



WESTMEATH COUNTY COUNCIL

**DESKTOP SURVEY OF WETLAND SITES IN
COUNTY WESTMEATH**

FINAL REPORT

4TH FEBRUARY 2020

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Citation

Smith, G.F. and D'Arcy, D. (2020) Desktop survey of wetland sites in County Westmeath. Report prepared for Westmeath County Council.

ACKNOWLEDGEMENTS

We are indebted to the many organisations and individuals who have provided data and other information without which this report and Westmeath Wetlands GIS would not have been possible. In particular we thank Dr Peter Foss (Foss Environmental Consulting) and Wetland Surveys Ireland for making available to us the data underpinning the Map of Irish Wetlands. We are grateful to the following for generously providing access to wetlands data:

- Coillte
- Environmental Protection Agency
- Forest Service
- Geological Survey of Ireland
- Meath County Council
- National Parks and Wildlife Service
- OpenStreetMap Ireland
- Roscommon County Council
- Waterways Ireland
- Westmeath County Council

We thank Westmeath County Council GIS section for providing support, OSI vector mapping and aerial imagery.

This project was supported by the Heritage Council and by Westmeath County Council as an objective of the Westmeath County Development Plan. This project was also supported by the Department of Culture, Heritage and the Gaeltacht under the National Biodiversity Action Plan grant scheme.

We are especially grateful to Melanie McQuade, Heritage Officer for Westmeath County Council for initiating the project and for the support, assistance and patience she has provided throughout.

1 INTRODUCTION

1.1 Context

Westmeath is a county rich in wetlands, including raised bogs, fens, transition mires, wet woodlands, and rivers and lakes and fringing reedswamp and marsh. Wetlands are important for biodiversity and also for their value for humans, including recreation and tourism. Intact wetlands also provide many important ecosystem services, such as flood prevention, provision of clean water and carbon sequestration. Wetland habitats in Westmeath have declined as a result of conversion to another land-use, e.g. intensive agriculture or forestry, peat extraction for fuel or compost, and water pollution.

The value of wetlands in the county context is recognised by Westmeath County Council (WCC). Policy P-WET1 commits the council “to ensure that floodplains, wetlands and watercourses are protected for their biodiversity and flood protection value”. In particular, it is an objective (O-WET1) of WCC “to identify and map wetland sites of good ecological value and protect them for their biodiversity”. This *Desktop Survey of Wetland Sites in County Westmeath* directly addresses this commitment.

1.2 Aims and Objectives

The primary aim of the project is to provide detailed and accurate knowledge of the wetlands in County Westmeath in order to inform planning policy and prioritise future field work in the wetlands of the county. To achieve this, the key objectives are to:

- Describe and map boundaries of wetland sites, including lakes, watercourses, springs, bogs, fens, bog woodland, riparian and wet woodland
- Incorporate the results of previous studies, such as the *Westmeath Fen Survey* (Natura Environmental Consultants, 2007) and the *Westmeath Peatland Survey* (Natura Environmental Consultants, 2005)
- Outline priority sites for survey and conservation
- Highlight threats to wetland sites and make conservation recommendations
- Produce a GIS database to upload onto Westmeath County Council’s GIS mapping system that will inform the Westmeath County Development Plan and heritagemaps.ie, among others

In addition to the GIS database, other deliverables from the project will include:

- A project report detailing:
 - Methodology
 - Results
 - Analysis of the significance of the results
 - Recommendations for future survey work and conservation

- Bibliography of published and other data sources
- A wetland event during Heritage Week to raise public awareness
- An outreach event on World Wetlands Day to raise public awareness

2 METHODS

2.1 Data Sources

The project began by collating sources of wetland data and assessing their suitability and accuracy for use.

The **spatial** datasets that map **wetland extent** (i.e. vector polygon layers) that were reviewed and the results of that review are detailed in Table 1.

Other spatial data sources were reviewed, including point and linear vector layers and polygon layers without habitat-specific data (Table 2). Of these, the Map of Irish Wetlands (MIW) (Foss and Crushell, 2019) was the most valuable. This database provides point locations of wetland sites and a range of other data on habitats, species and conservation value. This database is the result of an extensive desk review of spatial datasets, published and unpublished reports, and consultations with knowledgeable experts. Many of the datasets listed in Tables 1 and 2 have been reviewed and incorporated into the MIW. To make full use of the MIW, the database and site location shapefile that underlie the online version of the dataset¹ were obtained from Dr Peter Foss and Wetland Surveys Ireland.

Using raster habitat mapping datasets was initially considered, including the National Ecosystem and Ecosystem Services mapping pilot Habitat Asset Register and Corine 2018. It was found, however, that the spatial scale of these national datasets was too coarse for the project and that little additional information was gained from them.

OSi vector mapping at 1:5000 scale in polygon shapefile format and also aerial imagery were obtained under license from WCC.

¹ <http://www.wetlandsurveysireland.com/wetlands/map-of-irish-wetlands--/>

Table 1. GIS datasets mapping wetland extent reviewed for this project

Dataset	Description	Review Outcome
Westmeath Fen Study (Natura Environmental Consultants, 2007)	County survey of fens compiled by desk study and limited field survey	Included in project
Westmeath Peatlands Study (Natura Environmental Consultants, 2005)	County survey of bogs and fens compiled by desk study and limited field survey	Included in project
Semi-Natural Grassland Survey 2007-2012 (O'Neill <i>et al.</i> , 2013)	National survey of semi-natural grasslands conducted by extensive field survey	Included in project
National Survey of Native Woodlands 2003-2008 (Perrin <i>et al.</i> , 2008)	National survey of native woodlands conducted by extensive field survey	Included in project
Raised Bog Monitoring and Assessment Survey 2013 (Fernandez <i>et al.</i> , 2014)	<p>Four GIS layers from national raised bog surveys:</p> <ul style="list-style-type: none"> • RBMA13_ecotope_map: field-based mapping conducted 2011-2013 • RBMA13_habitats_prior_2007: field-based mapping conducted prior to 2007 • RBMA13_unsurveyed_data_prior_2007: desktop mapping of non-field survey uncut raised bog sites <p>RBMA13_2dary_DRB_unsurveyed: desktop mapping of non-field survey cutover, cutaway and reclaimed raised bog sites</p>	<p>RBMA13_ecotope_map and RBMA13_habitats_prior_2007 included in project.</p> <p>Other two datasets used as reference information due to low spatial accuracy.</p>
Site-Specific Conservation Objectives GIS datasets (National Parks and Wildlife Service, 2019a)	<p>Partial mapping in SACs of Annex I habitat types that are qualifying interests, including:</p> <ul style="list-style-type: none"> • active raised bogs • degraded raised bogs • non-Annex high bog • alkaline fens • transition mire 	<p>Following datasets included in project:</p> <ul style="list-style-type: none"> • active raised bogs • degraded raised bogs • non-Annex high bog • alkaline fens • transition mire • lake habitats

Dataset	Description	Review Outcome
	<ul style="list-style-type: none"> • lake habitats • juniper formations • limestone pavement • <i>Cladium</i> fens • blanket bogs • hydrophilous tall herb swamp • wet heath • rivers with muddy banks • floating river vegetation • turloughs 	No data for Westmeath in other layers.
NPWS Indicative Habitat Mapping (Conservation Planning Unit, 2012)	Indicative habitat mapping for a small number of SACs and SPAs based on desk study, ground-truthing and previous survey work	Included in project
OSI Lakes (Environmental Protection Agency, 2016)	Lakes from OSI 1:50,000 scale mapping pre-2000. Some small lakes later added using either OSI orthoimagery (2005) or OSI large scale maps as a source.	Included in project
Waterways Ireland habitat mapping	Field-based habitat mapping of the national canal network conducted 2011-2017	Included in project
Coillte BioClass areas	Layer of sites with habitat and other data managed by Coillte for biodiversity. Based on review of pre-2010 field survey data supplemented by some additional field surveys in 2018.	Included in project
Coillte sub-compartments	Forestry sub-compartment polygons with information about land-use type, tree species composition and planting date.	Included in project
Forest Service Private Forests database (Forest Service, 2018)	National forest cover dataset with information on forest type (broadleaf, conifer, mixed) and some data on tree species and planting year. Original FIPS dataset produced 1995 based on satellite imagery interpretation. Supplemented by planting grant application data.	Included in project
Inventory of Ancient and Long-Established Woodland (Perrin and Daly, 2010)	Provisional national survey of native and non-native old and ancient woodlands	Used as reference information as sites all included in other datasets

Dataset	Description	Review Outcome
Meath Wetlands Survey (Compass Informatics and Wilson, 2010)	Survey of wetlands in County Meath	Used as reference information for cross-border sites
Longford and Roscommon Wetlands Survey (Foss <i>et al.</i> , 2017)	Survey of wetlands in Counties Roscommon and Longford	Used as reference information for cross-border sites

Table 2. Other spatial datasets reviewed for this project

Dataset	Description	Review Outcome
Map of Irish Wetlands (Foss and Crushell, 2019)	Database and GIS point layer of wetland sites collated from numerous published and unpublished data sources.	Included in project
NPWS designated area site boundaries	Boundaries of SACs, SPAs, NHAs and pNHAs in vector polygon format (SAC_ITM_2019_08, SPA_ITM_2019_06, NHA_ITM_2019_06, Pnha_itm_2015_11)	Used as reference information or wetland site boundaries in a few sites
OSI Rivers (Environmental Protection Agency, 2017)	A river routes shapefile of Ireland's rivers at a scale of 1:50,000 showing rivers as complete lines attributed with name and Strahler river order.	Used as reference information
GSI Groundwater Karst Features (Geological Survey of Ireland, 2019)	Point layer of the centre of karst features, including springs	Used as reference information for geological context and location of potential petrifying spring habitats.
NPWS petrifying spring records (National Parks and Wildlife Service, 2006)	Point locations of Annex I petrifying springs (7220) sourced from NPWS fen study (Foss, 2007)	Included in project
Teagasc/EPA Soils Wet/Dry dataset	County-scale polygon dataset of soil types (soils_ie_WetDry_Westmeath.shp) including categorisation as poorly drained or peat	Used as reference information and for filtering other datasets
OpenStreetMap Ireland townland boundaries (OpenStreetMap Ireland, 2019)	Townland boundaries	Used as reference information and for naming wetland sites
BirdWatch Ireland IWeBS count locations	Point locations of sites used for Irish Wetland Bird Surveys.	Not used as data incorporated into Map of Irish Wetlands
National Frog Survey 2010-2011 sites	Point locations of frog records	Not used as no additional sites covered by dataset

2.2 Dataset Compilation

2.2.1 Source Dataset Preparation

Prior to use, datasets were clipped to the Westmeath county boundary (where required) as defined by OSi 1:5000 vector mapping.

