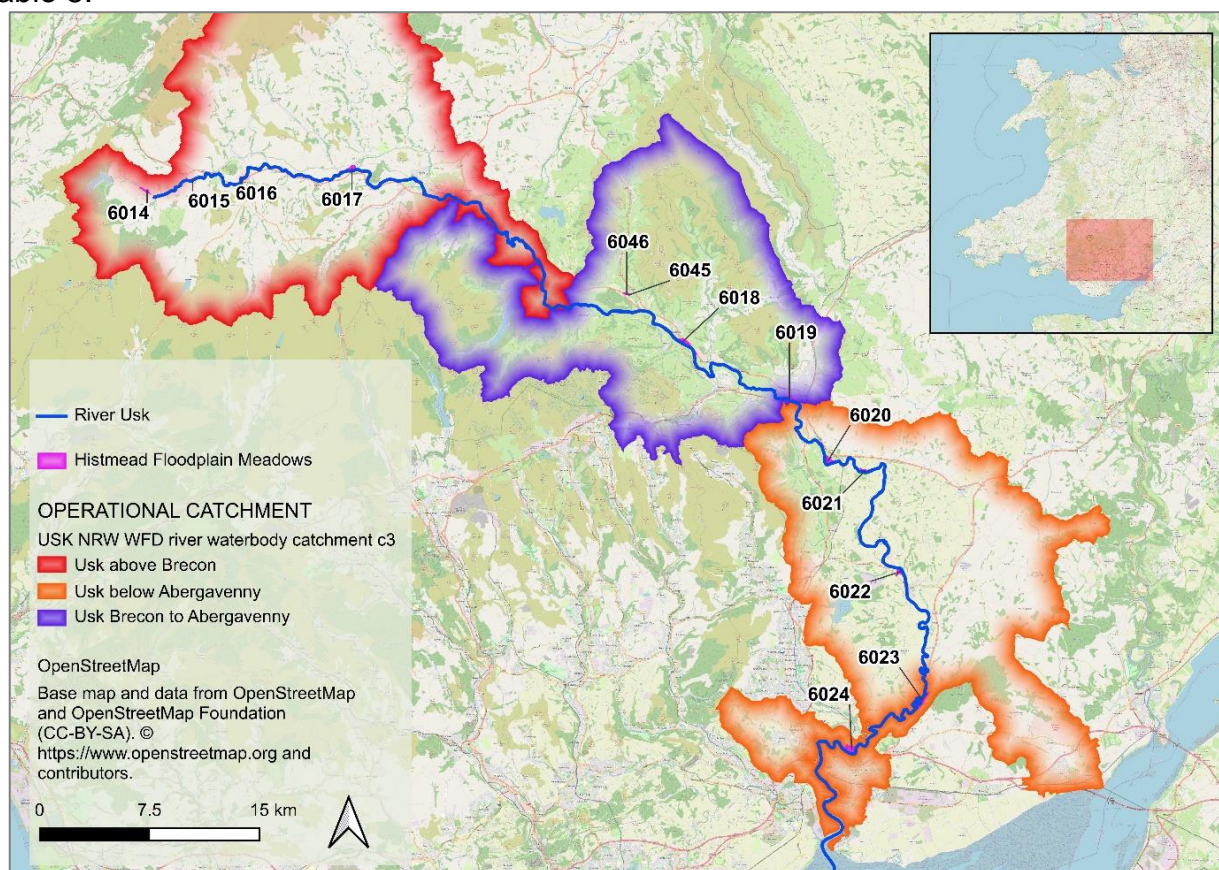


Figure 2 Distribution of selected floodplain meadows along the River Usk.

Upper floodplain meadows – Afon Wysg/River Usk

ID	Name	Notes
6014	Floodplain meadows as Ynys Fawr	Tithe Plots 703 Cae dan'r Ardd, 701 Cae Issa, 708 Ynys Genol, 709 Ynys Glanddu, 705 By Ynys Fawr, 955 Ynys Ucha, and 956 Ynys Issa. The farm Ynys Fawr, at the meadow's edge, means 'Big Meadow' in Welsh.

6015	Floodplain meadow south of Trecastle	Tithe plots 619 Gwern Mawr and 621/621 Part of Ynys Felin both recorded as meadows. There is a drove leading from opposite Trecastle Mound and Bailey medieval site to this area of meadow. Former river channels are mapped on the OS 25-inch Epoch 1 map.
6016	Car Hall Meadow at Senny Bridge	Tithe Plot 1033 is recorded in the apportionment as Car Hall Meadow. The northeast end appears to have a funnel, although it is not clear if this is the entrance. The meadow is crossed east-west by a Roman road.
6017	Floodplain meadows to the west of Aberyscir	Tithe records six plots as meadows, one as arable. Meadow lies west of Aberyscir Castle Mound (medieval), connected via a narrow strip with a funnel entrance. Plots to the north are also meadows but lie outside of floodplain.

Middle floodplain meadows – Afon Wysg/River Usk

ID	Name	Notes
6045	Wett Meadow at Tretower, St Michael, Cwmdu	The meadow is mapped on a 1587 survey map of Chrughoel and Tretowre, which is part of the Badminton Collection. The map shows a plot named 'Wett Meadowes', coloured in purple. Later tithe records show that this area is pasture.
6046	Constables Mead, Tretower, St Michael, Cwmdu	The meadow is mapped on a 1587 survey map of Chrughoel and Tretowre, which is part of the Badminton Collection. The map shows a plot named 'Constables Meadow' and it is coloured in green. Later tithe records plot 1989 as wood and 1954 as pasture.
6018	Floodplain meadow at Crickhowell	Meadows south of Crickhowell's medieval castle. Accessed via a lane off Bridge Street (shown on OS Survey Drawing) into plot 387, Bridge Common. Other plots include 457 Big Meadow, 101 Middle Meadow, 103 Lower Meadow, and 101 Beaufort's Meadow.
6019	The Castle Meadow, Abergavenny, Monmouthshire	Tithe plot 45, The Castle Meadow, lies south of Abergavenny Castle (11th Century) and Abergavenny Roman Fort. The meadow was likely in use during both periods. There are two funnel entrances and a leat (on tithe) that is no longer in situ.

