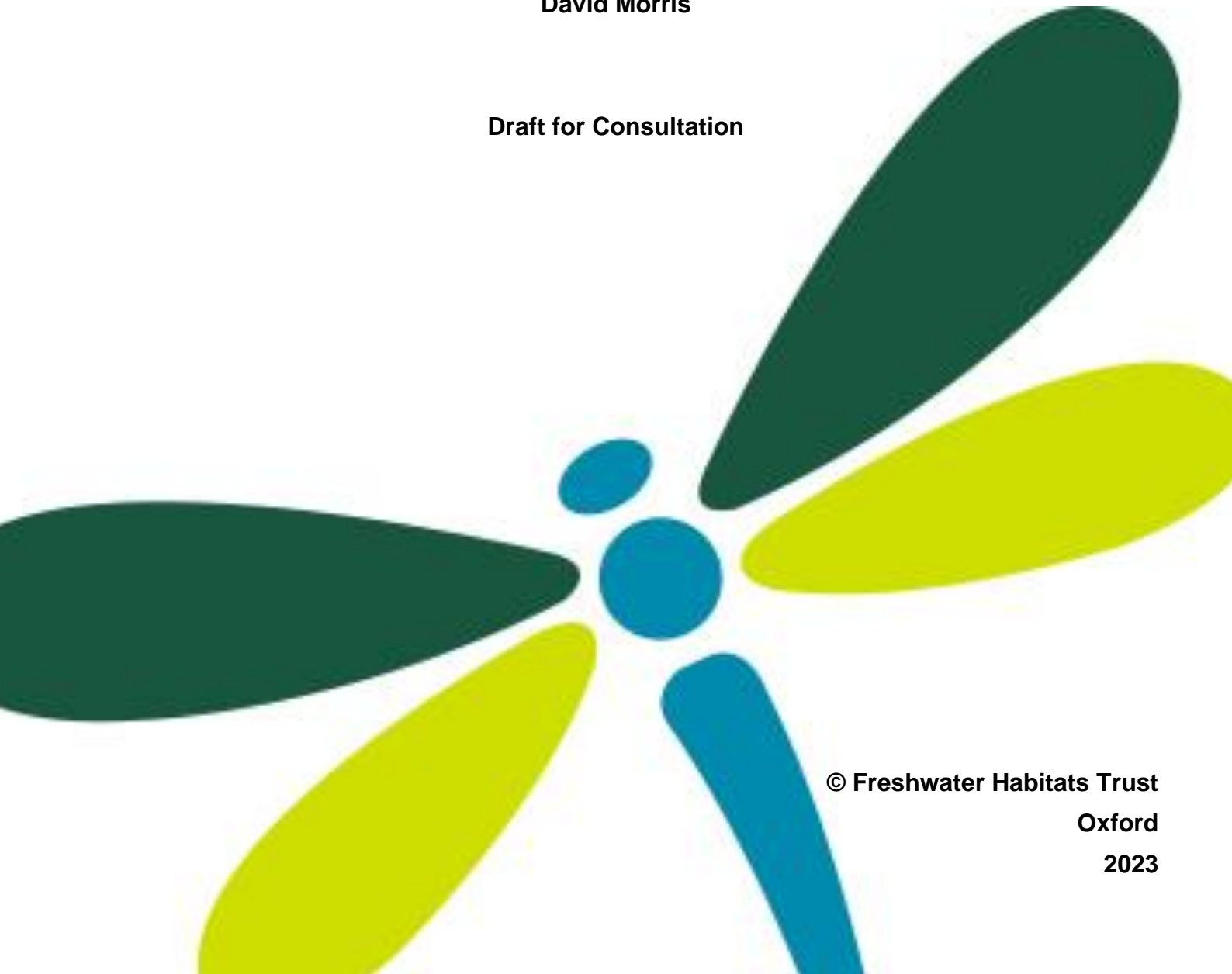


Important Freshwater Areas of the Irfon catchment

David Morris

Draft for Consultation



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Oxford
2023**

For further information please contact:

Freshwater Habitats Trust
Bury Knowle House
North Place
Headington
Oxford, OX3 9HY

This report should be cited as:

Morris, D. 2023. Important Freshwater Areas of the Irfon catchment. Freshwater Habitats Trust, Oxford.

Acknowledgements

We would like to thank Welsh Government for funding the production of this report through the Irfon Catchment Resilient Freshwater Habitats Sustainable Management Scheme.

Summary

The Irfon catchment in Mid Wales is internationally recognised for its exceptional freshwater biodiversity. An indicator of its high quality for freshwater biodiversity is its population of Freshwater Pearl Mussel (*Margaritifera margaritifera*), one of the very few remaining in Wales. However, exposure to multiple pressures has meant that the catchment is currently failing to meet Habitats Directive and Water Framework Directive targets.

From 2021-2023, Freshwater Habitats Trust ran the Irfon Catchment Resilient Freshwater Habitats project in the catchment, with the aim of establishing a collaborative programme of work to address these issues. The project was funded by the Welsh Government's Sustainable Management Scheme.

As part of this project, Freshwater Habitats Trust has identified the most important regions of the catchment for freshwater biodiversity associated with rivers, streams, ditches, ponds, lakes and wetlands. The study used publicly available sources of information about the catchment's freshwaters and followed criteria for the identification of Important Freshwater Areas developed by Freshwater Habitats Trust. The results of this Important Freshwater Areas study are presented in this report.

Based on available information, 26 Important Freshwater Areas have been identified, shown in the map below. These represent areas of the catchment that are legally protected for their freshwater and wetland biodiversity, have the greatest concentrations of freshwater species of conservation concern, or support high quality freshwater and wetland habitats. They cover approximately 32% of the catchment.

The Important Freshwater Areas identified include the main river system comprising the Irfon and its tributaries. The river system is protected as a Site of Special Scientific Interest and Special Area of Conservation, and five out of the nine rivers monitored under the Water Framework Directive have 'high' status for fish and / or invertebrates.

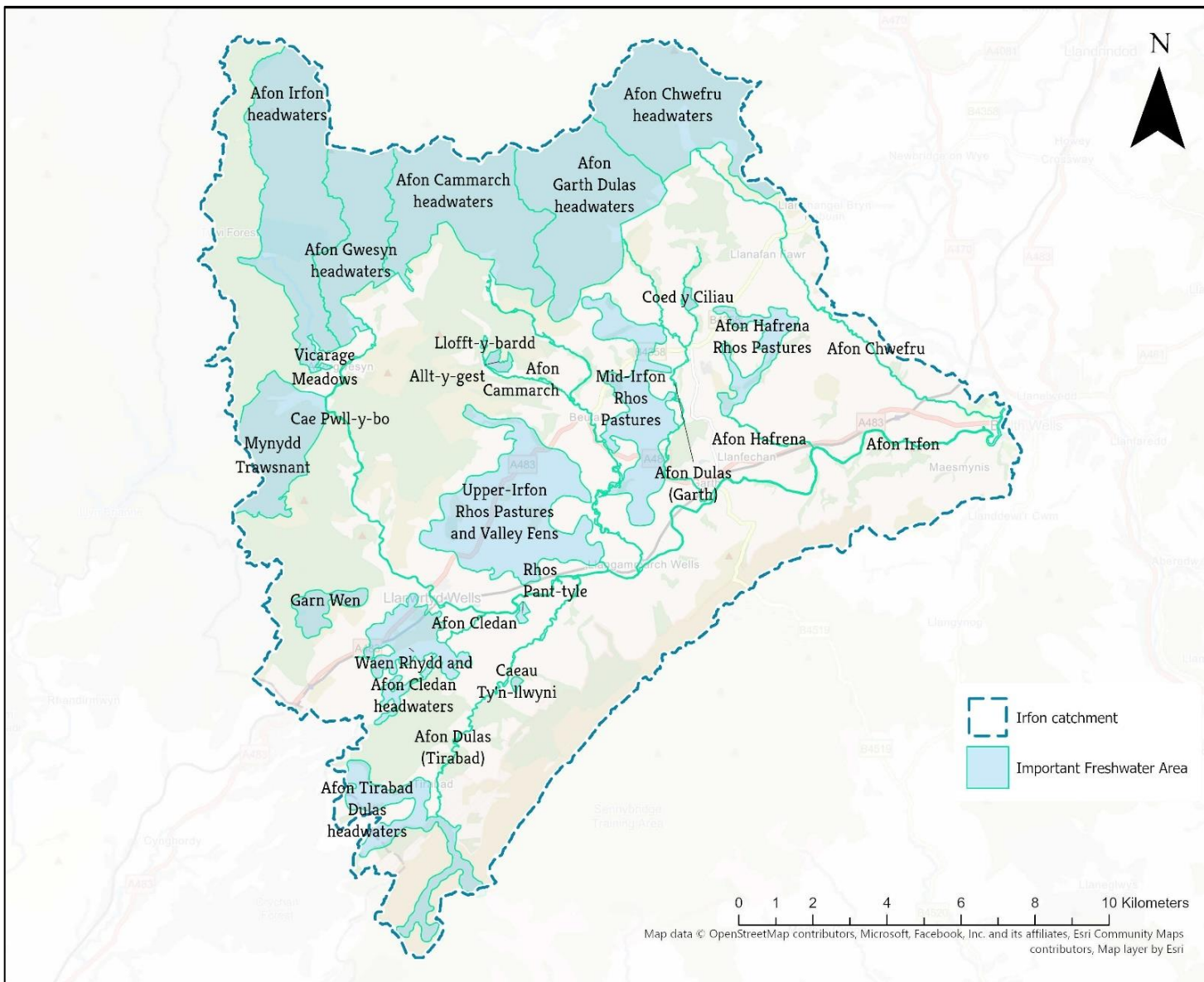
As well as the rivers, extensive headwater areas were also identified as Important Freshwater Areas. These were predominantly selected based on their wetland habitats, including in protected areas. Wetlands are a distinctive feature of the catchment, with priority wetland habitat covering 12% of the catchment, including 4% of the lowland part of the catchment and 22% of the upland. Habitats include Blanket Bog in the upland, and many fragments of Purple Moor-grass and Rush Pastures (also known as 'rhos pasture') in the lowlands. Important Freshwater Areas identified based on their concentration of these habitats included the Waen Rhydd and Afon Cledan Headwaters Important Freshwater Area, part of which is the Waen Rhydd Site of Special Scientific Interest, and the Upper Irfon Rhos Pasture and Valley Fens Important Freshwater Area.

These areas support a diversity of freshwater and wetland biodiversity. Using available biological records, 72 freshwater and wetland species of conservation concern were identified from across the catchment. Invertebrates were poorly represented in the available data, but invertebrate species of greatest conservation concern recorded from the catchment included Freshwater Pearl Mussel and White-clayed Crayfish (*Austropotamobius pallipes*).

The river also supports an internationally important assemblage of fish, including the rare Twaite Shad (*Alosa fallax*). Other vertebrates recorded included Otter (*Lutra lutra*), which is widespread in the catchment.

The catchment is also important for lower plants, with a significant proportion of the Welsh population of River Jelly-lichen (*Collema dichotomum*). The terrestrial liverwort Veilwort (*Pallavicinia lyellii*) also has one of the largest populations in the UK at Waen Rydd Site of Special Scientific Interest.

Further work, with a range of partners, to protect and extend Important Freshwater Areas in the Irfon catchment will be undertaken from 2023 onwards.



Contents

| | | |
|-------------------|---|-----------|
| 1 | Introduction..... | 1 |
| 1.1 | River Irfon Catchment Resilient Freshwater Habitats Sustainable Management Scheme | 1 |
| 1.2 | Important Freshwater Areas..... | 1 |
| 1.3 | Objectives for the Important Freshwater Area study..... | 1 |
| 2 | The Irfon catchment..... | 5 |
| 2.1 | Geography | 5 |
| 2.2 | Topography..... | 5 |
| 2.3 | Climate and hydrology | 5 |
| 2.4 | Landscape character and land use | 5 |
| 3 | Identifying Important Freshwater Areas..... | 7 |
| 3.1 | Method overview..... | 7 |
| 3.2 | Data types and sources | 7 |
| 3.3 | Criteria for identifying Important Freshwater Areas | 9 |
| 4 | Important Freshwater Areas of the Irfon catchment..... | 11 |
| 4.1 | Freshwater biodiversity | 11 |
| 4.2 | Important Freshwater Areas..... | 27 |
| 5 | Conclusion | 33 |
| Appendix 1 | Data sources..... | 34 |
| Appendix 2 | Designated site features | 36 |
| Appendix 3 | Species of Conservation Concern | 45 |

1 Introduction

1.1 River Irfon Catchment Resilient Freshwater Habitats Sustainable Management Scheme

The Irfon catchment in Mid Wales ([Figure 1.1](#)) is internationally recognised for its exceptional freshwater biodiversity, with the River Irfon forming part of the Afon Gwy / River Wye Special Area of Conservation (SAC). An indicator of its high quality for freshwater biodiversity is its population of Freshwater Pearl Mussel (*Margaritifera margaritifera*), one of the very few remaining in Wales. However, exposure to multiple pressures has meant that the catchment is currently failing to meet Habitats Directive and Water Framework Directive targets.

From 2021 to 2023 Freshwater Habitats Trust ran the Irfon Catchment Resilient Freshwater Habitats project in the catchment, with the aim to establish a collaborative programme to address these issues, jointly organised by local farmers, landowners, rural businesses, foresters, statutory organisations, specialist freshwater NGOs and the water industry. The project was funded by the Welsh Government's Sustainable Management Scheme (SMS) with the support of the European Union through Welsh Ministers.

1.2 Important Freshwater Areas

This report presents the results of a study to identify Important Freshwater Areas (IFAs), undertaken as part of the Irfon Catchment Resilient Freshwater Habitats project.

The IFA concept underpins action to protect freshwater biodiversity and develop projects to best protect, restore and improve connectivity for freshwater biodiversity. It has been developed by Freshwater Habitats Trust, working with national freshwater species and habitats experts, major land-owning and managing organisations and statutory bodies.

At the heart of the concept is the key principle that, to slow the decline in freshwater biodiversity and prevent further extinctions of freshwater species, both regionally and nationally, it is essential that we protect the remaining high-quality areas, and strategically restore and create new high quality habitats to extend these areas, and so improve connectivity and resilience. Thus, the identification of IFAs provides a basis for targeting the development of practical conservation projects, informed by the concept of natural ecosystem function.

Identification of IFAs requires the collection, collation and analysis of data on both freshwater species and habitats of importance. Based on these data, IFAs are identified following a set of criteria, and, depending on the data available, expert judgement.

For further information about the IFA concept and identification, and reports for other regions of the UK, see <https://freshwaterhabitats.org.uk/freshwater-network/important-freshwater-areas>.

1.3 Objectives for the Important Freshwater Area study

The objectives of the IFA identification for the Irfon catchment were:

- to develop a better understanding of where high-quality freshwater habitats and species of conservation concern are located, and support their protection;
- to support a focused approach to developing practical restoration and conservation works in the catchment, including all waterbody types, so helping to prioritise work to maximise benefits for freshwater biodiversity; and

- to identify data gaps and priorities for the survey and monitoring of freshwater biodiversity in the catchment, to inform practical work.

This is the first IFA analysis for the catchment. The areas identified as IFAs will be revised as new information becomes available, and in consultation with stakeholders.