GIS layers with a mixture of wetland and non-wetland habitats, e.g. the Irish Semi-natural Grassland Survey (ISGS) and the National Survey of Native Woodlands (NSNW), were filtered so that only wetland habitat types were used in the project. For example, bog woodland (WN7) polygons were retained, but oak-birch-holly (WN1) polygons were not. For some datasets, this was not possible, for example with PrivateForests2018 where habitat information was less detailed. In these cases, polygons were selected for use in the project where they intersected peat or poorly drained soils in the Teagasc/EPA soils dataset.

2.2.2 Source Dataset Evaluation

Given the abundance of good quality data on wetland habitats, a decision was made to map wetland sites at the habitat level, where possible. The main challenge that arose with this approach concerned uncertainty regarding the quality of the data sources in terms of wetland composition and spatial extent, especially where habitat polygons from different datasets overlapped. As highlighted in the *Best Practice Guidance for Habitat Survey and Mapping* (Smith *et al.*, 2011), potential data sources were critically evaluated to rank their thematic (i.e. habitat type assignment) and spatial quality.

Different data sources reported on wetland composition, threats and conservation value using different scales and different habitat classification systems. In many cases, it was difficult to confidently assign habitat types, for example, to older or more poorly defined survey data. Furthermore, the origins of data varied from field-based surveys to desktop studies based on proxies, such as soil data and aerial photo interpretation. Lastly, some wetlands mapped in older data sources were found to have diminished in area or disappeared entirely due to agricultural reclamation, peat extraction or afforestation.

Considering these factors, the contributing datasets were ranked according to thematic and spatial accuracy, with higher ranking datasets given precedence over lower ranking datasets in the habitat layer creation process. This was formalised and recorded in the GIS dataset by use of "(thematic) data quality" and "spatial quality" codes, following Smith *et al.* (2011). Code rankings are given in the metadata in Appendix A. Separate codes were used because one dataset may have lower thematic accuracy but higher spatial accuracy than another. For example, the EPA Lake Segments dataset was found to have greater spatial accuracy than NPWS Indicative Habitat Mapping data for lakes, but lacks the information about lake habitat type that the latter dataset has.

As a general rule, when considering thematic accuracy, more recent datasets were ranked higher than older datasets, with 10 years used as an arbitrary threshold defining the highest ranked datasets, following Smith *et al.* (2011).

2.2.3 Workflow

The MIW was taken as a starting point, as this was the most comprehensive data source available, although it does not map the spatial extent of wetland habitats or sites. For each site in the MIW, the workflow began by merging the more recent, higher quality vector polygon datasets. To this data from the lower ranked, older (>10 years old) vector polygon datasets were added. Aerial photography, OSi 1:5000 vector mapping and other reference datasets were used to check and edit the current extents of wetland polygons in the draft GIS database in the event of any changes after the original data were captured.

Locations of other wetland sites not included in the MIW were gathered from other spatial data sources, and their extents were digitised following review of aerial photography.

For many sites, additional digitising was necessary to fill gaps between polygons or where there were little or no polygon data available. Where appropriate, digitising followed 1:5000 OSi vector mapping boundaries or used entire OSi polygons to form the blueprint. In other words, habitat boundaries matched OSi mapping vectors exactly, where appropriate. Where wetland habitat boundaries did not coincide with existing OSi polygon boundaries, these were digitised at 1:2500 or 1:5000 scale, depending on the size of the polygon over aerial imagery. Habitat polygons were clipped to the OSi 1:5000 county boundary.

Attribute information was taken from the most up-to-date and accurate dataset. Habitat information and other data for new polygons were entered according to the best available information from non-spatial sources, such as site descriptions. Attributes in the habitat layer dataset are detailed in Appendix A.

This workflow is shown in Figure 1 below.

Following completion of the habitat layer, the habitat polygons were dissolved to the site code level to produce a layer of wetland sites.

The Westmeath wetland GIS layers were produced in the Irish Transverse Mercator (ITM) coordinate reference system. The datasets were provided to WCC in ESRI shapefile format, to ensure compatibility with the WCC GIS system.

All GIS work was carried out using QGIS 3.4 (QGIS Development Team, 2019).

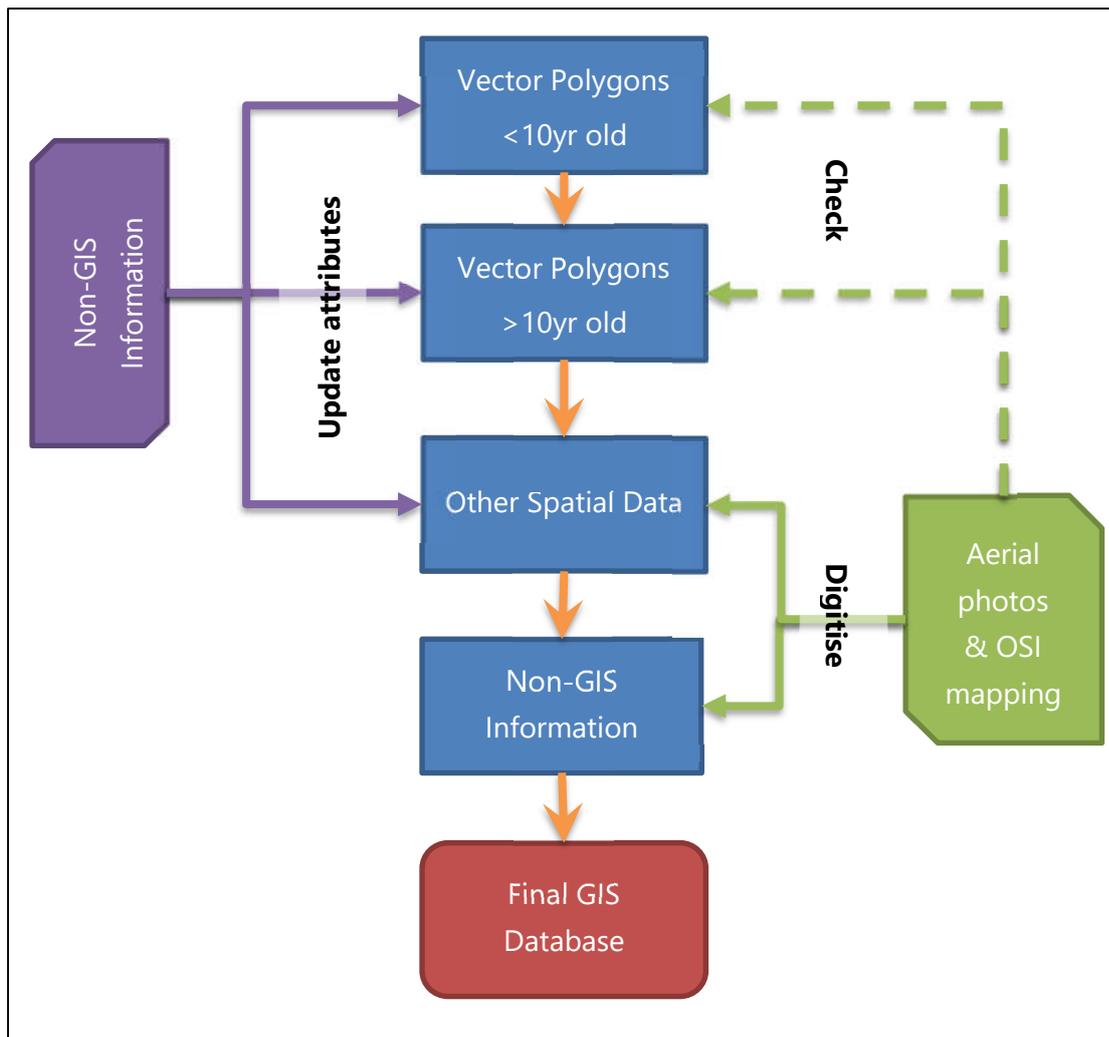


Figure 1. GIS database workflow

2.3 Quality Control

The final draft GIS database was run through a series of quality control checks using QGIS 3.4 and GRASS 7.8. Quality control checks and corrections included:

- Multi-polygon features were converted to single polygons
- Invalid geometries (e.g. self-intersections, polygons with <3 nodes) were manually corrected
- Polygons < 25m² were merged with the largest adjoining polygon
- Polygons ≥ 25 m² but < 100 m² were manually checked before merging (to retain small ponds, etc.)
- Duplicate polygons were deleted
- Overlaps between polygons were removed
- Very small angles (effectively 0°) were removed to eliminate slivers and spikes

- Gaps between polygons < 2 m wide were eliminated
- Sliver polygons < 2500 m² and with a perimeter : area ratio of > 0.4 were merged with the largest adjoining polygon, with the exception of watercourses (FW) and freshwater ponds (FL)

Summaries of attribute data values were inspected to detect errors in attribute values (e.g. invalid habitat codes) or impermissible missing values (e.g. unique site identifier).

