

The County Wicklow Wetland Survey II

Report for Wicklow County Council and The Heritage Council

Part 1: Main Report



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an action of the
County Wicklow
Heritage Plan



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Part 1: Main Report & Part 2: Site Reports

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Report cover images:

Side Panel: Enteucha acetosae (Leaf Mining micro moth) larval leaf tunnel patterns on Rumex acetosa, Killalish Upper Co. Wicklow (Photo: P. Foss).

Top: Wetland area on the Murrough, Co. Wicklow (Photo: F. Wilson)

Bottom: Transition mire on Lugduff North, Co. Wicklow (Photo: P. Foss).

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County Wicklow Wetland Survey II 2012

The project involved a field survey of 56 freshwater wetlands in County Wicklow, with the aim of identifying the specific wetlands and ecological interest of each site. These sites had previously been identified as being of potential interest during the County Wicklow Wetland project prepared in 2011 or were proposed for survey in 2012 by Wicklow County Council. The sites selected for survey were suspected to contain notable wetland habitats including transition mire, bog, fen and wet heaths as well as potential breeding sites for Marsh Fritillary butterfly. This report presents the results of the 2012 field survey and includes detailed site descriptions and habitat maps for the wetlands surveyed.

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2 Executive Summary

1. The aim of the County Wicklow Wetland Survey Phase II (WWSII) was to continue the field survey of wetland sites identified during the County Wicklow Wetland Survey, (Wilson & Foss 2011) for which little or no habitat or ecological information was available, and to assess more recently identified sites proposed by the County Wicklow Heritage Officer.
2. A total of 65 sites were selected for potential survey in 2012. As suggested in the County Wicklow Wetland Survey report (Wilson & Foss 2011), the sites selected for survey included those believed to contain the EU Habitats Directive habitats: bog, heaths, transition mires, springs and fens as well as sites with a significant area of wetland habitats with the potential to support breeding populations of Marsh Fritillary butterfly.
3. Three of the sites on this list were proposed for survey by the Wicklow Heritage Officer on the basis that information currently held on them was incomplete. These included The Murrrough Wetlands (Site No. 6), Arklow Town Marsh (Site No. 193) and Kilmacurragh Quarry pond (Site No. 328). A number of pond sites were also selected for survey.
4. The initial list of 65 sites for survey is presented in **Appendix 1**. Due to time constraints/difficulties with access only 56 of these sites were surveyed in detail in 2012 with the remaining seven and many other wetland sites in the county requiring further field surveys.
5. Field surveys were undertaken on a total of 56 sites. These were surveyed in detail and site descriptions, conservation evaluation and habitat map were prepared (see **Appendix 2**). An attempt was made to survey an additional site (Humewood Ponds, Site No. 251) but access was not possible to the estate and a further site was identified during fieldwork in the general area (Ballyknockan Wet Heath, Site No. 339). Some sites remained un-surveyed due to time constraints.
6. On the surveyed sites, habitats were classified and mapped according to the Guide to Habitats published by The Heritage Council (Fossitt 2000). Threats and impacts on the wetland sites were recorded. Habitats that occur surrounding each wetland site were also noted.
7. The County Wicklow Wetland Survey II used a newly developed field survey recording system (using Filemaker Go software operating on an iPad) to record site survey data directly in digital format. This increased survey efficiency and reduced the likelihood of errors associated with the transfer of data from paper survey forms (see **Appendix 5 & 6**).
8. A paper based field recording card was also available for the 2012 survey (see **Appendix 3**). This contained the same recording fields as the iPad survey form, and was created in case of failure of the digital recording system. These paper based cards were not required during the 2012 survey.
9. Information from the digital field survey form, together with habitat maps and site photographs was stored within a upgraded County Wicklow Wetland Survey (WWS) database (version 2.0) re-designed from the 2011 version, for use on this project (see **Appendix 5**). The re-design of the survey database was undertaken to make data export from the survey database more compatible with Access and SQL data standards. Site data in the survey database is linked via the site code to the Wicklow Wetlands Map (WWM) database (version 2.0).
10. The information collected from the field survey was used to update the Wicklow Wetlands Map (WWM) GIS dataset which was created in 2011.

11. The combined data from the County Wicklow Wetland Survey (WWS) database and Wicklow Wetlands Site (WWM) database was used to produce the site survey reports presented in **Appendix 7** (see Report Part 2).
12. The main findings to emerge from the 2012 survey of wetlands are that a number of important wetland sites were identified during the survey (deemed to be of high local importance or greater). This included three transition mires one of which was of national importance whilst the other two are of county importance, three new breeding sites for the Marsh Fritillary butterfly and a new area of *Schoenus* rich alkaline fen with tufa springs which unfortunately was damaged resulting in a lowered site rating of county importance. These habitats and species are listed under the EU Habitats Directive as habitats or species of conservation importance.
13. Of the 56 sites which were fully surveyed one site was ranked of international conservation importance (A); 3 were ranked nationally important (B); 8 were of County conservation value (C+) and 10 sites were ranked as of local conservation importance (high value) (C). A further 30 sites were ranked as of Local conservation value, moderate to low value (D & E rating). Four sites were ranked as having no conservation value in terms of their wetland habitats. Two other sites require further detailed survey due to difficulties with access. (See Results section for additional details).
14. The results of the 2012 survey indicates that many important wetlands sites remain un-identified throughout the County and further surveys will be required to complete the inventory of wetland sites in County Wicklow.

3 County Wicklow Wetland Survey II

3.1 Background

In 2011 Wicklow County Council and The Heritage Council funded the production of a County Wicklow wetland GIS dataset and associated site database holding information on all known and potential freshwater wetlands in County Wicklow (Wilson & Foss 2011).

The County Wicklow Wetland Survey conducted in 2011, identified more than 881 potential wetland habitat polygons which have been mapped within the county, representing an area of 39,594 ha (or 19.5% of the entire county).

Of the 39,594 ha of the land area of the county covered by potential wetland habitats this is detailed as follows:

- 2,541 ha of lakes (including reservoirs and ponds),
- 2,8731 ha of bog and heath,
- 340 ha of wet woodland and scrub (including 73 ha of bog woodland),
- 189 ha of coastal wetlands (including salt marsh, dune slacks, tidal rivers and lagoons), and
- 90 ha of fens and transition mires.

32,623 ha of land are located within the boundary of the Wicklow Mountains SAC/SPA protecting much of the upland wetland habitats. A further 7,703 ha of potential wetlands identified during the 2011 study could not be assigned to a particular habitat type and require detailed surveys. Detailed information was stored on 192 wetland sites in the WWS Site database.

The 881 potential wetland areas were identified from a range of information sources, including published reports and surveys, other GIS datasets, recommendations from ecologists and from a systematic aerial photographic survey of the County, undertaken in conjunction with sub soil data and information on areas liable to flood within the County. Full details on how sites were identified and the data sources used in the preparation of the WWM GIS and WWM database is provided in Wilson & Foss 2011. In 2011 as part of the first County Wicklow Wetland Survey (Wilson & Foss 2011) a total of 17 previously un-surveyed sites were examined in detail as part of the field survey and site reports and habitats maps were produced. The survey information was held in the Wicklow Wetland Survey (WWS) database.

The main aim of the current County Wicklow Wetland Survey II (WWSII) 2012 project was to continue the wetland field survey of a selection of the most important un-surveyed sites identified in the Wicklow Wetland Survey project and assess their ecological status with the view of improving the knowledge of the wetland resource of County Wicklow. This aim was achieved by undertaking the following tasks:

- Sites that were deemed a priority for survey were selected following a review of the WWM 2011 dataset
- Detailed field surveys were undertaken on 56 sites
- Following the completion of field surveys, the ecological value of each site was assessed and sites were then ranked according to ecological importance
- All data recorded during the survey was stored in the WWS survey database
- The Wicklow Wetland Map (WWM) GIS dataset and Site database were updated to include the results of the 2012 survey

The outputs of the County Wicklow Wetland Survey II will assist Wicklow County Council in its obligations to protect the most important wetlands within the County and inform future conservation policies in relation to wetlands in County Wicklow.

3.2 Project summary

This County Wicklow Wetland Survey II (WWSII) project was undertaken over a 4 month period from the mid-June 2012.

The following is a summary of the main elements which formed the basis of the project, details of which are provided in the Materials and Methods section which follows.

- Sixty five sites were selected from the County Wicklow Wetlands Map (WWM) GIS dataset for possible survey in 2012.
- Sites were selected on the basis of the potential occurrence of EU Habitats Directive habitats (e.g. bogs, transition mire, wet heath, petrifying springs and fens) or which could support Annex II species such as Marsh Fritillary butterfly.
- On the recommendations of the 2011 survey a number of pond sites were also selected for survey.
- A small number of sites were also recommended for survey by the County Wicklow Heritage Officer on the basis that information currently held on them was incomplete. These included The Murrough Wetlands (Site No. 6), Arklow Town Marsh (Site No. 193) and Kilmacurragh Quarry pond (Site No. 328).
- Following the site selection process, field survey maps of the sites were prepared.
- As part of the 2012 survey, a digital recording form was produced using the Filemaker Go app software for the iPad. This form was integrated into the survey database to allow direct entry of digital site information (species recorded, habitat information, threats and impacts noted on site etc.) during the field survey. It was hoped that this method of data capture would improve survey efficiency and accuracy, as data would not need to be transferred from paper survey cards following completion of the field visits.
- A paper based wetland survey recording card was also designed as a fall back in case digital recording was not possible for technical reasons (see **Appendix 3**). The paper based field card recorded identical information to that held in the iPad digital survey form.
- The County Wicklow Wetland Survey (WWS) database, which holds survey information on sites examined in detail, was re-designed from that used in 2011 (see Appendices 5 & 6) to include the iPad field survey forms and to make data transfer more compatible to Access and SQL databases. This survey database was linked to the original County Wicklow Wetlands Map (WWM) site database where core information on wetland sites is held via a unique site code and survey code numbering system. Once survey information was inputted to the WWS survey database, a complete site report could be produced from data held within the two related databases (see **Appendix 7**).
- The field survey was undertaken during June, August and September 2012. A total of 56 sites were surveyed in detail and habitat maps and site descriptions for these sites were prepared (see **Appendix 2**). Following the field survey, the ecological value of each site was assessed using an objective site evaluation scheme. Sites were subsequently ranked in terms of their local, national or international conservation value (see **Appendix 4**).

- Information gathered during the field survey was used to populate the Wicklow Survey Database (WWS), prepare habitat maps, and update the County Wicklow Wetlands Map (WWM) GIS dataset and Site database. A photographic record of the site was also prepared.
- Individual site reports (which include site descriptions, habitat map, photographs and conservation recommendations) were prepared for each site surveyed. These site reports are included in this final report.
- A CD containing digital copies of the updated County Wicklow Wetlands Map (WWM) GIS dataset and Site database suite accompanies this report.

4 Materials & Methods

4.1 County Wicklow Wetland Survey II - Site Selection

At project commencement a total of 65 sites were selected from the County Wicklow Wetlands Map (WWM) GIS dataset for possible survey. It was envisaged that somewhere in the region of forty to sixty sites would be surveyed in detail, based on the time and resources allocated for the project. The final list of sites proposed for survey is presented in **Appendix 1**.

4.2 County Wicklow Wetland Survey II - Field Survey

Following on from the selection of the 65 sites for survey from the GIS dataset, the field survey was undertaken over July and August with the full field survey team mobilized during the period 16th to 21st September 2012. Due to the time constraints for this survey only a limited amount of time was spent at each of the 56 sites examined, but this was typically sufficient to describe the site, identify the habitats both within and immediately adjoining the wetland, determine if any of the habitats present corresponded to a habitat type listed under Annex I of the EU Habitats Directive, record any obvious threats/damaging activities to the site and to compile a brief list of both faunal and botanical species observed.

Site information was recorded using the standard field survey card (digital or paper based, see Appendices 3, 5 & 6), designed for this survey. The information recorded on these cards during the field survey was subsequently used to populate the County Wicklow Wetland Survey (WWS) database.

Survey target notes, taken for interesting habitat, species or management features were also collect on site during the field survey. These target notes were recorded using the iGIS app on the iPad, which allows point locations to be geo-tagged and notes to be typed up while in the field. The data from iGIS was subsequently exported to the WWM GIS and WWS Survey database, so that the information would be included in the site description.

A photographic record was also made of each site visit. The GPS location of these photographs was recorded using the Geotag Photos app for the iPad. Following field work the geo-tag information was appended to each photograph, which can then be viewed on Google Maps or software packages that support the display of geotagged information.

Habitat information was marked up in the field using either the iGIS app on the iPad or in some cases by hand on the aerial photographs or 6" maps for each of the sites surveyed in detail. The habitats (both within and adjoining the wetland) were classified according to Fossitt (2000), and where a habitat corresponded to a habitat listed under Annex I of the EU Habitats Directive this was noted. This information was subsequently used to produce habitat maps for each site surveyed.

Plant identification followed Parnell & Curtis (2012), and species nomenclature follows Scannell & Synnott (1987). A search for rare or protected species of plants (Curtis & Mc Gough 1988) was not the focus of this study but where these were observed note was taken for inclusion in the database.

Mammals observed were recorded using nomenclature in Sterry (2004) and birds were identified using Ferguson-Lee *et al.* (1983). Any reptiles, amphibians or (readily identifiable) invertebrates were also noted.

Information on threats and damage on the site, and the severity of this was also noted on the field card and

the locations of same marked on either using the iGIS app on the iPad or on hard copy field maps.

Following the survey, sites were given an evaluation rating using the NRA '*Guidelines for Assessment of Ecological Impacts of National Road Schemes*' as outlined in **Appendix 4**.

4.3 Consultation with Landowners

Where possible, landowners were identified by calling to the nearest house to the wetland, and permission was sought for access to the site. Discussions with landowners typically included an explanation of the project often followed by an informal conversation about the particular wetland site and its past and recent management. If landowners could not be identified land was surveyed from the nearest publicly accessible point. All identified landowners provided access to their lands. A letter outlining the purpose of the survey prepared by the Heritage Office of Wicklow County Council was carried and shown to all landowners and displayed in survey vehicles.

4.4 Habitat Classification

The habitats within each wetland visited and those immediately adjacent to the site were classified using Fossitt (2000) '*A Guide to Habitats in Ireland*'. The habitat definitions and terminology used in this report follows this guide.

Guidance in determining whether or not a habitat type present within a wetland may correspond to an Annex I type was sought from a variety of sources including the *Interpretation Manual of European Habitats* (Ramao 1996), *Guidelines for a National Fen Survey of Ireland – Survey Manual* (Foss & Crushell 2008a), *NPWS Study of the extent and conservation status of springs, fens and flushes in Ireland in 2007* (Foss 2007), *The Status of EU Protected Habitats and Species in Ireland* (NPWS 2008) as well as Fossitt (2000).