Lower floodplain meadows – Afon Wysg/River Usk

ID	Name	Notes
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6020	Floodplain meadow near Castle Arnold at Llangattock, Monmouth	Tithe plots 356 Big Ynis, 305 The Upper Meadow, and 304/302 The Lower Meadow adjacent to the medieval site of Castle Arnold. There are arable plots within this area as well. Funnel-shaped entrance near the gravel pit (OS Survey Drawing).
6021	Floodplain meadow at Llanvihangle the County of Monmouth	Three meadow plots located near the Old Toll House at Llanvihangle. There is the remnant of a possible former funnel-shaped entrance at Ty Corner, which is marked on the OS six-inch map, which also shows a footpath (possibly a former drove).
6022	Floodplain meadows at Rhadyr	Tithe plots 556, 51, 560, 597, 598, 549 are all meadow, 549 being part of Brioras Mill. There is a entrance at the mill, but not clear if this would have been for all the meadows. There is a back drain and stream along one boundary.
6023	Floodplain meadow adjacent to Kemeys Inferior Mound and Bailey Castle	Tithe records show plots 3, 12, 13, 15, 23, and 24 as meadow. Plot 3 is adjacent to Kemeys Inferior Mound and Bailey Castle (medieval), suggesting the meadow could date back to the medieval period. Possible entrance near the church (plot 25).
6024	Floodplain meadow at Caerleon, Gwent	Tithe plots recorded as meadows adjacent to Caerleon. Meadows feature drainage systems. A funnel-shaped entrance from Broadway, Caerleon (shown on OS Survey). Area marked 'Burghs Land' suggests common meadow (Morgans map 1763).

Table 5 Summary information on selected floodplain meadows on the River Usk

4.4. Afon Teifi/River Teifi

Twenty meadows were identified along the River Teifi, illustrated in Figure 3, with summary information from the shapefile in Middle floodplain meadows – Afon Teifi/River Teifi

ID	Name	Notes
6029	Floodplain meadow at Cellan, Cardiganshire	Tithe plot 656 Dolissa, 363 Ddol Fawr, 655 Ddol bont Bren has a funnel-shaped entrance from the road into the meadow but there could also have been an entrance off plot 656.

6030	Floodplain meadow south east of Cellan, Cardiganshire	Tithe plots 304 Ddolfach penygraig, 303 Ddolfawr, 307 Ddol Fawr. Plot 302 is Cia Coch (Red Field) and it as been included as part of the meadow as it falls within the floodplain. Small area of meadow plots but no other features visible on the tithe.
6031	Floodplain meadow to the east of Cwmann, Pencarreg	Six tithe plots with the name Ddol and two without. It is likely that this entire stretch was historically a meadow. The meadow has a road running along its boundary, but no entrance could be identified.
6032	Floodplain meadow to the north west of Cwmann, Pencarreg	Tithe plots 1337 Ddol Whiaed, 1340 Ddol bont, 1336 Ddol las, 1341 Ddol danty. It is possible this meadow may have formed a larger meadow with the meadow to the west.
6033	Lampeter Common	Area marked on the 1841 tithe as Lampeter Common (plot 785) and Old Common (plot 774). Both plots lie within the floodplain and are accessible via a lane from the High Street. This area is named Dole Gwrddon on Emanuel Brown's 1766 map.
6034	Floodplain meadow to the west of Cwmann	Single tithe plot 1331 Ddol, west of Cwmann. This has a small funnel-shaped entrance shown on the tithe which is shown as being part of the adjoining plot 1329 (not a meadow) which leads to the road.
6035	Floodplain meadow at Dolgwm Mill, Pencarreg	Tithe plots 172 Dol Ran, 171 Dol yr Wyth, 174 Dol y Gelli, and 175 Ddol Faeh. Plot 174 had a funnel entrance that joined the road leading to Pencarreg but this entrance was truncated when the railway was constructed.
6036	Floodplain meadow Llanwenog, Cardiganshire/Ce ridigion	Tithe plots 2342 Ddol Fawr and 2343 Ddol Fach at Llanwenog. The Teifi has altered its course throughout the 19th century, and the old course has been mapped on the early tithe and showed the meadow was originally bounded by the Teifi.
6037	Floodplain meadow Llanwenog, Cardiganshire/Ce ridigion	Tithe plot 2333 Ddol yr Alsis, 2334 Ddol y Cnwcau, and 2335 Wasteland. The wasteland appears to be a remnant of a funnel-shaped entrance which leads to Dolau Ucha Farm and then up to the road to Llanbyther.
6038	Floodplain meadow to the south west of Rhyddlan, Llanwenog	Tithe plots 1218 Ddol Issaf, 1207 Ddol Uchaf, and 1206 Yr Ynys. Plot 1206 has a funnel-shaped entrance onto a drove to Cry-y-Whil and shown on the OS Survey Drawing. A second funnel-shaped entrance comes off plot 1208 and connects to the first drove.
6039	Floodplain meadow at Llanfihangle-ar-arth	Tithe plots 455 Dol Issa, 456 Dol Ganol, and 457 Dol Ucha. There is a funnel-shaped entrance into 456, with a track that goes past St. Michael's Church and the road into Llanfihangel-ar-arth. Plot 456 is not entirely within the floodplain.

Lower floodplain meadows – Afon Teifi/River Teifi

ID	Name	Notes
6040	Floodplain meadow at Llandyfriog, Cardiganshire	Tithe plots 70, 704, 705, 706, and 707 are recorded as meadow. The tithe shows a former channel of the Teifi forming the meadow's upper boundary. The OS 25-inch map shows a drove across this area and a second possible entrance to the northeast.
6041	Floodplain meadow at Canarth, Carmarthen	Tithe plots 10 Ddolfawr, 3 Ddol Leberwey, 4 Ddol Galch, 270 Meadow, 1 Ddolwen, and 35 Ddol Linwen. The meadows are accessed from a drove that crosses the meadow to the Teifi and a possible former ford.
6042	Argoed Meadow, Cenarth, Carmarthen	Tithe plots 102 and 103 are recorded as Argoed Meadow. There is possibly a funnel-shaped entrance at the east end of the meadow. The meadow is located to the northeast of the medieval motte-castle Parc-y-domen.
6043	Floodplain meadows at Llechryd, Cardiganshire	Tithe plots 130 Meadow, 132 Ddolfach and 133 Meadow at Llechryd. Narrow strip of meadow at Llechryd. Not clear where it would have been accessed from.
6044	Edge Hill Meadow and associated plots at Llechryd, Cardiganshire	Tithe plots 98 and 94 Meadow, 114 Lower Meadow at Edge Hill, Llechryd as shown the OS Survey Drawing of 1810 and the tithe map of 1839.

Table 6.