INSPIRE Directive compliant metadata accompany the project GIS.

3 RESULTS

3.1 Outreach

A wetlands event was held at Carn Park Bog SAC during Heritage Week 2019 where raised bog ecology and restoration was discussed in the context of the Coillte raised bog restoration LIFE project.

A second wetlands outreach event was held on World Wetlands Day, 2nd February 2020, where a very large turnout visited and discussed the transition mire, alkaline fen and bog woodland habitats visible from the boardwalk at Scragh Bog SAC.

3.2 Wetland Extent

3.2.1 Overview

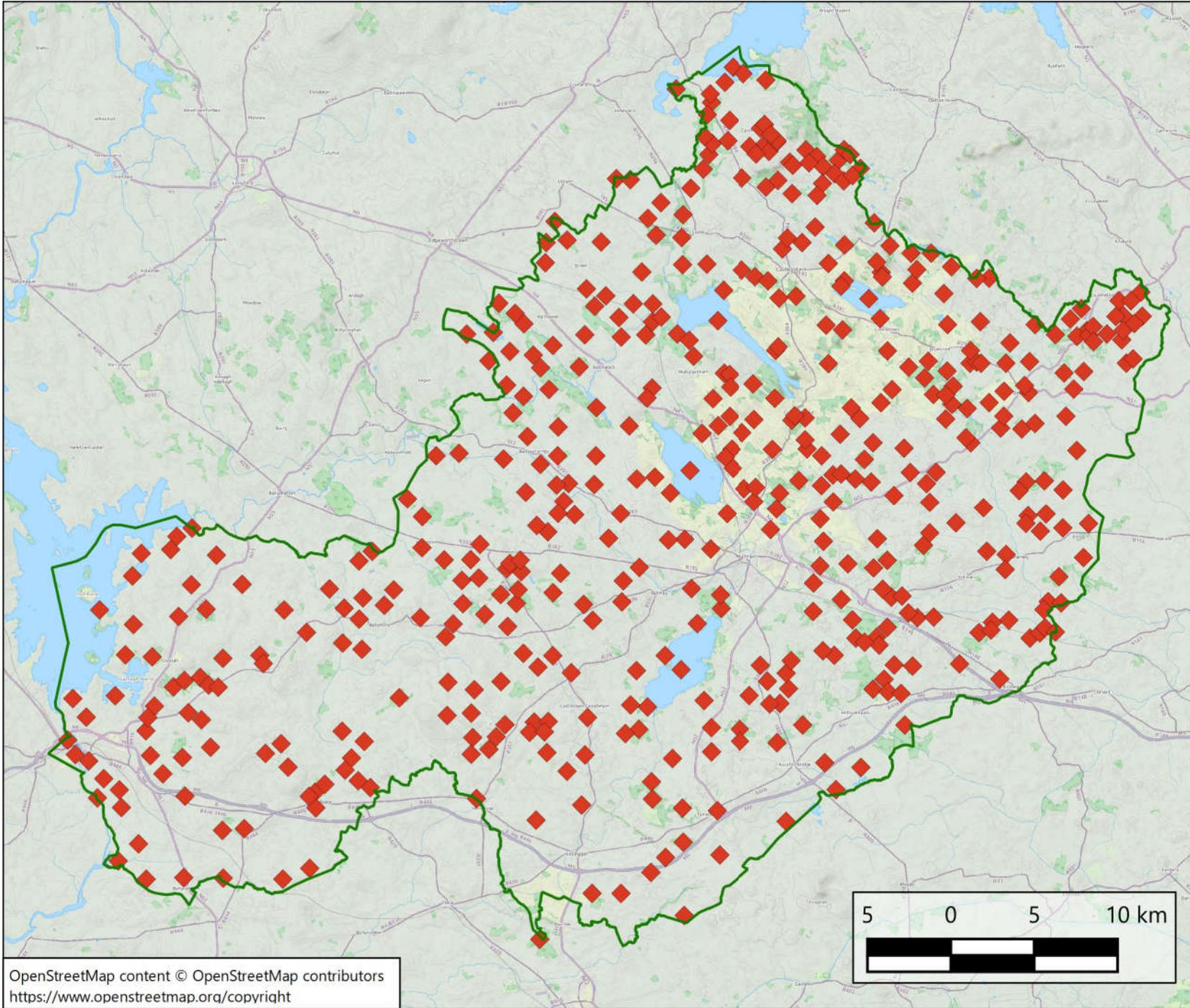
A total of 493 wetland sites have been mapped across Westmeath (Figure 2 and Figure 3). The total area of wetlands mapped in the county is 310.9 km², which represents 16.9% of the county. The sites vary greatly in terms of area and the amount of information that is available for them. The definition of a wetland "site" was often problematic in that several sites were contiguous with each other. In addition, large sites, especially designated areas, often formed complexes of sites. In the MIW, these are termed "main sites" and "sub-sites". For example, Lough Ree SAC is a main site in the MIW database with several subsites for significant additional areas of wetland habitat that have been described separately in other studies, such as Coosan Lough and Ross Lough.

These sites are widely distributed across the county, with a higher density in the north-east where smaller wetlands, especially lakes and ponds, are more frequent (Figure 2). Some of the apparent gaps in wetland site distribution can be explained by the presence of very large wetland sites, such as lakes and raised bog / cutover bog complexes (Figure 3).

3.2.2 Designated Areas

A total of 49 wetland sites, or 10.7% of the total number are located at least partly within designated areas (SACs, SPAs, NHAs). An additional 14 wetlands sites are located within standalone pNHAs, i.e. pNHAs that are not also designated as SACs or SPAs.

The importance of wetlands in Westmeath compared with dryland habitats is demonstrated by the fact that all but one of the designated areas in the county are designated mainly because of their wetland habitats and the species they support. The sole exception is the Split Hills and Long Hill Esker SAC, which is primarily a dry esker grassland site, but even it supports a small area of wetland habitat. The vast majority of pNHAs are also wetland sites, with the few exceptions being esker or hilltop dry grassland and woodland sites.



Legend

- ◆ Wetland sites
- Westmeath county boundary

Figure 2. Distribution of Westmeath wetland sites

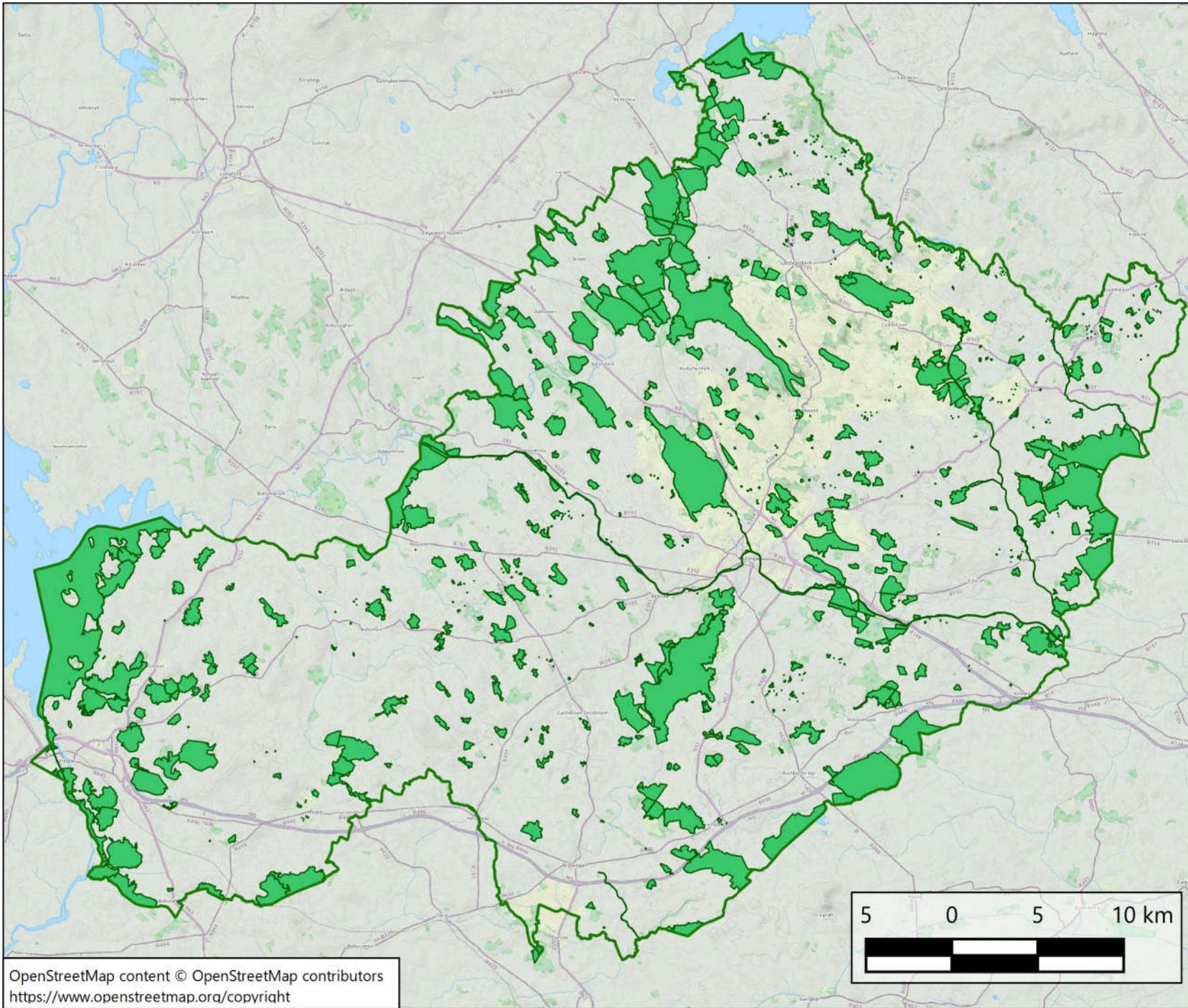
Westmeath Wetlands Survey

Scale 1:325,000

04-02-2020

Rev 1





Legend

-  Westmeath wetland sites
-  Westmeath county boundary

Figure 3. Westmeath wetland sites

Westmeath Wetlands Survey

Scale 1:315,000

04-02-2020

Rev 1



3.3 Wetland Habitats

3.3.1 Heritage Council Classification

For each habitat polygon in the project GIS, the habitats that are *likely* to be present were listed. The quality of this information varied greatly, depending on whether the site had been surveyed previously in the field, how comprehensive the survey was, and when it was carried out. The confidence that can be placed in the likely habitat types listed for each polygon is listed in the project GIS under the DATA_QUAL attribute (Appendix A).