The field surveys (and previous site knowledge held by Dr Curtis) confirmed that large areas of wet grassland adjoining the Murrough Wetlands (Site 6) do not fit any of the current Fossitt (2000) habitat categories. These are areas of wet grassland/marsh with a strong brackish influence which are transitional between freshwater and salt marsh communities. This habitat type as recognised internationally forms occasionally along the upland edge of salt marshes and tidal riverbanks where freshwater runoff or groundwater dilutes the salinity of the high marsh surface. This allows a mix of fresh and salt marsh species intolerant of higher or lower salinity to coexist along with species restricted to brackish conditions. Along the Murrough the natural hydrology of much of the farmland adjoining the wetland complex has been modified through drainage and the construction of embankments, which further complicates the distribution of habitats. In order to accurately map and define this habitat we have proposed and used a new habitat classification category described as Brackish Marsh (GM2).

4.5 Site Conservation Assessment & Evaluation

Each wetland surveyed in the field was assigned an evaluation rating by the project ecologist(s) who had visited the site. This evaluation was based on the criteria outlined in **Appendix 4**.

4.6 County Wicklow Wetland Survey database – structure and content

As part of the County Wicklow Wetland Survey 2011 a Wetland Survey (WWS) database (version 1.0) was created to hold survey data on sites from that survey. This database was connected to the County Wicklow Wetland Map (WWM 2011) site database (which holds general and descriptive site data recorded in various third party reports and datasets) via the unique site code number assigned to each site. These databases were created using Filemaker Pro 11.0 software package which allows data export to Excel spreadsheets.

The updated version of the WWM database (with the site survey data from the WWS 2011 added) was provided to Wicklow County Council at the end of the 2011 survey and was given the name County Wicklow Wetland Map (WWM) Version 1.

To improve survey and data entry efficiency as part of the WWS II and reduce the likelihood of errors associated with the transfer of data from paper survey forms, it was decided to develop a digital recording system using the touch screen feature of the Apple iPad. This involved using Filemaker Go software, an app developed to allow Filemaker databases to run on the iPad.

To allow digital recording of field survey data on the iPad, the County Wicklow Wetland Survey database suite was re-designed (see **Figure 3.1**, and **Appendix 5 & 6**), creating a series of data capture layouts formatted for the iPad screen. This 2012 revised database was given the name the County Wicklow Wetland Survey database (Version 2.0), and is included on the CD accompanying this report.

In addition, to facilitate the export of data from the County Wicklow Wetland Survey database (Version 2.0) and the County Wicklow Wetland Map database (Version 2.0), and ensure better data compatibility and integration into the GIS system used by Wicklow County Council, the databases created in 2011 were re-structured as shown in **Figure 3.1** so that data export to Excel, Access and SQL data formats would be more easily undertaken.

This involved a fundamental re-design of the two database into a series of related (sub) databases (data from which is displayed via the WWS and WWM databases), holding information on a number of site parameters. This ensured a 1 to 1 data field relationship, i.e. each single data element is related to one site (e.g. Species A occurs on Site A; Species B occurs on Site A, etc.). See **Appendix 5** for further information on the structure and field contents associated with the WWS and WWM database suite.

A paper based field recording card was also created for the 2012 survey (see **Appendix 3**). This contained the same recording fields as the iPad survey form. It was created in case of failure of the digital recording system. The paper based cards were not required during the 2012 survey.

Information from the digital field survey form, together with habitats maps and site photographs was stored within an upgraded County Wicklow Wetland Survey (WWS) database (Version 2.0) created for this project. Site data in the survey database is linked via the site code to the Wicklow Wetlands Map (WWM) database.

The information collected from the field survey was used to update the Wicklow Wetlands Map (WWM) GIS dataset and WWM site database (Version 2.0). Both of these database suites are included on the final project CD accompanying this report.

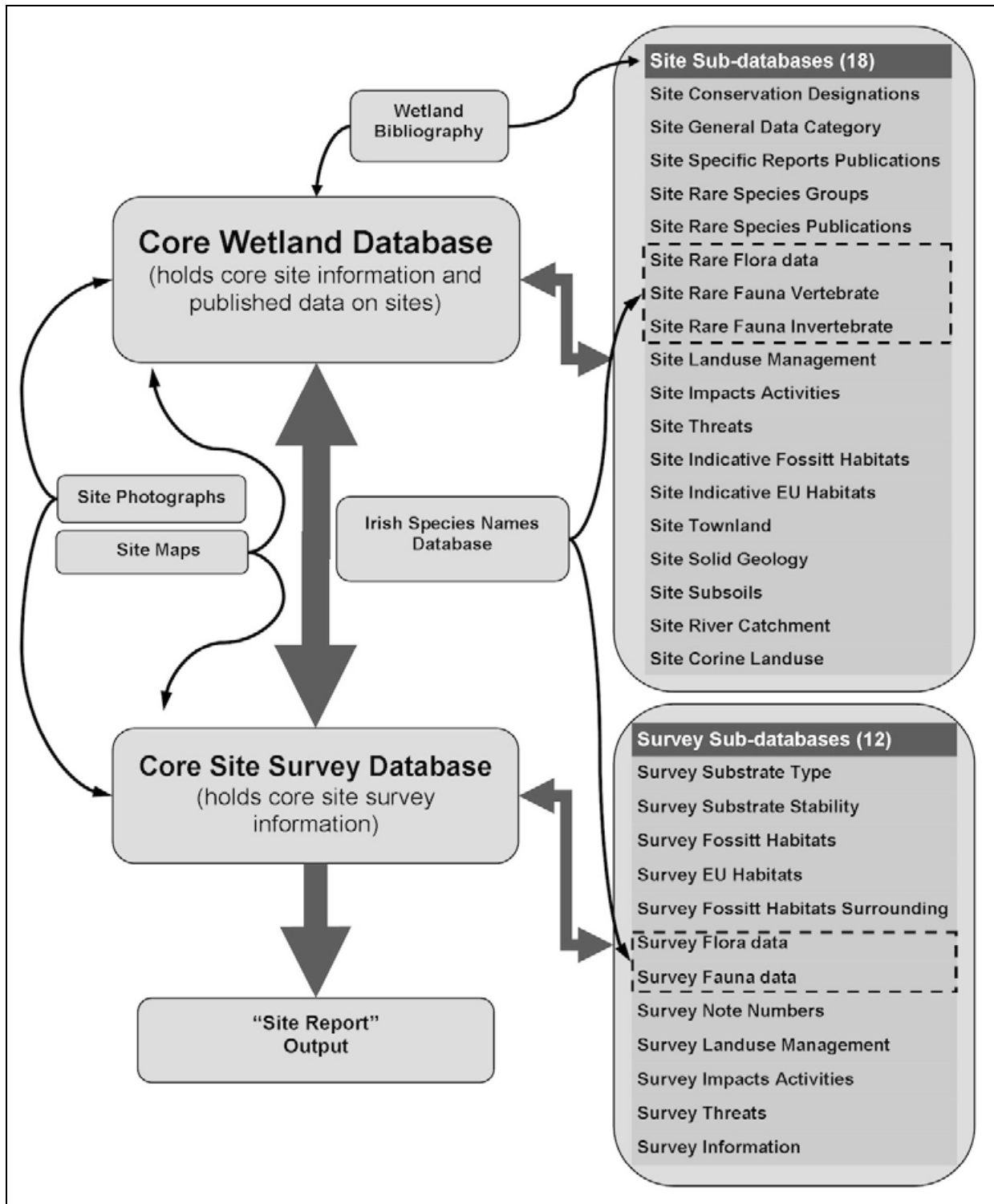


Figure 3.1. Database structure used in the County Wicklow Wetland Survey II database suite 2012.

4.7 County Wicklow Wetland Map (WWM) – GIS dataset

The County Wicklow Wetland Map (WWM) GIS dataset created by Wilson & Foss in 2011 (using ArcView 10 GIS software package on a Windows Operating System) and populated with data following the field surveys in 2011 was used throughout the County Wicklow Wetland Survey Phase II for all site selection and mapping purposes. See Wilson & Foss (2011) for further details on the structure and format of this WWM GIS dataset.

All habitat maps produced during the 2012 WWSII project were added to this WWM GIS dataset. In certain cases boundaries were also adjusted on sites based on field observations. The updated and revised version of the WWM GIS dataset was delivered at the end of the project to Wicklow County Council. The GIS files updated with the field survey results of this survey (WWSII 2012) are also included on the CD that accompanies this report.

4.8 Constraints

The presence of bulls, high barbed wire or security fencing, high water levels and wide deep drainage ditches hindered field work by preventing safe access to parts of some of the sites. We were unable to access the Humewood Estate to survey the wetlands there as the property is in receivership and closed to the public.

5 Results

5.1 County Wicklow Wetland Survey II

Of the 65 sites initially selected for survey as part of the 2012 project (**Appendix 1**), a total of 56 were visited during the field survey and described in detail, habitat maps were produced and conservation assessment was undertaken. The list of sites surveyed in detail in 2012 is presented in **Appendix 2**. A map showing the location of the 56 sites surveyed are shown in **Figure 5.1** below. A detailed report of each site (sorted according to site name) together with habitat maps are presented in **Appendix 7**.

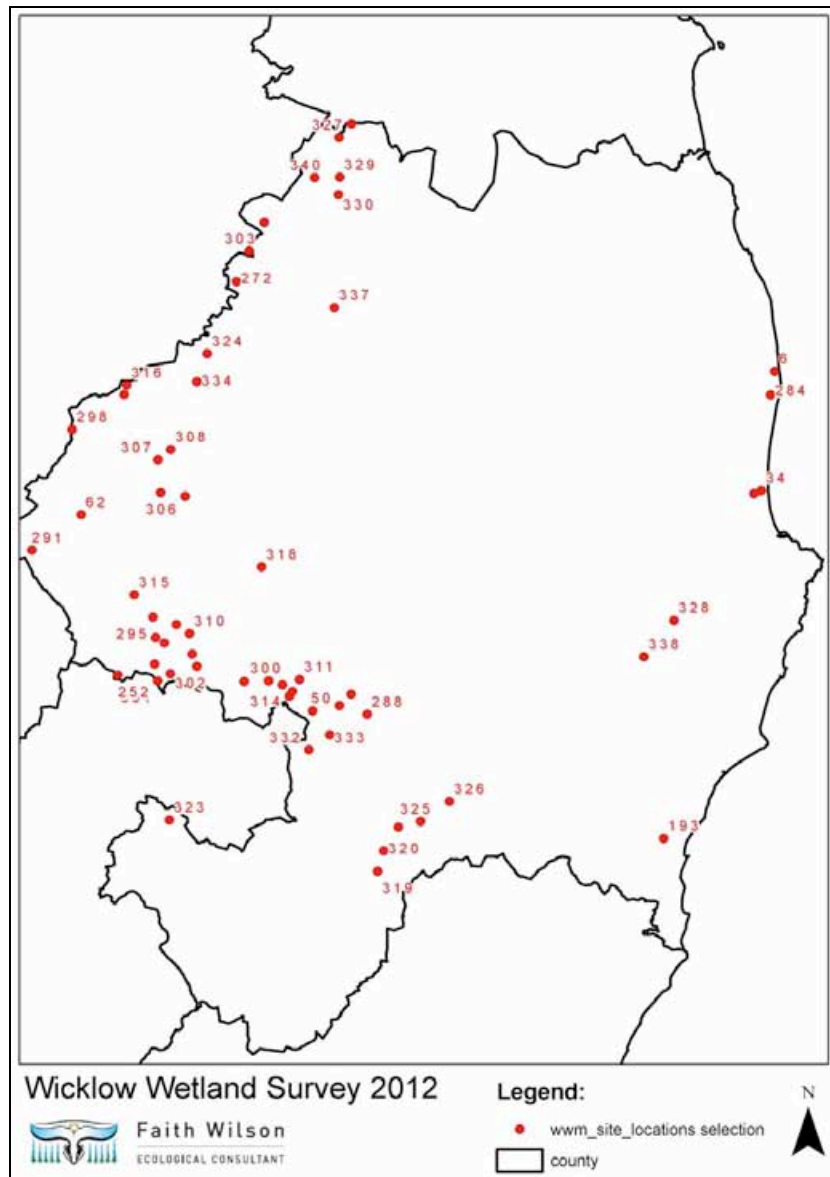


Figure 5.1. Location of sites selected for survey as part of the County Wicklow Wetland Survey II 2012. © Ordnance Survey Ireland. All rights reserved. License number 2012/35 CCMA/Wicklow County Council.

5.2 Wetland Types Recorded During the Site Surveys

56 sites were surveyed in detailed as part of the County Wicklow Wetland Survey 2012 (WWSII). The habitats present (both wetland and non-wetland) within and surrounding each wetland site were recorded using Fossitt (2000) based on field surveys observations. A summary of these wetland types, with examples of where they can be seen in County Wicklow is provided in Wilson & Foss (2011), while detailed habitat descriptions with species likely to occur on them is given in Fossitt (2000). Summary findings of the WWS 2012 in relation to those habitats targeted are presented in the following sections. Of particular significance are those sites which contained good examples of Annex I habitats such as raised bog, transition mire, wet heath, alkaline fen, tufa springs or supported populations of species listed under Annex II of the directive such as Marsh Fritillary butterfly.

5.2.1 Transition Mire Sites

Transition mires and quaking bogs are peat-forming communities developed at the surface of waters with little or moderate amounts of nutrients, with characteristics intermediate between rich (alkaline) and poor (acidic) fen types. For this reason, they are considered as a separate habitat but they may occur within, or on the fringes of other peat-forming systems (Crushell & Foss 2010).

They present a large and diverse range of plant communities. In large peaty systems, the most prominent communities are swaying swards, floating carpets or quaking mires formed by medium-sized or small sedges, associated with *Sphagnum* or brown mosses.

Transition mires and quaking bogs are usually associated with the wettest parts of a bog or fen and can be found in wet hollows, infilling depressions, or at the transition to areas of open water.

The vegetation frequently forms a floating mat or surface scraw over saturated, spongy or quaking peat. Standing water may occur in pools or along seepage zones. The vegetation typically comprises species that are characteristic of bog, fen and open water habitats.

In some cases the mire occupies a physically transitional location between bog and fen vegetation, for example on the margin of a raised bog, or may be associated with certain valley and basin mires.

Like most peatland types in Ireland, transition mire have declined in extent mostly as a result of activities such as peat cutting and mining, afforestation, agricultural drainage and reclamation, infilling, and agricultural enrichment from adjacent farmland.