Figure 1.1. The Irfon catchment

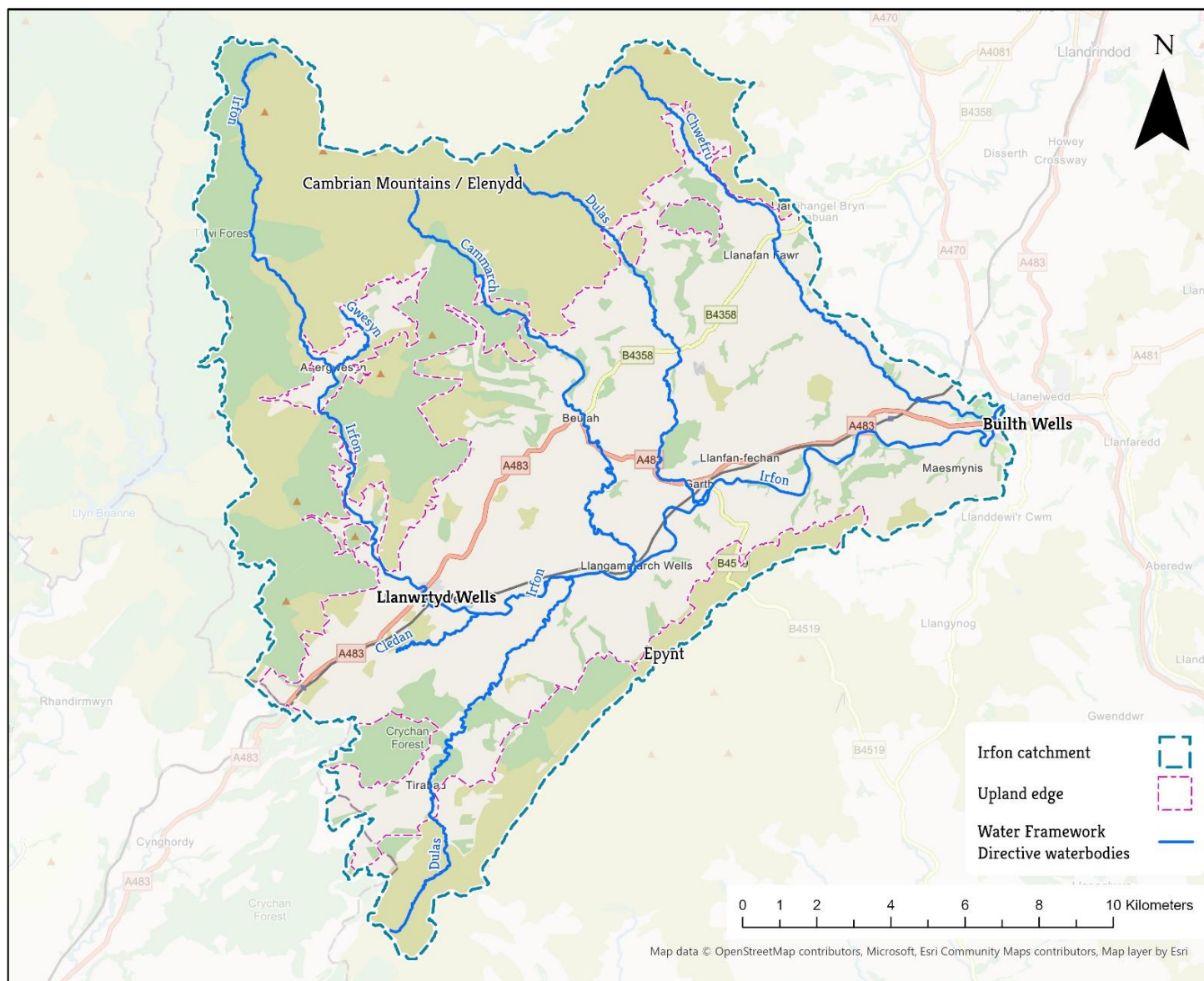
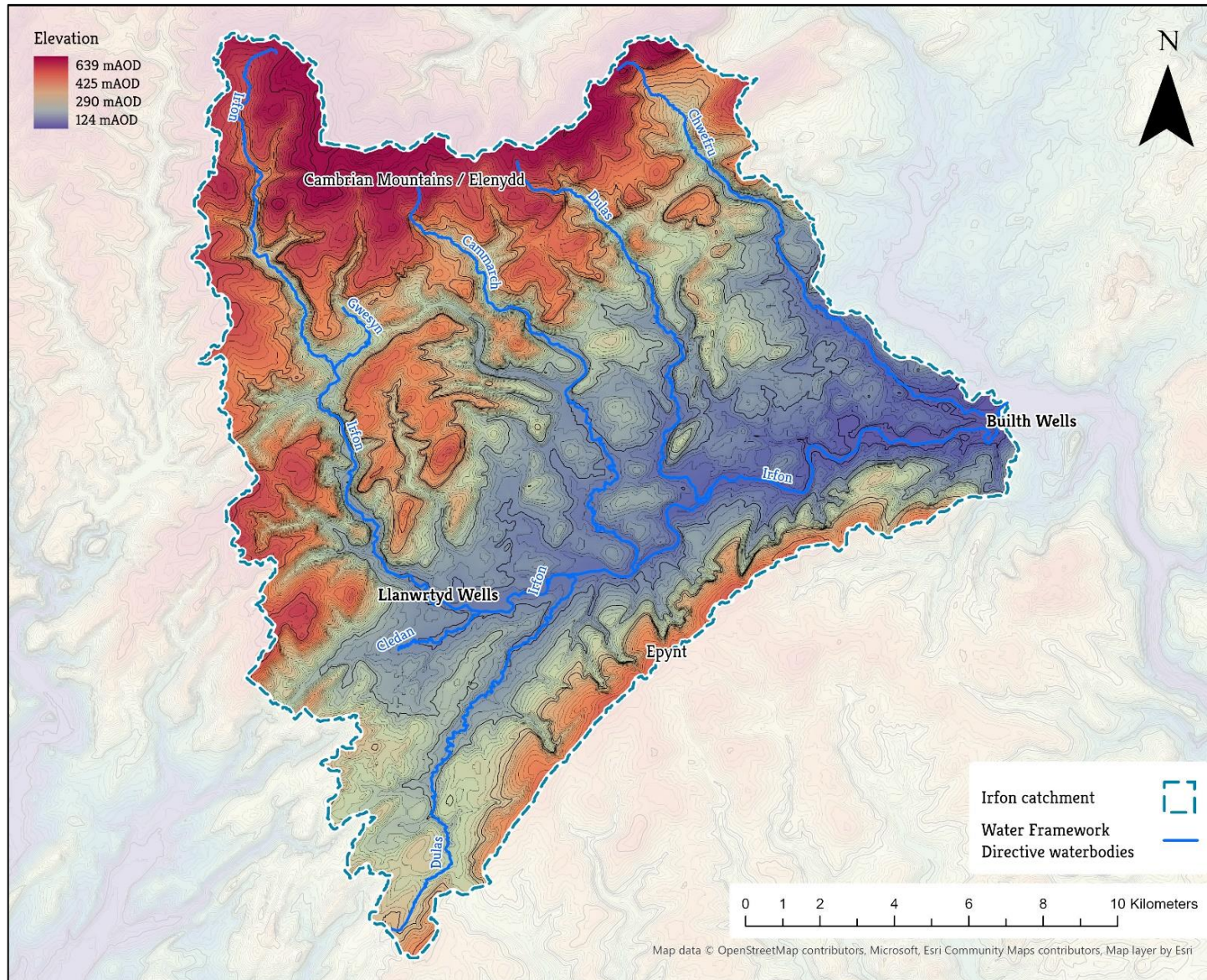


Figure 1.2. Topographic relief of the Irfon catchment. Darker contours are at 30 m intervals, lighter contours 10 m



2 The Irfon catchment

2.1 Geography

The Irfon catchment covers an area of approximately 290 km² in Powys, Wales, lying within the old county of Brecknock. The Afon Irfon is a tributary of the River Wye (Afon Gwy), and has its headwaters on the upper slopes of Bryn Garw in the Cambrian Mountains (Elenydd). The river flows south from its source through the Abergwesyn Valley to Llanwrtyd Wells and east to its confluence with the Wye at Builth Wells. The main tributaries of the Irfon are the rivers Cammarch, Chwefru, Cledan, Gwesyn, and two rivers called the Dulas. A map of the catchment is provided in [Figure 1.1](#).

2.2 Topography

The catchment rises to approximately 640 m above Ordnance Datum (mAOD) in the Elenydd, and the outfall at the confluence with the Wye is at approximately 124 mAOD. The topographic relief of the catchment is shown in [Figure 1.2](#).

The catchment comprises a broad undulating lowland valley across its middle third, oriented south-west to north-east from Tirabad to Builth Wells and Llanafan Fawr. This valley is encircled to the north and west by the Cambrian Mountains which occupy much of the northern half of the catchment. Most of the main tributaries of the Irfon rise in these hills, and flow down to the lowlands along valleys oriented north-north-west to south-south-east. The south of the catchment is formed of the escarpment of the Epynt plateau, and the hills along the western edge of the catchment form the watershed of the Wye catchment. A narrow range of low hills along the eastern edge of the catchment stretching between Llanafan Fawr and Builth Wells, separates the Afon Chwefru from the main Wye valley and form the eastern watershed of the Irfon catchment.

2.3 Climate and hydrology

The climate of the Irfon catchment is typical of the cool wet conditions of Mid Wales. However, being situated on the edge of the uplands, the climate varies between its outfall into the Wye Valley and its headwaters in the Elenydd. For instance, mean annual rainfall varies from 1,627 mm at Cilmeri near the outfall at Builth, to 1,845 mm at Llanwrtyd Wells near the edge of the uplands in the west.

The catchment is predominantly underlain by Ordovician and Silurian rocks. These sedimentary rocks have a relatively low permeability, so that with the high rainfall and steep terrain, the catchment is generally responsive to rainfall events. Soils in the catchment are also wet for most of the year¹.

2.4 Landscape character and land use

The Irfon catchment lies across three Landscape Character Areas, with 'The Vales of Irfon and Ithon' covering the central lowland third of the catchment, enclosed by the 'Cambrian Mountains' and 'Epynt Plateau and Valleys'².

¹ For further information about the climate and hydrology of the catchment, see the National River Flow Archive (<https://nrfa.ceh.ac.uk/data/>).

² <https://naturalresources.wales/evidence-and-data/maps/nlca/>

The valley of the Irfon is an enclosed, rolling, landscape of pasture and sheep grazing with a patchwork of small fields enclosed by hedges and mature hedgerow trees. This is a rural area with small, dispersed settlements. The Heart of Wales railway passes south-west to north-east through the catchment. The main road through the catchment is the A483 between Llandovery, to the south-west of the catchment, and Builth Wells, the home of the large and popular annual Royal Welsh Show. The area was known historically for its Spa towns, with Builth Wells and Llanwrtyd Wells within the catchment. These are the main population centres in the catchment, and larger villages include Abergwesyn, Beulah, Garth, Llangammarch Wells, Llanafan Fawr and Tirabad.

Approximately 46% of the catchment is upland, defined as land above the limit of agricultural enclosure, indicated in [Figure 1.1](#)³. The Cambrian Mountains form an extensive upland plateau stretching south-west to north-east across the upper third of the catchment. Deep valleys and glacial features are abundant, including a number of 'U' shaped valleys, lakes and moraines. Peat bogs, pools, open moorland and areas of extensive coniferous forestry collectively cover much of the area, except in the margins and deeper valleys. It is a windswept, remote and sparsely populated area with very few settlements. On the southern side of the catchment is the sandstone upland plateau of the Epynt, intersected by pastoral valleys and fast flowing streams. Much of the plateau is used as a military training range.

³ The definition of 'upland' in this report follows the 'Upper limit of enclosure' dataset published by Natural Resources Wales. Available at:
https://datamap.gov.wales/layers/geonode:phase1_upland_boundary

3 Identifying Important Freshwater Areas

3.1 Method overview

The study area for the identification of IFAs was the catchment of the Afon Irfon, defined as the Water Framework Directive (WFD) Cycle 2 operational catchment. This area is shown in [Figure 1.1](#).

The steps followed to identify Important Freshwater Areas in the Irfon catchment were:

- 1) Collect and verify available biological, physico-chemical and geographical data.
- 2) Map and analyse the data to identify areas that are of high value for their freshwater species and habitats based on the criteria for identifying Important Freshwater Areas.

Step 1 is described in subsection 3.2. Subsection 3.3 describes the criteria used to identify IFAs based on the data gathered.

3.2 Data types and sources

The following types of data were gathered for the Irfon catchment:

- statutory designated sites;
- WFD waterbodies;
- land use and habitats; and
- species of conservation concern.

These data types, and sources from which they were obtained, are described below.

Background information from third parties was also supplemented by results of site visits carried out during 2021 and 2022 for the River Irfon Catchment Project⁴. Where this information has been used to inform the identification of IFAs, this is indicated in the results presented in Section 4.

3.2.1 Designated sites

Information was gathered about Natura 2000 sites, i.e. sites designated as Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or Ramsar Wetlands of International Importance for their international importance for wildlife, and Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNRs), which are of national importance. Site boundaries and interest features were obtained from publicly available sources published by the Joint Nature Conservation Committee (JNCC) and Natural Resources Wales (NRW).

3.2.2 Water Framework Directive waterbodies

Information about WFD waterbodies in the catchment were obtained from sources made publicly available by NRW as part of Cycle 2 of the WFD. These include information about the overall status of waterbodies and individual assessment elements, including biological and chemical elements. The datasets used date from 2018; more recent assessments were not available.

⁴ <https://freshwaterhabitats.org.uk/projects/irfon-catchment/>

3.2.3 Habitats

The following habitat spatial datasets published by NRW were used:

- Terrestrial Phase 1 Habitat Survey⁵
- Phase 2 Lowland Grassland Survey of Wales⁶
- Phase 2 Lowland Peatland Survey of Wales⁷
- Glastir Woodland Creation - Sensitivity Layer - Priority Habitats⁸

The Phase 1 Habitat Survey data cover the whole of Wales and are derived from a programme of field recording begun by the Wales Field Unit of the Nature Conservancy Council in 1979 and continued by the Countryside Council for Wales after restructuring in 1991. More information about this dataset is available on the NRW data portal website.

The priority habitats dataset is the only publicly available source of information covering priority habitats⁹ in Wales. The dataset was developed by NRW woodland and grassland ecologists using data from the Terrestrial Phase 1 Habitat Survey, Lowland Grassland Survey of Wales Phase 2, Lowland Peatland Survey of Wales Phase 2, Calaminarian Grassland Annex 1 habitat map, Glastir Grassland Fungi dataset and the Chough woodland areas.

For mapping of linear waterbodies (rivers, streams and ditches) and standing waters (ponds and lakes), line and polygon water features were downloaded from the open-source OpenStreetMap website¹⁰. In this report, a river is defined as a watercourse shown as two parallel blue lines on the Ordnance Survey 1:25,000 map series, and streams and ditches as features shown as a single blue line; the classification of features in the OpenStreetMap data were checked against this definition and amended where required. Standing waterbodies were also classified using the standard UK definition of a pond, i.e., surface area less than 2 ha.

3.2.4 Species of conservation concern

Species of conservation concern (SoCC) are taxa largely dependent on freshwater and wetland habitats and that appear on national lists of rare and threatened species. Freshwater Habitats Trust developed a list of SoCC for use in identifying IFA.

Records of SoCC covering all taxonomic groups were downloaded under Creative Commons licenses from the National Biodiversity Network (NBN) Atlas website¹¹ on 5th January 2022. The records included contributions from the organisations listed in Appendix 1. In addition, as the Botanical Society of Britain and Ireland's (BSBI) records available via the NBN were only at 10km square resolution, records of vascular plants and charophytes were obtained from BSBI under license from the Botanical Society of Britain and Ireland.

⁵ https://datamap.gov.wales/layergroups/geonode:nrw_terrestrial_phase_1_habitat_survey

⁶ https://datamap.gov.wales/layergroups/geonode:nrw_phase_2_grassland

⁷ https://datamap.gov.wales/layergroups/geonode:nrw_phase_2_peatland

⁸ https://datamap.gov.wales/layers/inspire-wg:GWC_NRW_SensitiveHabitats

⁹ Priority habitats are habitats of principal importance for the conservation of biodiversity, listed in accordance with Section 7 of the Environment (Wales) Act 2016

¹⁰ <https://www.openstreetmap.org/export#map=5/54.910/-3.432>

¹¹ <https://nbnatlas.org/>

3.3 Criteria for identifying Important Freshwater Areas

Identification of IFAs is based on a set of criteria using information about species and habitats within the assessment area. The criteria are set out in [Table 3.1](#).

The IFA analysis distinguishes between species of conservation concern (SoCC) with a restricted national distribution (e.g. Marsh Stitchwort (*Stellaria palustris*)), and those which are still relatively widespread but are included on priority and red lists because of widespread declines (e.g. Bullhead (*Cottus gobio*)). The conservation of restricted species is of a particularly high priority in order to prevent local extinctions and maintain the species pool at catchment scale.

The SoCC list used in the analysis includes some species that are threatened in England but are not of conservation concern in Wales. The use of this list to identify diversity hotspots, therefore represents a conservative assessment. Where species of lower conservation concern in Wales have been identified by the analysis, these are discussed in the text.

In criterion 2.a, a diversity hotspot is defined as a 1 km square where the number of SoCC species recorded is at least two standard deviations greater than the mean number of SoCC for the study area (including squares with zero SoCC records).