Sample habitat maps of wetland sites produced from the project GIS are shown in Appendix B.

From the information on the likely presence of habitats in a site, the frequency of habitat types in Westmeath wetland sites was calculated to identify the most common wetland habitats in the county (Table 3). The wetland types that are likely to be most frequent in the county were wet grasslands, (wet) scrub, rich fen, cutover bog, and mesotrophic lakes and ponds. Data are not presented for depositing/lowland rivers (FW2) or drainage ditches (FW4) as these were not consistently recorded for every site. Drains are probably present in nearly all wetland sites.

Wet grasslands are likely to be underestimated for the county as a whole. The data sources did not contain many of the pure wet grassland sites that are probably frequent across the county as it is difficult to distinguish this habitat type from improved grassland on wet soils without detailed field survey.

Scrub in this survey was restricted to variants associated with other wetland habitats, especially the more developed wet woodlands.

Rich fen is notably frequent in the county. Westmeath has been noted as a national hotspot for fens and is considered to have good potential for the discovery of new fens (Foss, 2007). Natura Environmental Consultants (2007) estimated the area of fen (all types) in the county as 1587 ha or 0.9% of the area of the county.

Cutover and industrial cutaway bog was frequent and present in every raised bog site.

Mesotrophic lakes were present in nearly a third of wetland sites as is appropriate for the Lake County. These sites include several that comprise farm ponds, which can be valuable for biodiversity in a local context. As determining the trophic status of lakes requires field survey, it may be that the frequency of mesotrophic lakes has been overestimated and the abundance of eutrophic lakes has been underestimated.

Bog woodlands are woodlands of birch and other species on cutover bog or, more rarely, intact raised bog. They are quite frequent on most raised bog sites in the county.

Other artificial lakes and ponds includes quarry ponds and farm ponds of manmade origin. The latter are difficult to distinguish from small, naturally occurring lakes. In most cases, farm pond polygons were assigned as potentially being either artificial ponds (FL8) or mesotrophic ponds (FL4).

Table 3. Frequency of Heritage Council habitat types in wetland sites

Habitat Type	Habitat Code	Percentage of Sites
Wet grasslands	GS4	61.5%
Scrub	WS1	58.6%
Rich fen	PF1	40.0%
Cutover bog	PB4	33.1%
Mesotrophic lakes	FL4	30.8%
Bog woodlands	WN7	26.8%
Other artificial lakes and ponds	FL8	26.2%
Wet willow-alder-ash woodlands	WN6	23.9%
Reed and large sedge swamp	FS1	22.3%
Raised bog	PB1	20.3%
Marsh	GM1	9.9%
Poor fen and flush	PF2	6.1%
Limestone/marl lakes	FL3	4.1%
Transition mire and quaking bog	PF3	3.4%
Calcareous springs	FP1	3.2%
Tall-herb swamps	FS2	3.2%
Turloughs	FL6	2.6%
Eutrophic lakes	FL5	1.6%
Dystrophic lakes	FL1	1.2%
Acid oligotrophic lakes	FL2	0.2%

Wet willow-alder-ash woodland commonly occurred in association with other wetland types, such as fens, lakes and rivers. They were frequently difficult to distinguish from bog woodland and scrub without field survey data.

Reed and large sedge swamp is a habitat that frequently occurs along lakes, rivers and canals. It can also be found associated with other wetland types, such as infilled ponds or degraded fens.

Intact raised bog is present in just over 20% of Westmeath wetland sites, highlighting the county's importance in conserving this habitat.

Other wetland habitats are considered likely to be less frequent. Some of these habitat types are difficult to detect without specialist field survey, such as limestone/marl lakes, transition mire and tall-herb swamp. Habitats typical of acidic soil or water conditions are expected to be less frequent, given the limestone geology that underlies almost all the county. These include poor fen and flush, dystrophic lakes and acid oligotrophic lakes.

Given the degree of uncertainty regarding what habitat types were present within a site, which depended on the quality of the source data, it was not possible to derive meaningful statistics on the area occupied by different habitat types. Cutover bog (PB4) and lakes, especially mesotrophic lakes (FL4), were often among the largest habitat types within a site and would be expected to be among the most abundant in the county.

3.3.2 Habitats Directive Types

There is also uncertainty regarding the presence of Habitats Directive habitat types in Westmeath wetland sites. A more conservative approach was taken with these habitat types than with the Heritage Council classification. Habitats Directive types were only recorded as present in a site if there was good evidence, such as having been confirmed by field survey. Therefore, it is likely that many Habitats Directive types are more frequent than the current evidence suggests. This is especially the case for habitats that can be difficult to identify, such as *Molinia* meadows (6410), or where they have been poorly defined in Ireland, such as transition mires (7140) and natural eutrophic lakes (3150). Alkaline fens were recorded as the most frequent habitat type, followed by active and degraded raised bogs (Table 4).

Table 4. Frequency of Habitats Directive habitat types in wetland sites

Habitat Type	Habitat Code	Number of Sites	Percentage of Sites
Alkaline fens	7230	56	11.4%
Degraded raised bog	7120	19	3.9%
Active raised bog	7110	14	2.8%
<i>Cladium</i> fens	7210	11	2.2%
Turloughs	3180	10	2.0%
Transition mire	7140	10	2.0%
Hard water lakes	3140	8	1.6%
Alluvial forest	91E0	8	1.6%
Petrifying springs	7220	5	1.0%
Natural eutrophic lakes	3150	3	0.6%
<i>Molinia</i> meadows	6410	2	0.4%
Hydrophilous tall herb swamp	6430	2	0.4%
Bog woodland	91D0	2	0.4%

Westmeath is known to support some of the best examples of some Habitats Directive habitat types in the country. These include the transition mire (7140) at Scragh Bog, Lough Owel, a hard water lake (3140), and Garriskil Bog, which has some of the largest areas of active raised bog (7110) of the true Midland type.

3.4 Wetlands of County Value

The majority of wetland sites in the county are as yet of unknown conservation value and require further survey to understand their importance. On the other hand, sites of international and national value are reasonably well-known and most are designated as SACs, SPAs or NHAs or are pNHAs. Few sites have been able to be identified with confidence as being of local conservation interest.

A total of 51 wetland sites were judged to be of county-scale value for biodiversity conservation, either at present or in the recent past. These are listed and described in Table 5 and mapped in Figure 4. These sites consist mainly of fens, raised bogs and turloughs.

Two county value sites, however, appear to have been destroyed while another has been significantly damaged. Ballagh Bog was formerly thought to have supported the Habitats Directive habitat type, transition mire (7140), but it has been planted with conifers. There is the potential for some wetland habitat to persist in the site, however. Tullycross was formerly a small but active raised bog with good quality peat-forming vegetation. It has since been completely cutaway, and it is unlikely to be of any real conservation significance in its current state. Part of Ballykeeran Fen remains, but a large central portion has been afforested.

The sites of county value listed in Table 5 include several that have been candidates for NHA status but have not yet been formally proposed for designation. These include two raised bog sites that have been selected as new NHAs following a review in 2014 (Department of Arts, 2014) but have not yet been designated. Also included is Ballinderry Bog, which is currently part of Ballynagrenia and Ballinderry Bog NHA, but is proposed to be removed from the NHA following review (Department of Arts, Heritage and the Gaeltacht, 2014).

Table 5. County value wetland sites – habitat types likely to be present and site descriptions