During the WWS 2012 eight transition mire sites were recorded during the survey as presented below in **Table 5.2.1**. Four of these sites contained good quality transition mire communities, where the transition mire conformed to the EU Habitats Directive habitat and these were rated as being of:

- international importance - The Murrough Wetlands SAC/pNHA (6),
- national importance - Killalish Upper (301), and
- county importance Aghinree (323), Lugduff Transition Mire North (301).

The remaining four sites were rated as being of high/moderate local value. Detailed reports for these sites are provided in the individual site descriptions in **Appendix 7**.

Table 5.2.1: Transition Mire sites identified in County Wicklow during the 2012 Wetland Survey.

Site Code & Site Name	Habitats Present (Fossitt)	Annex I Habitats Present (EU Habitats Directive)	Conservation Ranking
6 THE MURROUGH WETLANDS pNHA/SAC/SPA	CB1 Shingle and gravel banks CM1 Lower salt marsh CM2 Upper salt marsh CW1 Lagoons and saline lakes CW2 Tidal rivers FP1 Calcareous springs FS1 Reed and large sedge swamps FS2 Tall herb swamps FW2 Depositing/lowland rivers FW4 Drainage ditches GM1 Marsh GS4 Wet grassland PF1 Rich fen and flush PF3 Transition mire & quaking bog WD4 Conifer plantation WN6 Wet willow-alder-ash woodland WS1 Scrub WS5 Recently-felled woodland	1130 Estuaries 1140 Mudflats and sandflats not covered by sea water at low tide 1150 *Coastal lagoons 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 1410 Mediterranean salt meadows (Juncetalia maritimi) 2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes') 7210 *Calcareous fens with Cladium mariscus and species of the Caricion davallianae 7230 Alkaline fens (9991) Semi -natural calcareous dry grasslands (orchid-poor)	A Rating: Internationally Important
301 KILLALISH UPPER	WS1 Scrub PF3 Transition mire & quaking bog GS4 Wet grassland FW4 Drainage ditches	7140 Transition mires and quaking bogs	B Rating: Nationally Important
323 AGHINREE	FW4 Drainage ditches PF3 Transition mire & quaking bog GS4 Wet grassland WS1 Scrub	7140 Transition mires and quaking bogs	C+ Rating: County Conservation value
320 LUGDUFF TRANSITION MIRE NORTH	PF3 Transition mire & quaking bog WN6 Wet willow-alder-ash woodland WS1 Scrub WN1 Oak-birch-holly woodland ED3 Recolonising bare ground GS4 Wet grassland WN7 Bog woodland	7140 Transition mires and quaking bogs	C+ Rating: County Conservation value
338 KILMACREA TRANSITION MIRE	FS1 Reed and large sedge swamps PF3 Transition mire & quaking bog WN6 Wet willow-alder-ash woodland WS1 Scrub	None noted	C Rating: Local conservation value (high value)
272 RUSSBOROUGH HOUSE POND	GS4 Wet grassland PF3 Transition mire & quaking bog WN6 Wet willow-alder-ash woodland FW4 Drainage ditches FS2 Tall herb swamps FL8 Other artificial lakes and ponds	None noted	C Rating: Local conservation value (high value)

Site Code & Site Name	Habitats Present (Fossitt)	Annex I Habitats Present (EU Habitats Directive)	Conservation Ranking
302 KILLALISH LOWER	GS4 Wet grassland WS1 Scrub FW4 Drainage ditches PF3 Transition mire & quaking bog	None noted	D Rating: Local conservation value (moderate value)
319 LUGDUFF TRANSITION MIRE SOUTH	WS1 Scrub PF3 Transition mire & quaking bog FW4 Drainage ditches	None noted	D Rating: Local conservation value (moderate value)



Plate 1. Lugduff Transition Mire North (site 320) – an excellent example of a transition mire dominated by *Carex rostrata*.

5.2.2 Raised Bog Sites

Another habitat of importance that was targeted for survey during the WWS 2012 was raised bog. Raised bogs are accumulations of deep acid peat (3-12 m) that originated in shallow lake basins or topographic depressions at the end of the last glaciation 10,000 years ago. The name is derived from the elevated surface, or dome, that develops as raised bogs grow upwards from the surface accumulating organic material; the domed effect is often exaggerated when the margins of a bog are damaged by turf cutting or drainage, and are drying out (Crushell & Foss 2010).

The surface of a relatively intact raised bog is typically wet, acid and deficient in plant nutrients (as bogs receive most of nutrients through rainfall), and supports specialised plant communities that are low in overall diversity. The vegetation is open and colourful *Sphagnum* mosses dominate the ground layer.

Raised bogs are most abundant in the lowlands of central and mid-west Ireland. This is a priority habitat under the EU Habitats Directive.

Intact actively growing raised bog is extremely rare, having decreased in area by over 35% in the last 10 years alone. Ongoing deterioration of the hydrological conditions of raised bogs at current rates caused by peat cutting, drainage, forestry and burning severely threatens the viability of the habitat at most locations in Ireland due to the economic value of the peat contained in raised bogs.

The WWS 2012 surveyed one site that contained active or degraded raised bog and cutover bog habitats – this was Knockananna Bog (site number 50), which is the sole remaining representative of this habitat type in the County (See **Table 5.2.2** below). A detailed report for this site is provided in the individual site descriptions in **Appendix 7**.

Table 5.2.2: Raised bog and degraded cutover bog sites identified in County Wicklow during the 2012 Wetland Survey.

Site Code & Site Name	Habitats Present (Fossitt)	Annex I Habitats Present (EU Habitats Directive)	Conservation Ranking
50 KNOCKANANNA BOG	PB1 Raised bogs PB3 Lowland blanket bog FW4 Drainage ditches PB4 Cutover bog WS1 Scrub FW1 Eroding/upland rivers ED3 Recolonising bare ground FL1 Dystrophic lakes	7120 Degraded raised bogs still capable of natural regeneration 7150 Depressions on peat substrates of the Rhynchosporion 3160 Natural dystrophic lakes and ponds	B Rating: Nationally Important



Plate 2. Knockananna Bog (site 50) – the last extant raised bog in County Wicklow.

5.2.3 Alkaline fen and tufa springs

Fens are defined as that group of mires which, in contrast to raised bog and blanket bog, receive the major proportion of water and nutrient input from the mineral catchment. The water may be derived from surface (flush) as well as sub-surface (aquifer) sources (e.g. springs). Fens may have a peat and/or mineral substrate. Water tables are generally high, often close to the surface, though this may vary seasonally. During winter, sites may be flooded, but in summer water levels may often lie substantially below the surface (Foss & Crushell 2008a). The alkaline fen habitats within the Murrough Wetlands SAC are well known as good examples of fen habitat in the county and this site contains excellent examples of both *Schoenus* rich alkaline fen and **Cladium* fen.

Tufa springs are spring head or seepage areas, fed by meso- to eutrophic water rich in lime, usually dominated by bryophytes in which small vascular plants root. On contact with the atmosphere the lime rich water in the spring often deposits a hard deposit of calcium carbonate known as “tufa”.

All of these wetland types are habitats listed under Annex I of the EU Habitats Directive and both *Cladium* fen and tufa springs are priority habitats.

The 2012 survey identified a new area of previously unknown alkaline fen and tufa spring habitat in the county at Rathtoole (site code 291) which unfortunately has been damaged through drainage works and hence was given a rating of county importance. If appropriate restoration and management works were undertaken at the site (e.g. drain blocking) the quality of the site might be significantly improved.

Table 5.2.3 Alkaline fen and tufa spring sites identified in County Wicklow during the 2012 Wetland Survey.

Site Code & Site Name	Habitats Present (Fossitt)	Annex I Habitats Present (EU Habitats Directive)	Conservation Ranking
6 THE MURROUGH WETLANDS pNHA/SAC/SPA	CB1 Shingle and gravel banks CM1 Lower salt marsh CM2 Upper salt marsh CW1 Lagoons and saline lakes CW2 Tidal rivers FP1 Calcareous springs FS1 Reed and large sedge swamps FS2 Tall herb swamps GM1 Marsh FW4 Drainage ditches FW2 Depositing/lowland rivers GS4 Wet grassland PF1 Rich fen and flush PF3 Transition mire & quaking bog WD4 Conifer plantation WN6 Wet willow-alder-ash woodland WS1 Scrub WS5 Recently-felled woodland	1130 Estuaries 1140 Mudflats and sandflats not covered by sea water at low tide 1150 *Coastal lagoons 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 1410 Mediterranean salt meadows (Juncetalia maritimi) 2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes') (9991) Semi -natural calcareous dry grasslands (orchid-poor) 7230 Alkaline fens 7210 *Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae	A Rating: Internationally Important

Site Code & Site Name	Habitats Present (Fossitt)	Annex I Habitats Present (EU Habitats Directive)	Conservation Ranking
291 RATHTOOLE	FW2 Depositing/lowland rivers PF1 Rich fen and flush FP1 Calcareous springs GS2 Dry meadows and grassy verges FW4 Drainage ditches	7230 Alkaline fens 7220 *Petrifying springs with tufa formation (Cratoneurion) 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites)	C+ Rating: County Conservation value



Plate 3. Rathtoole Bog (Site 291) – the area of alkaline fen is visible as the darker section of vegetation.

5.2.4 Wet heath

Wet heath is a common habitat particularly in the uplands of County Wicklow and was recorded at fourteen sites in total during the 2012 survey. Some of these sites contain some examples of the habitat as described under the EU Habitats Directive but there were no outstanding undamaged sites encountered. Three of the fourteen sites surveyed are rated as being of County importance with the remaining eleven sites being rated as being of either high or moderate local value. One of those sites of county importance (Slievenamough Wet Flush (Site No. 234)) was given that rating in 2011 solely on the basis of the population of ivy leaved

wall flower (*Wahlenbergia hederacea*) which was recorded at the site in 2007 during the rare, threatened and scarce vascular plant survey of County Wicklow commissioned by National Parks and Wildlife Service. Subsequent searches for the plant were conducted as part of this survey and failed to relocate the species. The species may well recover if a suitable grazing regime is implemented on the site so the site rating has been retained for present.

Wet heath sites are also of importance for Marsh Fritillary butterfly which form characteristic larval webs during late summer/autumn on Devil's bit Scabious plants (*Succisa pratensis*).



Plate 4. Marsh Fritillary larval web.

Table 5.2.4. Wet heath sites identified in County Wicklow during the 2012 Wetland Survey.

Site Code & Site Name	Habitats Present (Fossitt)	Annex I Habitats Present (EU Habitats Directive)	Conservation Ranking
234 SLIEVENAMOUGH WET FLUSH	FW1 Eroding/upland rivers GS4 Wet grassland HH3 Wet heath	None noted	C+ Rating: County Conservation value
305 DONARD LOWER	GS3 Dry-humid acid grassland GS4 Wet grassland HH3 Wet heath WS1 Scrub WD4 Conifer plantation	None noted	C+ Rating: County Conservation value
288 SHEILSTOWN	WS1 Scrub FW1 Eroding/upland rivers GS4 Wet grassland PF2 Poor fen and flush HH3 Wet heath	None noted	C+ Rating: County Conservation value
337 BLACK BANKS	FP2 Non-Calcareous springs HH3 Wet heath PF2 Poor fen and flush	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	C Rating: Local conservation value (high value)
311 RATHCOYLE	FW4 Drainage ditches GA1 Improved agricultural grassland GS4 Wet grassland BL3 Buildings and artificial surfaces HH3 Wet heath WS1 Scrub	None noted	C Rating: Local conservation value (high value)
314 RATHDUFF BEG	GA1 Improved agricultural grassland HH3 Wet heath PB3 Lowland blanket bog GS4 Wet grassland FW4 Drainage ditches WN7 Bog woodland	None noted	C Rating: Local conservation value (high value)
290 KNOCKANOCKER	FW4 Drainage ditches HH3 Wet heath GS4 Wet grassland WS1 Scrub PB4 Cutover bog PF2 Poor fen and flush	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	C Rating: Local conservation value (high value)
312 RATHDUFF BOG SOUTH	PB4 Cutover bog FW1 Eroding/upland rivers GS4 Wet grassland WS1 Scrub HH3 Wet heath	None noted	D Rating: Local conservation value (moderate value)
318 BALLINEDDAN BOG	GS4 Wet grassland WD4 Conifer plantation WL2 Treelines HH3 Wet heath BL1 Stone walls and other stonework FW4 Drainage ditches PF2 Poor fen and flush	None noted	D Rating: Local conservation value (moderate value)

Site Code & Site Name	Habitats Present (Fossitt)	Annex I Habitats Present (EU Habitats Directive)	Conservation Ranking
300 KILLAMOAT	WS1 Scrub GS4 Wet grassland HH3 Wet heath BL3 Buildings and artificial surfaces PB4 Cutover bog FW4 Drainage ditches	None noted	D Rating: Local conservation value (moderate value)
289 KNOCKNASHAMROGE	GS4 Wet grassland HH3 Wet heath FW1 Eroding/upland rivers PB4 Cutover bog PF2 Poor fen and flush WS1 Scrub	None noted	D Rating: Local conservation value (moderate value)
332 RATHBANE	WS1 Scrub WD4 Conifer plantation GA1 Improved agricultural grassland FW1 Eroding/upland rivers WL2 Treelines PF2 Poor fen and flush HH3 Wet heath	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	D Rating: Local conservation value (moderate value)
333 ARDNABOY	WS1 Scrub FW4 Drainage ditches ED5 Refuse and other waste HH3 Wet heath PB4 Cutover bog GS4 Wet grassland GA1 Improved agricultural grassland	None noted	D Rating: Local conservation value (moderate value)
339 BALLYKNOCKAN WET HEATH	HH3 Wet heath	None noted	F Rating: Unknown value - survey required

5.3 Floral Observations

Floral observations and records made on the sites surveyed were included in the County Wicklow Wetland Survey database. For the site surveyed the species recorded are presented in the site descriptions presented in **Appendix 7**. The following sites contained records of bog cranberry (*Vaccinium oxycoccus*), which are of note as many are either new records or reconfirm old records made by Brunner (1950):

Site Code	Site Name
50	KNOCKANANNA BOG
289	KNOCKNASHAMROGE
290	KNOCKANOCKER
300	KILLAMOAT
311	RATHCOYLE
312	RATHDUFF BOG SOUTH
313	RATHDUFF BOG NORTH
332	RATHBANE
337	BLACK BANKS

Other observations of note were the populations of Water Sedge (*Carex aquatilis*) which was first recorded at the Brittas River (Site 330) during the Wicklow Rare, Scarce and Threatened Vascular Plant Survey by Curtis & Wilson in 2007, which was the second County record, and a new population was recorded by Wilson and Foss during the current survey at Hollywood Marsh (Site 324) which is only the third record for the county. Unfortunately it was hoped to reconfirm another old record for this species which was recorded by Brunner in 1926 from the 'edge of the middle lake in Humewood Demesne, Kiltegan' but it was not possible to access this site.