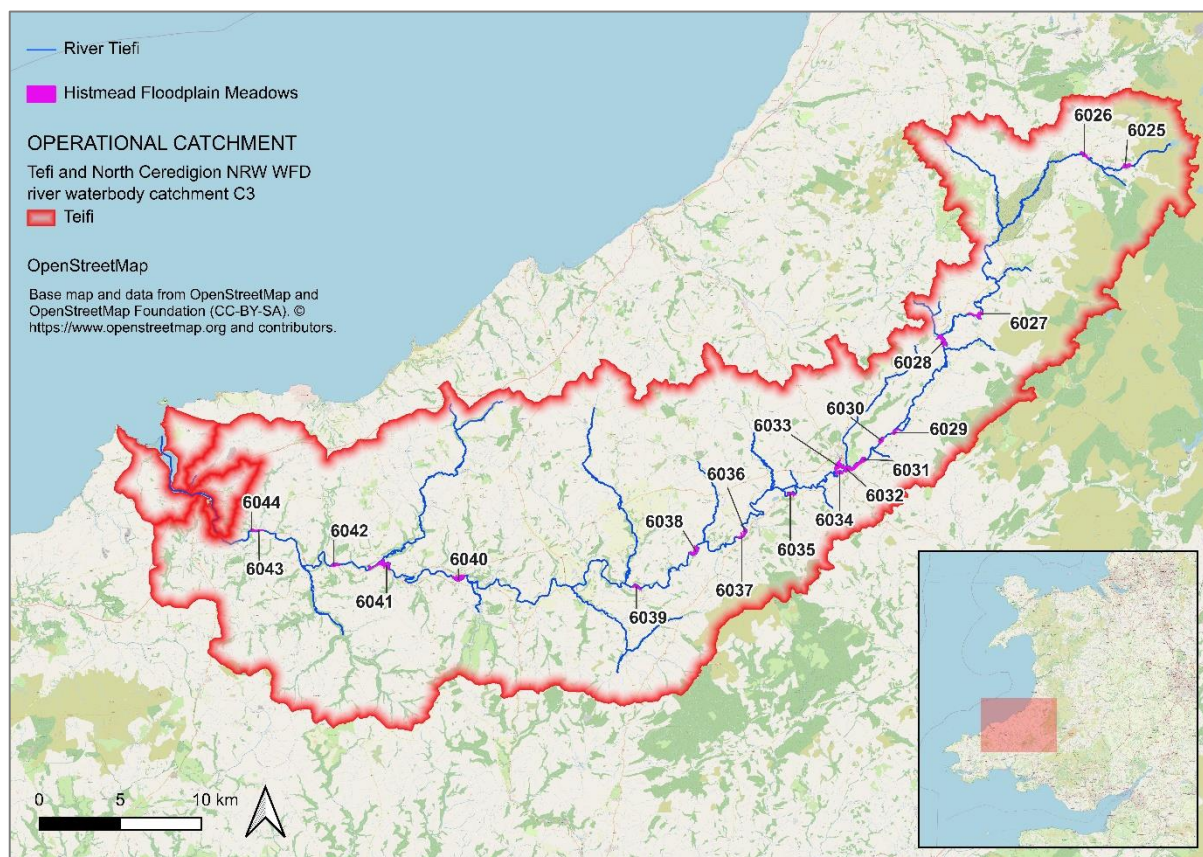


Figure 3 Distribution of selected floodplain meadows along the River Teifi

Upper floodplain meadows – Afon Teifi/River Teifi

ID	Name	Notes
6025	Floodplain meadow at Cae-Madog, Cardiganshire	Tithe plots 371 Ddolfach, 403 Ddol Issa, 372 Ddolfach Glanrafon and 402 Ddol Ganol have recorded cultivation types as arable and meadow. Each plot partially lies within the floodplain, suggesting the lower areas were likely meadow.
6026	Floodplain meadow at Pontrhydfendigaid, Cardiganshire	Tithe plots 6 Ddol, 67 Cae Issa (meadow), 134 Cae Bach (meadow), and 135 Ddolie. No funnel-shaped entrance, but there's an entrance to a plot next to 67 that comes off the high street.
6027	Floodplain meadow at Llanio, Llanddewybrefy	Meadow with funnel-shaped entrance, comprising tithe plots 177 Dol Issa, 178 Dol Ganol, 191 and 192 Gro (meadow).
6028	Floodplain meadow at Gogoyan, Llanddewybrefi, Cardiganshire	Tithe plots 218 Cae ddol fan y cueau, 219 Cae rhos fach, 202 Cae morfa, 201 Cae yr ynys uchaf, 200 Cae yr ynys isaf, 199 Cae yr ynys at Llanddewibrefi. There are droves and funnel-shaped entrances at either end of the meadow.

Middle floodplain meadows – Afon Teifi/River Teifi

ID	Name	Notes
6029	Floodplain meadow at Cellan, Cardiganshire	Tithe plot 656 Dolissa, 363 Ddol Fawr, 655 Ddol bont Bren has a funnel-shaped entrance from the road into the meadow but there could also have been an entrance off plot 656.
6030	Floodplain meadow south east of Cellan, Cardiganshire	Tithe plots 304 Ddolfach penygraig, 303 Ddolfawr, 307 Ddol Fawr. Plot 302 is Cia Coch (Red Field) and it as been included as part of the meadow as it falls within the floodplain. Small area of meadow plots but no other features visible on the tithe.
6031	Floodplain meadow to the east of Cwmann, Pencarreg	Six tithe plots with the name Ddol and two without. It is likely that this entire stretch was historically a meadow. The meadow has a road running along its boundary, but no entrance could be identified.
6032	Floodplain meadow to the north west of Cwmann, Pencarreg	Tithe plots 1337 Ddol Whiaed, 1340 Ddol bont, 1336 Ddol las, 1341 Ddol danty. It is possible this meadow may have formed a larger meadow with the meadow to the west.
6033	Lampeter Common	Area marked on the 1841 tithe as Lampeter Common (plot 785) and Old Common (plot 774). Both plots lie within the floodplain and are accessible via a lane from the High Street. This area is named Dole Gwrddon on Emanuel Brown's 1766 map.
6034	Floodplain meadow to the west of Cwmann	Single tithe plot 1331 Ddol, west of Cwmann. This has a small funnel-shaped entrance shown on the tithe which is shown as being part of the adjoining plot 1329 (not a meadow) which leads to the road.
6035	Floodplain meadow at Dolgwm Mill, Pencarreg	Tithe plots 172 Dol Ran, 171 Dol yr Wyth, 174 Dol y Gelli, and 175 Ddol Faeh. Plot 174 had a funnel entrance that joined the road leading to Pencarreg but this entrance was truncated when the railway was constructed.
6036	Floodplain meadow Llanwenog, Cardiganshire/Ce ridigion	Tithe plots 2342 Ddol Fawr and 2343 Ddol Fach at Llanwenog. The Teifi has altered its course throughout the 19th century, and the old course has been mapped on the early tithe and showed the meadow was originally bounded by the Teifi.
6037	Floodplain meadow Llanwenog, Cardiganshire/Ce ridigion	Tithe plot 2333 Ddol yr Als, 2334 Ddol y Cnwcau, and 2335 Wasteland. The wasteland appears to be a remnant of a funnel-shaped entrance which leads to Dolau Ucha Farm and then up to the road to Llanbyther.