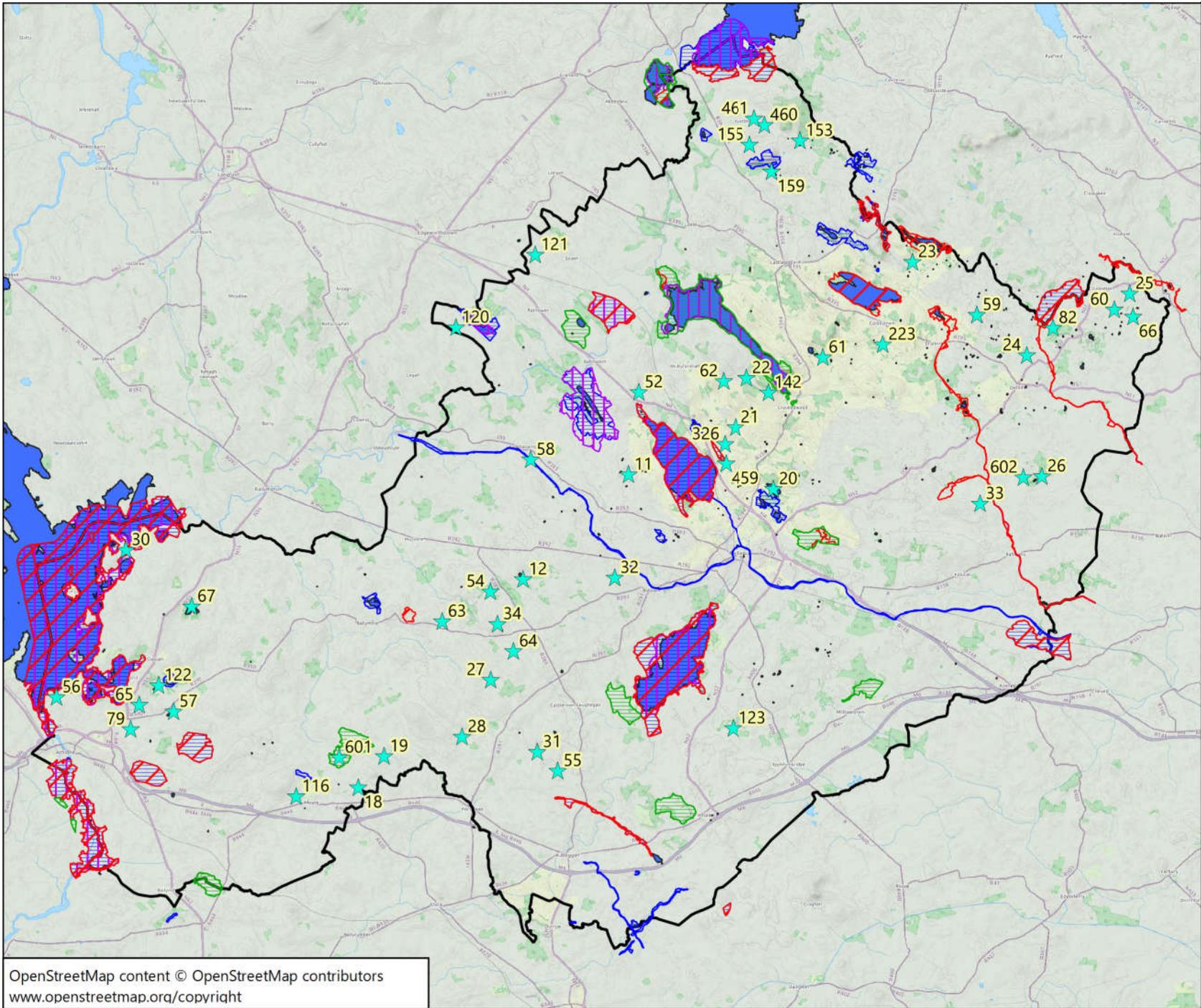
Site	Site Code	HC Habitat Types	Habitats Directive Types	Description
Archerstown Fen	59	FS1, GS4, PB4, PF1, WN7, WS1	7230	An alkaline fen to bog transition site. Intact bog is at the centre with heather, Sphagnum and sedges. The perimeter of the site is occupied by birch scrub and woodland.
Ardnagross Turlough Complex	460	FL6, GS4, WS1	3180	This site includes a turlough with two basins. Fencing has allowed willow scrub to develop.
Ballagh Bog	19	FP1, WD1, WD4		Formerly supported transition mire according to the NPWS Fen Study database (Foss, 2007). Afforested in 2004 with Norway spruce, ash and alder. Current status unknown.
Ballinderry Bog	528	GS4, PB1, PB4, WS1	7110, 7120	A small raised bog actively being cut that is separated from Ballynagrenia Bog by a mineral ridge. Following NPWS Raised Bog NHA review, Ballinderry Bog due to be removed from NHA.
Ballinderry Lough	18	FL4, FS1, FW2, GM1, GS4, PF1, WS1	7210, 7230	An area of fen and wet grassland dominated by purple moor-grass. Encroached by birch scrub. A small lake is in the southern end of the site. The site is divided by the Mullingar-Athlone greenway.
Ballykeeran Fen	65	GS4, PF1, WD4, WN6, WS1	7230	A mosaic of fen and wet grassland with scrub and wet woodland. A large section in the centre of the site has been afforested with conifers.
Ballynacarrigy - Deerpark Fen	58	GS4, PF1, PF3, WS1	7230	An area of fen and marsh vegetation on either side of the Royal Canal pNHA 0.5 km east of Ballynacarrigy bridge.
Ballynacliffy Fen	30	PF1, PB4, WD4, WS1, WS5	7230	Fen and cutover bog site adjacent to Lough Ree SAC/SPA. Pool areas with <i>Pyrola rotundifolia</i> . Rich diversity of species present.
Ballynagal Turlough	459	FL6, FS1, GS4, WN6, WS1	3180	This turlough consists of two linked pools and is near Scragh Bog SAC and supports a good diversity of habitats.
Balnavine Fen	23	PB1, PB4, PF1, WN6, WS1	7230	Schoenus fen (with <i>Carex lasiocarpa</i>) on cutover bog with some birch & willow scrub, but this is quite open. <i>Pyrola rotundifolia</i> site.

Site	Site Code	HC Habitat Types	Habitats Directive Types	Description
Benalbit Fen	55	GS4, PF1, WN6, WS1	7230	Alkaline fen with a seasonal (turlough-like) lake in winter. It is one of the few Westmeath sites for <i>Stellaria palustris</i> .
Bishops Lough	61	FL4, FS1, FW2, GS4, PF1, WD2, WN6, WS1	7230	Mosaic of fen with purple moor-grass and sedges around small lakes and willow woodland/scrub. A river meanders through middle of site.
Bog Lake	56	GS4, PF1, WN6, WS1	7230	Alkaline fen, wet woodland and scrub complex.
Bracklin Wood	529	WD2, WN2, WN7, WS1		Large woodland grading from mixed conifer woodland in the west to patches of oak woodland and extensive bog woodland in the east. Many mature oaks, yew and other species. Cherry laurel is invasive. Joint 2nd highest conservation ranking by NSNW in county.
Carlanstown Turlough	155	FL6, WS1	3180	A turlough in good condition with a diversity of plant communities surrounded by scrub. It is hydrologically connected to other water sources locally.
Castletown Upper Turlough	461	FL6, FL8, GM1, GS4, WS1	3180	A turlough in good condition that supports a good diversity of breeding waterbirds.
Cavestown	82	FP1, HH3, PF1, PF3, WN7, WS1		Wet woodland and open wetland parts of a site that includes long-established woodland on adjoining eskers. Together, the site is ranked by the NSNW as the woodland of joint 2nd highest conservation value in the county.
Clonagh Lake	24	FL3, FL4, GS4, PF1, WN6, WS1	7230	Complex of fen, wet grassland, woodland and scrub centred around a small lake. <i>Pyrola rotundifolia</i> present.
Clonyrina Fen and Grassland	27	FP1, FW2, PF1, GS1, WS1	6210, 7210, 7220, 7230	Fen, hazel scrub and calcareous grassland site. <i>Eriophorum latifolium</i> present.
Cloran Loughs	66	FL4, GS4, PF1, PF3	7140, 7230	The site is a series of kettlehole type lakes in limestone drift with fringing fen areas that are possibly classifiable as alkaline fen or transition mire.
Corbetstown Fen	33	FW2, GS4, PF1	7230	Small fen in the River Deel catchment near the River Boyne and River Blackwater SAC
Corclaragh Bog	121	GS4, PB1, PB4, WN7, WS1	7120	Selected as new NHA in the 2014 Raised Bog Conservation Plan NHA assessment

Site	Site Code	HC Habitat Types	Habitats Directive Types	Description
Cruckboeltane Turlough	142	FL6	3180	A turlough, known locally as the "gully-hole". It is a medium-sized basin. According to the landowner it is hydrologically linked to Lough Derravaragh. It is in good condition and grazing intensity is low.
Dromore Fen	31	FP1, GS4, PF1, WS1	7220, 7230	Fen grassland and rich fen associated with diffuse calcareous tufa forming flushes
Dún na Sí Turlough	116	FL4, FL6, FP1, GM1, GS4, WS1, WN6	3180	The county's first confirmed turlough located within the Dun na Si Amenity and Heritage Park. It consists of a central basin that remains wet in most years surrounded by a mosaic of marsh and sedge-dominated vegetation with scrub and wet woodland at the margins.
Garrysallagh Fen	21	FP1, FS1, FW2, GM1, GS4, PF1, PF3, WS1	7140, 7230	Flat bottomed valley of the River Gaine. Main habitat is rich fen covering about 30% of the site. Good population of <i>Pyrola rotundifolia</i> . Some quaking fen areas and some springs and seepage areas are present. Fen grades into wet grassland to south-east.
Hill of Ushnagh Grassland	34	FP1, FL3, FL4, GS1, WS1	7220	Springs, seepage areas and small loughs in calcareous grassland mosaic.
Kilbrennan (Gaybrook) Bog	123	PB1, PB4, WD2, WD4, WN7	7120	A small raised bog considered but not selected as a candidate for NHA designation. It is surrounded by cutover, and the southern part of the high bog has been afforested.
Killinagh Bog	120	GS4, PB1, PB4, PF2, WS1	7120	Selected as new NHA in the Raised Bog Conservation Plan NHA assessment in 2014. Site includes industrial cutaway.
Killua Castle Fen	25	GM1, GS4, PF1, WN6, WS1	7230	Alkaline fen has developed in dried out bed of an estate lake which was open water in 1913. 30% of site covered by fen (30% by wet woodland). <i>Pyrola rotundifolia</i> present.
Kilrush Lower Fen	60	PF1, WS1	7230	A small grassy/sedgy fen with purple moor-grass. Gorse, willow and birch scrub at edges.
Lalistown Fen	64	FW2, GS4, PB4, PF1, WD1, WD2, WS1	7230	A cutover bog that has developed fen vegetation with heather and purple moor-grass. Grades into wet grassland to the north. Mixed conifer/broadleaved woodland and more recent plantations are at the edge of the site.
Leny Fen	52	FW2, GM1, GS4, PF3, WS1	7140	Main habitat on site is transition fen with a well-developed moss layer. <i>Pyrola rotundifolia</i> present.