Plate 5. Bog cranberry (*Vaccinium oxycoccus*) at Knockananna Bog.

Invasive species of note include records of Nutall's pondweed (*Elodea nutallii*) and Canadian pondweed (*Elodea canadensis*) both of which were recorded from artificial ponds, monkey flower (*Mimulus guttatus*) which was recorded from the Brittas River and Rhododendron (*Rhododendron ponticum*) which is threatening several heath sites.

5.4 Faunal Observations

One of the highlights of the 2011 wetland surveys was the identification of a number of breeding populations of Marsh Fritillary butterfly (*Euphydryas aurinia*), which is the sole invertebrate in the Irish fauna which is given legal protection under Annex II of the EU Habitats Directive. A large number of the sites selected for survey in 2012 were chosen based on their potential to support further breeding populations of this rare butterfly which requires a mosaic of sites within short distances of each other. Three new breeding sites were identified during the 2012 survey as follows;

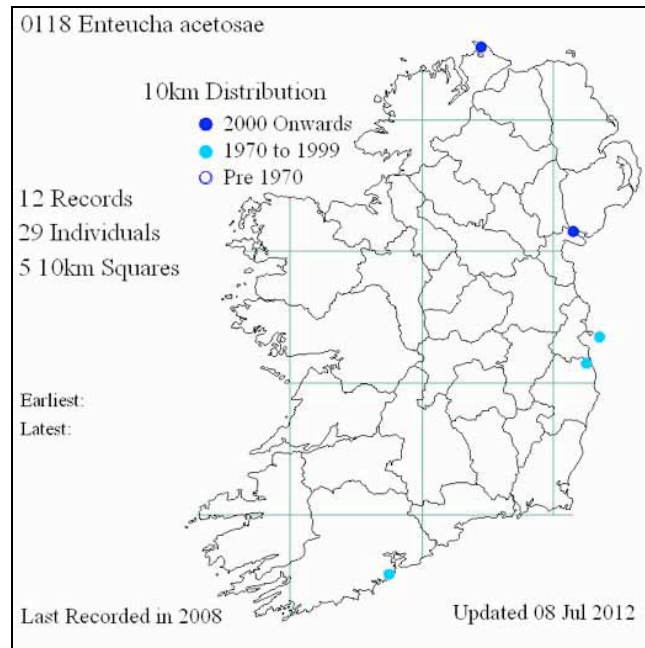
Site Code	Site Name
288	SHEILSTOWN
314	RATHDUFF BEG
305	DONARD LOWER

One of these records (from Donard Lower) is a new 10km record for this species. The sites which were discovered in 2011 were surveyed by National Parks and Wildlife Service in 2012 as part of a survey of Marsh fritillary butterfly in South and East Ireland (Wilson, Bond, Crushell, Foss & Osthoff (2013, in prep.)).

Another Lepidopteron species of interest was the discovery of several new inland sites for the micro moth *Enteucha acetosae*. This is the smallest moth species in Ireland and the original "type locality" of the species is Howth Head (sea cliffs), where it was bred from Sorrel by Shields in 1853, and sent to Stainton who gave it its name the next year (Ken Bond, pers. comm.).

The characteristic mining activity of the larvae of this species on *Rumex acetosa* was observed at Killalish Upper (Site 301) and at Rathshanmore South which was first surveyed in the 2011 wetland survey. All previous known sites were coastal in their distribution (see map from Moths Ireland below) making the discovery at two inland sites in Wicklow of interest.

Other faunal observations including various other moths and other butterflies, mammals, amphibians and birds were also made and are recorded in the WWSII database. Species recorded on the sites surveyed are included in the site reports presented in **Appendix 7**.



Species distribution map for *Enteucha acetosae* (courtesy of Moths Ireland).



Plate 6. The characteristic leaf mines of Ireland's smallest moth species *Enteucha acetosae*.

5.5 Site Conservation Assessment

On completion of the WWSII fieldwork in 2012, sites were reviewed and given a site conservation rating using the criteria presented in **Appendix 4**. The site conservation rating for sites surveyed is presented in **Table 5.3** below. Of the 56 sites surveyed in detail, twelve are deemed to be of County importance of greater.

Of the 56 sites surveyed, two sites have previously been recognized as being of conservation interest by being listed as either Special Areas of Conservation (SAC) or proposed Natural Heritage Areas by NPWS (The Murrough Wetlands SAC/pNHA and Arklow Town Marsh pNHA). All other sites are new wetland sites not previously surveyed or recorded in detail in the county.

A Rated Sites (International Ecological Importance):

One site (The Murrough Wetlands SAC/pNHA) has been rated as of international conservation importance. This site contains a suite of habitats of conservation value that correspond to those listed on Annex I of the EU Habitats Directive including both wetland and coastal habitats (those which are priority habitats are marked with an asterisk). These include the following Annex I habitat types:

- 1130 Estuaries
- 1140 Mudflats and sandflats not covered by sea water at low tide
- 1150 *Coastal lagoons
- 1210 Annual vegetation of drift lines
- 1220 Perennial vegetation of stony banks
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- 1410 Mediterranean salt meadows (*Juncetalia maritimi*)
- 2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')
- (9991) Semi -natural calcareous dry grasslands (orchid-poor)
- 7230 Alkaline fens
- 7210 *Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*

B Rated Sites (National Ecological Importance):

Three sites (Arklow Town Marsh pNHA, KNOCKANANNA BOG and KILLALISH UPPER) have been rated as being of national conservation importance, principally on the basis of the habitats present. These include; reedbed and marsh habitats and the presence of a scarce plant species – the Broad-leaved Cottongrass (*Eriophorum latifolium*) within Arklow Town Marsh pNHA, raised bog with dystrophic pools and well regenerating cutover bog at KNOCKANANNA BOG and transition mire at KILLALISH UPPER.

C+ Rated Sites (County Value):

Eight sites (SLIEVENAMOUGH WET FLUSH, SHEILSTOWN, RATHTOOLE, DONARD LOWER, LUGDUFF TRANSITION MIRE NORTH, AGHINREE, BRITTAS RIVER and TINODE GOLDENHILL) have been rated as of County conservation importance. These sites have been identified as containing habitats of conservation value that may correspond to those listed on Annex I of the EU Habitats Directive such as transition mire, alkaline fen and tufa springs or else support populations of rare, scarce or threatened botanical species or as breeding sites for Marsh Fritillary butterfly.

C Rated Sites (High Value, Locally Important):

Ten sites (RATHCON FISHING LAKE, HOLDENSTOWN POND, RUSSBOROUGH HOUSE POND, KNOCKANOCKER, BOLEYLUG, RATHCOYLE, RATHDUFF BEG, HOLLYWOOD MARSH, BLACK BANKS and KILMACREA TRANSITION MIRE) are rated as C sites. These sites have been identified as containing

habitats of conservation value that may correspond to those listed on Annex I of the EU Habitats Directive. These include the following Annex I habitat types:

- 4010 Northern Atlantic wet heaths with *Erica tetralix*

The remaining sites have been given a lower conservation value based on the habitats/species present and are indicated in **Table 5.3** below.

The majority of sites, as summarised in **Table 5.3** are currently undesignated, with the exception of two sites: Arklow Town Marsh pNHA and The Murrough Wetlands SAC/pNHA. It is recommended that those sites that are deemed to be of high local importance or greater (A, B and C+ importance) should be submitted to the National Parks and Wildlife Service for inclusion on their list of sites for consideration as NHAs.

Table 5.3: Conservation Assessment and ranking of sites surveyed in detail in County Wicklow during the 2012 Wetland Survey.

Site Code	Site Name	Conservation Ranking After Survey
6	THE MURROUGH WETLANDS pNHA/SAC/SPA	A Rating: Internationally Important
50	KNOCKANANNA BOG	B Rating: Nationally Important
193	ARKLOW TOWN MARSH pNHA	B Rating: Nationally Important
301	KILLALISH UPPER	B Rating: Nationally Important
234	SLIEVENAMOUGH WET FLUSH	C+ Rating: County Conservation value
288	SHEILSTOWN	C+ Rating: County Conservation value
291	RATHTOOLE	C+ Rating: County Conservation value
305	DONARD LOWER	C+ Rating: County Conservation value
320	LUGDUFF TRANSITION MIRE NORTH	C+ Rating: County Conservation value
323	AGHINREE	C+ Rating: County Conservation value
330	BRITTAS RIVER	C+ Rating: County Conservation value
340	TINODE GOLDENHILL	C+ Rating: County Conservation value
62	RATHCON FISHING LAKE	C Rating: Local conservation value (high value)
252	HOLDENSTOWN POND	C Rating: Local conservation value (high value)
272	RUSSBOROUGH HOUSE POND	C Rating: Local conservation value (high value)
290	KNOCKANOCKER	C Rating: Local conservation value (high value)
294	BOLEYLUG	C Rating: Local conservation value (high value)
311	RATHCOYLE	C Rating: Local conservation value (high value)
314	RATHDUFF BEG	C Rating: Local conservation value (high value)
324	HOLLYWOOD MARSH	C Rating: Local conservation value (high value)
337	BLACK BANKS	C Rating: Local conservation value (high value)
338	KILMACREA TRANSITION MIRE	C Rating: Local conservation value (high value)
224	TOBER DEMESNE FISH POND	D Rating: Local conservation value (moderate value)
245	BRITTAS GOLF COURSE PONDS	D Rating: Local conservation value (moderate value)
267	BLESSINGTON DEMESNE PONDS	D Rating: Local conservation value (moderate value)
289	KNOCKNASHAMROGE	D Rating: Local conservation value (moderate value)
297	BALLINROAN LOWER	D Rating: Local conservation value (moderate value)
298	MERVILLE AND MILLTOWN	D Rating: Local conservation value (moderate value)

Site Code	Site Name	Conservation Ranking After Survey
300	KILLAMOAT	D Rating: Local conservation value (moderate value)
302	KILLALISH LOWER	D Rating: Local conservation value (moderate value)
312	RATHDUFF BOG SOUTH	D Rating: Local conservation value (moderate value)
313	RATHDUFF BOG NORTH	D Rating: Local conservation value (moderate value)
316	TOBER DEMESNE WETLANDS	D Rating: Local conservation value (moderate value)
318	BALLINEDDAN BOG	D Rating: Local conservation value (moderate value)
319	LUGDUFF TRANSITION MIRE SOUTH	D Rating: Local conservation value (moderate value)
329	MANOR KILBRIDE PONDS	D Rating: Local conservation value (moderate value)
332	RATHBANE	D Rating: Local conservation value (moderate value)
333	ARDNABOY	D Rating: Local conservation value (moderate value)
334	RATHATTIN	D Rating: Local conservation value (moderate value)
233	HIGHPARK POND	E Rating: Local conservation value (low value)
295	WOODFIELD GLEN	E Rating: Local conservation value (low value)
296	ENGLISHTOWN	E Rating: Local conservation value (low value)
303	KILLAMULLIM AND BURGAGE	E Rating: Local conservation value (low value)
306	COOLHARBOUR LOWER	E Rating: Local conservation value (low value)
307	MERGINSTOWN	E Rating: Local conservation value (low value)
308	ANNALECKY DONARD	E Rating: Local conservation value (low value)
310	COLVINSTOWN	E Rating: Local conservation value (low value)
315	COOLINARRIG UPPER	E Rating: Local conservation value (low value)
321	BALLYBEG	E Rating: Local conservation value (low value)
325	MUCKLAGH	E Rating: Local conservation value (low value)
326	AVOCA RIVER - KILBALLYOWEN	E Rating: Local conservation value (low value)
335	FORTGRANITE POND	E Rating: Local conservation value (low value)
339	BALLYKNOCKAN WET HEATH	F Rating: Unknown value - survey required
299	BALLYKILLMURRY LOWER	No Conservation Value
327	MOANASPICK	No Conservation Value
328	KILMACURRAGH QUARRY POND	No Conservation Value
336	FAIRY LAKE	No Conservation Value
251	HUME WOOD PONDS	Survey attempted but no access

6 Recommendations

From the results of the County Wicklow Wetland Survey conducted in 2012 the following recommendations in relation to future surveys, additional data acquisition and project development are suggested:

6.1.1 Ongoing Wetland Surveys

It is recommended that the Countywide survey of wetlands in Wicklow continues and builds on the baseline information gathered in the 2011 and 2012 surveys. The database was increased in 2012 with information on 192 wetland sites documented in the Wicklow Wetland Survey 2011 to 244 wetland sites of which we

have good information on approximately 80. Many additional sites exist which require dedicated field surveys and these remain identified as potential wetlands in the GIS file (wmm_potential_wetlands.shp). These sites may have some limited data to accompany them but are mostly not fully surveyed.

A number of wetland habitat types have been identified in County Wicklow, for which habitat data, information on habitat extent, site boundaries and conservation status is lacking in many cases. These should be a priority for surveyed as part of the ongoing development of a wetland inventory for the County.

Future phases of the WWS should aim to continue to provide the following information on the wetland sites being surveyed:

- A detailed site description highlighting the wetland habitat types (classified according to Fossitt) present on each site;
- Detailed mapping of the extent of each of the wetland type(s) within each site;
- Mapping of general site boundaries to ensure conservation of a hydrologically intact unit;
- Recording of threats to the conservation and future protection of the site; to include restoration suggestions and management priorities and needs;
- Evaluation of each site on a national scale and ranking of each site in terms of its suitability and priority for designation within the NHA and/or SAC process.

6.1.2 Hydrological Assessment

Future surveys of wetland sites should include a hydrological assessment of sites in order to assist in our understanding of how these wetlands function hydrologically. The National Fen Survey manual (Foss (2008)) also recommends that a hydro-chemical analysis is conducted – this could be done in collaboration with the County Council Environmental Laboratory.

6.1.3 Interpretation of GIS Data – Potential Wetlands

The main GIS layer which has been developed for the identification of potential wetlands in Wicklow (wmm_potential_wetlands.shp) has been derived from the subsoils map produced by the EPA Soil and Subsoil Mapping Project (Teagasc, Kinsealy, 1998-2006). This sub-soils map was created using high resolution digital photo-grammetry at the scale of 1:40,000, which means that the aerial photographs used had a pixel size of 1m across. This allowed for the accurate spatial representation of even small areas of lake clay, alluvium and peatlands: all of which, are areas where hydromorphic conditions occur in the landscape and are all mapped with high spatial accuracy at a regional, catchment or sub-catchment scale.