6038	Floodplain meadow to the south west of Rhyddlan, Llanwenog	Tithe plots 1218 Ddol Issaf, 1207 Ddol Uchaf, and 1206 Yr Ynys. Plot 1206 has a funnel-shaped entrance onto a drove to Cry-y-Whil and shown on the OS Survey Drawing. A second funnel-shaped entrance comes off plot 1208 and connects to the first drove.
6039	Floodplain meadow at Llanfihangle-ar-arth	Tithe plots 455 Dol Issa, 456 Dol Ganol, and 457 Dol Ucha. There is a funnel-shaped entrance into 456, with a track that goes past St. Michael's Church and the road into Llanfihangel-ar-arth. Plot 456 is not entirely within the floodplain.

Lower floodplain meadows – Afon Teifi/River Teifi

ID	Name	Notes
6040	Floodplain meadow at Llandyfriog, Cardiganshire	Tithe plots 70, 704, 705, 706, and 707 are recorded as meadow. The tithe shows a former channel of the Teifi forming the meadow's upper boundary. The OS 25-inch map shows a drove across this area and a second possible entrance to the northeast.
6041	Floodplain meadow at Canarth, Carmarthen	Tithe plots 10 Ddolfawr, 3 Ddol Leberwey, 4 Ddol Galch, 270 Meadow, 1 Ddolwen, and 35 Ddol Linwen. The meadows are accessed from a drove that crosses the meadow to the Teifi and a possible former ford.
6042	Argoed Meadow, Cenarth, Carmarthen	Tithe plots 102 and 103 are recorded as Argoed Meadow. There is possibly a funnel-shaped entrance at the east end of the meadow. The meadow is located to the northeast of the medieval motte-castle Parc-y-domen.
6043	Floodplain meadows at Llechryd, Cardiganshire	Tithe plots 130 Meadow, 132 Ddolfach and 133 Meadow at Llechryd. Narrow strip of meadow at Llechryd. Not clear where it would have been accessed from.
6044	Edge Hill Meadow and associated plots at Llechryd, Cardiganshire	Tithe plots 98 and 94 Meadow, 114 Lower Meadow at Edge Hill, Llechryd as shown the OS Survey Drawing of 1810 and the tithe map of 1839.

Table 6 Summary information on selected floodplain meadows on the River Teifi

5. Discussion

This investigation was intended to test the presence and distribution of floodplain meadows and the availability of suitable sources, rather than providing comprehensive mapping, recording, and analysis. Nonetheless, even this brief work gives rise to observations about floodplain meadows on these three rivers in Wales that are of note.

5.1. Evidence for Common Meadows

The total number of floodplain meadows identified as common meadows is summarised by river in Table 7

River	No	Possible	Yes	Total for each River
Dee	4	5	5	14
Teifi	19	0	1	20
Usk*	11	1	1	13
Total	34	6	7	47

Table 7 Count of common floodplain meadows by river.
(*including Rhiangoll tributary)

Seven meadows showed clear evidence that they may have been former common meadows, and six were possible former common meadows. The highest number of common meadows was identified along the River Dee, with both the Usk and Teifi only having a single potential common meadow each: though this may be a consequence of the selective approach.

At Lampeter there is an area marked on the 1841 tithe¹³ as Lampeter Common (plot 785) together with Old Common (plot 774). The earliest evidence of a common floodplain meadow in this area is marked as Dole Gwrddon on Emanuel Brown's 1766 map, A New and Accurate Map of South Wales. Unfortunately, boundaries were not mapped so actual extents could not be determined from this map. The 1811 OS Survey Drawing for Lampeter shows the meadow with clearly defined boundaries, indicating how the common was accessed from Lampeter via a wide, funnel-shaped entrance with a few scattered buildings along its edges. The common depicted on the 1766 map and the 1811 OS Survey Drawing are shown in green on Figure 4.

¹³ National Archives IR 29/47/79 Tithe apportionment of Pencarreg (parish), Carmarthenshire. 1841 accessed via The Genealogist



Figure 4 Earliest maps showing FPM 6033 Common floodplain meadow at Lampeter. To the left is Emanuel Brown's 1766 map, *A New and Accurate Map of South Wales*¹⁴ showing Dol Gwrddon (highlighted in green) and Thomas Budgen's 1811 OS Survey Drawing of Lampeter¹⁵.

The access from Lampeter also shown on the tithe map, but unfortunately, the tithe apportionment for this area does not record the cultivation type for either Lampeter Common or The Old Common. Given that much of this area lies within the floodplain and the reference to Dole Gwrddon on the 1766 map, it seems likely to have been a common meadow. The OS 25-inch and six-inch maps show that the funnel-shaped entrance still ran down to the common from Lampeter High Street later in the nineteenth century. However, instead of a wide funnel there is a lane through the centre of the funnel, with infill development on each side, between the buildings shown in 1811. The lane from High Street divides as it enters the common.

¹⁴ Emanuel Brown's 1766 map, *A New and Accurate Map of South Wales* accessed January 2025 at <https://britishlibrary.oldmapsonline.org/maps/413aeefa-822a-4b9d-8abb-15b1402dcdf8/>

¹⁵ Thomas Budgen's 1811 OS Survey Drawing of Lampeter accessed January 2025 at <https://britishlibrary.oldmapsonline.org/maps/7b812fbf-5718-508b-9fd5-a76fcb531267/>