Site	Site Code	HC Habitat Types	Habitats Directive Types	Description
Lickbla Robinstown Turloughs	159	FL6, FL8, GA1, GS4	3180	One of the larger turloughs in the local area dominated by a grass-forb community. It is in good condition.
Lisclogher Bog	26	FL1, GM1, PB1, PB4, PF1, WN7, WS1	7230	Cutover bog and fen pool areas adjacent to extensive industrially worked raised bog site. Part of area may have been recently lost due to peat extraction.
Lisnagree Fen	28	FW2, GS4, PF1, WN6, WS1	7230	This is a wet fen adjacent to the Old Rail Trail. <i>Epipactis palustris</i> , <i>Eriophorum latifolium</i> and <i>Carex dioica</i> occur here.
Lough Drin	20	FL3, FL4, FS1, FW2, GM1, GS4, PF3, WD2, WD4, WN6, WS1	7140	Drained marl lake with <i>Pyrola rotundifolia</i> communities on former lake bed. Lake bed exposed by arterial drainage scheme.
Lough Makeegan Fen	67	FL3, FW2, GS4, PB4, PF1, WN6, WS1	7210, 7230, 91E0	Excellent fen fringing a hard-water lake with a range of fen habitats and several interesting species. Wet woodland with mature larch in places. The youngest part of the site has developed on old cutover over the last 60 years.
Lough Patrick	62	FS1, GS4, PF1, WS1	7230	Lough Patrick is a small lake in a depression surrounded by reed swamp, marsh and/or fen. Drains run perpendicular to lake.
Loughanstown Turlough	326	FL6, GA1, GS4, WS1	3180	A turlough with a diversity of vegetation communities, but suffering from nutrient enrichment and intensive grazing.
Monroe Fen	11	FL4, FW2, GM1, GS4, PF1	7230	This excellent example of fen has developed from open water. It is an extremely wet site, groundwater fed from three springs. Some quaking areas and an area of <i>Cladium</i> fen also recorded.
Morningtown Fen	22	GS4, PF1, WN6	7230	Wet grassland and fen with birch woodland. Site has significantly dried out between surveys in 1988 and 2006.
Mount Dalton Lough	12	FL4, FW2, GM1, GS4, PF1, PF3, WD1, WN6, WS1	7140, 7230	An excellent example of open water transition fen around edge of lough. Half the site still covered by open water. Some areas of calcareous fen with <i>Schoenus nigricans</i> on pure marl with grazing damage.
Rathskeagh Lower Fen	63	HH1, HH3, GS4, PF1, WS1	7230	Fen of heather, <i>Molinia</i> and gorse on east side of woodland/scrub and wet grassland to north. Cutover bog site.

Site	Site Code	HC Habitat Types	Habitats Directive Types	Description
Robinstown Wet Woodland	223	FW4, WD2, WN6	91E0	Part of a larger woodland complex ranked by NSNW as having joint 3rd highest conservation value in the county. Long-established woodland (LEW (II)).
Togherstown Fen	54	GS4, PF1, WD2, WD4, WN6, WS1, WS2	7230	Alkaline fen with extensive recent (2016) afforestation. Downgraded from B (national) conservation value.
Tonyowen Lower and Upper Turlough Complex	153	FL6	3180	A complex of small turloughs adjacent to seasonally flooded wet woodland. The site is threatened by nutrient enrichment and past dumping.
Tuitestown Fen	32	FL4, FW2, GS4, PF1, PF3, WD4, WN6, WS1	7230	Small lake (Tuitestown Lough) with two adjacent lakes both completely infilled with vegetation. Semi-natural woodland covers most of the site, but 1 ha area of transition mire also present. Wet grassland on river floodplain adjacent to lough.
Tullycross Cutover	79	PB4, WD4, WN7		Formerly a small bog of County value with a very wet central area of interconnecting pools and quaking Sphagnum carpets. The site is now industrial cutaway and requires survey to establish its conservation value, if any.
Twy Lough and Bog	57	FL3, FL4, FW2, GS4, PF1, WS1	7230	Two small lakes with associated fen and wet woodland.
Waterstown Bog	122	FL1, PB1, PB4, WD2, WN7		Small raised bog in a habitat mosaic. There is active peat formation along a half or two thirds of the lake margin. There are extensive fen and species-rich reed-bed areas which now divide the open water into pools.



Legend

- ★ Wetlands of county value for biodiversity (and site codes)
- Designated Areas**
- ▨ Special Areas of Conservation (SACs)
- ▨ Special Protection Areas (SPAs)
- ▨ Natural Heritage Areas (NHAs)
- ▨ Proposed Natural Heritage Areas (pNHAs)
- Lakes

Figure 4. Wetland sites of county value

Westmeath Wetlands Survey

Scale 1:320,000
 10-12-2019
 Rev 2



3.5 Threats to Wetlands

The area of wetlands in Westmeath prior to human exploitation and disturbance has been reduced to a fraction of its former extent. The conservation condition of most of those wetland habitats that remain has also been degraded. Many of these threats to wetland conservation are still ongoing.

Drainage and reclamation of wetlands for agriculture has historically been the greatest cause of wetland loss. For example, the original area of fen peat in Ireland has been estimated as being over 92,500 ha, while the current estimated area of all types of fen habitat is only 22,180 ha: a 75% reduction (Foss, 2007). Wetland reclamation for agriculture is still ongoing (G. Smith, pers. obs.) and is driven at least in part by incentives under the CAP to maximise the area of productive land for the Single Farm Payment. Statutory protection for wetlands against reclamation exists in the form of the European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011, but this applies only to areas over 5 ha, designated areas, or sites protected under county development or local area plans. The effectiveness of the EIA Agriculture Regulations 2011 remains unclear.

For raised bogs, peat extraction and associated drainage and burning have been the primary causes of habitat loss and degradation (Fernandez *et al.*, 2014, Fernandez Valverde *et al.*, 2005, Kelly *et al.*, 1995). Peat extraction has largely ceased on raised bog SACs and is being phased out in NHAs. Peat extraction for domestic use or industrially harvested for fuel or for peat compost is ongoing, however, on undesignated raised bogs in Westmeath. Cutover bog is frequently reclaimed for agriculture or afforested, but the end uses of industrial cutaway bog are dependent on the regulatory regime.

Most wetland sites have been drained to some extent in the past, and many are bounded by marginal drains. The effect of these drains is the long term drying out of wetland habitats. The effects of drainage on raised bogs is particularly well-known and severe (Fernandez *et al.*, 2014). Even old drains can function and dry out wetlands for many years without maintenance. Arterial drainage or other deep drains that affect the regional water table are particularly severe in their impacts on wetlands, as research at Clara Bog in Offaly has shown (Regan and Johnston, 2010). Arterial drainage schemes continue to operate in many wetland sites, including those of county value or higher, such as Ballinderry Lough.

As "marginal" land, it may require less effort to convert wetlands to plantation forestry – usually but not exclusively conifers – rather than reclaim them for agriculture. During the course of the project, several conifer plantations were noted on cutover bog or former fens. Many of these are legacy plantations that pre-date the current Forest Service policy of not grant-aiding afforestation on deep peat. This policy, however, does not protect wetlands on shallow peaty or mineral soils, such as marshes, wet grassland and some fens. Forestry inspectors take biodiversity into consideration when deciding whether to grant-aid new forests, but as they are not ecologists, they may be unaware of the value of some wetland sites.

Dumping and infilling wetlands with spoil or construction material has been noted as an issue in fens and many other wetland types (National Parks and Wildlife Service, 2019b), but the extent of the problem can be difficult to gauge without extensive monitoring.

Water pollution, especially nutrient enrichment leading to eutrophication has been a serious problem historically. It remains a problem for many wetlands, especially hard water lakes, such as Lough Ennell. Point sources from sewage discharges are becoming less of a problem, but the issues around diffuse sources from agriculture and rural septic tanks remain difficult to address.

Invasive species are a significant threat to particular wetland sites and include plants, such as rhododendron and Nuttall's waterweed, and animals, such as zebra mussel and dace.

4 RECOMMENDATIONS

4.1 County Wetlands Plan

- The information contained in the Westmeath Wetlands Survey should be used to inform a County Wetlands Plan – a plan for natural resources planning, “wise use” and the maximisation of the potential of wetlands for biodiversity conservation, habitat provision for wintering birds and other wildlife, amenity, flood alleviation, carbon sequestration and other green infrastructure provision.
- The county wetland plan would provide for the conservation of existing sites of county value, the restoration of sites of lesser value or those experiencing threats, and the creation of new wetlands.
- The County Wetlands Plan could be combined with or incorporated into an overall green infrastructure plan for the county.
- Key stakeholders should participate in the formulation and implementation of the plan, such as Coillte, the agricultural sector, Bord na Móna, the peat compost industry, quarry owners, local community representatives, NPWS, Inland Fisheries Ireland and other conservation organisations. The objective would be to form partnerships to provide for the conservation and management of wetlands integrated across all sectors.
- The remaining recommendations in this report can be incorporated into or implemented through the County Wetlands Plan.

4.2 Land Use Planning

- It should be an objective to increase the total area of wetlands in the county through restoration of drained and degraded wetlands and creation of new wetlands. New wetlands should be located where they would be effective buffers, ecological corridors or stepping stones connecting existing natural areas.
- Proposed developments on wetlands or potential wetlands should be subject to Ecological Impact Assessment (EclA) as part of the planning process.
- In line with Action 1.1.3 of the National Biodiversity Action Plan 2017-2021, developments or other projects (e.g. peat extraction for horticulture) should not result in a net loss of wetland habitat in the county. Where wetland loss is inevitable in a project of overriding public importance, this should be offset through the creation or restoration of similar wetland habitat elsewhere on site or off site.
- Wetland sites of county value should be listed for conservation in the County Development Plan and relevant local area plans, in line with the definition of “nature areas” in Regulation 2 of the European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011.