This means that the subsoil data are good proxy for the delineation of wetland areas, which are over 200m across *i.e.* those at the 1:40,000 scale. However, more detailed refinement of the exact wetland type and discrete and distinct hydrological processes and changes in substrate both slightly above and also below this scale (*i.e.* at field scale) is not possible without detailed fieldwork. Hence the potential occurs for some occurrences of slight 'mis-labelling' of wetlands in the County based on the subsoil map. These areas may also have been altered by land management practices and may no longer support a wetland or only contain remnants of same. These two caveats provide a definitive reasoning for the requirement of a detailed wetland survey by a suitably qualified ecologist of an area characterised as a 'potential wetland'.

6.1.4 Planning Control

Sites which are listed as being of County importance (C+) or of high value, local importance (C) and of moderate value, local importance (D) should be highlighted and included in any recommendations made under the County Biodiversity Action Plan or included in local area plans, County development plans or other planning strategies. Sligo County Council began an initiative in 2011 whereby those wetlands rated C+ or

higher are listed in the County Development Plan as sites of biodiversity importance and this could also be considered for County Wicklow. Again, such recommendations for the recognition and listing of sites should be made on a regular basis as further information on the wetland resource of County Wicklow becomes known.

As a planning tool it is recommended that council planners consult with the GIS layers, which indicate potential wetlands in the County and where a development could adversely affect a wetland – through water abstraction, infilling, drainage, etc. a site visit should be conducted by a suitably qualified ecologist to determine if the area supports a wetland of conservation interest. This recommendation is made based on the experience gained in this current and other County Surveys (Sligo, Monaghan, Kildare, Louth and Meath) whereby soils have been found to be a good indicator of the locations of wetlands in the County and an adequate assessment of habitat type or likely habitat type cannot be based solely on a visual assessment of aerial photography. This is further substantiated through a review of published documentation on wetlands in the County – only the obvious sites such as lakes and peatlands would have been identified visually using aerial photography yet the presence of nearly all the wetlands identified in these reports had already been accurately indicated by the soils.

It is recommended that council staff should be aware of a variety of issues regarding wetlands when assessing development proposals and planning applications. These include:

- The need for an appropriate buffer zone surrounding wetland sites. This is often already provided in REPS plans, where for example landowners are required to leave a buffer zone around a wetland when slurry spreading.
- The importance of hydrology in how wetland sites function and how indirect impacts on a wetland system can be caused by activities occurring at some distance from the wetland,
- The cumulative effect of seemingly isolated losses of wetland habitats across the County on the County resource,
- The loss of wetland habitats as a result of fragmentation of sites and impacts on wetland hydrology,
- The ecological value of wetland habitats adjacent to, and fringing lakes and ponds,
- The ecological value of large areas of reed and tall sedge swamps, rivers and river flood plains in controlling and reducing the impacts of flooding events,
- The wetland fauna, some of which are listed on Annex II of the Habitats Directive, found in the County wetlands and the potential impacts on these species as well as their habitats,
- The limited coverage provided in the initial NPWS NHA survey – this was never a comprehensive survey of the entire County – many sites of high nature conservation value remain undesignated,
- The potential value of wetland sites which are outside statutory designated areas and the need for adoption of a precautionary approach when assessing applications that may impact on same.
- The role that the wetland resource plays in combating global warming. It is likely that the wetlands of County Wicklow act as a major sink of carbon.

6.1.5 Local Authority Wetlands Policy

A review of the statutory provisions that govern the management of wetlands in County Wicklow (such as the Habitats Directive, Wildlife Act, Water Framework Directive, Environmental Liability Directive, Nitrates Directive, Planning Act, etc.) should be conducted and the role of the Local Authority in this regard should be examined. This review could be done in collaboration with other Local Authorities in the Greater Dublin Area. Increased co-ordination between agencies in their policy and operative approaches to wetlands need to be strengthened.

6.1.6 Local Biodiversity Areas

A study in 2005, prepared with funding from the Heritage Council wildlife grants (Wilson & Nairn (2005), explored a pilot methodology for the identification and evaluation of local areas for wildlife and nature conservation. These are known as *Local Biodiversity Areas* (LBAs) and although they have no legislative basis, they have begun to be incorporated into local area plans and hence are protected through policy objectives and zonings. Wetland sites could potentially be listed as LBAs using this methodology.

6.1.7 Ongoing Maintenance of the Wicklow Wetlands Database

Undoubtedly additional information on many of the sites, which is currently unpublished, exists. It is recommended that this data is compiled within the database and that it is kept up to date where possible by collating data from additional surveys, EIS documents, etc. This work needs to be done concurrently with ongoing maintenance of the Wicklow Wetlands Map GIS and following the naming procedure described previously. From this compiled data new site location maps (`wwm_site_locations.shp`) can be derived in the GIS.

6.1.8 Ongoing Maintenance of the Wicklow Wetlands GIS

Coupled with ongoing updates of the Wicklow Wetlands Database it is recommended that the Wicklow Wetlands GIS layers are also regularly updated to reflect knowledge on the ground. This could include digitising the location of new wetland sites which are identified in the County following fieldwork, boundary amendments of potential wetland site polygons (`wwm_potential_wetlands.shp`) to a more appropriate extent and deletion of any sites that were identified as potential wetlands but no longer contain wetland habitats from the wetland inventory shapefile.

Habitat maps of wetland sites have been created for only a small number of sites (i.e. those which were visited in the field) and some detailed habitat maps of designated sites (i.e. NHAs, SACs and SPAs) have been incorporated into the Wicklow Wetlands habitat files (`wwm_fossitt_habitats.shp` and `wwm_linear_features.shp`). This work needs to be done concurrently with ongoing maintenance of the Wicklow Wetlands Database and following the naming procedure described previously.

In addition NPWS are likely to produce further detailed habitat maps of sites (i.e. NHAs, SACs and SPAs) which should be incorporated into the WWS dataset as they become available. Wicklow is likely to be the focus of ongoing national surveys conducted by the National Parks and Wildlife Service such as the Uplands Survey and the Grassland Survey and useful datasets from these studies should be incorporated into the Wicklow datasets as it becomes available.

6.1.9 Site Boundaries Review

During the course of the WWS 2012, existing site boundaries were largely retained depending on the data source from which they were derived. For those sites which were surveyed in the field the boundaries were adjusted using the aerial photographs and background mapping for reference.

Prior to field surveys it is recommended that site boundaries should be adjusted using base mapping at an appropriate scale. Ecological advice should inform the revised boundaries to ensure that the entire area of ecological interest (and hydrological unit) is included. This revised site boundary than can form the basis of the habitat map for the site.

6.1.10 Management of Wicklow Wetland Sites

Many of the landowners of wetland sites are likely to be members of the Rural Environmental Protection Scheme (REPS). Where landowners are not members of REPS they should be contacted to make sure that management is sensitive to the requirements of wetland areas, such as the need for an adequate buffer zone.

REPS planners based in County Wicklow should be briefed on the value of wetland habitats and suitable management practices for these sites. Management of agricultural runoff and other measures to prevent water pollution should be discussed and agreed on. These measures will also assist the local authority in meeting its requirements under both the EU Nitrates Directive and the EU Water Framework Directive.

For further information on best practice management guidelines for many of the wetland habitats listed, the reader is referred to "The Living Farmland – A Guide to Farming for Nature in Clare" (Anonymous 2008c) which provides practical advice on habitat maintenance and improvement for landowners and farmers. In addition the NPWS website (www.npws.ie) provides a range of guidelines to help with the protection, management and wise use of conservation worthy habitats and protected species including information on the Rural Environment Protection Scheme (REPS), Farm Plan Schemes, Notifiable actions inter alia. Furthermore the Irish Peatland Conservation Council have published a Management Handbook for Peatland which provides practical advice on habitat restoration (see www.ipcc.ie).

Restoration of threatened and degraded wetland habitats should be encouraged such as the area of alkaline fen and tufa springs at Rathtoole. Funding opportunities for such initiatives should be investigated and pursued.

Newly proposed regulations requiring certain agricultural activities to go through the EIA process is a positive development and should aid the protection of wetlands throughout the County.

6.1.11 Enforcement of Fines for Illegal Dumping and Infill

Infilling and reclamation of wetland is an ongoing threat to many wetland resources in Ireland. Dumping is less of an issue in County Wicklow where the 'PURE' project has successfully reduced the impacts of dumping in the uplands but infilling has resulted in the loss of many small wetland areas in the county. This practice should be dissuaded through both education on the value of wetlands and the enforcement of suitably deterring fines. Article 10(1)(y) of the EPA Guidance Manual Waste Facility Permit and Registration Regulations requires that an application for a waste facility permit or certificate of registration contain details of the biodiversity of the land and specifically details wetlands within same. The protection of Wicklow's diverse wetland resource depends on strict enforcement of national conservation legislation by the NPWS, and planning laws by the County Council to ensure unauthorised damaging activities are prevented.

6.1.12 Control of Invasive Species in Wetlands

It is important that invasive species are controlled and eradicated within wetland sites as they have the potential to cause serious nuisance and can be very costly and difficult to remove once they become established. Typical species affecting wetlands include Rhododendron (*Rhododendron ponticum*), Japanese knotweed (*Fallopia japonica*) and Indian balsam (*Impatiens glandulifera*). It is recommended that all records of invasive species in County Wicklow are submitted to the Invasive Species Ireland database (<http://www.invasivespeciesireland.com/sighting/>) where advice on control and removal is also available.

6.1.13 Water Framework Directive

As a member of the European Union, Ireland must, as of the 22nd December 2000 implement the Water Framework Directive (2000/60/EC). This directive provides a consolidated, strengthened framework for the protection and improvement of all of our waters - rivers, lakes, marine and groundwaters, and of our water-dependent habitats and species. The aim of the Water Framework Directive is to prevent any deterioration in the existing status of our waters, including the protection of good and high status where it exists, and to ensure that all waters are restored to at least good status by 2015. The objectives of the WFD are:

- to protect and enhance the status of aquatic ecosystems (and terrestrial ecosystems and wetlands directly dependent on aquatic ecosystems)
- to promote sustainable water use based on long-term protection of available water resources
- to provide for sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use
- to provide for enhanced protection and improvement of the aquatic environment by reducing / phasing out of discharges, emissions etc.
- to contribute to mitigating the effects of floods and droughts
- to protect territorial and marine waters
- to establish a register of 'protected areas' e.g. areas designated for protection of habitats or species

Clearly the identification of wetland habitats in County Wicklow assists in fulfilling not only our obligations under the EU Habitats Directive and the National Biodiversity Plan but also in implementing the Water Framework Directive.

6.1.14 Public Information and Interpretation Measures

Public awareness about the importance of the wetlands in County Wicklow should be developed through a series of targeted measures. On-going public awareness campaigns should be undertaken to inform the people of Wicklow of the value of the County's wetland resource and the valuable ecosystem services they provide.

These could include:

- Information aimed specifically at landowners and farmers to explain the value of wetlands on their land should be developed,
- Specific events County-wide as part of 'Heritage Day' which takes place annually in September further details are available from http://www.ramsar.org/wwd/wwd_index.htm,
- A series of school visits celebrating local wetlands – co-ordinated through the Heritage in Schools Scheme,
- Public display boards and signage at popular wetland sites should be developed to inform the public of their biodiversity value and the ecosystem services such wetlands play,
- A workshop on wetland management for landowners should be held,
- A colour leaflet should be produced to illustrate the beauty and importance of wetland conservation within the County. A similar leaflet was produced in County Monaghan (MCC 2008).

6.1.15 Wetland Restoration

Restoration of threatened and degraded wetland habitats should be encouraged such as the highly modified blanket bogs of the upland areas where forestry has caused significant losses. Funding opportunities for such initiatives should be investigated and pursued.

6.1.16 Invertebrates associated with Wetlands

A number of sites examined in 2012 have been identified (see site reports in **Appendix 7**) which may contain important invertebrate assemblages. Surveys of these groups could be undertaken within the County to increase knowledge of the biodiversity value of these wetlands (e.g. Dragonfly & Damselfly survey; Water Beetle Survey, Marsh Fritillary survey *inter alia*). Should field surveys be scheduled for August – October inclusive the presence of breeding Marsh Fritillary butterfly within sites can be confirmed.

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8 Appendices

In the report appendices which follow, the PDF layouts (produced from Excel or Word files) have been formatted and reduced to allow printing of tables at A4 page size. The original Excel spreadsheets from which some of these PDF's were created are included on the CD Rom accompanying this report.

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Appendix 1: The County Wicklow Wetland Survey II

List of Sites Initially Proposed for Survey in 2012

The list is sorted alphabetically by site name and formatted, surveyed sites appearing first.

Data presented for each site includes: Survey code, Site code, Site name and an indication of whether the site was surveyed in 2012.

Survey Code	Site Code	Site Name	Surveyed
WW62	6	THE MURROUGH WETLANDS pNHA/SAC/SPA	Yes
WW50	50	KNOCKANANNA BOG	Yes
WW62	62	RATHCON FISHING LAKE	Yes
WW193	193	ARKLOW TOWN MARSH pNHA	Yes
WW224	224	TOBER DEMESNE FISH POND	Yes
WW233	233	HIGHPARK POND	Yes
WW234	234	SLIEVENAMOUGH WET FLUSH	Yes
WW245	245	BRITTAS GOLF PONDS	Yes
WW252	252	HOLDENSTOWN POND	Yes
WW267	267	BLESSINGTON DEMESNE PONDS	Yes
WW272	272	RUSSBOROUGH HOUSE POND	Yes
WW288	288	SHEILSTOWN	Yes
WW289	289	KNOCKNASHAMROGE	Yes
WW290	290	KNOCKANOCKER	Yes
WW291	291	RATHTOOLE	Yes
WW294	294	BOLEYLUG	Yes
WW295	295	WOODFIELD GLEN	Yes
WW296	296	ENGLISHTOWN	Yes
WW297	297	BALLINROAN LOWER	Yes
WW298	298	MERVILLE AND MILLTOWN	Yes
WW299	299	BALLYKILLMURRY LOWER	Yes
WW300	300	KILLAMOAT	Yes
WW301	301	KILLALISH UPPER	Yes
WW302	302	KILLALISH LOWER	Yes
WW303	303	KILLAMULLIN AND BURGAGE	Yes
WW305	305	DONARD LOWER	Yes
WW306	306	COOLHARBOUR LOWER	Yes
WW307	307	MERGINSTOWN	Yes
WW308	308	ANNALECKY DONARD	Yes
WW310	310	COLVINSTOWN	Yes
WW311	311	RATHCOYLE	Yes
WW312	312	RATHDUFF BOG SOUTH	Yes
WW313	313	RATHDUFF BOG NORTH	Yes
WW314	314	RATHDUFF BEG	Yes
WW315	315	COOLINARRIG UPPER	Yes
WW316	316	TOBER DEMESNE WETLANDS	Yes
WW318	318	BALLINEDDAN BOG	Yes
WW319	319	LUGDUFF TRANSITION MIRE SOUTH	Yes
WW320	320	LUGDUFF TRANSITION MIRE NORTH	Yes
WW321	321	BALLYBEG	Yes
WW323	323	AGHINREE	Yes
WW324	324	HOLLYWOOD MARSH	Yes
WW325	325	MUCKLAGH	Yes
WW326	326	AVOCA RIVER - kilballyowen	Yes

Survey Code	Site Code	Site Name	Surveyed
WW327	327	MOANASPICK	Yes
WW328	328	KILMACURRAGH QUARRY POND	Yes
WW329	329	MANOR KILBRIDE PONDS	Yes
WW330	330	BRITTAS RIVER	Yes
WW332	332	RATHBANE	Yes
WW333	333	ARDNABOY	Yes
WW334	334	RATHATTIN	Yes
WW335	335	FORTGRANITE POND	Yes
WW336	336	FAIRY LAKE	Yes
WW337	337	BLACK BANKS	Yes
WW338	338	KILMACREA TRANSITION MIRE	Yes
WW37	37	LOCKSTOWN BRIDGE	No
WW287	287	BALLYMAGHROE WET HEATH	No
WW292	292	GOLDENFORT	No
WW293	293	TUCKMILLS	No
WW309	309	RATHBRAN	No
WW317	317	KNOCKALT	No
WW322	322	UMRYGAR	No
WW331	331	KILCAVAN QUARRY	No
WW339	339	BALLYKNOCKAN WET HEATH	No
WWS251	251	HUME WOOD PONDS	Attempted

Appendix 2: The County Wicklow Wetland Survey II

List of Sites Surveyed in Detail in 2012

The list is sorted alphabetically by site name and formatted so as to print on A4 page.