Table 3.1. Important Freshwater Area criteria

| Criteria | | Sub-criteria | Description |
|-----------------|--|---|---|
| 1. | Designated sites supporting water-dependent habitats and species | None | Water-dependent nationally designated sites are automatically IFAs. Nationally designated sites consist of sites of special scientific interest (SSSI), national nature reserves (NNR), Ramsar wetlands of international importance, special areas of conservation (SAC) and special protection areas (SPA) |
| AND / OR | | | |
| 2a. | Species | Diversity hotspot – number of SoCC in a 1 km square | Both sub-criteria must be met |
| 2b. | | Presence of a restricted SoCC | |
| 3a. | Habitats | WFD High biological element | At least one of these criteria must be met The extent and density of clean water can be used as a proxy for species data |
| 3b. | | Habitat of principal importance | |
| 3c. | | High concentration of clean water sites | |

| Criteria | | Sub-criteria | Description |
|----------|------------------|--------------|--|
| OR | | | |
| 4. | Expert knowledge | | For data deficient areas, IFA identified based on expert knowledge, or that qualify because of another reason (e.g. the last remaining population for a particular species, or a high quality habitat not recognised as a habitat of principal importance) |

4 Important Freshwater Areas of the Irfon catchment

4.1 Freshwater biodiversity

4.1.1 Designated sites

The Irfon catchment overlaps or contains many sites designated for biodiversity which support important freshwater species and habitats. The designated sites are shown in [Figure 4.1](#), and comprise four Natura 2000 sites, 15 SSSIs, and one NNR. The features of Natura 2000 sites and SSSIs are described below, and further detail is given in tables A2.1 and A2.2 in Appendix 2.

There are three further SSSIs within the catchment which are former quarries notified for their geological interest: Cwm Craig-ddu Quarry SSSI, Garth Bank Quarry SSSI and Llangammarch Wells Quarry SSSI. These geological sites are not referred to further in this report.

Natura 2000 sites

The Elenydd range along the north side of the catchment is largely designated as the Elenydd - Mallaen SPA, notified for the bird species Merlin (*Falco columbarius*) and Red Kite (*Milvus milvus*). While not strictly species of freshwater habitats, Merlin and Red Kite range across the landscape to find food, and Merlin nest in areas of open moorland, including habitats such as blanket bog. A smaller area of the Elenydd range is designated as Elenydd SAC, notified for its blanket bog, Calaminarian grassland, heathland and lake habitats, and population of Floating Water-plantain (*Luronium natans*), an aquatic plant of European conservation concern. However, there are no records of Floating Water-plantain within the Irfon catchment (see subsection 4.1.4).

Within the south-west of the catchment is a small area of the Mynydd Epynt SAC, which consists of several small units scattered across the Epynt range, otherwise outside the catchment. The SAC is notified for Slender Green Feather-moss (*Hamatocaulis vernicosus*), a moss of European conservation concern found in base-rich flushes and springs, mostly in the uplands. There are recent records of this species within this unit of the site, and elsewhere in the catchment (see subsection 4.1.4).

In the lowland area of the catchment is the River Wye / Afon Gwy SAC, which covers the main Irfon channel and the tributaries Camdwr, Chwefru, Cammach, Cledan, Hafrena and the two Dulas rivers, and extends along the River Wye upstream and downstream of the Irfon catchment. The SAC is notified for its river habitat and vegetation, for a range of fish species including Atlantic Salmon (*Salmo salar*), Brook Lamprey (*Lampetra planeri*), Bullhead (*Cottus gobio*), River Lamprey (*L. fluviatilis*) and Twaite Shad (*Alosa fallax*), White-clawed Crayfish (*Austropotamobius pallipes*) and Otter (*Lutra lutra*), all of which are present within the Irfon catchment. Transition mire and quaking bog habitat is a secondary feature of the SAC.

Sites of special scientific interest

Three SSSI coincide with the above Natura 2000 sites: the Afon Irfon SSSI, the Elenydd SSSI and the Epynt SSSI. These SSSI designations cover a broader range of species and habitat features than the Nature 2000 designations. The whole Elenydd SSSI covers approximately 21% of the Irfon catchment and includes a range of upland habitats, including blanket bog, acid grassland, flushes, watercourses and lakes, and uncommon wetland plants such as Bog Orchid (*Hammarbya paludosa*). An area of the Elenydd SSSI along the Abergwesyn valley in the upper reaches of the Afon Irfon is designated as the Nant Irfon NNR. The Epynt SSSI comprises 33 separate units, all but one of which lie outside the

catchment. The Afon Irfon SSSI, in addition to freshwater species and habitats associated directly with the river channel, includes habitats in the floodplain such as wetlands and ponds in oxbows and old channels, such as along the Afon Cammarch and its tributary the Nant Cnyffiad.

Also in the Epynt range is the Blaen Cilieni SSSI, located on the south-western edge of the catchment. This site supports one of the largest and most diverse areas of fen-meadow in Brecknock, including base-rich flushes, with species such as Marsh Fern (*Thelypteris palustris*) at its only site in Powys, and transition mire habitat.

The SSSI between these upland SSSI and the Afon Irfon SSSI represent the range of semi-natural habitats remaining in the Irfon valley. All these SSSIs support freshwater or wetland habitats, indicating how prevalent water and the wildlife its supports are in this landscape.

There are two SSSIs notified for their ancient Sessile Oak (*Quercus petraea*) dominated woodlands on the slopes of river valleys near the edge of the uplands and which include complexes of flushes. These are the Allt-y-gest SSSI above the Afon Cammarch, and Coed y Ciliau SSSI above the Garth Dulas. This type of woodland, often now referred to as 'temperate rainforest', represents the climax vegetation in Mid Wales, with its high rainfall and mild climate.

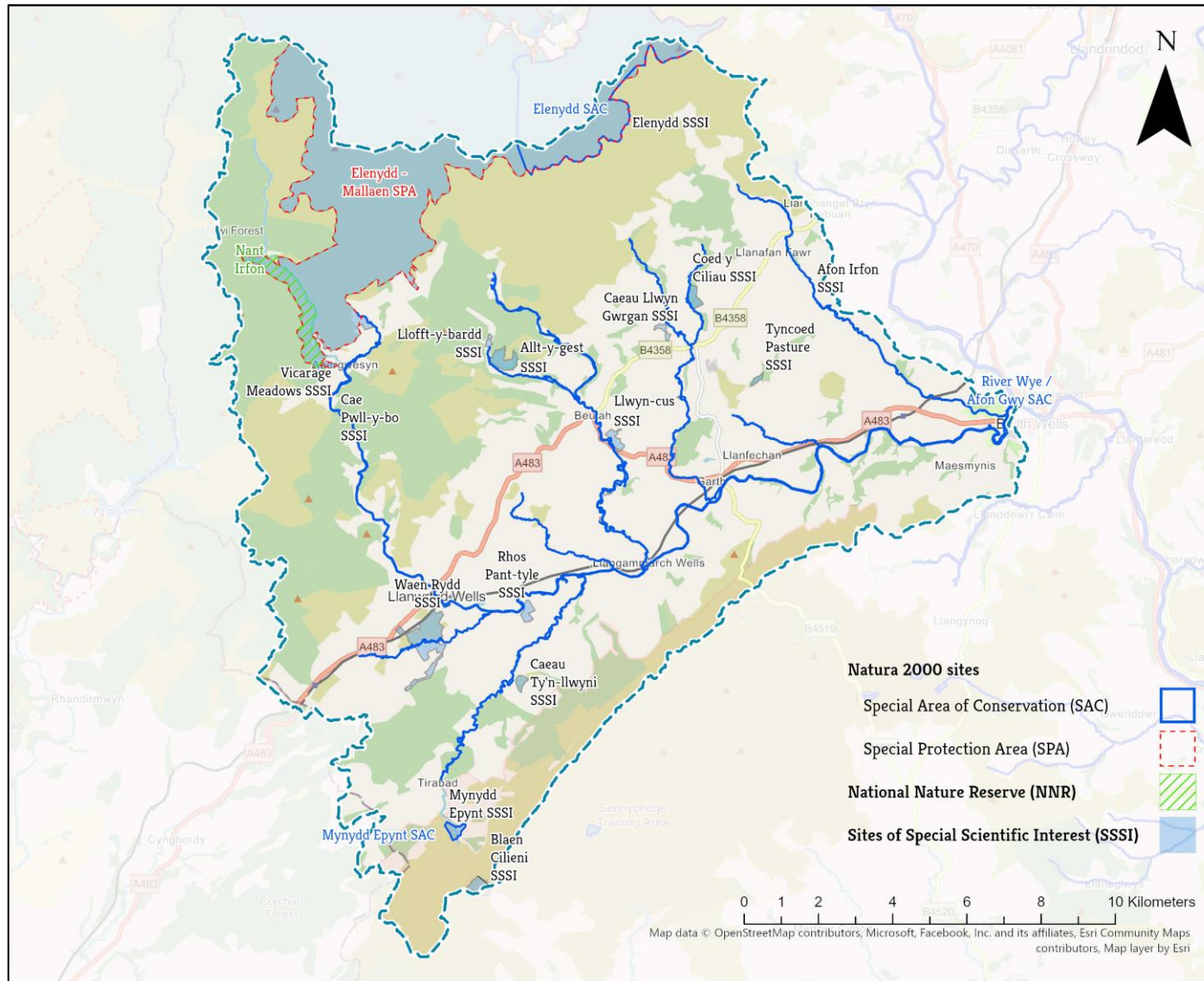
Caeau Llwyn Gwrgan SSSI, Caeau Ty'n-Illwyni SSSI, Llofft-y-bardd, Rhos Pant-tyle SSSI, Tyncoed Pasture SSSI and Vicarage Meadows SSSI represent semi-natural grassland in the catchment, and all include or are dominated by rhos pasture, a type of wet grassland characteristic of this area of Wales (see subsection 4.1.3 for further description). These sites comprise one or more fields along streams or rivers, and range in size from 10 ha to 32 ha. All are relatively far upstream in the catchment, and Vicarage Meadows SSSI is at the upper edge of the lowlands, above the Afon Irfon and adjacent to the Elenydd SSSI. Vicarage Meadows SSSI is also a nature reserve owned by the Wildlife Trust of South and West Wales¹². The sites support a rich diversity of broad-leaved plant species, many of which are uncommon, including Whorled Caraway (*Carum verticillatum*), a characteristic plant of rhos pasture, and many orchids. Caeau Ty'n-Illwyni SSSI supports the only population of the orchid Marsh Helleborine (*Epipactis helleborine*) in Brecknock.

River valley habitats are also features of the Cae Pwll-y-bo SSSI and Llwyn-cus SSSI. The former is a Wildlife Trust of South and West Wales nature reserve and supports species-rich tall-herb fen. The latter SSSI is a complex of floodplain fen and grassland, flushes, rhos pasture, wet woodland, and Sessile Oak woodland.

Finally, along the Afon Cledan, south of Llanwrtyd Wells, is an extensive area of lowland bog and other wetland habitats at Waen Rhydd SSSI.

¹² <https://www.welshwildlife.org/nature-reserve/vicarage-meadows/>

Figure 4.1. Designated sites within the Irfon catchment supporting freshwater species and habitats



4.1.2 Water Framework Directive ‘high’ status waterbodies

There are nine WFD waterbodies within the Irfon catchment, all of which are flowing waterbodies. They are shown in [Figure 1.1](#). The waterbodies and their WFD status, including the status of individual biological elements are listed in [Table 4.2](#). The status of fish and invertebrate elements only are listed as there are no data available for macrophytes or diatoms.

Five WFD waterbodies have ‘high’ status for fish and/or invertebrates. These are shown in [Figure 4.2](#).

4.1.3 Habitats

Rivers and streams

Watercourses across the catchment are shown in [Figure 4.3](#). There are five channels classed as rivers: the Irfon, Chwefru, Garth Dulas, Cammarch, Tirabad Dulas and a short reach of the Gwesyn above its confluence with the Irfon. These rivers have a total length of approximately 85 km.

The hundreds of other watercourses are classed as streams, including larger streams such as the Cledan, and ditches/drains. Based on available data, these other watercourses have a total length of approximately 629 km.

Ponds and lakes

Ponds and lakes across the catchment are shown in [Figure 4.3](#). There is one lake in the catchment, an artificial dammed waterbody of approximately 2.5 ha north of Garth. Based on available data, there are 146 ponds in the catchment.

Upland areas of Radnorshire and Brecknock in Powys are a hotspot of high-quality ponds in Wales¹³. This Important Area for Ponds is particularly well known for the ‘mawn’ pools, a distinctive type of pond which supports a flora and fauna of national importance. However, this area does not cover the Irfon catchment.

Mapping of priority pond habitat does not cover Wales, but 12 ponds out of 17 surveyed as part of the SMS project have been identified as priority habitat. Given the high proportion of priority ponds identified so far, there are likely to be many more across the catchment.

Wetland habitats

Wetland habitats are widespread across the catchment and include a diversity of priority habitat types, shown in [Figure 4.4](#). The areas of habitat from the NRW habitat datasets are summarised in [Table 4.1](#) and described below. Based on these data, wetland priority habitat covers 12% of the catchment, including 4% of the lowland part of the catchment and 22% of the upland area.

- **Blanket Bog** – Across the upland plateau of the Elenydd extensive stands of blanket bog are mapped. Areas mapped as Blanket Bog priority habitat in the lowlands, such as around Waen Rhydd SSSI and in the valley of the Nant Melyn north-east of Llanwrtyd Wells, are likely to be errors. They are mapped as the Phase 1 habitat type ‘E1.7 Wet modified bog’ but are likely to be Lowland Raised Bog or, in the valley of the Nant, Lowland Fens priority habitats.
- **Lowland Fens** – There are small stands of this habitat mapped in the NRW datasets along upper reaches of streams in lowland areas. Additional areas of this habitat were

¹³ <https://freshwaterhabitats.org.uk/research/important-areas-ponds-iaps/>

identified during farm visits carried out for the SMS project, and it is likely that much more remains unmapped across the enclosed part of the catchment.

- Lowland Heathland – There are 17 stands of wet dwarf shrub heath mapped, scattered across the upper part of the lowlands. Most stands are small and form part of habitat mosaics, particularly with Purple Moor-grass and Rush Pasture priority habitat. This mosaic of grassland and dwarf shrub heath is a typical feature of rhos pasture. The largest stand is approximately 3.5 ha, and lies west of Tirabad, below Crychan Forest.
- Lowland Raised Bog – This habitat is found within and around Waen Rhydd SSSI.
- Purple Moor-grass and Rush Pastures – This is the most extensive wetland habitat in the lowland part of the catchment. The habitat is the main component of rhos pasture, together with smaller areas of Lowland Fens and Lowland Heathland, a characteristic habitat of unimproved farmland in Wales¹⁴. The habitat forms one of the most distinctive and widespread semi-natural features of the farmed landscape of the catchment, together with its rivers, streams and woodlands.

Fragments of Purple Moor-grass and Rush Pastures are scattered across the catchment, largely on the north side of the main Irfon channel, along the sides of low valleys underlain by deposits of glacial till¹⁵. There is a particular concentration of this habitat around the headwater valleys north-east of Llanwrtyd Wells, where some of the largest continuous stands occur.

Twenty-eight sites in the catchment with this habitat were surveyed by the Lowland Grassland Survey of Wales Phase 2 survey, including all SSSIs with this habitat. The main vegetation types recorded were the National Vegetation Classification¹⁶ plant communities M23 *Juncus acutiflorus/effusus-Galium palustre* rush pasture, M24c *Molinia caerulea-Cirsium dissectum* fen meadow, *Juncus acutiflorus-Erica tetralix* sub-community and M25 *Molinia caerulea-Potentilla erecta* mire. Smaller stands of wet heath, fen and dry grassland were also mapped.

- Upland Flushes, Fens and Swamps – Extensive areas of this habitat are mapped around headwaters in upland valleys where water drains off upland plateaus. Especially large areas are mapped in the wide round valley head that forms the headwaters of the Afon Chwefru, and along the headwater streams of the Garth Dulas.

Not mapped in the NRW habitat dataset are the many small areas of fen habitats in the upland part of the catchment. Such features were encountered widely as part of habitat surveys so far carried out for the SMS project; they supported a diverse vascular plant and bryophyte flora, often absent from surrounding land.