4.3 Local Communities

- Encourage the formation of local committees to sustainably manage wetlands in conjunction with such bodies as the Community Wetlands Forum.
- Efforts by local communities to conserve or restore local wetlands and to sustainably develop them for recreation (e.g. boardwalks) should be supported by Westmeath County Council.

4.4 Raising Awareness

- Ensure that landowners, land managers and other statutory/advisory bodies (e.g. the Forest Service, Teagasc) are aware of the wetland sites of county value and their value.
- Raise awareness of legislation and policies protecting wetlands, including the EIA Agriculture Regulations 2011.

4.5 Conservation

- Implement the Westmeath BAP 2014-2020.
- Identify wetlands sites under Westmeath County Council ownership where conservation management and restoration can be readily accomplished and prioritise these sites as "easy wins".
- Work with landowners to conserve and restore wetlands of county importance.
- Consideration should be given to forming EIP partnerships focusing a results-based agri-environment scheme for large and small wetlands sites.
- Identify areas of wetland habitat degraded through drainage, peat extraction and afforestation that have good potential for restoration. Restored wetlands should be located where they would be effective buffers, ecological corridors or stepping stones connecting existing natural areas.

4.6 Further Research

- Wetland sites of county value should be prioritised for field survey to validate their conservation importance and to gather information for their conservation management.
- Wetland sites of unknown or local value that have good conservation potential should be prioritised for field survey to better understand their ecology and assess their biodiversity importance.
- An indicative list of sites to be prioritised for field survey is presented in Table 6.
- The Westmeath Wetlands Survey GIS database should be treated as a living dataset and should be updated with the results of additional research and conservation efforts. In particular, the following NPWS research projects are known to be underway or recently completed, but their results were not available to incorporate into this project:

- Raised bog NHA surveys: updated raised bog ecotope data for several NHAs in Westmeath
- The Living Bog raised bog LIFE restoration project: updated raised bog ecotope mapping and habitat maps of cutover bog for Garriskil Bog SAC
- Pilot fen surveys: habitat mapping and monitoring of fen sites in 2019-2020, which should include several sites in Westmeath. Scragh Bog SAC was resurveyed in 2019.

Table 6. Indicative list of sites to be prioritised for field survey

Site Code	Site Name	Notes
19	BALLAGH BOG	Afforested. Verify if any biodiversity interest remains or can be restored.
39	LOUGH IRON	Appears to be extensive wetland habitat outside what is mapped. More information may be available in NPWS files.
54	TOGHERSTOWN FEN	Afforested. Verify if any biodiversity interest remains or can be restored.
59	ARCHERSTOWN FEN	
60	KILRUSH LOWER FEN	
61	BISHOPS LOUGH	
62	LOUGH PATRICK	
63	RATHSKEAGH LOWER FEN	
64	LALISTOWN FEN	
65	BALLYKEERAN FEN	
79	TULLYCROSS CUTOVER	Cutaway. Verify if any biodiversity interest remains or can be restored.
154	BALRATH WETLAND	
191	KNOCKMORRIS FEN	
212	MARTINSTOWN FEN	
218	KILCORNAN	
225	BALLYMACAHIL LAKE	
282	RATHCALED	
289	SHINGLIS BOG	Highlighted as local biodiversity site in Westmeath BAP
295	DERRIES BOG	
311	RATHDUFF	
312	DAVIDSTOWN RATHTRIM	
313	SIMONSTOWN POND AND WETLANDS	
320	GLASCARN LOUGHAN BOG	
322	BALLINLUG FARTHINGSTOWN	
333	LOUGHAGAR MORE MACETOWN BOG	
341	MACETOWN BOG	
345	BALTRASNA NORTH FEN	

Site Code	Site Name	Notes
356	KILLYNAN (COOKE) BOG SOUTH	
357	KILLYNAN LOUGHAGAR MORE BOG	
358	BLACK AND WHITE LOUGHS AND BOG	
361	BRUTONSTOWN LITTLE	
371	BANAGHER SOUTH	
382	KNOCKAVILLE SOUTH FEN	
396	KILLAVALLY BOG NORTH	
408	ROBINSTOWN BRACKAGH	
413	GALLSTOWN BOG COMPLEX	
429	LOUGH LUM	Seasonal lake with odd winter flooding shape in GA1. Potential turlough?
435	KILLAROO FEN	Older forestry appears failed on possible fen site. Potential for restoration?
440	ARDNAGRAGH (GRAY)	
456	COOSAN WEST	Potential development pressure.
465	BALLYKILMORE LOUGH WETLAND	Tyrrellspass Tidy Towns is interested in this site

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APPENDIX A WESTMEATH WETLANDS SURVEY GIS ATTRIBUTES

Attribute	Description
fid	Unique id number for each polygon
WH_SITE_ID	Westmeath Wetland Survey site code
SITE_NAME	Westmeath Wetland Survey site name
MIW_ID	Map of Irish Wetlands site code
OTHER_ID	Other site codes or names that have been used for the site
FOSS_CODE	Heritage Council habitat classification scheme level 3 habitat codes for habitats that are likely but not necessarily known to be present in the polygon.
FOSS_NAME	Heritage Council habitat classification scheme level 3 habitat names for habitats that are likely but not necessarily known to be present in the polygon.
ANNEX_CODE	Habitats Directive Annex I habitat type codes for habitats that are likely but not necessarily known to be present in the polygon.
DATA_QUAL	Quality of the source used for polygon attribute data, following Smith et al. (2011): <ul style="list-style-type: none"> • DA = source is 2010 or more recent, high quality and permits high confidence in the data • DB = source is pre-2010 but high quality and permits high confidence in the data • DC = source is of lesser quality supplemented by aerial photography interpretation
SPAT_QUAL	Quality of the source used for polygon spatial data: <ul style="list-style-type: none"> • A = source is 2010 or more recent, high quality and permits high confidence in the boundary • B = source is pre-2010 but high quality and permits high confidence in the boundary • C = boundaries digitised from aerial photography
CONS_VAL	Conservation value rank of the site, as adapted from the Map of Irish Wetlands ranking: <ul style="list-style-type: none"> • A = Internationally important [SACs and SPAs] • B = Nationally important [NHAs and pNHAs] • B/C+ = County conservation value (higher) [candidate NHAs not proposed for designation and other sites rated B by MIW that are not NHAs or pNHAs] • C+ = County conservation value (lower) • C = High local conservation value • D = Moderate local conservation value • E = Low local conservation value • F = Unknown conservation value, survey required

Attribute	Description
	<ul style="list-style-type: none"> • X = Former wetland site that appears to have been destroyed
DESIGNATED	Indicates if the polygon is in or partially in an SAC, SPA, NHA or pNHA and the designated area site code.
THREATS	<p>Significant threats to the conservation value of the site or polygon. For SACs and SPAs, these are threats and pressures with a High rank in the Natura 2000 Standard Data Form.</p> <ul style="list-style-type: none"> • Afforestation = polygon has been recently afforested • Agricultural abandonment = at risk of cessation of grazing, mowing or other agricultural management • Agricultural improvement = at risk of reclamation or improvement for agriculture • Development = at risk from development • Drainage = confirmed to be significantly impacted by drainage [sites without Drainage listed may still be negatively affected by drainage] • Dumping = negatively affected by dumping • Eutrophication = negatively affected by eutrophication • Hydrological changes = negatively affected by hydrological changes other than drainage • Infilling = polygon has been recently infilled • Invasive species = negatively affected by invasive non-native species • Moss peat extraction = negatively affected by moss peat extraction • Overgrazing = negatively affected by overgrazing • Peat extraction = negatively affected by ongoing peat extraction [sites without Peat extraction listed may still be impacted by past peat extraction] • Recreation = at risk from recreational activities • River drainage = negatively affected by river drainage works • Siltation = negatively affected by siltation • Urbanisation = at risk from adjacent urban habitats
DESCRIPT	Brief site description
SOURCE	<p>Source(s) for polygon spatial and attribute data:</p> <ul style="list-style-type: none"> • ALEW = Ancient and long-established woodland inventory • ANT = Athlone Nature Trail report • BAP = Westmeath Biodiversity Action Plan • CO_7140 = transition mire boundaries from NPWS Site Specific Conservation Objectives spatial data for SACs and SPAs • CO_7230 = alkaline fen boundaries from NPWS Site Specific Conservation Objectives spatial data for SACs and SPAs • CO_ARB = Active Raised Bog ecotopes from NPWS Site Specific Conservation Objectives spatial data for SACs and SPAs • CO_HB = High bog boundaries from NPWS Site Specific Conservation Objectives spatial data for SACs and SPAs

Attribute	Description
	<ul style="list-style-type: none"> • CO_LAKES = lake boundaries from NPWS Site Specific Conservation Objectives spatial data for SACs and SPAs • CO_PARB = Potential Active Raised Bog from NPWS Site Specific Conservation Objectives spatial data for SACs and SPAs • COILLTE_BIOC = Coillte BioClass area GIS • COILLTE_SUBS = Coillte sub-compartment GIS • CPUH = NPWS Conservation Planning Unit habitat GIS • EPA_LAKES = OSI lakes data obtained from the EPA • FS = Forest Service private forests database • GS = George F Smith personal knowledge of the site • GSI_KARST = GSI groundwater karst features GIS • ISGS = Irish Semi-natural Grassland Survey • MIW = Map of Irish Wetlands database • NPWS_7220 = NPWS petrifying spring records • NSNW = National Survey of Native Woodlands • OSI = Ordnance Survey Ireland vector mapping [spatial data only] • RBMA_CUT_DESK = NPWS Raised Bog Monitoring and Assessment desktop mapping of cutover, cutaway and reclaimed bog • RBMA_ECO = NPWS Raised Bog Monitoring and Assessment data from 2011-2013 surveys • RBMA_HAB07 = NPWS Raised Bog Monitoring and Assessment data from surveys prior to 2007 • RBMA_HB_DESK = NPWS Raised Bog Monitoring and Assessment desktop mapping of uncut high bog • SOILS = Teagasc EPA soil types dataset • WI = Waterways Ireland canal habitats GIS • WPS = Westmeath Peatlands Study and Westmeath Fen Study <p>Aerial imagery review was a data source for all polygons.</p>
AREA	Polygon area in square metres (m ²)