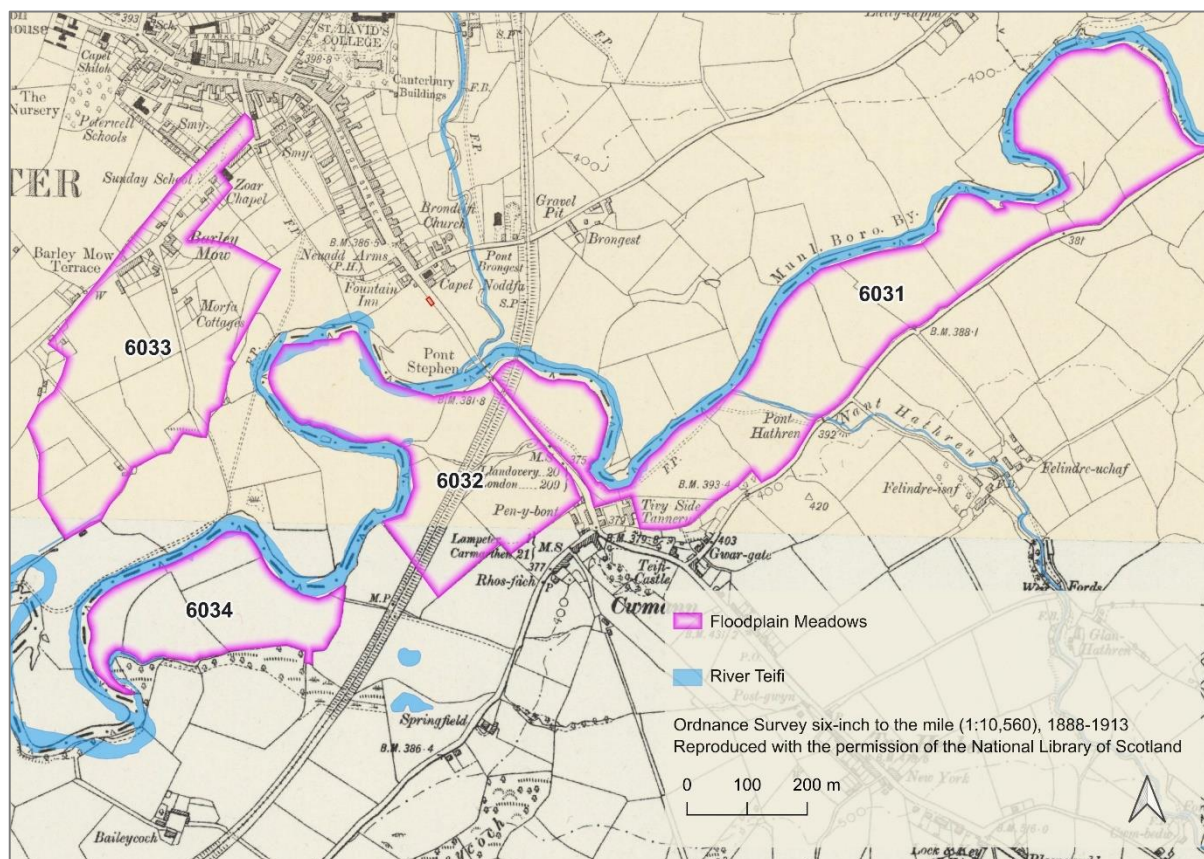


Figure 5 Floodplain meadows alongside of the River Teifi at Lampeter.

Previous work in England often shows floodplain meadows mapped with multiple doles, usually shown as thin strips with boundaries mapped as dashed or dotted lines rather than as solid lines. Plot numbers are usually recorded against each strip and accompanying apportionment records listing their attribution to individuals. It is not clear, however, if there is a Welsh equivalent term for the English *dole* or *lot*, i.e. the strips allocated as part of the common meadow system. Palmer and Owen (1910) note that the Welsh word *dôl* (which means meadow) – although pronounced the same as the English *dole* – does not have the same meaning: *dôl* refers to the meadow as a whole, not the individual strips or plots within it. Palmer and Owen also discuss the use of the term *quillet*, used to describe a division or strip of land in the open field system, being more commonly associated with arable lands:

In many cases where the ancient arable area is divided into quilletts there are also tracts of 'gwairdir', or hayland, which are similarly divided. These tracts may be called 'common meadows' and the strips which lie, or formerly lay, in them 'doles' thus restricting for the most part the name 'quilletts' to the strips of arable land in the common fields.

Further, they observed that in Flintshire, *loons* were recorded as quilletts of meadow. However, Silvester (in Comeau and Seaman, 2019, page 100) noted that the arable strips from open field systems could in fact have been meadows:

A diminutive group of strips survived into the nineteenth century because of their varied ownership; it is even possible that they functioned as meadows rather than arable.

Along the Dee, several meadows had plots that had been recorded in the tithe with the name 'quillets', where their cultivation type was meadow. Neither the Teifi nor the Usk had any quillets recorded in the tithe, though as above this could be a result of the selective approach.

At Llandrillo, FPM 6012 had multiple quillets mapped within an area of floodplain meadows (Figure 6). This meadow, situated at the edge of the Dee, consists of multiple small plots, each with names related to meadows, such as Ddol and Weirglodd. The meadow also has two funnel-shaped entrances opening onto droves: within the meadow, early field boundaries survived after enclosure. There are two areas of plots within the meadow which are recorded as 'Quillet' in the tithe apportionment, all having their cultivation type recorded as 'meadow'. The annotation of the boundaries of these narrow strips is by dashed lines, rather than solid. The location of these quillet-named plots is shown in Figure 7.