- Upland Heathland – There are eight stands of wet dwarf shrub heath mapped in upland areas, mostly in the north of the catchment among the Elenydd hills.
- Wet Woodland – There are 21 small stands of this habitat mapped across the catchment. It is likely to be under-represented in the habitat dataset as there has not

¹⁴ <https://www.rwtwales.org/rhospasture>

¹⁵ British Geological Survey 1:50,000 superficial geology mapping, available at https://geologyviewer.bgs.ac.uk/?_ga=2.254532104.1893324373.1667899315-246729692.1667899315

¹⁶ Rodwell, J.S. (Ed.). 1992-2010. *British Plant Communities. Volumes I-V*. Cambridge: Cambridge University Press.

been a systematic survey of Wet Woodland in the area, and there are likely to be many small stands which have not been mapped along waterbodies and within wetlands.

Based on habitat surveys and farm visits carried out for the SMS project, across the lowland part of the catchment there are extensive areas of Purple Moor-grass and Rush Pastures and associated semi-natural wetland habitats that are not in conservation management. As a result, these habitats appear to be in poor condition, are overgrown with Purple Moor-grass and are likely to have lost plant and animal species of high nature conservation importance. These areas include whole fields and other large continuous areas, but also many farms support small pockets of unimproved wet ground with this habitat.

Table 4.1. Summary of the extent of wetland priority habitats in the Irfon catchment¹⁷

| Priority habitat | Area (ha) (% of catchment) | | |
|-------------------------------------|----------------------------|----------------|------------------|
| | Upland | Lowland | Total |
| Blanket Bog | 2,021.08 (6.96%) | 104.52 (0.36%) | 2,125.59 (7.32%) |
| Lowland Fens | 0.09 (0%) | 26.48 (0.09%) | 26.57 (0.09%) |
| Lowland Heathland | 0.00 (0%) | 18.57 (0.06%) | 18.57 (0.06%) |
| Lowland Raised Bog | 0.00 (0%) | 57.42 (0.2%) | 57.42 (0.2%) |
| Purple Moor Grass and Rush Pastures | 6.09 (0.02%) | 445.1 (1.53%) | 451.19 (1.55%) |
| Upland Flushes, Fens and Swamps | 771.22 (2.66%) | 0.00 (0%) | 771.22 (2.66%) |
| Upland Heathland | 82.45 (0.28%) | 0.00 (0%) | 82.45 (0.28%) |
| Wet Woodland | 0.00 (0%) | 6.46 (0.02%) | 6.46 (0.02%) |
| Total | 2,880.92 (22%) | 642.05 (4%) | 3,522.97 (12%) |

¹⁷ Areas of Lowland and Upland Heathland habitats include only areas mapped as wet dwarf shrub heath habitat in the Wales Phase 1 habitat dataset

Table 4.2. WFD waterbodies and their statuses

| WFD waterbody | Overall waterbody status | Chemical status | Ecological status | Fish | Invertebrates |
|---|--------------------------|-----------------|-------------------|----------|---------------|
| Afon Cammarch - source to confluence with River Irfon | Good | Good | Good | Good | Good |
| Afon Chwefru - source to confluence with River Irfon | Moderate | Good | Moderate | High | High |
| Afon Garth Dulas - source to confluence with River Irfon | Good | Good | Good | High | High |
| Afon Gwesyn - source to confluence with River Irfon | Poor | Good | Poor | Poor | No data |
| Cledan - source to confluence with River Irfon | Good | Good | Good | High | Good |
| Irfon – confluence of Afon Gwesyn to confluence with Cledan | Moderate | Good | Moderate | Moderate | No data |
| Irfon – confluence of Cledan to confluence of River Wye | Good | Good | Good | High | High |
| Irfon - source to confluence with Afon Gwesyn | Poor | Good | Poor | Good | Good |
| Tirabad Dulas - source to confluence with River Irfon | Good | Good | Good | High | High |

Figure 4.2. WFD waterbodies with biological elements at high status

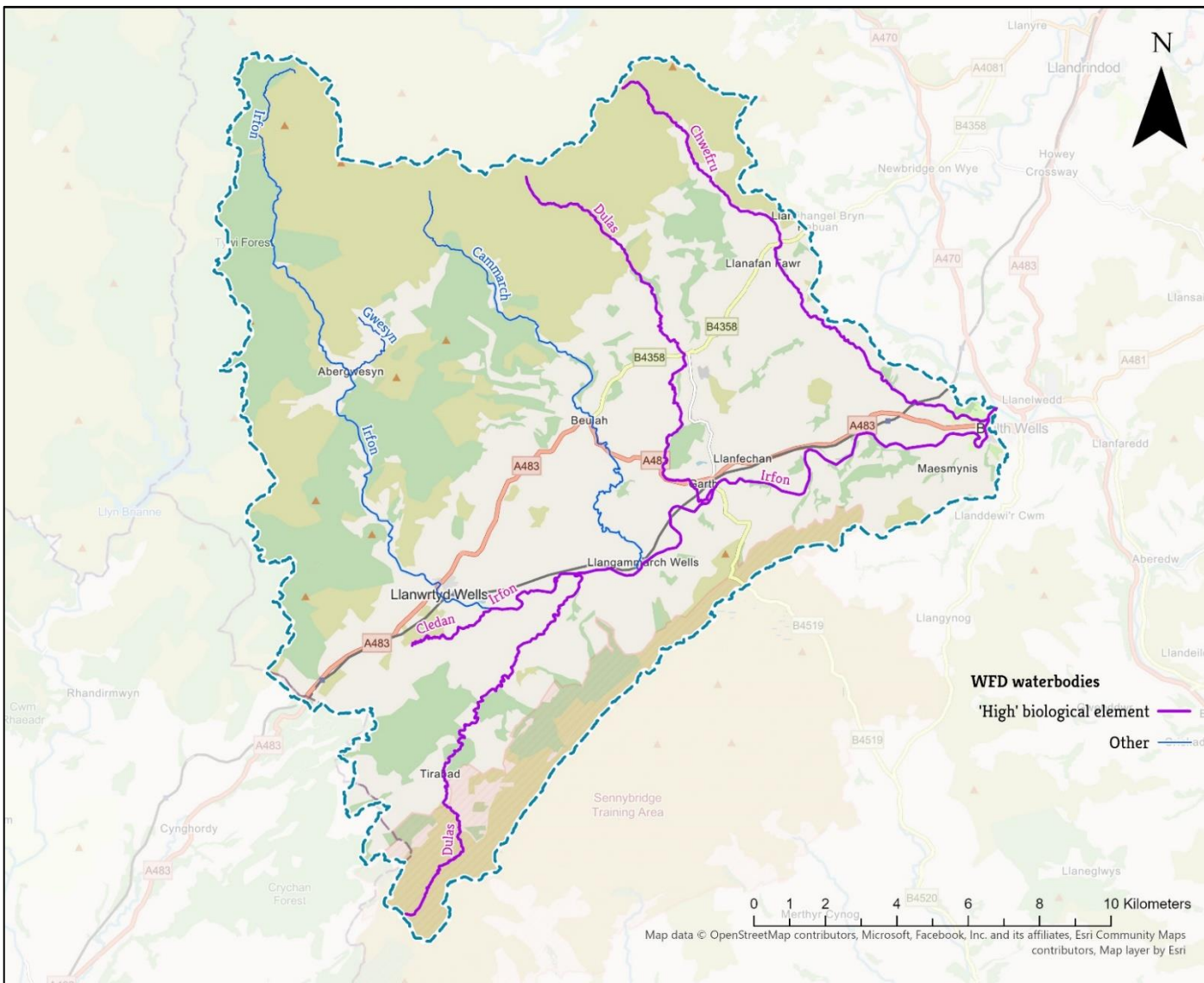


Figure 4.3. Rivers, streams, ditches, lakes and ponds of the Irfon catchment

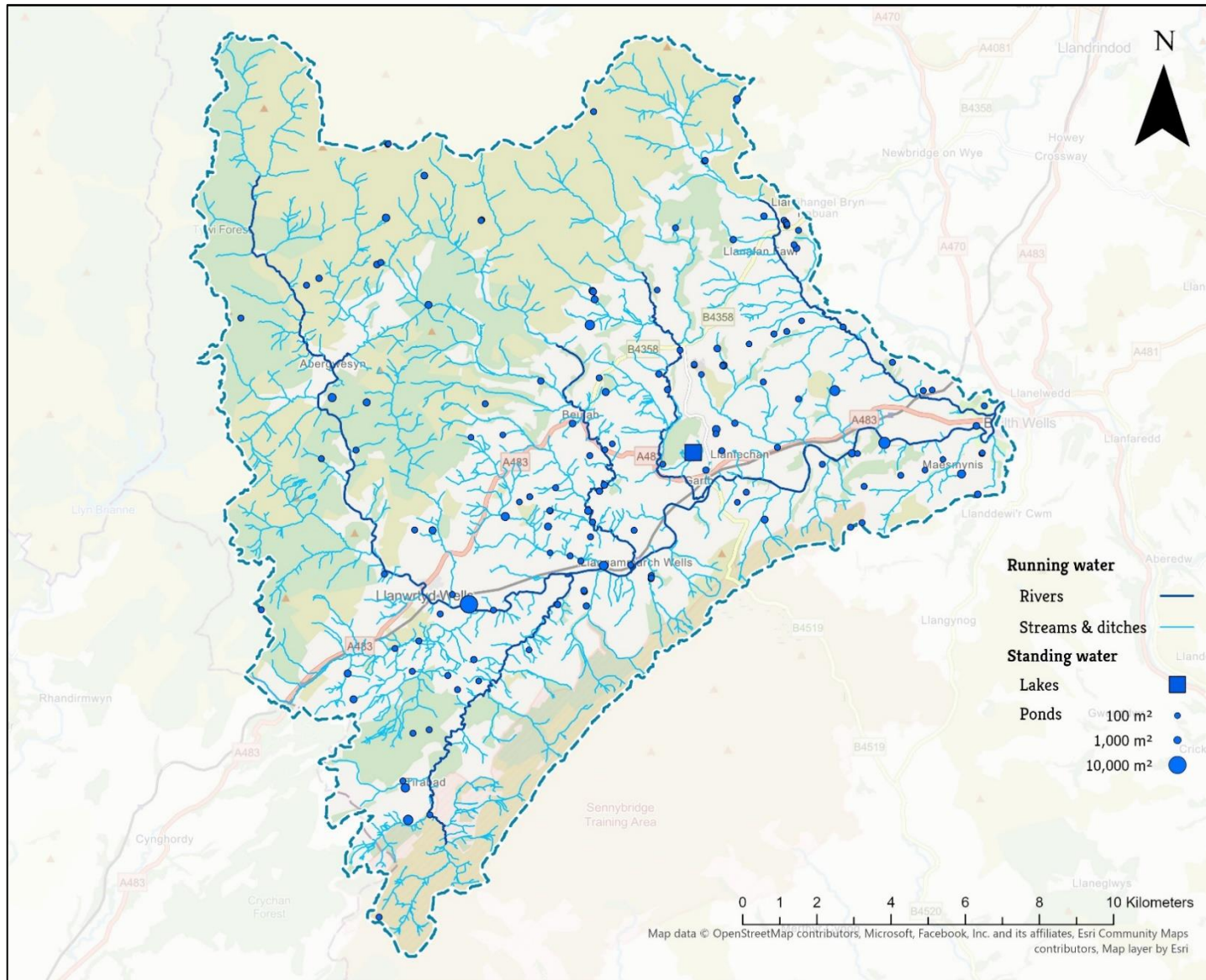
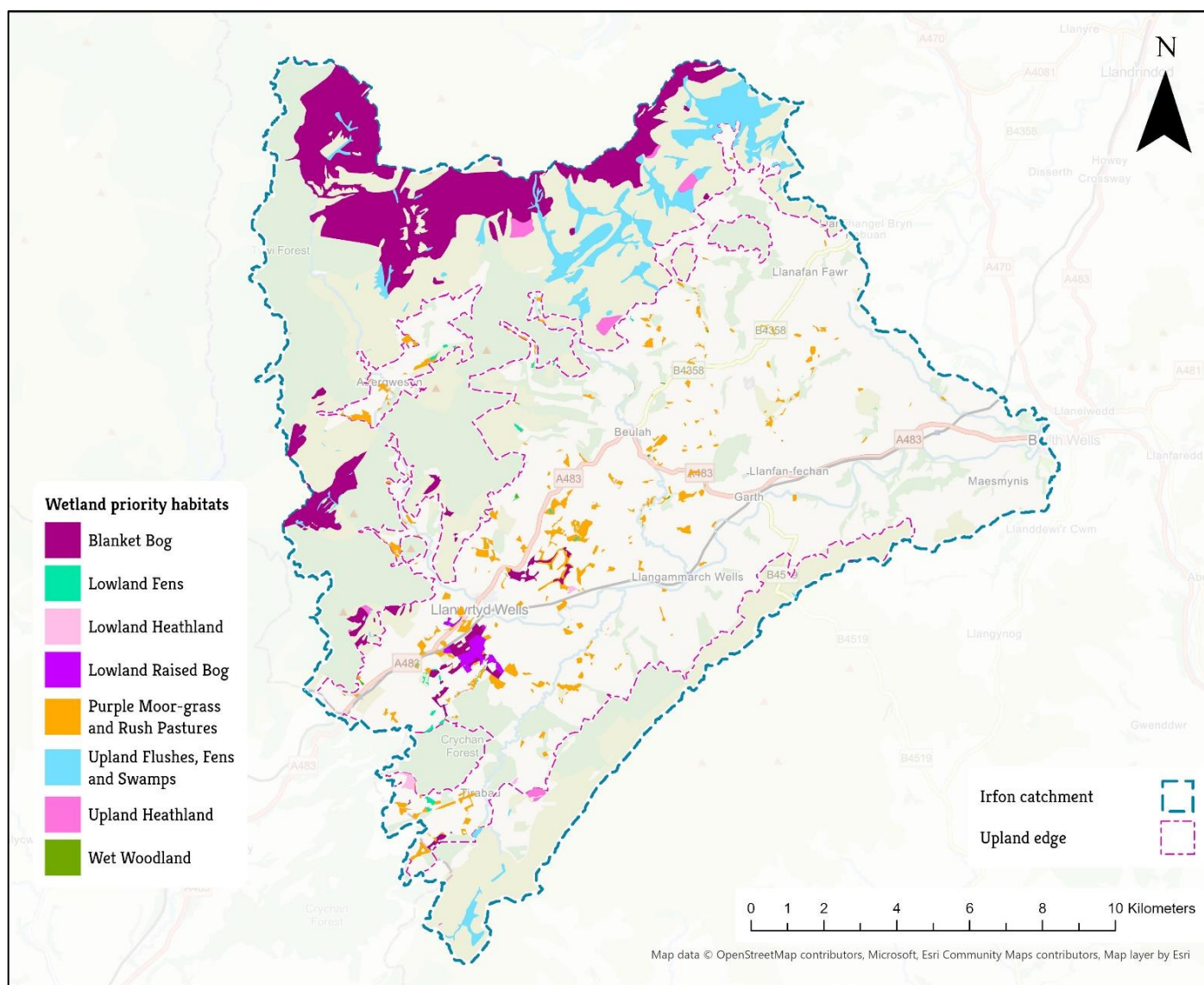


Figure 4.4. Wetland habitats of the Irfon catchment



4.1.4 Species of conservation concern

Biological records gathered for the catchment include 72 freshwater and wetland species of conservation concern (SoCC). A full list of SoCC species and their conservation statuses is given in [Table A3.3](#). There were records of 28 restricted species, indicated in [Table A3.3](#).

A summary of records by species group and conservation status is given in [Table 4.3](#). The list included 17 priority species, listed in accordance with Section 7 of the Environment (Wales) Act, such as Freshwater Pearl Mussel (*Margaritifera margaritifera*), White-clawed Crayfish (*Austropotamobius pallipes*) and River Jelly-lichen (*Collema dichotomum*). Note that many of the vascular plant species listed as SoCC with records from the catchment have no conservation status as they are listed on the red list for England but are Least Concern in Wales.

Vertebrates and vascular plants are well represented in the records obtained, while invertebrates are not. Most of the records of SoCC invertebrates come from NRW's river monitoring work. River invertebrates include Freshwater Pearl Mussel, White-clawed Crayfish (*Austropotamobius pallipes*), and the nationally scarce River Skater (*Aquarius najas*), the caddisfly *Potamophylax rotundipennis* and nationally scarce and priority stonefly Northern February Red (*Brachyptera putata*). White-clawed Crayfish records were scattered along the lower reaches of the Irfon, from Llangammarch Wells to Builth, and the Chewfri and Hafrena just upstream of their confluences with the Irfon.