APPENDIX B SAMPLE WETLAND HABITAT MAPS



Wetland Habitats: Coosan Lough and
Friar's Island, Lough Ree

Westmeath Wetland Survey

Scale: 1:14,000

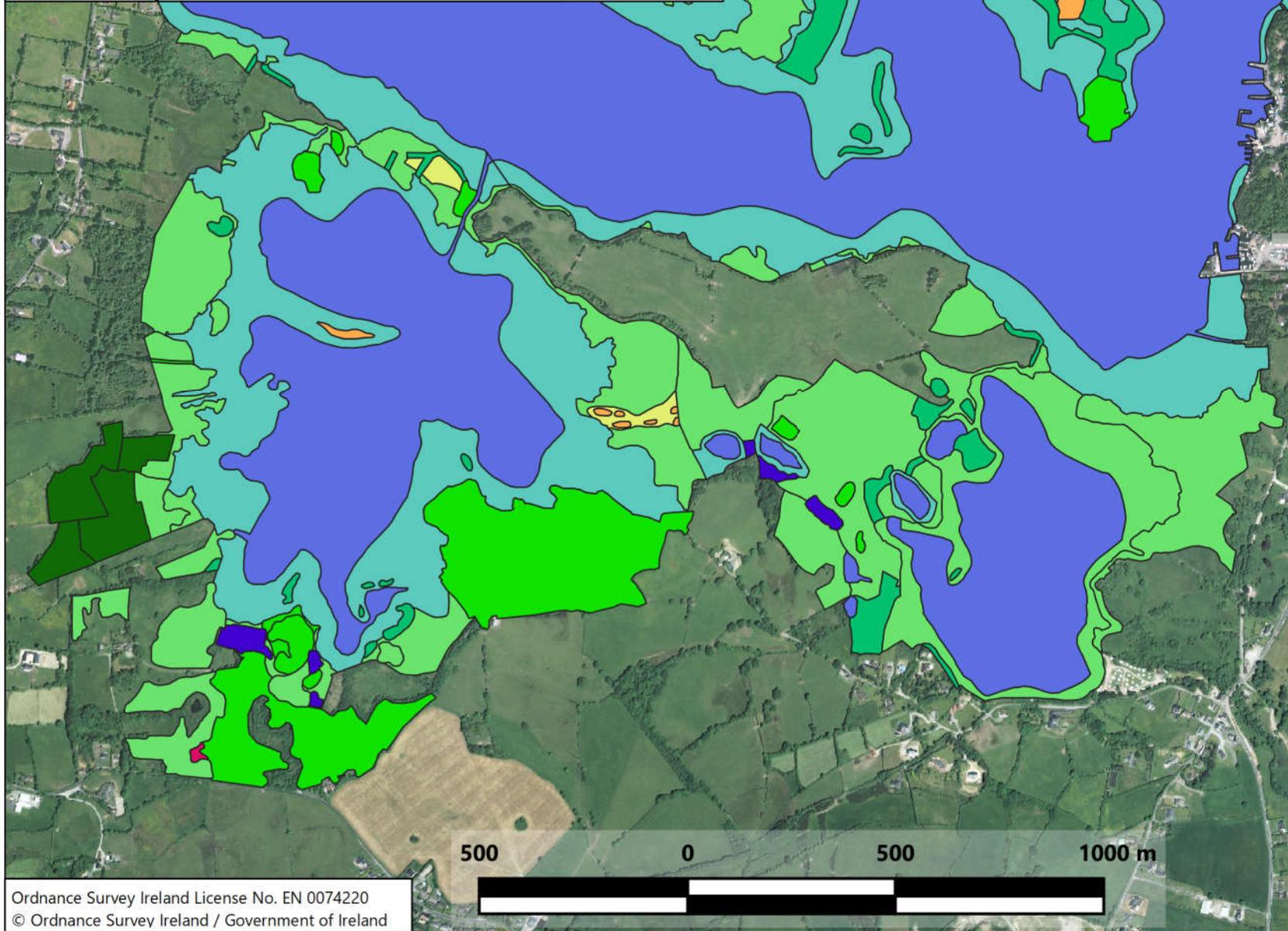
04-02-2020

Rev 1

Legend

Habitat types

-  Eutrophic lakes (FL5)
-  Reed and large sedge swamp (FS1)
-  Improved agricultural grassland (GA1)
-  Marsh (GM1)
-  Wet grassland (GS4)
-  Rich fen (PF1)
-  Broadleaved woodland (WD1)
-  Oak-ash-hazel woodland (WN2)
-  Wet willow-alder-ash woodland (WN6)
-  Scrub (WS1)





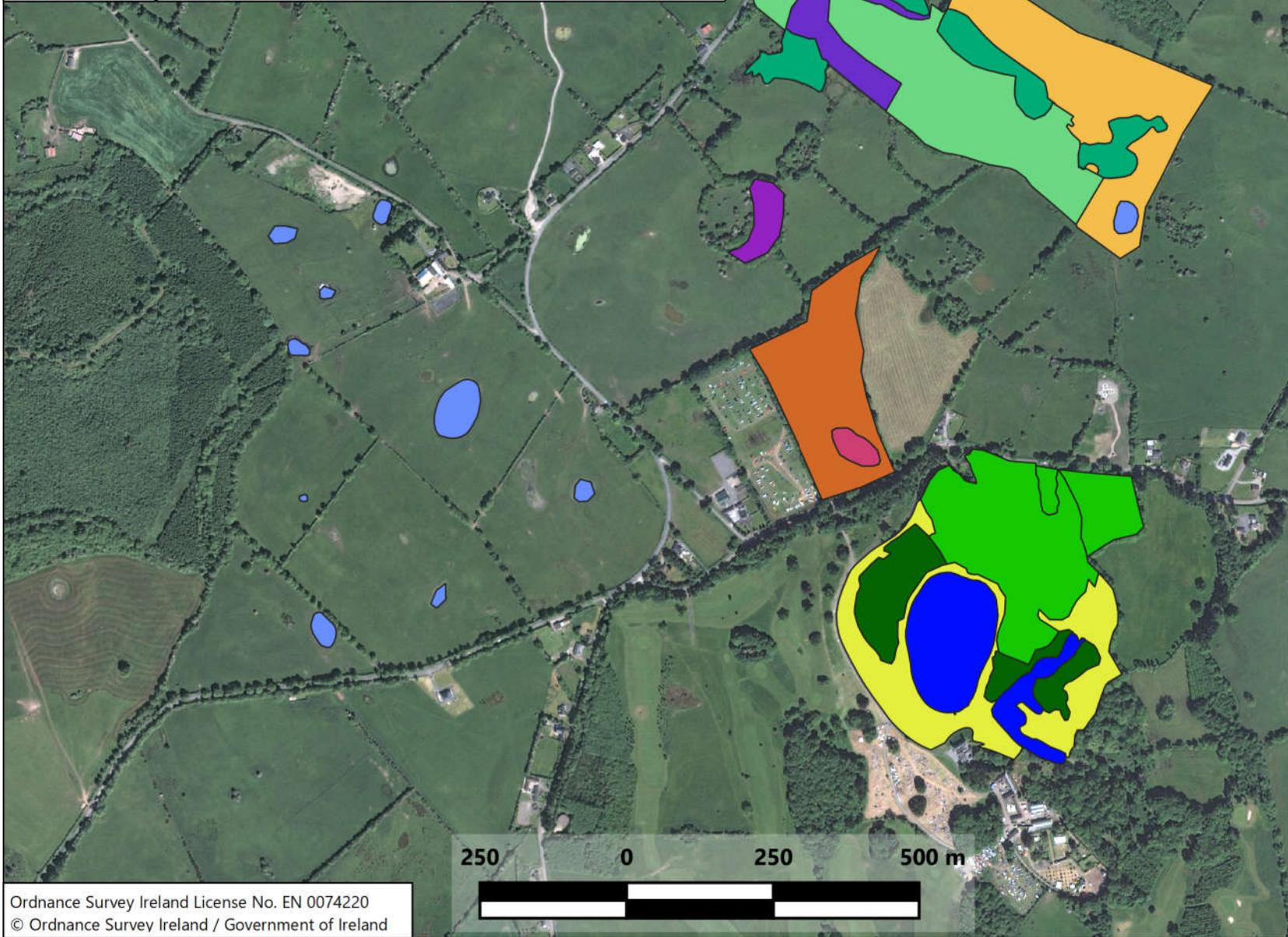
Wetland Habitats: Several small sites
near Ballinlough Castle, Delvin

Westmeath Wetland Survey

Scale: 1:10,000

04-02-2020

Rev 1



Legend

Habitat types

-  Mesotrophic lakes (FL4)
-  Mesotrophic lakes (FL4)/
Other artificial ponds (FL8)
-  Artificial ponds (FL8)/
Marsh (GM1)/Reedswamp
(FS1)
-  Amenity grassland (GA2)/
Dry meadows (GS2)/
Reedswamp (FS1)
-  Amenity grassland (GA2)/
Wet willow-alder-ash
woodland (WN6)/
Scrub (WS1)
-  Wet grassland(GS4)/
Scrub (WS1)
-  Rich fen (PF1)/
Wet grassland (GS4)/
Reedswamp (FS1)
-  Rich fen (PF1)/Scrub (WS1)
-  Broadleaved woodland
(WD1)
-  Conifer plantation (WD4)
-  Wet willow-alder-ash
woodland (WN6)/
Scrub (WS1)
-  Immature woodland (WS2)/
Wet willow-alder-ash
woodland (WN6)





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