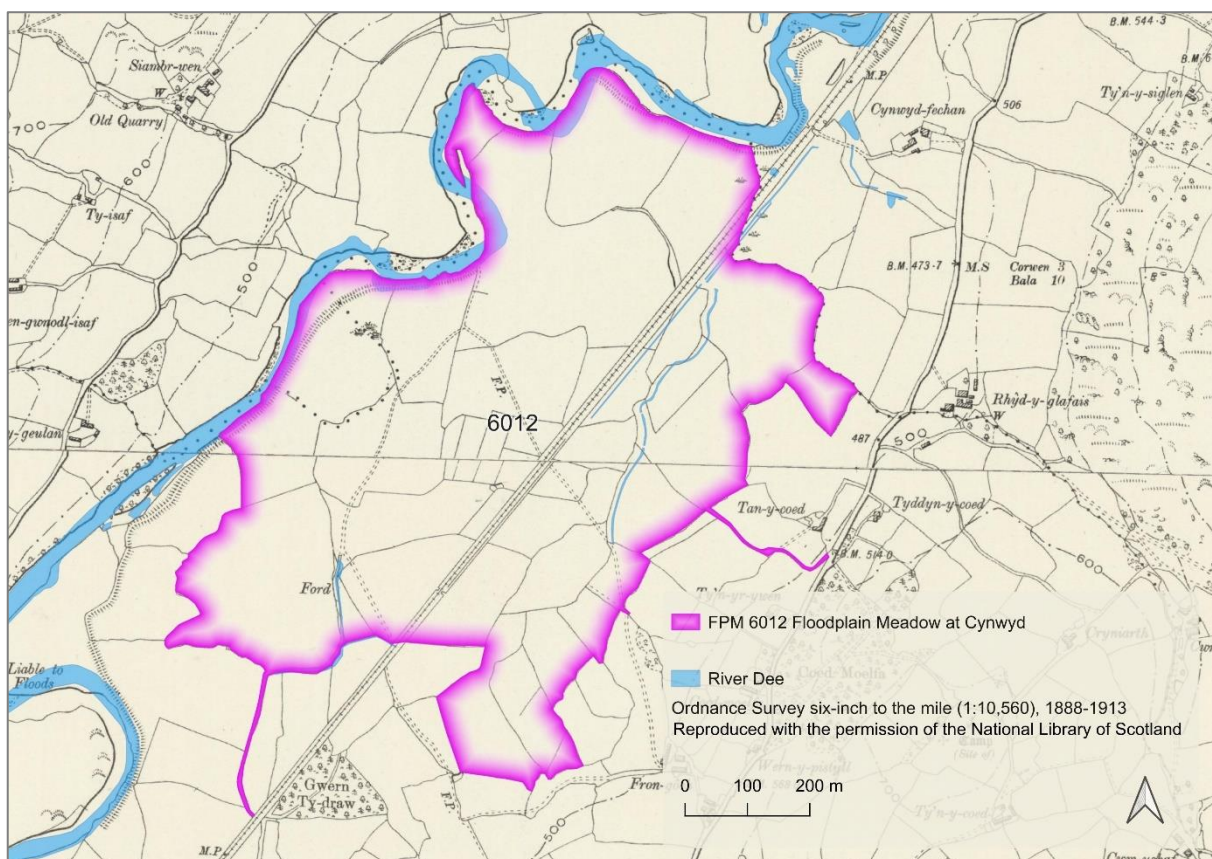


Figure 6 FPM 6012 Floodplain Meadows at Llandrillo, Merioneth

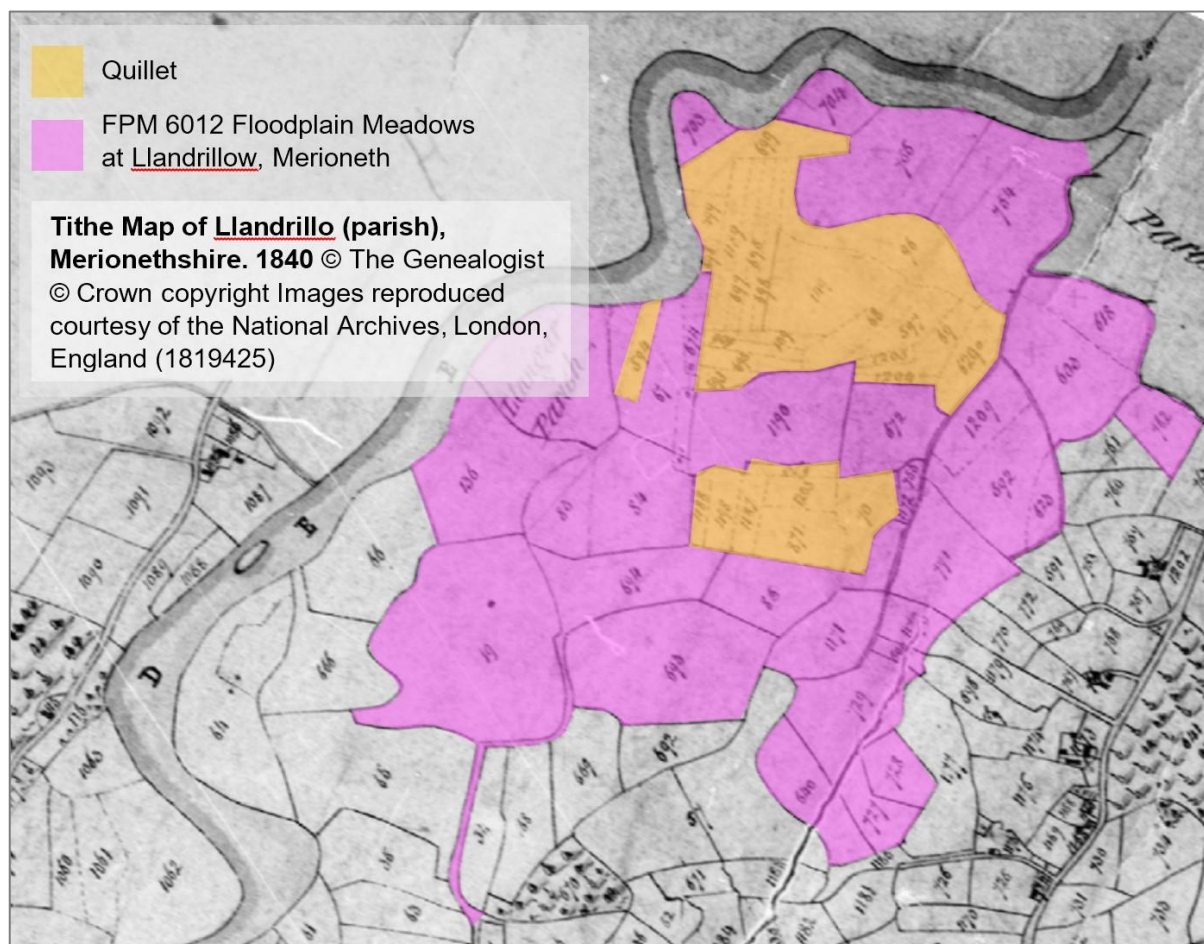


Figure 7 FPM 6012 Floodplain Meadows at Llandrillo, Merioneth shown on the 1840 tithe map of Landrillo, showing the location of quillets (yellow) and plots either recorded as meadow or with meadow related names.

The presence of multiple small plots on tithe maps indicate that the meadows in Wales were once divided in a similar way to common meadows in England, even though we have yet to see reference to doles.

Potential common meadows were also identified on the Usk at Crickhowell (FPM 6018) referred to as Bridge Common; and at Caerleon (FPM 6024), where a 1765 estate map of Henry Morgan's lands shows an area marked as 'Burghs Land' situated next to the River Usk. Identifying this as land pertaining to the burgh might suggest this area was a common meadow. Along the Teifi, the only common that was identified was at Lampeter, as discussed above.

5.2. Evidence for funnels and droves

Funnel-shaped entrances and their associated droves are the distinctive entrances that enable livestock to move on and off floodplain meadows and other commons used for grazing, found in landscapes from the Bronze Age (Oosthuizen, 2013, page 28) onwards.

The distinctive funnel-shaped entrances can persist in the landscape as the open fields are enclosed around them, but enclosure can also result in a loss of these earlier forms. Funnel-shaped entrances were observed on 31 of the meadows identified: their distribution by river is summarised in Table 8. On each river, around half of the floodplain meadows had funnel-shaped entrances.

River	No	Possible	Yes	Total for each River
Dee	2	4	8	14
Teifi	8	3	9	20
Usk	6	1	6	13
Total	16	8	23	47

Table 8 Table summarising the distribution of floodplain meadows with funnel-shaped entrances across the three rivers.