There were records of a diversity of fish, with Atlantic Salmon, Brook Lamprey, Brown/Sea Trout (*Salmo trutta*), Bullhead, European Eel (*Anguilla anguilla*), River Lamprey, Sea Lamprey (*Petromyzon marinus*) and Twaite Shad. Most of these are features of the Afon Irfon SSSI and Afon Gwy / River Wye SAC (see subsection 4.1.1). Twaite Shad is a restricted species.

There were records of one SoCC amphibian species, Common Toad (*Bufo bufo*). Records were from five scattered localities, including Caeau Ty-n-llwyni. However, Common Toad is likely to be much more widespread in the catchment than records suggest.

Records of SoCC mammals covered three species: Otter, Water Shrew (*Neomys fodiens*) and Water Vole (*Arvicola amphibius*). There were over 200 records of Otter from the Irfon and its tributaries across the catchment and extending up to the edge of the uplands. There were two records of Water Shrew, one from Llanwrtyd and one from Tirabad; as in other parts of the UK, the species is likely to be under-recorded. There was one record of Water Vole, from the Irfon at Builth Wells in 1989.

The records include all those for the area held by the British Bryological Society which runs the national recording scheme for bryophytes. However, there were few SoCC records as there are relatively few bryophytes on the SoCC list. Records included several from Waen Rhydd SSSI of the liverwort Veilwort (*Pallavicinia lyellii*) a liverwort of rank stands of Purple Moor-grass. The SSSI supports a nationally significant concentration of this species¹⁸. Other restricted bryophytes recorded include the liverwort Bog Earwort (*Scapania paludicola*), known only from .Caeau Llwyn Gwrgan SSSI. The SoCC does not list Slender Green Feather-moss, a species of neutral to base-rich flushes, a feature of the Mynydd Epynt SAC (see subsection 4.1.1). Slender Green Feather-moss is also recorded from around the hills that form the headwaters of the Afon Chwefru.

There are 206 records of River Jelly-lichen (*Collema dichotomum*) from the catchment, all of which are from the main channel of the Irfon downstream of Llangammarch Wells. The River Jelly-lichen is a feature of the Afon Irfon SSSI and the catchment holds a significant proportion of the Welsh population of this lichen (R. Woods, pers. comm.), which is a priority

¹⁸ <https://www.plantlifeipa.org/site/factsheet/1080>

species, nationally scarce and legally protected. The catchment also supports three other aquatic lichens, with two nationally scarce and one nationally rare species.

Vascular plants were the group with the most SoCC and restricted species, with 38 and 9 species, respectively. These included one fern species, Marsh Fern, known from Blaen Cilieni SSSI, its only site in Powys. Flowering plants included relatively widespread species such as Butterwort (*Pinguicula vulgaris*), Star Sedge (*Carex echinata*) and Whorled Caraway, as well as restricted species such as Bog Orchid (*Hammarbya paludosa*), Bog Rosemary (*Andromeda polifolia*) and Marsh Helleborine (*Epipactis palustris*). Bog Orchid has only been recorded from one area of the Elenydd, above Cefn Garw. There are several records of Bog Rosemary, recorded from across the Elenydd, but the latest is from 1992. Caeau Ty'n-Ilwyni SSSI is the only remaining site for Marsh Helleborine in the catchment.

There was one record of Marsh Stitchwort, from 2002. No location information was available other than the 10 km grid square SN95, which lies almost entirely within the catchment.

Records also included Marsh Sowthistle (*Sonchus palustris*), but information supplied with the record indicated that this represented a population that had established from plants that spread from a native plant conservation nursery in the catchment. The species otherwise does not occur naturally in Wales¹⁹.

¹⁹ <https://plantatlas2020.org/atlas/2cd4p9h.fry>

Table 4.3. Summary of SoCC records and conservation statuses²⁰

| Species group | No. records | No. spp. | No. restricted spp. | Conservation status / No. spp. | | | | | | | | | | |
|---------------------------|-------------|----------|---------------------|--------------------------------|-----------------|-------------|----------------|-------------------------|-----------------|-------------------|----------|---------|------|------|
| | | | | Priority species | Global Red List | GB Red List | Wales Red List | Notable (invertebrates) | Nationally Rare | Nationally Scarce | Annex II | Annex V | WACA | None |
| Invertebrate - Mollusc | 11 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| Invertebrate - Crustacean | 86 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| Invertebrate - Beetle | 3 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Invertebrate - Bug | 8 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Invertebrate - Caddisfly | 4 | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Invertebrate - Crane fly | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Invertebrate - True Fly | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Invertebrate - Stonefly | 2 | 2 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Vertebrate - Fish | 1,112 | 8 | 1 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 3 | 1 | 0 |

²⁰ Nationally Rare and Scarce are species recorded from 1-15 and 16-100 10 km squares in Great Britain; Annex II and Annex V refer to species of European conservation concern and European Protected Species, respectively, listed on annexes to the Conservation of Habitats and Species Regulations 2017; WACA refers to species listed on schedules 5 or 8 of the Wildlife and Countryside Act 1981.

| | | | | Conservation status / No. spp. | | | | | | | | | | |
|-------------------------|-------------|----------|---------------------|--------------------------------|-----------------|-------------|----------------|-------------------------|-----------------|-------------------|----------|---------|------|------|
| Species group | No. records | No. spp. | No. restricted spp. | Priority species | Global Red List | GB Red List | Wales Red List | Notable (invertebrates) | Nationally Rare | Nationally Scarce | Annex II | Annex V | WACA | None |
| Vertebrate – Amphibian | 90 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Vertebrate - Mammal | 230 | 3 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 1 |
| Lichen | 213 | 4 | 4 | 1 | 0 | 1 | 0 | 0 | 1 | 3 | 0 | 0 | 1 | 0 |
| Plant - Moss | 39 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Plant - Liverwort | 29 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Plant - Fern | 6 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Plant - Flowering plant | 2,230 | 37 | 8 | 3 | 0 | 3 | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 28 |

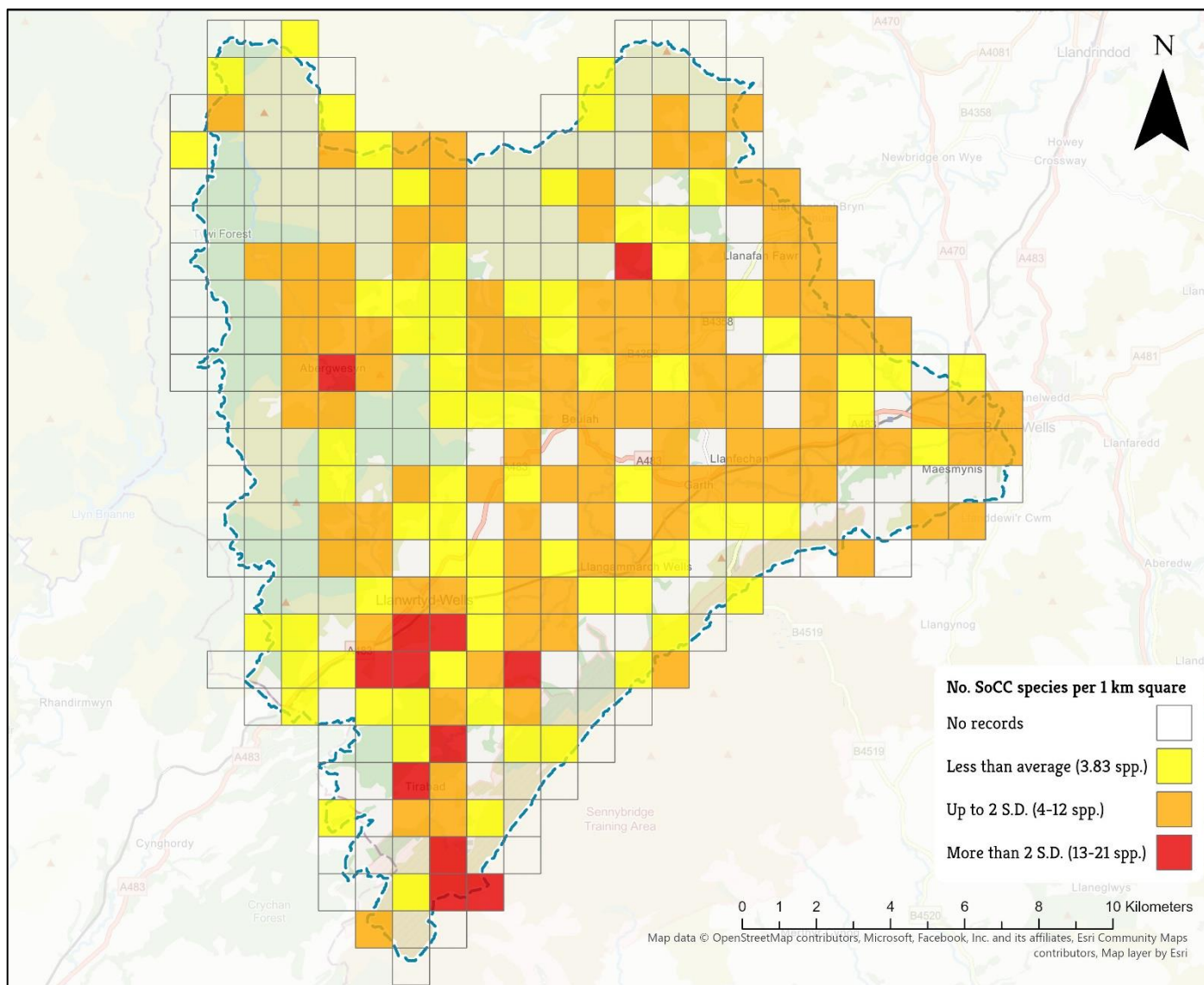
4.1.5 Species of Conservation Concern hotspots

The SoCC richness per 1 km square is shown in [Figure 4.5](#). Only those species with records localised to at least a 1 km square are shown. For seven taxa there were records localised only to 2 km or 10 km square, including Freshwater Pearl Mussel and Marsh Stitchwort. The exact locations of populations of Freshwater Pearl Mussel in the Irfon catchment are known, but records are only available at 10 km square resolution to protect them from persecution.

The mean richness per 1 km square was 3.83 SoCC species, and the threshold for a hotspot was at least 13 SoCC species. There were twelve 1 km squares that qualified as hotspots. Most of these hotspots coincided with designated sites. Four coincided with the Waen Rhydd SSSI and three with Blaen Cilieni SSSI and Mynydd Epynt SSSI. The hotspot around Abergwesyn is based on records from the Arfon Irfon SSSI and Vicarage Meadows SSSI, and the hotspot south of Cefn-gorwydd is from Caeau Ty-n-Ilwyni SSSI. The two hotspots north of Tirabad comprise records from the Afon Dulas and surrounding wet grassland. Finally, there is a hotspot comprising records from the Garth Dulas and nearby wet grassland at Tynybeili.

There were five 1 km squares that were both hotspots and supported restricted species. These squares intersect Blaen Cilieni SSSI, Caeau Ty'n-Ilwyni SSSI, Vicarage Meadows SSSI and Waen Rhydd SSSI.

Figure 4.5. Numbers of species of conservation concern (SoCC) recorded from 1 km squares in the Irfon catchment



4.2 Important Freshwater Areas

Using the information gathered about freshwater biodiversity in the Irfon catchment and presented in the previous section, 26 Important Freshwater Areas (IFAs) have been identified, shown in [Figure 4.6](#). A description of each IFA, and the criteria under which they qualify, is given in [Table 4.4](#).

The IFAs identified cover 32% of the Irfon catchment, ranging from the main river channels from the outfall with the Wye at Builth to their headwaters in the uplands, and extensive lowland wetland areas. For most taxonomic groups, especially invertebrates, there were few records to use in the identification of IFAs. All the IFAs have therefore been identified based primarily on designated sites, and freshwater and wetland habitat of high nature conservation value. The detailed mapping of terrestrial habitat available for the catchment was of especial value in identifying IFAs in the absence of more complete biological records.

The main Irfon channel and each of its tributaries have been demarcated as individual IFAs, including the smaller Afon Hafrena which is not a waterbody monitored as part of the WFD but is part of the River Wye / Afon Gwy SAC and Afon Irfon SSSI. The headwaters of the Irfon, Gwesyn, Cammarch, Garth Dulas and Chewfri in the hills of the Elenydd have also been demarcated as individual IFAs. As well as the River Wye / Afon Gwy SAC and Afon Irfon SSSI, these headwater areas include the Elenydd SAC and Elenydd SSSI, and extensive areas of blanket bog and other upland wetland habitats.

The headwaters of the Cledan and Tirabad Dulas in the wetlands among the lower hills in the south-west of the Irfon catchment have also been demarcated as individual IFA. These IFA include Blaen Cilieni SSSI, Mynydd Epynt SSSI and Waen Rhydd SSSI, as well as the Afon Irfon SSSI, and wetlands in other undesignated areas.

Two undesignated predominantly upland headwaters were also identified as IFAs. The Mynydd Trawsant IFA comprises the catchment of the Nant Henog and Nant Rhyd-goch, headwater streams of the Irfon, and includes areas of blanket bog and other wetlands. The smaller Garn Wen IFA comprises an upland plateau drained by the Nant y Cae, a headwater stream of the Cledan, and supports areas of blanket bog and wet heath habitats. Except for the NRW habitat mapping, there was little further information about these regions of the catchment, e.g. with very few records covering them.

Across the middle of the catchment are three extensive IFAs that take in the small wetlands among the rolling hills and valleys on the northern side of the Irfon. These IFAs include large areas of improved grassland but take in most of the fragments of remaining rhos pasture and other wetlands outside of the catchment's designated sites. The Upper-Irfon Rhos Pastures and Valley Fens IFA also includes systems of fens in the headwater valleys north-east of Llanwrtyd Wells. The Mid-Irfon Rhos Pastures IFA includes Caeau Llwyn Gwrgan SSSI and Llwyn-Cus SSSI.

Finally, there are six smaller IFAs that coincide with individual SSSIs. Vicarage Meadows IFA lies just below the limit of enclosure but is adjacent to the Afon Irfon Headwaters IFA. Downstream is Cae Pwll-y-bo IFA. In the upper reaches of the Cammarch are Llofft-y-bardd IFA and Allt-y-Gest IFA, corresponding to SSSIs of the same names. Although the latter, like Coed-y-Ciliau IFA, predominantly support ancient woodland habitat, the flushes set within them are also features of these SSSI. Rhos Pant-tyle IFA and Caeau Ty'n-llwyni IFA are also SSSI notified for their rhos pasture and associated wetland habitat.