Data presented for each site includes: Site code, Site name, Grid reference, summary site description, EU habitats on site comments and conservation ranking following survey.

Site Code	Site name UACC	Easting	Northing	Report Site Description	Report Survey site EU habitat comments	Conservation Ranking After Survey
323	AGHINREE	291569	175309	Transition mire which has been negatively affected by the insertion of marginal drains and is reverting to wet grassland, rehabilitation would be possible if drains were blocked.	The transition mire on the site corresponds to habitat type 7140 Transition mires and quaking bogs.	C+ Rating: County Conservation value
308	ANNALECKY DONARD	291656	199703	Area of species poor wet grassland along a narrow valley floor. A large drainage ditch crosses the site with abundant in stream vegetation. Iris marsh occurs to west of drain.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
333	ARDNABOY	302120	180916	Cutover bog dominated by <i>Molinia caerulea</i> and <i>Calluna vulgaris</i> with willow scrub commonly occurring around the margin at western end. A large drainage ditch crosses the site. Eastern end of site dominated by wet grassland.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
193	ARKLOW TOWN MARSH pNHA	324079	174095	This is a large reedbed with scattered <i>Salix</i> scrub adjoining the Avoca River. There has been recent infilling and development along the northern edge of the site with historic infilling at the western end.	None.	B Rating: Nationally Important
326	AVOCA RIVER - KILBALLYOWEN	309993	176531	Following discussion with landowner visit was cancelled. Western field had been cleared and drained. Large central field is scheduled for drainage (permission obtained). Field is dry in summer months. Bull in field prevented access.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
318	BALLINEDDAN BOG	297639	191965	Site largely comprises species poor wet grassland. A remnant heath area with interesting wet flushes (in low lying depressions) persists in the central part of the site.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
297	BALLINROAN LOWER	291246	186966	Main part of site is improved pasture that is currently lightly grazed and being encroached	It is not thought any of the habitats present correspond to any of the	D Rating: Local conservation value (moderate value)

Site Code	Site name UACC	Easting	Northing	Report Site Description	Report Survey site EU habitat comments	Conservation Ranking After Survey
				by Ulex scrub and dense bracken. The main wetland interest of the site comprises a small wet depression dominated by wet grassland with poor fen flushes.	habitats listed under Annex I of the EU Habitats Directive.	
321	BALLYBEG	306628	174844	Series of wet grassland field dominated by Juncus effusus with scattered birch forming small areas of bog woodland on peat. Some heather on ditches. Ulex europaeus scrub throughout.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
299	BALLYKILLMURRY LOWER	298673	183204	Eastern half of the site has been reclaimed and fertilised to produce grazing for horses. Sward 1 cm tall and very heavily impacted by grazing.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	No Conservation Value
339	BALLYKNOCKAN WET HEATH	301200	207061	The site appears to support good wet heath but requires further survey.		F Rating: Unknown value - survey required
337	BLACK BANKS	302416	209046	This is a sloping site which supports a series of small flushes some of which are quite species rich, surrounded by wet heath.	The wet heath in the site may correspond to the Annex I habitat Northern Atlantic Wet Heaths.	C Rating: Local conservation value (high value)
267	BLESSINGTON DEMESNE POND	297808	214661	Small pond beside Blessington by-pass with marginal landscape planting of Alder and Willow. Only the eastern pond remains. Appear to be fed by small watercourse. Eutrophic conditions occur within pond as evidenced by high algal mat cover.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
294	BOLEYLUG	290508	188666	River valley with steep sides dominated by scrub, hazel woodland and dense bracken. Wetland interest is confined to a number of small wet grassland fields at the toe of the western slope on the valley floor.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	C Rating: Local conservation value (high value)
245	BRITTAS GOLF COURSE PONDS	303458	221147	Three small artificial golf course ponds with a 1 to 2 m wide reed fringe.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
330	BRITTAS RIVER	302684	216482	Series of abandoned meanders and ox bow lakes adjacent to the Brittas river. These natural linear depressions contain marsh communities dominated by Carex aquatilis. Calcareous	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	C+ Rating: County Conservation value

Site Code	Site name UACC	Easting	Northing	Report Site Description	Report Survey site EU habitat comments	Conservation Ranking After Survey
				grassland on adjoining dry banks.		
310	COLVINSTOWN	292891	187575	Main part of site has been recently afforested with Sitka Spruce plantation. Small areas of wet grassland continue to occur at both the northern and southern ends. Site has been heavily impacted by drainage and forestry operations.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
306	COOLHARBOUR LOWER	291010	196872	Area of species poor wet grassland occurring adjacent to lowland river. The site is used for grazing and silage production. Heavily modified due to drainage and agricultural improvement.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
315	COOLINARRIG UPPER	289263	190133	Two fields of wet grassland on a moderate east facing slope. Habitat is of low interest being dominated by a species poor sward of <i>Juncus effusus</i> and <i>Holcus lanatus</i> . The southern field has scattered willow.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
305	DONARD LOWER	292610	196623	Moderately sloping west facing site. Main habitats that occur throughout site include wet grassland, scrub and wet heath. Marsh Fritillary larvae were recorded making the site of county importance.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	C+ Rating: County Conservation value
296	ENGLISHTOWN	292034	188190	Site comprises steep slope with dry meadow grassland with gorse scrub. Large stockpiles of soil originating from drainage works have revegetated with dry grassland. Site was surveyed from the roadside. No wetland interest.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
336	FAIRY LAKE	293070	186247	Former artificial lake that has been drained by landowner. Undertaken as the pond sluice had been repeatedly vandalised and owner had no further interest in repairing damage after several attempts. No wetland remaining. No site visit undertaken.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	No Conservation Value
335	FORTGRANITE POND	290603	185578	Ornamental garden pond located in demesne grounds. Surrounded by various invasive and ornamental trees and shrubs.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
233	HIGHPARK POND	296498	184437	This is a man made	It is not thought any	E Rating: Local

Site Code	Site name UACC	Easting	Northing	Report Site Description	Report Survey site EU habitat comments	Conservation Ranking After Survey
				reservoir with a sluice at the eastern end. It is surrounded by mixed broad leaved woodland.	of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	conservation value (low value)
252	HOLDENSTOWN POND	288192	184846	This site is located in a natural depression in the landscape and is a natural pond which is becoming naturally infilled. Holdenstown Bog SAC is found to the north and Slaney River Valley SAC to the SE.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	C Rating: Local conservation value (high value)
324	HOLLYWOOD MARSH	294076	206014	Former marsh area which has been drained. Central part of site has remaining wetland interest, and is split by a cattle track into two parts. The northern is acid wet grassland, the south section is marsh which extends to deep drain.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	C Rating: Local conservation value (high value)
302	KILLALISH LOWER	291638	184942	This former transition mire has been badly damaged by drainage and the southern half of the site was planted in 2011. The site is drying out and becoming dominated by grasses and rushes.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
301	KILLALISH UPPER	290815	184486	Excellent example of intact wet and quaking transition mire with scattered willow scrub and stands of <i>Osmunda</i> . <i>Carex diandra</i> scattered throughout site adding to interest. The rare micro moth <i>Enteucha acetosae</i> was found on <i>Rumex acetosa</i> on site. Possible site for <i>Salix cinerea</i> subsp. <i>cinerea</i> .	The transition mire on the site corresponds to habitat type 7140 Transition mires and quaking bogs.	B Rating: Nationally Important
300	KILLAMOAT	298104	184484	Area of cutover bog with linear <i>Calluna</i> dominated raised ridges. Intervening depressions have good <i>Sphagnum</i> cover with typical bog flora. Scattered birch scrub occurs throughout the site.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
303	KILLAMULLIM AND BURGAGE	296829	212758	Floating scraw of vegetation dominated by <i>Phalaris</i> and <i>Glyceria</i> on floodplain of stream, empounded by road embankment of the N81. Hydrologically connected to Poulaphouca reservoir. Water levels fluctuate regularly.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
338	KILMACREA TRANSITION MIRE	322772	186055	This is a nice area of transition mire with willow woodland/scrub.	The area of transition mire is relatively small at	C Rating: Local conservation value (high value)

Site Code	Site name UACC	Easting	Northing	Report Site Description	Report Survey site EU habitat comments	Conservation Ranking After Survey
					this stage.	value)
328	KILMACURRAGH QUARRY POND	324757	188444	Large flooded quarry floor, no aquatic vegetation.	None.	No Conservation Value
50	KNOCKANANNA BOG	301000	182500	The margins of the site were cut in the past but have completely regenerated. The bog remains wet but is dominated in places by Narthecium and Trichophorum, with good Sphagnum cover throughout. It lacks good raised bog topography and pools are mostly located in cutover margins.	This is the only raised bog in Wicklow with Rhynchospora depressions and Dystrophic pools.	B Rating: Nationally Important
290	KNOCKANOCKER	303518	183595	Site dominated by wet heath with Calluna up to 60 cm tall. Small areas of abandoned old cutover bog occur with wetter Sphagnum dominated vegetation in the hollows. Light cattle grazing only. Extensive good quality large poor flush areas within site adds to interest.	The wet heath on the site corresponds to the EU habitat type 4010 Northern Atlantic wet heaths with Erica tetralix.	C Rating: Local conservation value (high value)
289	KNOCKNASHAMROGE	302751	182854	Area of cutover bog with mosaic of wet grassland, wet heath and hollows with regenerating bog. Area grazed by cattle and horses. Some old turf banks occur. Some small poor fen flush areas.	The wet heath on the site corresponds to the EU habitat type 4010 Northern Atlantic wet heaths with Erica tetralix.	D Rating: Local conservation value (moderate value)
320	LUGDUFF TRANSITION MIRE NORTH	305676	173268	Extremely wet quaking transition mire dominated by Carex rostrata surrounded by Oak Birch Holly woodland. Northern end has increased scattered willow scrub cover.	The transition mire on the site corresponds to habitat type 7140 Transition mires and quaking bogs.	C+ Rating: County Conservation value
319	LUGDUFF TRANSITION MIRE SOUTH	305260	171924	Degraded transition mire surrounded by conifer forestry to north, east and west. Site still relatively wet with quaking surface but rank rush dominated. Scattered willow throughout. It is likely that increased nutrient inputs are affecting area.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
329	MANOR KILBRIDE PONDS	302767	217632	Man made estate pond surrounded by mature mixed broadleaved / conifer woodland. Extensive exotic planting, including Rhododendron, Gunnera, Lysichiton.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
307	MERGINSTOWN	290828	199023	An area of wet grassland used for grazing cattle. Firm and relatively dry underfoot, drainage ditches occur	It is not thought any of the habitats present correspond to any of the habitats listed under	E Rating: Local conservation value (low value)

Site Code	Site name UACC	Easting	Northing	Report Site Description	Report Survey site EU habitat comments	Conservation Ranking After Survey
				throughout and stockpiles of vegetated soil occur. Site is of low ecological value and has been extensively modified for agriculture.	Annex I of the EU Habitats Directive.	
298	MERVILLE AND MILLTOWN	285181	201016	Heavily disturbed wetland that is dominated by wet grassland. A large drain (4m wide) bisects the site at the county boundary. Part of the site has recently been planted with Alder.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
327	MOANASPICK	302734	220239	Former river meanders severely impacted by re-canalisation and deepening of the Brittas river. No longer supports wetland vegetation with exception of <i>Juncus effusus</i> . River surface 2 m below field surface.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	No Conservation Value
325	MUCKLAGH	308099	175208	Linear former wetland area in valley which has been impacted by land reclamation and drainage. Site has reverted to grassland with scattered scrub and bracken.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)
334	RATHATTIN	293376	204162	Small flooded linear depression in landscape. Appears to be permanently flooded. Little in the way of marginal vegetation. Grades into adjoining grassland grazed by sheep. Surface covered in floating liverwort <i>Riccardia fluitans</i> .	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
332	RATHBANE	300746	179935	Valley site with a mosaic of gorse scrub, wet grassland and wet heath occurring on sloped ground. A series of wet flushes run down the valley.	The wet heath on the site corresponds to the EU habitat type 4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> .	D Rating: Local conservation value (moderate value)
62	RATHCON FISHING LAKE	285789	195409	Artificial fishing lake stocked with Rainbow Trout. The lake is surrounded by narrow fringe of reeds and sedges and supports a good diversity of wildlife.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	C Rating: Local conservation value (high value)
311	RATHCOYLE	300136	184574	This former wet heath site has been heavily impacted by land reclamation. Only a small example of wet heath remains in the western part of site. The heath is currently being impacted by intensive cattle grazing.	The wet heath on the site corresponds to the EU habitat type 4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> .	C Rating: Local conservation value (high value)
314	RATHDUFF BEG	299013	184219	Gently sloping site with wet Heath present throughout. Small pockets of <i>Ulex</i> scrub	It is not thought any of the habitats present correspond to any of the	C Rating: Local conservation value (high value)