5.3. River dynamics and floodplain meadows

All three rivers show signs of physical modification by people, such as canalising sections to improve water flow or creating channels to supply mills with water, sometimes resulting in islands or altered courses. These actions altered the landscape and, in some cases, the boundaries of floodplain meadows. Additionally, river channels have been altered dramatically by natural processes: these changes are visible in lidar data which shows former channels, and by comparison with earlier maps. Some of these old river channels were so clear that they were mapped on earlier OS Survey maps, as at Llanvihangel (Figure 8). The OS map shows how the River Usk has moved across the landscape, with plots to the north east clearly representing former river channels. The modern course of the river is quite different from that shown on the OS 25-inch and OS six-inch maps: such river dynamics may affect the survival and visibility of former floodplain meadows.

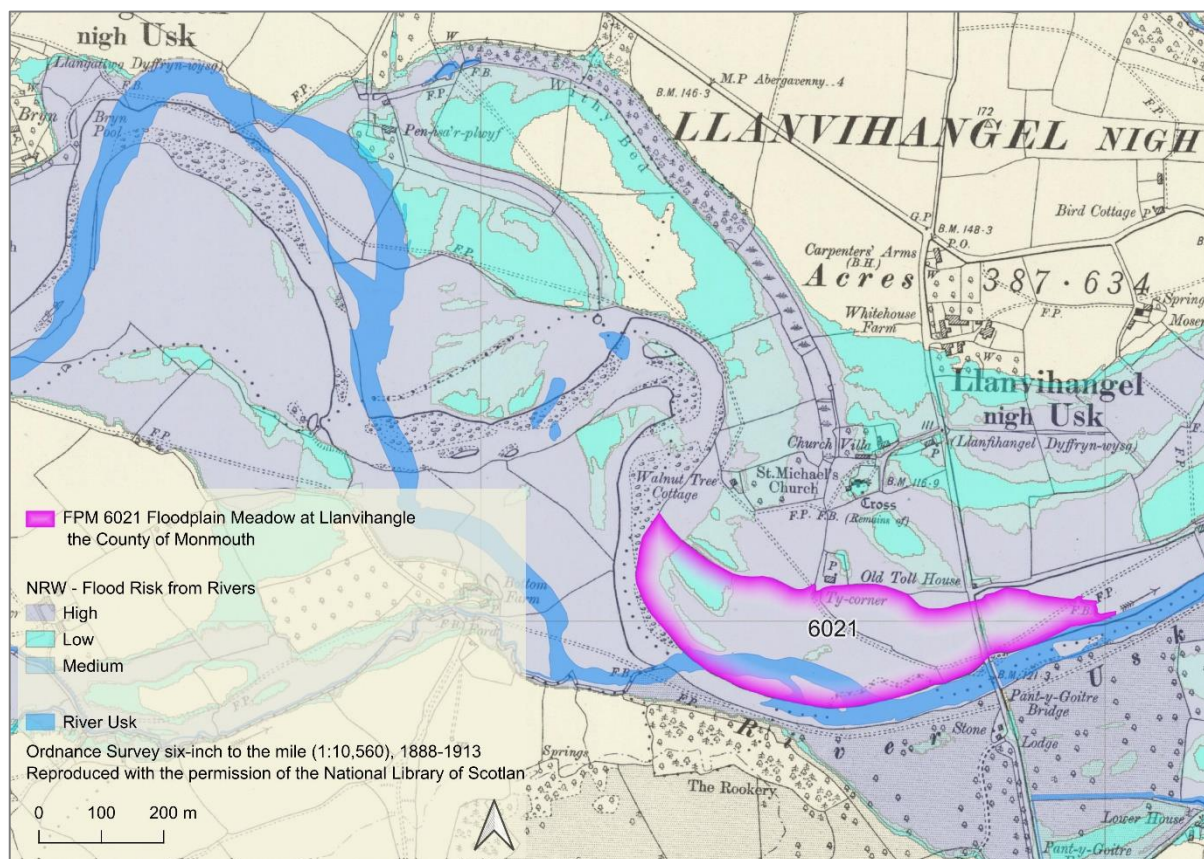


Figure 8 FPM 6019 Floodplain meadow at Llanvihangel nigh Usk, showing the former river channel and the modern flood risk.

5.4. Floodplain meadows and changing landuse

The form of floodplain meadows can survive into nineteenth century mapping, as demonstrated by this project, even if the practices that gave rise to them were lost. Moreover, it is not uncommon for former meadows to become arable at the time of enclosure, but meadow related names will indicate their previous use. This place name information is often recorded in the tithe map alongside their contemporary cultivation category: plots with meadow names but arable cultivation at the time of the tithe are present on all three rivers.

Floodplain meadows are also visible on earlier estate maps: the earliest mapped examples of floodplain meadows in this project were found on the River Usk, as depicted on the 16th-century map of Crughoel and Tretowre, which is part of an archive from the Badminton Estate. This map features two named meadows: FPM 6045 Wett Meadow and FPM 6046 Constables Mead (Figure 9). By the time of the tithe map, these two plots were no longer floodplain meadows: one had become arable land; and the other was recorded as wood. This was a result of the former meadows being enclosed: a comparison with the later tithe map shows that the field boundaries had altered.



Figure 9 Robert Johnson's 1587 Survey of the manors of Crickhowell and Tretower¹⁶. The orientation of this map is with the north to the bottom: the original map covers a larger area in which the Usk is located in the upper left-hand corner (not visible here). Llyfrgell Genedlaethol Cymru – The National Library of Wales.

5.5. Floodplain meadows with historic sites

Floodplain meadows in the form examined here are likely to date back to the early medieval period and have earlier antecedents in terms of floodplain grassland management in the Roman, Iron Age, and even Bronze Age periods (Firth and Firth 2022). Their antiquity can be inferred, to some degree, by historic sites in their vicinity.

Nine floodplain meadows were located near or adjacent to medieval sites such as castles or medieval ridge and furrow field systems that are visible in lidar data. Two floodplain meadows on the River Dee, FPM 6004 Altheny Meadow and FPM 6003 Bangor Meadow, are in areas where the lidar shows areas of ridge and furrow. The floodplain meadow FPM 6003 lies to the north of Bangor with surviving medieval fields systems between the floodplain meadow and Bangor (Figure 10). These medieval field systems are often truncated by later interventions, such as roads, railways and settlement expansion. Where they have not been impacted by modern interventions, medieval ridge and furrow often respects the edge of the floodplain, marking the boundary of floodplain meadows that were contemporary with them.

¹⁶ available at <http://hdl.handle.net/10107/1446088>. f. 68v. and 69r.