Figure 4.6. Important Freshwater Areas of the Irfon catchment

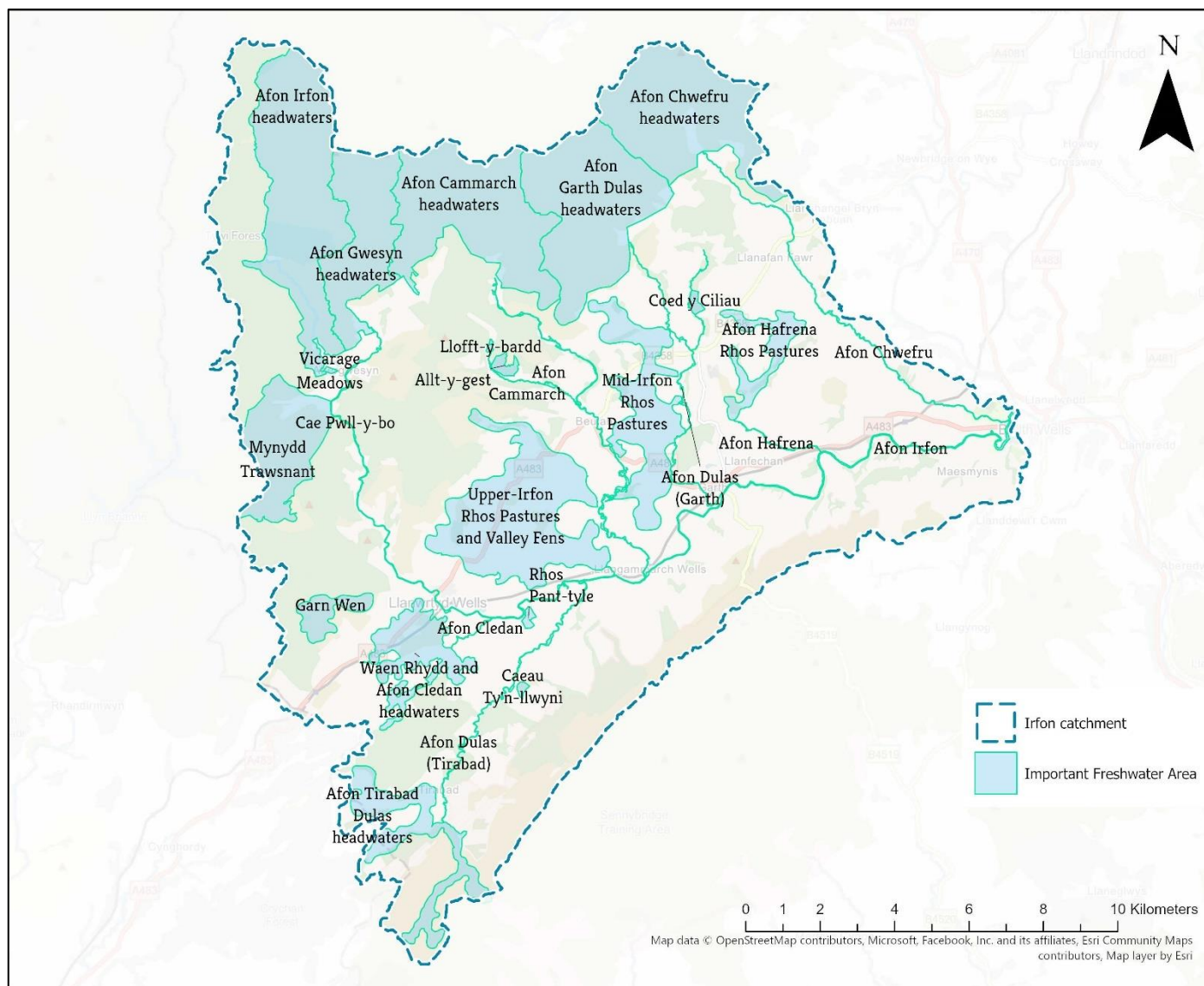


Table 4.4. Important Freshwater Areas of the Irfon catchment qualifying criteria and descriptions

| IFA name | IFA criteria | | | | | | IFA description |
|---------------------------------|--|------------------|-----------------------------|---|--|---------------------|---|
| | 1. Designated sites | 2a. SoCC hotspot | 2b. SoCC restricted species | 3a. WFD waterbodies with high-biological element | 3b. Water-dependent priority habitat | 4. Expert knowledge | |
| Afon Cammarch | Afon Irfon SSSI; River Wye / Afon Gwy (Wales) SAC | - | ✓ | - | - | - | Main channel of the Afon Cammarch upstream of its confluence with the Afon Irfon at Llangammach Wells |
| Afon Cammarch Headwaters | Elenydd SSSI; Elenydd SAC | - | ✓ | - | Blanket Bog; Upland Flushes, Fens and Swamps | - | Headwaters of the Afon Cammarch catchment, with extensive upland area comprising blanket bog habitat around watershed and systems of flushes supplying headwater streams. |
| Afon Chwefru | Afon Irfon SSSI; River Wye / Afon Gwy (Wales) SAC | - | - | Afon Chwefru - source to conf R Irfon: High fish and invertebrates biological element | - | - | Afon Chwefru south from Cwmchwerfr to confluence with the Afon Irfon |
| Afon Chwefru Headwaters | Afon Irfon SSSI; Elenydd SSSI; Elenydd SAC; River Wye / Afon Gwy (Wales) SAC | - | ✓ | Afon Chwefru - source to conf R Irfon: High fish and invertebrates biological element | Blanket Bog; Purple Moor-grass and Rush Pasture; Upland Fens, Flushes and Swamps | - | The IFA encompasses the headwater system of the Afon Chwefru. This comprises a glacial coombe with systems of blanket bogs and flushes on high ground around the Irfon watershed from which the Afon Chwefru rises. The eastern side of the watershed includes flushes supporting the legally protected moss <i>Hamatocaulis vernicosus</i> . |
| Afon Cledan | Afon Irfon SSSI; River Wye / Afon Gwy (Wales) SAC | ✓ | - | Cledan - source to conf R Irfon: High fish biological element | - | - | Main channel of the Afon Cledan upstream to the Waen Whydd wetland system |
| Afon Dulas (Garth) | Afon Irfon SSSI; River Wye / Afon Gwy (Wales) SAC | ✓ | ✓ | Afon Garth Dulas - source to conf R Irfon: High fish and | - | - | Main channel of the Afon Dulas upstream of its confluence with the Afon Irfon at Garth |

| IFA criteria | | | | | | | IFA description |
|------------------------------------|--|------------------|-----------------------------|---|--|---------------------|--|
| IFA name | 1. Designated sites | 2a. SoCC hotspot | 2b. SoCC restricted species | 3a. WFD waterbodies with high-biological element | 3b. Water-dependent priority habitat | 4. Expert knowledge | |
| | | | | invertebrates biological element | | | |
| Afon Dulas (Tirabad) | Afon Irfon SSSI; River Wye / Afon Gwy (Wales) SAC | ✓ | - | Tirabad Dulas - source to conf R Irfon: High fish and invertebrate biological element | - | - | Main channel of the Afon Dulas upstream of its confluence of the Afon Irfon to near its headwaters upstream of Tirabad |
| Afon Garth Dulas Headwaters | Afon Irfon SSSI; Elenydd SSSI; Elenydd SAC; River Wye / Afon Gwy (Wales) SAC | - | ✓ | Afon Garth Dulas - source to conf R Irfon: High fish and invertebrates biological element | Blanket Bog; Upland Flushes, Fens and Swamps; Upland Heathland | - | The IFA encompasses the headwater system of the Afon Chwefru. This upland area comprises a system of blanket bogs on the high ground around the Irfon watershed, with flushes from which the Afon Dulas rises. |
| Afon Gwesyn Headwaters | Elenydd SSSI | - | ✓ | - | Blanket Bog; Upland Flushes, Fens and Swamps | - | Blanket bog and flushes |
| Afon Hafrena | Afon Irfon SSSI; River Wye / Afon Gwy (Wales) SAC | - | - | - | | - | Main channel of the Afon Hafrena upstream of its confluence with the Afon Irfon to the Nant Gwineuddu |
| Afon Hafrena Rhos Pastures | Tyncoed Pasture SSSI | - | - | - | Purple Moor-grass and Rush Pasture | - | Fen meadow / rhos pasture |
| Afon Irfon | Afon Irfon SSSI; River Wye / Afon Gwy (Wales) SAC | ✓ | - | Irfon - conf Cledan to conf R Wye: High fish and invertebrate biological element | - | - | Main channel of the Afon Irfon upstream of the Afon Gwy confluence to its headwaters |
| Afon Irfon Headwaters | Elenydd SSSI; Elenydd SAC | - | ✓ | - | Blanket Bog; Upland Flushes, Fens and Swamps | - | Blanket bog and flushes |

| IFA name | IFA criteria | | | | | | IFA description |
|--------------------------------------|--|------------------|-----------------------------|---|---|---------------------|---|
| | 1. Designated sites | 2a. SoCC hotspot | 2b. SoCC restricted species | 3a. WFD waterbodies with high-biological element | 3b. Water-dependent priority habitat | 4. Expert knowledge | |
| Afon Tirabad Dulas Headwaters | Afon Irfon SSSI; Blaen Cilieni SSSI; Mynydd Epynt SSSI; River Wye / Afon Gwy (Wales) SAC | ✓ | ✓ | Tirabad Dulas - source to conf R Irfon: High fish and invertebrate biological element | Purple Moor-grass and Rush Pastures; Upland Fens, Flushes and Swamps; Lowland Heathland | - | Headwaters of the Afon Dulas upstream of Tirabad, including the river channel, a unit of the Mynydd Epynt SSSI and, at the edge of the Irfon catchment, Blaen Cilieni SSSI. The Mynydd Epynt SSSI supports a population of the Annex II moss <i>Hamatocaulis vernicosus</i> . The Afon Dulas rises within the Blaen Cilieni SSSI and in a system of fens in a valley to the west. |
| Allt-y-gest | Allt-y-gest SSSI | - | - | - | - | - | Predominantly sessile oak wood but citation describes presence of wet flushes |
| Cae Pwll-y-bo | Cae Pwll-y-bo SSSI | - | - | - | - | - | Tall herb fen with one of the largest remaining stands of <i>Trollius europaeus</i> in Mid Wales |
| Caeau Ty'n-llwyni | Caeau Ty'n-llwyni SSSI | ✓ | ✓ | - | Purple moor-grass and rush pastures | - | Description of vegetation in SSSI citation indicates rhos pasture and flushes are present in parts of site |
| Coed y Ciliau | Coed y Ciliau SSSI | - | - | - | - | - | Predominantly sessile oak wood but citation describes presence of wet flushes |
| Garn Wen | - | - | - | - | Blanket Bog; Upland Heathland | - | Upland plateau drained by the Nant y Cae, comprising areas of blanket bog. |
| Llofft-y-bardd | Llofft-y-bardd SSSI | - | - | - | - | - | Meadows with areas of rhos pasture |
| Mid-Irfon Rhos Pastures | Caeau Llwyn Gwrgan SSSI; Llwyn-Cus SSSI | - | - | - | Purple moor-grass and rush pastures | - | Description of vegetation in Caeau Llwyn Gwrgan SSSI citation indicates rhos pasture and flushes are present in parts of site, and floodplain wetlands in Llwyn-Cus SSSI |

| IFA name | IFA criteria | | | | | | IFA description |
|--|---|------------------|-----------------------------|---|---|---------------------|---|
| | 1. Designated sites | 2a. SoCC hotspot | 2b. SoCC restricted species | 3a. WFD waterbodies with high-biological element | 3b. Water-dependent priority habitat | 4. Expert knowledge | |
| Mynydd Trawsnant | - | - | - | - | Blanket Bog; Upland Fens, Flushes and Swamps | - | Upland plateau with blanket bog and flush systems supplying the Irfon headwater streams Nant Henog and Nant Rhyd goch |
| Rhos Pant-tyle | Rhos Pant-tyle SSSI | - | - | - | - | - | Extensive area of rhos pasture |
| Upper-Irfon Rhos Pastures and Valley Fens | Afon Irfon SSSI; River Wye / Afon Gwy (Wales) SAC | - | - | - | Lowland Fens; Purple Moor-grass and Rush Pastures | - | Headwater system of the Afon Camddwr, with areas of Purple Moor-grass pasture and valley fen |
| Vicarage Meadows | Vicarage Meadows SSSI | ✓ | ✓ | - | - | - | SSSI features include 'wet and heathy areas supporting] bog-mosses <i>Sphagnum</i> spp. and round-leaved sundew <i>Drosera rotundifolia</i> ' |
| Waen Rhydd and Afon Cledan Headwaters | Afon Irfon SSSI; Waen Rydd SSSI; River Wye / Afon Gwy (Wales) SAC | ✓ | ✓ | Cledan - source to conf R Irfon: High fish biological element | Lowland Fens; Lowland Raised Bog; Purple Moor-grass and Rush Pastures | - | Lowland bog, wet heath, rhos pasture and flushes |

5 Conclusion

This report has identified 26 IFAs in the Irfon catchment. These areas support the richest assemblages of freshwater species and most extensive areas of priority freshwater and wetland habitats in the catchment. Together, these IFAs cover 32% of the catchment.

The IFAs include many farmed areas of lower value for freshwater and wetland species, but that take in a network of fragments of priority habitat critical for conserving freshwater biodiversity. These fragments are not just limited to SSSI but also include very many small and large areas of undesignated farmed land.

In terms of data availability there is a need for:

- better invertebrate data from the freshwater and wetland habitats, other than the main rivers which are well-covered by NRW monitoring; and
- better habitat mapping to cover obvious gaps in publicly available data on wet woodland, wetlands on farmed land and small features in the uplands.

Practically, further work is needed to focus on:

- Protecting endangered species, particularly the Freshwater Pearl Mussel, White-clawed Crayfish and the rich fish fauna. In particular, there is potential for introduction and reintroduction for species which have been lost from the area or have very small and vulnerable populations.
- Reducing point-source and diffuse pollution of running and standing waters in the landscape.
- Bringing back into management under-grazed fen and wet grassland habitats.
- Managing blanket bog to maintain ecological quality and reduce carbon loss.
- Creating new ponds, which provide the richest individual freshwater habitat type in the landscape.

Some of this practical work is now starting in follow-up projects being undertaken by various organisation and individuals working in the landscape, often building on the Irfon SMS project foundations. Further projects are needed to develop new species and habitat mapping work.

Appendix 1 Data sources

Records from the following data sources were returned in the NBN Atlas data search:

- Amphibian and Reptile Groups of the UK
- Balfour-Browne Club
- Bat Conservation Trust
- Biodiversity Information Service for Powys and Brecon Beacons National Park
- Biological Records Centre
- Botanical Society of Britain and Ireland
- Biological Records Centre
- British Bryological Society
- British Dragonfly Society
- British Mycological Society
- British Trust for Ornithology
- Caddisfly Recording Scheme and Biological Records Centre
- Cofnod - North Wales Environmental Information Service
- Conchological Society of Great Britain & Ireland
- Freshwater Fish Recording Scheme
- Ground Beetle Recording Scheme
- Joint Nature Conservation Committee
- Longhorn Beetle Recording Scheme
- National Trust
- Natural Apptitude
- Natural Resources Wales
- People's Trust for Endangered Species
- Project Splatter
- Riverfly Recording Schemes
- Royal Horticultural Society
- South East Wales Biodiversity Records Centre
- Soldier Beetles and Allies Recording Scheme
- Soldierflies and Allies Recording Scheme

- Terrestrial Heteroptera Recording Scheme
- The Mammal Society
- The National Plant Monitoring Scheme partnership
- The Royal Society for the Protection of Birds
- The Woodland Trust
- UK Crane-fly Recording Scheme
- UK Trichoptera (Caddisfly) Recording Scheme
- West Wales Biodiversity Information Centre

Appendix 2 Designated site features

Table A2.1. Natura 2000 sites within the Irfon catchment that support freshwater species and habitats. Qualifying features in bold face are a primary reason for selection of the site; those in regular face are qualifying features present within the site but not a primary reason for selection of the site.²¹

| Site name | Designation | Features | Description |
|--------------------------|-------------|--|---|
| River Wye / Afon Gwy SAC | SAC | 3260 Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation | The Wye, on the border of England and Wales, is a large river with a geologically mixed catchment. There is a clear transition between the upland reaches, with characteristic bryophyte-dominated vegetation, and the lower reaches, with extensive Water Crow-foot (<i>Ranunculus</i>) beds, and an exceptional range of aquatic flora. The river channel is largely unmodified and includes several gorges, as well as significant areas of associated woodland. |
| | | 7140 Transition mires and quaking bogs | No information available about this feature |
| | | 1092 White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i> | The Welsh River Wye system is the best site known in Wales for White-clawed Crayfish (<i>Austropotamobius pallipes</i>). The tributaries are the main haven for the species, particularly at the confluences of the main river and the Edw, Dulas Brook, Sgithwen and Clettwr Brook. |
| | | 1095 Sea lamprey <i>Petromyzon marinus</i> | The Sea Lamprey (<i>Petromyzon marinus</i>) population is found in the main stem below Llyswen, downstream of the Irfon. The site provides exceptionally good quality habitat for Sea Lamprey. |
| | | 1096 Brook lamprey <i>Lampetra planeri</i> | The Brook Lamprey (<i>Lampetra planeri</i>) population is widely distributed in the Wye catchment, which provides exceptionally good quality habitat for the species. |
| | | 1099 River lamprey <i>Lampetra fluviatilis</i> | The River Lamprey (<i>Lampetra fluviatilis</i>) population is widely distributed in the Wye catchment, which provides exceptionally good quality habitat for the species. |
| | | 1103 Twaite shad <i>Alosa fallax</i> | Twaite Shad (<i>Alosa fallax</i>) migrate over 100 km upstream from the tidal limit of the Wye to spawn, the highest spawning site being at Builth Wells. The Wye supports one of the largest spawning areas for this species in the UK. The river provides good habitat for this species, with relatively good water quality, adequate flows through an unobstructed main channel and a wide range of aquatic habitats, such as deep pools essential for congregation before spawning. |

²¹ For SAC, numeric codes refer to habitat and species features listed on Annex I and Annex II, respectively, of the European Union Habitats Directive (Council Directive 92/43/EEC). For SPA, alphanumeric codes refer to species listed on Annex I of the European Union Birds Directive (Directive 2009/147/EC).