Site Code	Site name UACC	Easting	Northing	Report Site Description	Report Survey site EU habitat comments	Conservation Ranking After Survey
				are present in drier areas on old turf banks. Small area of disturbed blanket bog at southern end. Marsh Fritillary webs recorded during wetland survey.	habitats listed under Annex I of the EU Habitats Directive.	
313	RATHDUFF BOG NORTH	299659	183777	Area dominated by cutover bog abandoned for many years. Good Sphagnum regeneration with Vaccinium oxycoccus common on lawn and hummock areas.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
312	RATHDUFF BOG SOUTH	299470	183467	This site was selected due to its proximity to a known Marsh Fritillary breeding site but the site does not contain any Succisa. The site consists of old cutover bog/wet heath which has regenerated well.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
291	RATHTOOLE	282608	193083	Area of rich fen on valley slopes with a dominance of Schoenus nigricans in areas that remain spring fed. Drainage and infilling has damaged parts of the site where dry grassland (calcareous influence notable) now dominates on old spoil heaps.	The alkaline fen on the site corresponds to EU habitat type 7230 Alkaline Fen, the calcareous springs conform to a priority habitat 7220 Petrifying springs with tufa formation. The Calcareous grassland corresponding to 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea).	C+ Rating: County Conservation value
272	RUSSBOROUGH HOUSE POND	295984	210760	Wetland mosaic composed of lakes, wet woodland, tall herb swamp, transition mire and flooded grassland within Russborough Estate. Currently managed for amenity and conservation, surrounded by grazed lands.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	C Rating: Local conservation value (high value)
288	SHEILSTOWN	304587	182262	Site is mosaic of wet heath, gorse and Rhododendron scrub with wet grassland areas. Eastern half of site being badly invaded by Rhododendron. Western half of site on steeper slope with wet heath and with abundant Succisa. One Marsh Fritillary web located here.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	C+ Rating: County Conservation value
234	SLIEVENAMOUGH WET FLUSH	300999	186426	The upper parts of the site is dominated by wet grassland with wet heath along the stream margin. This site was	It is not thought any of the habitats present correspond to any of the habitats listed under	C+ Rating: County Conservation value

Site Code	Site name UACC	Easting	Northing	Report Site Description	Report Survey site EU habitat comments	Conservation Ranking After Survey
				ranked as county importance due to the presence of <i>Wahlenbergia hederacea</i> . Species not recorded on this visit, but plant may still occur.	Annex I of the EU Habitats Directive.	
6	THE MURROUGH WETLANDS pNHA/SAC/SPA	331368	204851	This is an extensive wetland site with a high diversity of wetland habitats present including brackish marsh, marsh, reedbed, alkaline fen, salt marsh, tidal river and coastal lagoon as well as wet woodland and scrub.	The site supports a number of habitats listed on Annex I of the EU Habitats Directive including several priority habitats. These include: Annual vegetation of drift lines [1210]; Perennial vegetation of stony banks [1220]; Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330]; Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]; Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210]; Alkaline fens [7230]	A Rating: Internationally Important
224	TOBER DEMESNE FISH POND	288596	203328	Old man made fish pond associated with former estate. Site is fed by calcareous springs. Vegetation is dominated by <i>Apium nodiflorum</i> . Site used for water abstraction by local authority. Small stream discharges to west of site.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
316	TOBER DEMESNE WETLANDS	288775	203939	Series of rain fed wet hollows in undulating landscape of glacial deposits. Mostly wet grassland dominated by <i>Juncus effusus</i> . Two hollows had significant open water, the more extensive of which is in county Kildare.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	D Rating: Local conservation value (moderate value)
295	WOODFIELD GLEN	290672	187314	The site has no wetland interest. Comprises an area of conifer plantation north of the road. Elsewhere species poor wet grassland dominated by <i>Juncus effusus</i> occurs. Drains traverse the site. Areas of dense bracken and <i>Ulex</i> scrub are also present.	It is not thought any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.	E Rating: Local conservation value (low value)

Appendix 3: Field Survey Card for the County Wicklow Wetland Survey II 2012

Wetland Survey County Wicklow 2012 - Survey Card

Detailed Site Survey Preliminary site inspection *New wetland site not in GIS*

Site Name		Altitude (m)	
County: Wicklow	Site Code:	Survey Date	
Grid Ref		Photos	
Surveyor(s)		Water Table +(cm)	
Substrate type	<input type="checkbox"/> Min Soil <input type="checkbox"/> Clay <input type="checkbox"/> Silt <input type="checkbox"/> Bedrock <input type="checkbox"/> Loose rock <input type="checkbox"/> Rocky till <input type="checkbox"/> Peat <input type="checkbox"/> Tufa Depth		
Stability	<input type="checkbox"/> Very Firm <input type="checkbox"/> Firm <input type="checkbox"/> Some quaking <input type="checkbox"/> Quaking <input type="checkbox"/> Floating mat		
Adjacent habitats (Fossitt codes)			
Conservation Assessment	<input type="checkbox"/> A International <input type="checkbox"/> B National <input type="checkbox"/> C+ County <input type="checkbox"/> C High Local <input type="checkbox"/> D Moderate Local <input type="checkbox"/> E Low Local <input type="checkbox"/> F Unknown – need survey		
Wetland on site:	Fossitt Habitats within site (EU Pr Hab bold / EU Hab Affinities Italic)	<input type="checkbox"/> WN6 Wet willow-alder-ash woodland <input type="checkbox"/> WN7 Bog woodland <input type="checkbox"/> WD1 (Mixed) broadleaved woodland <input type="checkbox"/> WD2 Mixed broadleaved/conifer wood <input type="checkbox"/> WD3 Yew woodland <input type="checkbox"/> WD4 Conifer plantation <input type="checkbox"/> WD5 Scattered trees and parkland	
Present:	<input type="checkbox"/> FL1 <i>Dystrophic lakes</i>	<input type="checkbox"/> WS1 Scrub	
Not wetland:	<input type="checkbox"/> FL2 <i>Acid oligotrophic lakes</i>	<input type="checkbox"/> WS2 Immature woodland	
Future Survey needed:	<input type="checkbox"/> FL3 <i>Limestone/marl lakes</i>	<input type="checkbox"/> WS3 Ornamental/non-native shrub	
Yes:	<input type="checkbox"/> FL4 Mesotrophic lakes	<input type="checkbox"/> WS4 Short rotation coppice	
No:	<input type="checkbox"/> FL5 Eutrophic lakes (<i>natural</i>)	<input type="checkbox"/> WS5 Recently-felled woodland	
Suggestion:	<input type="checkbox"/> FL6 Turloughs	<input type="checkbox"/> WL1 Hedgerows	
	<input type="checkbox"/> FL7 Reservoirs	<input type="checkbox"/> WL2 Treelines	
	<input type="checkbox"/> FL8 Other artificial lakes and ponds	<input type="checkbox"/> ER1 <i>Exposed siliceous rock</i>	
General / Landowner /EU Habs Comments:	<input type="checkbox"/> FW1 <i>Eroding/upland rivers</i>	<input type="checkbox"/> ER2 <i>Exposed calcareous rock</i>	
	<input type="checkbox"/> FW2 <i>Depositing/lowland rivers</i>	<input type="checkbox"/> ER3 <i>Siliceous scree and loose rock</i>	
	<input type="checkbox"/> FW3 Canals	<input type="checkbox"/> ER4 <i>Calcareous scree and loose rock</i>	
	<input type="checkbox"/> FW4 Drainage ditches	<input type="checkbox"/> ED1 Exposed sand, gravel or till	
	<input type="checkbox"/> FP1 Calcareous springs	<input type="checkbox"/> ED2 Spoil and bare ground	
	<input type="checkbox"/> FP2 Non-Calcareous springs	<input type="checkbox"/> ED3 Recolonising bare ground	
	<input type="checkbox"/> FFS1 Reed and large sedge swamps	<input type="checkbox"/> ED4 Active quarries and mines	
	<input type="checkbox"/> FFS2 <i>Tall herb swamps</i>	<input type="checkbox"/> ED5 Refuse and other waste	
	<input type="checkbox"/> GA1 Improved agricultural grassland	<input type="checkbox"/> BC1 Arable crops	
	<input type="checkbox"/> GA2 Amenity grassland (improved)	<input type="checkbox"/> BC2 Horticultural land	
	<input type="checkbox"/> GS1 <i>Dry calcareous & neutral grassland</i>	<input type="checkbox"/> BC3 Tilled land	
	<input type="checkbox"/> GS2 <i>Dry meadows & grassy verges</i>	<input type="checkbox"/> BC4 Flower beds and borders	
	<input type="checkbox"/> GS3 Dry-humid acid grassland	<input type="checkbox"/> BL1 Stone walls and other stonework	
	<input type="checkbox"/> GS4 Wet grassland	<input type="checkbox"/> BL2 Earth banks	
	<input type="checkbox"/> GM1 <i>Marsh</i>	<input type="checkbox"/> BL3 Buildings and artificial surfaces	
	<input type="checkbox"/> HH1 <i>Dry siliceous heath</i>	<input type="checkbox"/> CW1 Lagoons and saline lakes	
	<input type="checkbox"/> HH2 <i>Dry calcareous heath</i>	<input type="checkbox"/> CW2 <i>Tidal rivers</i>	
	<input type="checkbox"/> HH3 <i>Wet heath</i>	<input type="checkbox"/> CM1 <i>Lower salt marsh</i>	
	<input type="checkbox"/> HH4 <i>Montane heath</i>	<input type="checkbox"/> CM2 <i>Upper salt marsh</i>	
	<input type="checkbox"/> HD1 Dense bracken	<input type="checkbox"/> CB1 <i>Shingle and gravel banks</i>	
	<input type="checkbox"/> PB1 Raised bogs	<input type="checkbox"/> CD1 <i>Embryonic dunes</i>	
	<input type="checkbox"/> PB2 Upland blanket bog	<input type="checkbox"/> CD2 <i>Marram dunes</i>	
	<input type="checkbox"/> PB3 Lowland blanket bog	<input type="checkbox"/> CD3 Fixed dunes	
	<input type="checkbox"/> PB4 Cutover bog	<input type="checkbox"/> CD4 <i>Dune scrub and woodland</i>	
	<input type="checkbox"/> PB5 Eroding blanket bog	<input type="checkbox"/> CD5 <i>Dune slacks</i>	
	<input type="checkbox"/> PF1 Rich fen/flush (Cladium/Alkaline)	<input type="checkbox"/> CD6 Machair	
	<input type="checkbox"/> PF2 Poor fen and flush		
	<input type="checkbox"/> PF3 <i>Transition mire & quaking bog</i>		
	<input type="checkbox"/> WN1 <i>Oak-birch-holly woodland</i>		
	<input type="checkbox"/> WN2 <i>Oak-ash-hazel woodland</i>		
	<input type="checkbox"/> WN3 Yew woodland		
	<input type="checkbox"/> WN4 Wet pedunc oak-ash wood		
	<input type="checkbox"/> WN5 <i>Riparian woodland</i>		

Aneura ping	Sphag ripar	Cirsium dis	Juncus bulb	Potamo perfol
Aulocoom pal	Sphag squarr	Cirsium pal	Juncus cong	Potamo poly
Brachy riv	Sphag subnit	Cladium mar	Juncus eff	Pot erecta
Bry pseudo	Sphag subsec	Dactylof incar	Juncus subn	Pot palust
Call gig	Thuid tamar	Dactylof macu	Lemna min	Ranunc flam
Call stram	Toment nit	Dactylof maj	Lemna tri	Ranunc ling
Call cusp	Agros can	Dactyl glom	Leont autum	Rhynch alba
Calyp muell	Agrost stol	Descha caes	Littor unifl	Rorip amph
Camp stell	Alisma plan eq	Drosera rot	Lotus ulig	Rorip palus
Cinc font	Alnus glut	Dryopt affin	Luzula camp	Rumex acosa
Cladop fruit	Alopecu genic	Dryopt carth	Luzula mut	Rumex cong
Clim dend	Anag tenella	Dryopt fx-ma	Lynchnis flos	Rumex hydro
Craton filicin	Angel sylv	Eleoche mult	Lycopus eu	Salix aur
Ctenid moll	Anthox od	Eleoche pal	Lysimach nem	Salix on
Dicran scop	Apium inunda	Eleoche quin	Lythrum sal	Salix frag
Drep cossou	Apium nodi	Elodea can	Mentha aq	Salix rep
Drep revolvi	Berula eric	Epilob hirs	Menyanthes	Salix vim
Euclad vertic	Betula pub	Epilob obscur	Molinia	Saxifrag aizo
Eurhyn prae	Bidens cer	Epilob palu	Myosot laxa	Schoeno lac
Fies adian	Bidens tripar	Epilob parvi	Myosot secu	Schoenus
Font antl	Briza med	Epipactis pal	Myosot scor	Senecio aq
Hamat verni	Callitrich stag	Equis fluv	Myrica gale	Spart erg
Hyloc splend	Calluna vul	Equis pal	Myrioph after	Spart min
Palust comm	Calluna pal	Equis varie	Myrioph spic	Stellar gram
Palust c v c	Cardam pra	Erica tet	Narth ossi	Stellar pal
Palust co v fa	Carex curta	Erioph ang	Nastur off	Stellar ulig
Pellia epi	Carex diand	Erioph lat	Nuphar lut	Succisa prat
Philon calc	Carex dioic	Erioph vag	Nymph alba	Thelyp pal
Plagio aff	Carex disti	Eupat can	Oenanth aq	Trigloc pal
Plagio ellip	Carex echin	Fest arund	Oenanth croc	Typh ang
Pleur echre	Carex flac	Fest rub	Parnassia pal	Typha latif
Polyt comm	Carex hod	Filipend ulm	Pedic palust	Utric austral
Scleropo pur	Carex lasio	Galium pal	Phalar arund	Utric inter
Rhizo punc	Carex limosa	Galium sax	Phragmites	Utric minor
Rhytid squar	Carex nigra	Galium ulig	Pinguic vul	Utric vulg
Rhytid triq	Carex panic	Glyceria flut	Plantago lan	Vaccin oxy
Scorp scorp	Carex pand	Glyceria not	Poa prat	Valeria offic
Sphag fimb	Carex pulica	Hippuris	Poa triv	Veron an-aq
Sphag angus	Carex ros	Holcus lan	Polygala serp	Veron becca
Sphag capit	Carex brach	Hydrocot vul	Polygo amph	Veron caben
Sphag cusp	Carex oed	Hyperic elod	Polygo hydro	Veron scutell
Sphag dent	Carex virid	Hyperic tetrap	Potamo berc	Vicia cracca
Sphag tallax	Cerast nigra	Hypoch rad	Potamo color	Viola pal
Sphag pal	Cerast font	Iris pseudo	Potamo crisp	Algae
Sphag papil	Chara spp	Juncus acuti	Potamo lucen	
Sphag recurv	Cicuta vtro	Juncus artic	Potamo obtus	

DAFOR Scale: D - Dominant; A - Abundant; F - Frequent; O - Occasional; R - Rare

Site Description (and faunal records)

Appendix 4: Site Evaluation Criteria

Modified from National Roads Authority (2009). Guidelines for Assessment of Ecological Impacts of National Roads Schemes.