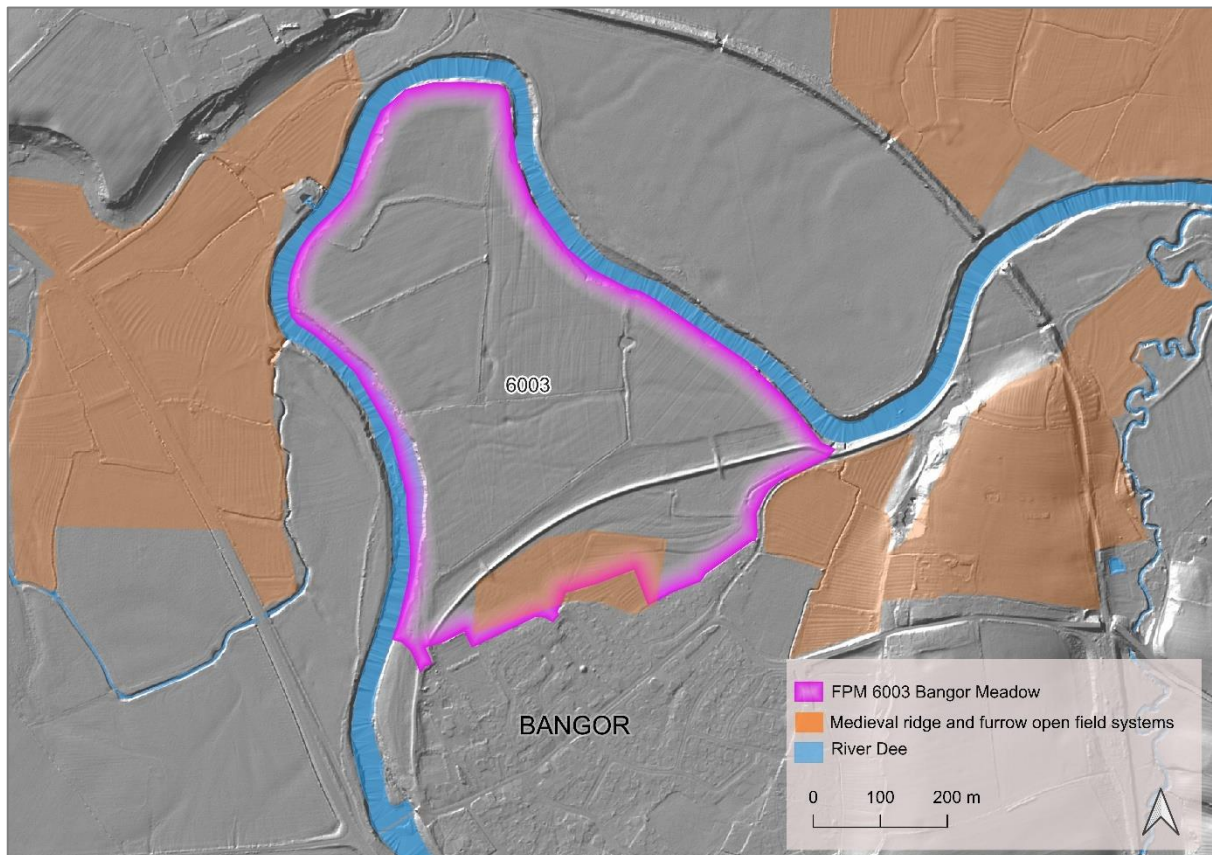


Figure 10 FPM 6003 directly north of Bangor. The orange areas show where medieval ridge and furrow has survived. (Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights reserved.)

6. Conclusion and Recommendations

This initial assessment sought to identify, map and record examples of floodplain meadows on the Dee, Usk and Teifi, testing their presence and distribution, the availability of suitable sources, and the applicability of the methodology developed by Fjodr in other catchments.

A total of 47 floodplain meadows was identified, mapped and recorded, clearly demonstrating the presence of floodplain meadows on the Rivers Dee, Usk, and Teifi, including in their lower, middle, and upper sections. Floodplain meadows on these rivers displayed the same traits and diagnostic features found in meadows identified in other studies, using the same relatively accessible sources and the same methods.

The project was intended as a test and only sought a selection of floodplain meadows. Consequently, the results do not present a comprehensive identification of all floodplain meadows in these catchments. Also, the assessment focussed on the main channel of each river, not their tributaries.

This initial project was selective, but the sources and methods used for this project suggest that the floodplain of the Rivers Usk, Teifi, and Dee was used extensively for floodplain meadows, probably from the early medieval period to the early nineteenth century. Examples of floodplain meadows in the vicinity of medieval castles and field systems emphasises the longevity of meadows prior to their mapping in early 19th-century sources. Two meadows were identified from 16th-century estate maps.

The time at which floodplain meadow ceased to be used as such will have varied according to the local history of enclosure, agricultural 'improvement', and intensification. Whilst the form of floodplain meadows survived – and may still survive today – it is understood that there are no examples of floodplain meadow habitats surviving on these three rivers. This historic landscape approach offers clear evidence that these important habitats, extinguished on these rivers, were once extensive. Applied comprehensively, this approach could provide a baseline for gauging the amount of loss, whilst also supporting the potential for restoration in their former locations.

Although not explored in this initial study, the results also have the potential to stimulate interest in the role that floodplain meadows played not only in the Welsh environment, but also in the history of Welsh farming and rural society. This may be important in building the case for regenerative farming and for increasing interest among farmers, land managers and the public about the possibilities it presents.

Having indicated the widespread presence of floodplain meadows historically in Wales, and the suitability of sources and methods for this historical approach, the following should be considered for future work:

- Test the presence of historic floodplain meadows in other catchments in Wales.
- Carry out comprehensive identification, mapping and recording of historic floodplain meadows on one or more catchments, including their tributaries and headwaters.
- Use the approach tested in this project to develop restoration proposals for floodplain meadows at both strategic and site-specific scales.
- Develop accessible information on the history of floodplain meadows for farmers, land managers and the public.
- Undertake detailed research into historical sources such as estate maps and documentary records to extend the time depth of floodplain meadows.
- Assess identified floodplain meadows for the survival of their historic forms and features (e.g. boundaries; droves; access).
- If circumstances permit, carry out palaeo-environmental investigations in suitable contexts, accompanied by scientific dating, to better understand the origin and development of floodplain meadows.
- Carry out ground truthing for ecology, hydrology and soils in places where historic floodplain meadows can be attested to establish if floodplain meadow habitats and species may in fact survive at these locations.

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Appendices

Data Archive Appendix

Data outputs associated with this project are archived in [NRW to enter relevant corporate store and / or reference numbers] on server-based storage at Natural Resources Wales.

The data archive contains:

- A The final report in Microsoft Word and Adobe PDF formats.
- B A GIS layer – Histmead Floodplain Meadows.shp – generated in the course of the project.

Metadata for this project is publicly accessible through Natural Resources Wales' Data Discovery Service <https://metadata.naturalresources.wales/geonetwork/srv> (English version) and <https://metadata.cyfoethnaturiol.cymru/geonetwork/cym/> (Welsh Version). The metadata is held as record no [NRW to insert this number].

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