| Site name | Designation | Features | Description |
|-----------|-------------|---|--|
| | | 1106 Atlantic salmon <i>Salmo salar</i> | Historically, the Wye is the most famous and productive river in Wales for Atlantic Salmon (<i>Salmo salar</i>), with high-quality spawning grounds and juvenile habitat in both the main channel and tributaries. The most important tributaries for spawning are included in the SAC. The effect of river engineering work on migration and spawning has been limited, although there is a localised influence from the Elan Valley reservoirs. The Wye salmon population is particularly notable for the very high proportion (around 75%) of multi sea winter fish, a stock component which has declined sharply in recent years throughout the UK. This pattern has also occurred in the Wye, with a consequent marked decline in the population since the 1980s. However, the Wye salmon population is still of considerable importance in UK terms. |
| | | 1163 Bullhead <i>Cottus gobio</i> | The Wye represents Bullhead (<i>Cottus gobio</i>) in an extensive river system crossing the border between England and Wales. The diversity of habitat types in the Wye means that it is likely to represent most of the habitat conditions in which Bullhead occurs in Britain. |
| | | 1355 Otter <i>Lutra lutra</i> | The Wye holds the densest and most well-established Otter (<i>Lutra lutra</i>) population in Wales. The river has bank-side vegetation cover, abundant food supply, clean water and undisturbed areas of dense scrub suitable for breeding, making it particularly favourable as Otter habitat. |
| Elenydd | SAC | 6130 Calaminarian grasslands of the <i>Violetalia calaminariae</i> | This feature is present within the Ystwyth Valley, outside of the Irfon catchment, where heavy metals have been extracted for over 1000 years. This habitat does not support freshwater species. |
| | | 7130 Blanket bogs | Elenydd comprises the largest tract of blanket mire within the central Wales uplands. Considerable areas of the habitat display signs of modification, with impoverished vegetation dominated by grasses and with reduced amounts of dwarf shrubs. Areas of good quality mire are typically fragmented by species-poor vegetation dominated by Purple Moor-grass (<i>Molinia caerulea</i>). However, there are extensive stands of good quality mire that contain locally abundant Bog-rosemary (<i>Andromeda polifolia</i>), as well as areas of mire in which Heather (<i>Calluna vulgaris</i>) and Hare's-tail Cottongrass (<i>Eriophorum vaginatum</i>) are dominant. Areas of hummock and hollow surface patterning are found locally. |
| | | 1831 Floating water-plantain <i>Luronium natans</i> | The remote Elenydd lakes are amongst the best upland oligotrophic lakes in Wales and have been relatively untouched by abstraction and water-level modification. Their populations of Floating Water-plantain (<i>Luronium natans</i>) show a highly natural submerged distribution, in association with a wide range of associated species. |
| | | 3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i> | No information available about this feature |

| Site name | Designation | Features | Description |
|-------------------|-------------|---|---|
| | | 4030 European dry heaths | No information available about this feature and it does not comprise a freshwater habitat |
| Mynydd Epynt | SAC | 1393 Slender green feather-moss <i>Drepanocladus (Hamatocaulis) vernicosus</i> | Slender Green Feather-moss (<i>Hamatocaulis vernicosus</i>) occurs in at least five flush complexes within this upland range in south central Wales. The flush habitats are generally situated within expanses of grass moorland. |
| Elenydd - Mallaen | SPA | A098 <i>Falco columbarius</i> | The SPA supports 1-12% of the population of Merlin (<i>Falco columbarius</i>) in Great Britain. |
| | | A074 <i>Milvus milvus</i> | The SPA supports 2-15% of the population of Red Kite (<i>Milvus milvus</i>) in Great Britain. |

Table A2.2. SSSI within the Irfon catchment that support freshwater species and habitats. All information is taken from site citations²²

| Site name | Area in catchment (ha) | Description |
|---------------|------------------------|--|
| Afon Irfon | 476.51 | <p>The site includes the main Irfon channel, from Abergwesyn to the confluence with the River Wye, and a number of important tributaries such as Afon Gwesyn, Cledan, Afon Dulas (south), Camddwr, Afon Cammarch, Garth Dulas, Hafrena and Chwefri. Together they form a representative series of mid-altitude, oligo-mesotrophic watercourses that have characteristics of both northern and south-western British types. The site is of special interest for its populations of Otter, Atlantic Salmon, Bullhead, River Lamprey, Brook Lamprey and lichen species, including River Jelly Lichen (<i>Collema dichotomum</i>), <i>Pyrenocollema strontianensis</i>, <i>Verrucaria pachyderma</i> and <i>Dermatocarpon meiophyllizum</i>, as well as its mesotrophic and oligo-mesotrophic river types, which include communities of submerged aquatic plants containing Water-crowfoot.</p> <p>The headwaters support ultra-oligotrophic aquatic communities and extensive areas of seminatural riparian habitats can still be found next to the Irfon and its tributaries. These include semi-natural woodland, dry and marshy grassland, stands of tall fen and marsh vegetation and gravel banks. The site also includes back channels and oxbows that support Otter and waterfowl and provide valuable refuges for small fish and invertebrates in times of flood.</p> |
| Allt-y-gest | 70.89 | <p>The site is a Sessile Oak (<i>Quercus petraea</i>) dominated ancient woodland developed on the side of the valley of the Afon Cnyffiad. A special feature of the site is its fine mature maiden oak trees, which support a rich epiphytic lichen flora including a number of uncommon species. With its rock outcrops and wet flushes, this grazed woodland is a fine example of the upland acidic oakwoods which once covered most of Mid Wales.</p> |
| Blaen Cilieni | 38.01 | <p>The gently sloping ground at the head of the Cilieni valley supports one of the largest and most diverse areas of fen-meadow in Brecknock. Plant communities present include those favouring base-rich conditions, including small sedge-dominated areas, brown moss flushes and areas dominated by common reed <i>Phragmites australis</i>. Amongst the base-rich flushes hummocks of acidic peat have developed supporting different plant communities, including areas of heath-like and blanket bog-like vegetation. Notable species present include Marsh Fern (<i>Thelypteris palustris</i>), in its only known location in Powys, Bogbean (<i>Menyanthes trifoliata</i>), Few-flowered Spike-rush (<i>E. quinqueflora</i>), Greater Tussock-sedge (<i>C. paniculata</i>), Lesser Skullcap (<i>Scutellaria minor</i>), Marsh Cinquefoil (<i>Comarum palustre</i>), Needle Spike-rush (<i>Eleocharis acicularis</i>) and Tawny Sedge (<i>Carex hostiana</i>), and the moss Large-leaf Tyhyme Moss (<i>Rhizomnium pseudopunctatum</i>).</p> |
| Cae Pwll-y-bo | 0.66 | <p>The site is the finest known example in Brecknock of an uncommon habitat comprised of flushed tall-herb fen vegetation with some similarities to fen-meadow. Elsewhere in Mid Wales, such vegetation is usually confined to river banks and small flushed areas. The most notable feature is the great abundance of Globeflower (<i>Trollius europaeus</i>), possibly the largest stand remaining in Mid Wales of this spectacular and attractive plant. Growing with it, are Common Valerian (<i>Valeriana officinalis</i>), Devil's-bit Scabious (<i>Succisa pratensis</i>) and</p> |

²² Available at <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/?lang=en>

| Site name | Area in catchment (ha) | Description |
|--------------------|------------------------|--|
| | | Great Burnet (<i>Sanguisorba officinalis</i>). The site is all that remains of a larger field now planted with conifers. This small remnant was left unplanted on account of its rich flora. |
| Caeau Llwyn Gwrgan | 15.36 | This site is an important area of unimproved herb-rich pasture, being one in a series of grassland sites demonstrating the range of variation which occurs in Brecknock and mid Wales generally. These damp north-facing pastures lie on the floor of the Nant Gwnfel valley. Grazed as a single dingle unit, they are separated into three parts by narrow strips of open alder, oak and birch woodland and bounded on their north and east sides by wooded streams. The fields comprise a series drier with intervening flushed areas. The drier grassland supports a rich diversity of herbs such as Dyer's Greenweed (<i>Genista tinctoria</i>), Greater Butterfly-orchid (<i>Platanthera chlorantha</i>) and Wood Bitter-vetch (<i>Vicia orobus</i>), all scarce species in Brecknock and mid Wales. The wet flushes support a diverse sedge flora, together with a range of herbs such as Common Valerian (<i>Valeriana officinalis</i>), Devil's-bit Scabious (<i>Succisa pratensis</i>), Marsh-marigold (<i>Caltha palustris</i>), Meadowsweet (<i>Filipendula ulmaria</i>) and Whorled Caraway (<i>Carum verticillatum</i>). These flushes reach their best development in the eastern-most part, where they clothe the southern and eastern edge of the field, supporting in addition to the other species Bog Asphodel (<i>Narthecium ossifragum</i>) and Heath Spotted-orchid (<i>Dactylorhiza maculata</i>). This orchid extends in some abundance into the purple moor-grass dominated grassland of the gently sloping central parts of the field. Here, Petty Whin (<i>Genista anglica</i>) occurs in greater abundance than in any other site in Brecknock. With the presence of other woody species such as Heather and Cross-leaved Heath (<i>Erica tetralix</i>) this grassland shows a transition towards heathland. |
| Caeau Ty'n-llwyni | 21.07 | The site comprises an outstanding area of unimproved herb-rich pasture situated close to the river Dulas. The sward is characterised by Purple Moor-grass, Whorled Caraway and Lesser Spearwort (<i>Ranunculus flammula</i>). Sharp-flowered Rush (<i>Juncus acutiflorus</i>), Meadow Thistle (<i>Cirsium dissectum</i>), Devil's-bit Scabious and Meadowsweet are frequent. The botanical interest of the field is greatly increased by a scattering of drier raised areas which support a contrasting plant community, including several uncommon plants. The small triangular field at the southern end of the site has small areas of wet flush dominated by sedges and containing plants such as Marsh Helleborine (<i>Epipactis palustris</i>), an orchid unknown elsewhere in Brecknock following drainage of its only other known locality. |
| Coed y Ciliau | 41.79 | This site remains as the last substantial fragment of the formerly more extensive woodlands of the steeply sloping sides of the Gwenwst and Dulas valleys. As an example of an acidic Sessile Oak woodland, it is particularly notable for its species-rich wet flushes. A wide range of herbs occur and a rich lichen flora is recorded from the trees, including the rare Tree Lungwort (<i>Lobaria pulmonaria</i>) and other species characteristic of ancient woodland. |
| Elenydd | 6,142.31 | The Elenydd range is one of the most important areas of hill land in Wales for nature conservation. It is of outstanding interest for its range of breeding birds of upland and woodland, and much of the vegetation is also of special interest. The moorland plateau is largely covered by blanket bog vegetation. Purple Moor-grass is the dominant plant of these hills, occurring in valley mires, on hill slopes and on the plateau tops. This dominance is possibly due to management effects of grazing and burning. Hillside and streamside flushes are botanically diverse and some support uncommon species, including two localities for Bog Orchid (<i>Hammarbya paludosa</i>). Mountain lakes within the site support several rare species, including Water Lobelia (<i>Lobelia dortmanna</i>), and watercourses, together with their riparian vegetation, are of botanical interest. |

| Site name | Area in catchment (ha) | Description |
|----------------|------------------------|--|
| Llofft-y-bardd | 10.40 | <p>The meadows at Llofft-y-bardd are a fine example of a type of herb-rich grassland that is now rare in Mid Wales because of agricultural intensification. The site consists of two enclosures with an easterly aspect, lying on the level floor and gently sloping valley side of the Afon Cnyffiad, a tributary of the Afon Cammarch. The land is generally free-draining, although areas on the margins of the brook have impeded drainage.</p> <p>In the southern enclosure, moister soils support a small wetland area, adding to the diversity of habitat on the site. This comprises an area of rush-pasture, dominated by Sharp-flowered Rush with Purple Moor-grass. Associated species include Marsh-bedstraw (<i>Galium palustre</i>), Marsh-marigold, Ragged-robin (<i>Silene flos-cuculi</i>), Meadowsweet and Marsh Violet (<i>Viola palustris</i>). A small area of Purple Moor-grass dominated mire grassland also occurs, where Tormentil (<i>Potentilla erecta</i>) and Marsh Violet occur in abundance, with Heath Spotted-orchid, Devil's bit Scabious, Star Sedge (<i>Carex echinata</i>), and Marsh Lousewort (<i>Pedicularis palustris</i>). A notable feature of this habitat is the presence of Whorled Caraway.</p> |
| Llwyn-cus | 37.32 | <p>This site occupies the lower south-west facing sides of the Cammarch valley below Beulah and displays the range of semi-natural wildlife habitats once common in north Brecknock, but now scarce due to post-war agricultural improvement. Former courses of the Cammarch support tall-fen vegetation, dominated by Lesser Pond-sedge (<i>Carex acutiformis</i>). This vegetation extends on to a wet, spring-fed river terrace where a large colony of Purple Small-reed (<i>Calamagrostis canescens</i>) is present in its only known Mid Wales locality. Grey Willow dominated wet woodland provides a canopy over part of the area, the trees supporting a rich epiphytic flora.</p> <p>The most southerly field is an unimproved pasture. The upper slopes are flushed with spring water from the wood above and support extensive small sedge-dominated communities. Similar wet flushes occur in the fields in the centre of the site amongst a mosaic of drier unimproved pasture types. The northerly end of the site, in contrast, consists of rough pasture dominated by Purple Moor-grass. More acidic, it is less species-rich, with dwarf-shrubs such as Petty Whin and Western Gorse (<i>Ulex gallii</i>), as well as flushes dominated by bog-mosses. A lightly grazed Sessile Oak and Birch (<i>Betula</i> spp.) woodland covers most of the steeper slopes throughout the site.</p> |
| Mynydd Epynt | 35.04 | <p>Mynydd Epynt is of special interest for its population of the rare Slender Green Feather-moss (<i>Hamatocaulis vernicosus</i>), its diverse assemblage of grassland fungi, including at least 37 species of waxcap and important populations of five species of grassland fungi that are globally threatened. The site comprises 35 separate areas of land situated on the Mynydd Epynt at an altitude of 300–400m, between Halfway Forest, to the north-west of Sennybridge and Cwm Owen, to the South of Builth Wells.</p> <p>Spring-fed wetlands occur throughout the site. These are largely dominated by rushes and Purple Moor-grass, with patches of willow (<i>Salix</i> spp.) scrub and Alder (<i>Alnus glutinosa</i>) woodland in places. However, the areas closest to the springs support more open vegetation. Acidic springs are characterised by plants such as Common Cottongrass, Bog Asphodel, Bog Pondweed, Star Sedge and bog mosses, whilst more base-rich springs support a variety of small sedges and 'brown mosses'. The Slender Green Feather-moss occurs in association with springs of intermediate base status, typically associated with plants including Carnation Sedge, Star Sedge, Common Sedge (<i>C. nigra</i>), Sharp-flowered Rush, Purple Moor-grass, Lesser Spearwort, Greater Bird's-foot-trefoil (<i>Lotus pedunculatus</i>), the Marsh Bryum (<i>Bryum pseudotriquetrum</i>), Mountain Fern-moss (<i>Hylocomium splendens</i>), Twiggy Spear-moss (<i>Calliergonella cuspidata</i>), Fountain Apple-moss (<i>Philonotis fontana</i>) and Slender Cow-horn Bog-moss (<i>Sphagnum ubsecundum</i>).</p> |

| Site name | Area in catchment (ha) | Description |
|------------------|------------------------|---|
| Rhos Pant-tyle | 32.93 | <p>The site consists of an extensive area of rhos pasture above the southern bank of the Afon Irfon, near Llanwrtyd Wells. It is of special interest for its marshy grassland, wet heath and flush vegetation and is one of the few remaining large areas of such habitat remaining in the district. Apart from a few drier banks supporting acidic grassland, the soils across the site have a water-table at or near the ground surface.</p> <p>The principal feature of special interest is a large and continuous area of marshy grassland in which Purple Moor-grass <i>Molinia caerulea</i> is the principal component. Growing within the Purple Moor-grass are Tormentil, Cross-leaved Heath, Heather, Heath Rush (<i>Juncus squarrosus</i>), Heath Milkwort (<i>Polygala serpyllifolia</i>), Bilberry (<i>Vaccinium myrtillus</i>), Common Haircap (<i>Polytrichum commune</i>) and bog-mosses. Elsewhere Purple Moor-grass remains dominant but the sward supports more grasses and include Whorled Caraway, Heath Wood-rush (<i>Luzula multiflora</i>). Locally, Meadow Thistle (<i>Cirsium dissectum</i>), Carnation Sedge, Sharp-flowered Rush, Lousewort (<i>Pedicularis sylvatica</i>), Whorled Caraway, Tawny Sedge and bog-mosses occur within a sward composed primarily of Purple Moor-grass and Sheep's-fescue (<i>Festuca ovina</i>). In patches this vegetation grades into wet heath. Towards the south of the site, the vegetation is dominated by Sharp-flowered Rush, with Velvet Bent (<i>Agrostis canina</i>), Marsh Pennywort (<i>Hydrocotyle vulgaris</i>), Meadowsweet, Marsh Valerian and Marsh Violet. In places, there are flushed areas.</p> |
| Tyncoed Pasture | 10.72 | <p>The site is of special interest for its extensive area of fen-meadow, with associated rush-pasture and mire communities, which form a mosaic determined by soil moisture, drainage and base status. The site comprises a single enclosure bounded by tree-lined ditches. A sinuous drainage channel traverses the pasture, and its marshy surrounds support a rich variety of plant communities. The central part of Tyncoed Pasture consists of a large area of fen-meadow, dominated by tussocky Purple Moor-grass. Associated species include Meadow Thistle, Devil's-bit Scabious, Velvet Bent (<i>Agrostis canina</i>), Flea Sedge (<i>Carex pulicaris</i>) and Tawny Sedge. Whorled Caraway is a notable feature of this community. The area adjacent to the stream has a more marshy element, characterised by Marsh Marigold, Marsh Pennywort and Marsh Valerian. A patch of fen-meadow to the west of the stream has a heathy character, containing frequent Cross-leaved Heath and bog-moss. The north-eastern part of the enclosure consists of rush-pasture, in which Sharp-flowered Rush is the dominant component. Small areas of mire are interspersed with the fen-meadow, dominated by Purple Moor-grass.</p> |
| Vicarage Meadows | 10.19 | <p>The site is a nationally important example of an upland type of unimproved, herb-rich grassland. The rich flora includes a number of uncommon plants. Many sedges occur, including the scarce but Soft-leaved Sedge (<i>Carex montana</i>). Some small wet and heathy areas support bog-mosses (<i>Sphagnum</i> spp.) and Round-leaved Sundew (<i>Drosera rotundifolia</i>).</p> |
| Waen Rydd | 242.46 | <p>The site is of special interest for its extensive areas of lowland bog and associated wet heath, marshy grassland, mire and flush communities. The site also includes a section of the Afon Cledan, which supports an important population of juvenile Atlantic Salmon. Stratigraphic studies of the bog have revealed up to 7.4 m of peat and the sequence of plant remains preserved in the peat suggest that the site is a modified example of a raised bog, a now rare type of lowland peatland which depends largely on rainfall as a source of water and nutrients.</p> <p>The bog vegetation is characterised by a high frequency of Hare's-tail Cottongrass and bog mosses amongst abundant Purple Moor-grass with Cross-leaved Heath, Heather, Bilberry (<i>Vaccinium myrtillus</i>), Common Cottongrass (<i>Eriophorum angustifolium</i>) and Narrow Buckler-fern (<i>Dryopteris carthusiana</i>). This vegetation often grades into wet heath. Within these habitats are small bog pools, where Round-leaved Sundew is locally frequent.</p> |

| Site name | Area in catchment (ha) | Description |
|-----------|------------------------|--|
| | | <p>Elsewhere in this northern area the vegetation has been modified under the influence of past burning, peat cutting and drainage. These areas tend to be dominated by dense tussocky Purple Moor-grass or by rushes. In some places Sharp-flowered Rush is accompanied by a variety of characteristic associates including Marsh Bedstraw, Ragged-robin, Lesser Skullcap, Whorled Caraway and, in one area, Greater Tussock-sedge. In the small north-western field, this type of rush pasture approaches a swamp community in the wettest areas, with Bogbean, Water Horsetail (<i>Equisetum fluviatile</i>) and Marsh Pennywort (<i>Hydrocotyle vulgaris</i>).</p> <p>Associated with the wet heath there are a series of wet runnels and flushes. Some are dominated by Bottle Sedge (<i>Carex rostrata</i>), with other species, including Sharp-flowered Rush, Bogbean, Bog Pondweed (<i>Potamogeton polygonifolius</i>), Carnation Sedge (<i>Carex panicea</i>), Common Yellow-sedge (<i>C. demissa</i>), Tawny Sedge, Common Cottongrass, Round-leaved Sundew and a high cover of the brown moss Yellow Starry Feather-moss (<i>Campylium stellatum</i>). Other runnels are characterised by a different assemblage, with Marsh St John's-wort (<i>Hypericum elodes</i>), Bog Pondweed, Common Cottongrass and Lesser Spearwort. White Beak-sedge (<i>Rhynchospora alba</i>) occurs in this community in the southern arm of the site, where there is also localised base-rich flushing, with abundant brown moss <i>Scorpidium revolvens</i> alongside species such as Marsh Valerian (<i>Valeriana dioica</i>), Marsh Lousewort and Whorled Caraway.</p> <p>Throughout the site there are patches of more acid flush. These areas are often species-poor but are characterised by a luxuriant carpet of bog mosses beneath rushes. There are also some areas of short-sedge dominated acid flush, characterised by species such as Star Sedge, Common Cottongrass, Bog Asphodel, Marsh Violet <i>Viola palustris</i>, Tormentil and Bulbous Rush (<i>Juncus bulbosus</i>) amongst abundant Cow-horn Bog-moss (<i>Sphagnum denticulatum</i>) and Papillose Bog-moss (<i>S. papillosum</i>).</p> <p>The north-western field also supports stands of Purple Moor-grass dominated mire with a tall herb element, and some areas of the site includes dry acid grassland.</p> <p>A section of the Cledan runs through part of the site and supports aquatic species such as Intermediate Water-starwort (<i>Callitriche hamulata</i>), Broad-leaved Pondweed (<i>Potamogeton natans</i>) and Alpine Water-moss (<i>Fontinalis squamosa</i>). In addition, there are patches of Grey Willow and Alder (<i>Alnus glutinosa</i>) scrub which have developed around the northern periphery of the site. These habitats add to the ecological and structural diversity of the site.</p> <p>This extensive wetland area supports a number of dragonflies including Keeled Skimmer (<i>Orthetrum coerulescens</i>), Golden-ringed Dragonfly (<i>Cordulegaster boltonii</i>), Common Darer (<i>Sympetrum striolatum</i>), Black Darer (<i>S. danae</i>), Emerald Damselfly (<i>Lestes sponsa</i>) and Large Red Damselfly (<i>Pyrrhosoma nymphula</i>). In addition, there is a good range of breeding bird species, such as Common Snipe (<i>Gallinago gallinago</i>), Curlew (<i>Numenius arquata</i>), Grasshopper Warbler (<i>Locustella naevia</i>) and Reed Bunting (<i>Emberiza schoeniclus</i>).</p> |

Appendix 3 Species of Conservation Concern

Table A3.3. Species of Conservation Concern within the Irfon catchment

| Group | Scientific name | Common name | Conservation status | Restricted species |
|------------|------------------------------------|-------------------------|---|--------------------|
| Mollusc | <i>Margaritifera margaritifera</i> | Freshwater Pearl Mussel | Habitats Directive A2, A5; Red list Global EN; Red list GB CR; Nationally Rare; BAP 2007; Env (Wales) Act S7; WACA Sch5 | ✓ |
| Isopod | <i>Proasellus cavaticus</i> | - | Nationally Scarce | ✓ |
| Crustacean | <i>Austropotamobius pallipes</i> | White-clawed Crayfish | Habitats Directive A2, A5; Red list Global EN; BAP 2007; Env (Wales) Act S7; WACA Sch5 | - |
| Beetle | <i>Plateumaris rustica</i> | - | Nationally Scarce | ✓ |
| Beetle | <i>Stictonectes lepidus</i> | - | Red list GB NT | - |
| Bug | <i>Chartoscirta cocksi</i> | - | Nationally Scarce | ✓ |
| Bug | <i>Aquarius najas</i> | River Skater | Nationally Scarce | ✓ |
| Caddisfly | <i>Potamophylax rotundipennis</i> | - | Red list GB DD; Nationally Scarce | ✓ |
| Caddisfly | <i>Tinodes maculachlani</i> | - | Nationally Scarce | ✓ |
| Crane fly | <i>Paradelphomyia nielsenii</i> | - | Notable | - |
| Fly | <i>Stilpon sublunatus</i> | - | Notable | - |
| Stonefly | <i>Brachyptera putata</i> | Northern February Red | Nationally Scarce; BAP 2007; Env (Wales) Act S7 | ✓ |
| Stonefly | <i>Protonemura montana</i> | - | Red list GB DD; Nationally Scarce | ✓ |
| Fish | <i>Alosa fallax</i> | Twaite Shad | Habitats Directive A2, A5; BAP 2007; Env (Wales) Act S7; WACA Sch5 | ✓ |
| Fish | <i>Anguilla anguilla</i> | European Eel | Red list Global CR; BAP 2007; Env (Wales) Act S7 | - |
| Fish | <i>Cottus gobio</i> | Bullhead | Habitats Directive A2 | - |

| Group | Scientific name | Common name | Conservation status | Restricted species |
|-----------|------------------------------------|---------------------------|---|--------------------|
| Fish | <i>Lampetra fluviatilis</i> | River Lamprey | Habitats Directive A2, A5; BAP 2007; Env (Wales) Act S7 | - |
| Fish | <i>Lampetra planeri</i> | Brook Lamprey | Habitats Directive A2 | - |
| Fish | <i>Petromyzon marinus</i> | Sea Lamprey | Habitats Directive A2; BAP 2007; Env (Wales) Act S7 | - |
| Fish | <i>Salmo salar</i> | Atlantic Salmon | Habitats Directive A2, A5; BAP 2007; Env (Wales) Act S7 | - |
| Fish | <i>Salmo trutta</i> | Brown/Sea Trout | BAP 2007; Env (Wales) Act S7 | - |
| Amphibian | <i>Bufo bufo</i> | Common Toad | BAP 2007; Env (Wales) Act S7; WACA Sch5 | - |
| Mammal | <i>Arvicola amphibius</i> | European Water Vole | Red list GB EN; BAP 2007; Env (Wales) Act S7; WACA Sch5 | - |
| Mammal | <i>Lutra lutra</i> | Eurasian Otter | Habitats Directive A2, A4; ECCITES A; BAP 2007; Env (Wales) Act S7; WACA Sch5 sect9.4b,WACA Sch5 sect9.5a,WACA Sch5Sect9.4c; HabReg Sch2; ConsRegsNI Sch2 | - |
| Mammal | <i>Neomys fodiens</i> | Eurasian Water Shrew | - | - |
| Lichen | <i>Collema dichotomum</i> | River Jelly-Lichen | Red list GB VU; Nationally Scarce; BAP 2007; Env (Wales) Act S7; WACA Sch8 | ✓ |
| Lichen | <i>Dermatocarpon meiophyllizum</i> | - | Nationally Scarce | ✓ |
| Lichen | <i>Verrucaria funckii</i> | - | Nationally Scarce | ✓ |
| Lichen | <i>Verrucaria latebrosa</i> | - | Nationally Rare | ✓ |
| Moss | <i>Racomitrium macounii</i> | Macoun's Fringe-moss | - | ✓ |
| Moss | <i>Sphagnum flexuosum</i> | Flexuous Bog-moss | - | ✓ |
| Moss | <i>Sphagnum platyphyllum</i> | Flat-leaved Bog-moss | - | ✓ |
| Moss | <i>Sphagnum subsecundum</i> | Slender Cow-horn Bog-moss | - | ✓ |

| Group | Scientific name | Common name | Conservation status | Restricted species |
|-----------------|--|----------------------|---|--------------------|
| Liverwort | <i>Pallavicinia lyellii</i> | Ribbonwort | BAP 2007; Env (Wales) Act S7 | ✓ |
| Liverwort | <i>Scapania paludicola</i> | Bog Earwort | - | ✓ |
| Fern | <i>Thelypteris palustris</i> | Marsh Fern | Nationally Scarce | ✓ |
| Flowering plant | <i>Althaea officinalis</i> | Marsh Mallow | Nationally Scarce | ✓ |
| Flowering plant | <i>Andromeda polifolia</i> | Bog-rosemary | - | - |
| Flowering plant | <i>Apium inundatum</i> | Lesser Marshwort | - | - |
| Flowering plant | <i>Carex echinata</i> | Star Sedge | - | - |
| Flowering plant | <i>Carex vesicaria</i> | Bladder-sedge | - | - |
| Flowering plant | <i>Carum verticillatum</i> | Whorled Caraway | - | - |
| Flowering plant | <i>Chamaemelum nobile</i> | Chamomile | Red list GB VU; Red list Wales EN; BAP 2007; Env (Wales) Act S7 | - |
| Flowering plant | <i>Dactylorhiza incarnata</i> subsp. <i>coccinea</i> | Early Marsh-orchid | - | - |
| Flowering plant | <i>Drosera intermedia</i> | Oblong-leaved Sundew | Red list Wales VU | - |
| Flowering plant | <i>Drosera rotundifolia</i> | Round-leaved Sundew | - | - |
| Flowering plant | <i>Eleocharis acicularis</i> | Needle Spike-rush | - | - |
| Flowering plant | <i>Epipactis palustris</i> | Marsh Helleborine | - | ✓ |
| Flowering plant | <i>Eriophorum angustifolium</i> | Common Cottongrass | - | - |
| Flowering plant | <i>Hammarbya paludosa</i> | Bog Orchid | Red list Wales EN; Env (Wales) Act S7 | ✓ |
| Flowering plant | <i>Hydrocotyle vulgaris</i> | Marsh Pennywort | - | - |

| Group | Scientific name | Common name | Conservation status | Restricted species |
|-----------------|--|-----------------------|---------------------|--------------------|
| Flowering plant | <i>Hypericum elodes</i> | Marsh St John's-wort | - | - |
| Flowering plant | <i>Littorella uniflora</i> | Shoreweed | - | - |
| Flowering plant | <i>Nymphoides peltata</i> | Fringed Water-lily | Nationally Scarce | ✓ |
| Flowering plant | <i>Pedicularis palustris</i> | Marsh Lousewort | - | - |
| Flowering plant | <i>Pinguicula vulgaris</i> | Common Butterwort | - | - |
| Flowering plant | <i>Potentilla palustris</i> | Marsh Cinquefoil | - | - |
| Flowering plant | <i>Radiola linoides</i> | Allseed | Red list GB NT | - |
| Flowering plant | <i>Ranunculus flammula</i> | Lesser Spearwort | - | - |
| Flowering plant | <i>Ranunculus fluitans</i> | River Water-crowfoot | - | - |
| Flowering plant | <i>Ranunculus peltatus</i> | Pond Water-crowfoot | - | - |
| Flowering plant | <i>Ranunculus penicillatus subsp. pseudofluitans</i> | Stream Water-crowfoot | - | - |
| Flowering plant | <i>Rhynchospora alba</i> | White Beak-sedge | - | - |
| Flowering plant | <i>Rorippa islandica</i> | Northern Yellow-cress | Nationally Scarce | ✓ |
| Flowering plant | <i>Salix repens</i> | Creeping Willow | - | - |
| Flowering plant | <i>Jacobaea aquatica</i> | Marsh Ragwort | - | - |
| Flowering plant | <i>Silene flos-cuculi</i> | Ragged-Robin | - | - |
| Flowering plant | <i>Sonchus palustris</i> | Marsh Sow-thistle | Nationally Scarce | ✓ |
| Flowering plant | <i>Spirodela polyrhiza</i> | Greater Duckweed | - | - |

| Group | Scientific name | Common name | Conservation status | Restricted species |
|-----------------|----------------------------|--------------------|---|--------------------|
| Flowering plant | <i>Stellaria palustris</i> | Marsh Stitchwort | Red list GB VU; Red list Wales VU; BAP 2007; Env (Wales) Act S7 | ✓ |
| Flowering plant | <i>Triglochin palustre</i> | Marsh Arrowgrass | - | - |
| Flowering plant | <i>Utricularia minor</i> | Lesser Bladderwort | - | - |
| Flowering plant | <i>Veronica scutellata</i> | Marsh Speedwell | - | - |