Rating	Importance of Ecological Sites
A	<p>Internationally important</p> <p>Sites designated (or qualifying for designation) as SAC* or SPA* under the EU Habitats or Birds Directives.</p> <p>Undesignated sites containing good examples of Annex I <u>priority</u> habitats under the EU Habitats Directive. Sites designated (or qualifying for designation) as SAC* for salmonids or Annex II species under the EU Habitats Directives.</p> <p>Major salmon river fisheries.</p> <p>Major salmonid (salmon, trout or char) lake fisheries.</p>
B	<p>Nationally important</p> <ul style="list-style-type: none"> • Sites or waters designated or proposed as an NHA* or statutory Nature Reserves. • Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive). • Undesignated sites containing <u>significant numbers</u> of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. • Major trout river fisheries. • Water bodies with major amenity fishery value. • Commercially important coarse fisheries.
C+	<p>County value</p> <p>Area of Special Amenity.</p> <p>Area subject to a Tree Preservation Order.</p> <p>Area of High Amenity, or equivalent, designated under the County Development Plan.</p> <p>Resident or regularly occurring populations (assessed to be important at the County level) of the following:</p> <ul style="list-style-type: none"> • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; • Species protected under the Wildlife Acts; and/or • Species listed on the relevant Red Data list. <p>Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.</p> <p>County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared.</p> <p>Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.</p>
C	<p>High value, locally important</p> <p>Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species.</p> <p>Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive.</p> <p>Small water bodies with known salmonid populations or with good potential salmonid habitat.</p> <p>Large water bodies with some coarse fisheries value.</p>
D	<p>Moderate value, locally important</p> <p>Sites containing some semi-natural habitat or locally important for wildlife.</p> <p>Small water bodies with some coarse fisheries value or some potential salmonid habitat.</p> <p>Any water body with unpolluted water (Q-value rating 4-5).</p>
E	<p>Low value, locally important</p> <p>Artificial or highly modified habitats with low species diversity and low wildlife value.</p> <p>Water bodies with no current fisheries value and no significant potential fisheries value.</p>
F	<p>Unknown Value</p> <p>Sites of possible ecological value which require further investigation at the optimum season to establish importance.</p> <p>Sites of possible fisheries value requiring further survey.</p>

* SAC = *Special Area of Conservation*, SPA = *Special Protection Area*, NHA = *Natural Heritage Area*

Appendix 5: Database suite structure and data fields used on the County Wicklow Wetland Survey II

As part of the Wicklow Wetland Survey 2011 project (WWS) two main database suites were used to hold site information, namely the Wicklow Wetland Map (WWM) GIS dataset and the (WWM) Site database (version 1.0).

As part of the 2012 WWS the structure of the WWM GIS database and the WWS site and survey database were re-designed. This was done to allow digital recording of field survey data on the iPad and to facilitate better data transfer and integration of results into the GIS system used by Wicklow County Council via the export of data in the WWM & WWS database into Excel, Access and SQL formats.

The revised database structure used in 2012 of the WWM Site (version 2.0) and WWS Survey database (version 2.0) suites are outlined below, as well as changes made to the WWM GIS dataset.

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1. WWM GIS Dataset

The **WWM GIS Dataset 2012** (ArcView 10.0 GIS software package) holds site related information on each polygon, point or linear feature mapped. Data held in this dataset were converted into MapInfo format at the end of the project period for use by Wicklow County Council.

This dataset was revised and updated as part of the WWS 2012 project. Fields in the GIS dataset are similar as those used in Wilson & Foss (2011) with some minor adjustments. A detailed explanation of the various GIS files and associated attribute fields are presented in the readme document accompanying the GIS files on the final WWS 2012 project CD.

2. WWM Site & WWS Survey databases

The relationship of the Wicklow Wetland Map Site (MWM) and Wicklow Wetland Survey (MWS) database suites (i.e. the main database elements and the sub-database that feed data to the main WWS and WWM database) is presented in Figure 1 below.

The fields held within each database and sub-database are explained in the table below.

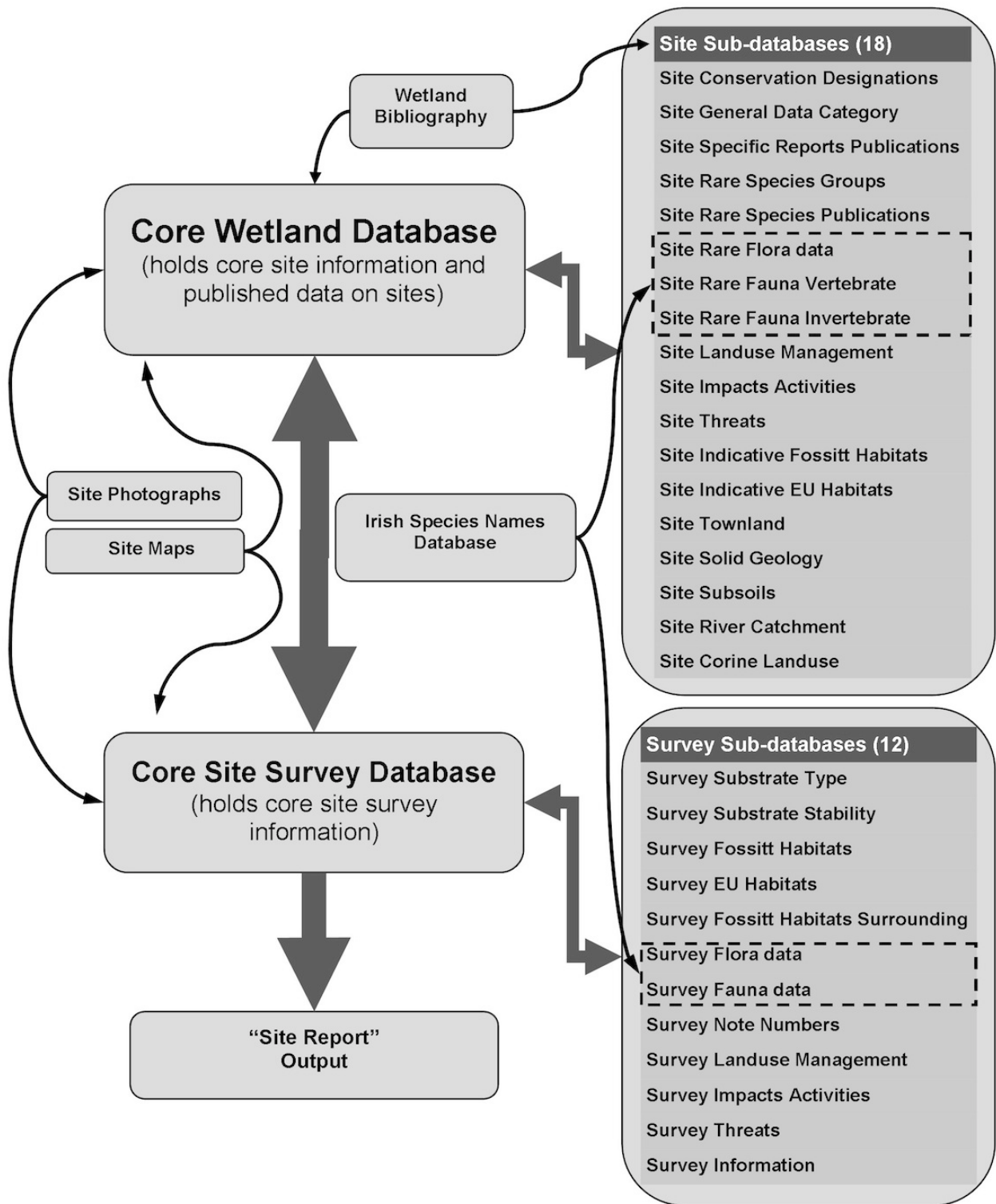


Figure 1. County Wicklow Wetland Survey II 2012 database suite relationship structure of the Wicklow Wetland Map Site (WWM) and Wickow Wetland Survey (MWS) databases and associated sub-databases.

3. Wicklow Wetland Map (WWM) database suite version 2.0

The **WWM Site Database** (Filemaker Pro 11.0 software package) suite holds some of the information in the GIS database, but allows for easier sorting and display of site records as well as data analysis. In addition this database and the associated sub-databases (18 in total) hold more detailed information on sites than is possible within the GIS for certain data fields (e.g. site descriptions, rare species recorded from the site, survey history etc.), and allows site photographs and maps to be displayed.

The WWM database displays site data via a series of layouts. These layouts are used when adding or reviewing data on a site. These layouts are accessed via the green or yellow link buttons along the top of the WWM database window.

The main Wicklow Wetland Map database amalgamates data from a series of 18 sub-databases to compile a complete site description. The sub-databases and the data they contain are detailed below.

4.1.1 Data fields held in the WWM database suite (version 2.0)

An explanation of the data fields used in the WWM database suite is provided below.

Table 4.1 Wicklow Wetland Map (WWM) database and sub-database files and the record data held within each database for individual sites.

** Name in bold is the name applied to database fields as seen when accessing the database in browse/operating mode; the underlined name is the actual field name assigned within the database (used when exporting data, performing calculations etc.).*

Database name <i>(sub database names are italicised)</i>	Field name *	Comment
Database Fields Common to the Core Wetland Database (WWM) and all associated sub-databases listed here		
	Site Code (<u>Site Code UACC</u>)	Unique site code for the site as assigned in Core Site database (WWM) and used by each of the sub-databases to relate site record information. Auto generated.
	Database Record number (<u>Database Record number</u>)	Unique record number for each record entry within each database and sub-database. Auto generated.
	Created by (<u>Created by</u>)	Name of person who created record within each database and sub-database. Auto generated.
	Date Created (<u>Date Created</u>)	Date record was created within each database and sub-database. Auto generated.
	Modified by (<u>Modified by</u>)	Name of person who last modified record within each database and sub-database. Auto generated.
	Date modified (<u>Date modified</u>)	Date record was last modified within each database and sub-database. Auto generated.
	Time modified (<u>Time modified</u>)	Time record was last modified within each database and sub-database. Auto generated.
Core Wetland Database		Wetland Map Site database

(WWM)		holding information on wetlands identified within the county.
	Site Name (<u>Site Name UACC</u>)	The name of the wetland site, based on the most widely used name for site proposed by third party sources and adopted for the project. (see also Other Groups Site Name below). <i>Where a site record occurs as a subsite within a larger site complex, the specific subsite name is followed by the name of the main site preceded by a - (e.g. DUMMYS LOUGH - KILROOSKY LOUGH CLUSTER SAC, here Dummys Lough, a subsite occurs within the Kilroosky Bog Cluster SAC, the main site).</i>
	Designated Site Code (<u>Designated Site Code UACC</u>)	NPWS Site Code number for NHA, SAC and SPA.
	Other Groups Site Name (<u>Other Group Site Name UACC</u>)	Alternative site name applied to site by other reports or publications (for reference). <i>(When trying to locate a site within the database it is essential that this field is also searched in the case where the site cannot be found under the Site Name field above).</i>
	Other Groups Site Code (<u>Other Group Site Code UACC</u>)	Site code applied by other groups (for reference).
	Site area (ha) from literature (<u>Total Site Area (ha) from literature UACC</u>)	
	Site area (ha) from GIS (<u>Total Site area (ha) from GIS UACC</u>)	Calculated site area from GIS dataset.
	Total Site Length (km) from literature (<u>Total Site Length (km) from literature UACC</u>)	
	Total Site Length (km) from GIS (<u>Total Site Length (km) from GIS UACC</u>)	Calculated site length from GIS dataset.
	Easting Centre (<u>Easting Centre UACC</u>)	The grid reference of the E co-ordinate of the site is recorded, where this is given in the new format of a 6 digit number.
	Northing Centre (<u>Northing Centre UACC</u>)	The grid reference of the N co-ordinate of the site is recorded, where this is given in the new format of a 6 digit number.
	Grid Reference (<u>Grid Ref Old UACC</u>)	Grid reference previously reported from literature. The grid reference of the site is recorded, where this is given in the old format of a letter followed by 4 or 6 digit number. <i>(It should be noted that this grid reference, based on information provided in published reports, should be interpreted with care, and in many cases may be found to be inaccurate. In relation to site location the Easting and Northing co-ordinates above are</i>

		<i>considered the more reliable when locating the site in question).</i>
	Year last reported field Survey (Date of last survey UACC)	4 digit year for the last reported survey of site.
	First Noted in (Site Source UACC)	Report or Bibliography reference to where site was first reported in literature source.
	County (County Name UACC and County Name UACC text string)	Two fields to record county; the first a check box selection; the second producing county names in which site occurs as a text string.
	Wetland areas on site (Wetland areas on site UACC)	Check box system to record whether a wetland type occurred on site, was likely to occur or was absent. Check box selection, only 1 choice to be selected. <ul style="list-style-type: none"> • YES • No wetland present • No Data - wetland possible • No Data - wetland unlikely
	Site type (Site type UACC)	Check box allowing a site record to be characterised, i.e. whether the database record is for a discrete site or a subsite, a smaller part (e.g. lake) within a larger site complex. A subsite record was generally created where specific site data related to the subsite. <p><i>(Example: RAMAGES LOUGH (KILROOSKY LOUGH CLUSTER) - here Ramages Lough has a unique data record, while the inclusion of the Kilroosky Lough Cluster in the site name allows the relationship to the larger main site (an SAC) to be maintained and recognised).</i></p> Check box selection, only 1 choice to be selected. <ul style="list-style-type: none"> • Main Site • Sub-site
	Comment Box (Comment Box UACC)	Text field to hold temporary comments on site, queries on site etc. Used during data compilation phase of the project.
	Temporary flag record (Temporary flag record UACC)	Check box allowing the temporary flagging of selected site records. Used during data compilation or data abstraction phase of the project.
	Annex Species Present – EU Birds or Habitats Directive (Species Annex species Present EU Birds Habitats Directive UACC)	Yes No option for the reported occurrence of EU Habitats or Birds Directive Annex species on site.
	Red Data Book Species Present (Species Red Data Book Species Present UACC)	Yes No option for the reported occurrence of Red species on site.
	Comment/Notes on rare species	Comment box.

	groups (<u>Species comments on rare groups UACC</u>)	
	Damaging Operations/ Threats on site comments (<u>Damaging operations comments UACC</u>)	Comment box.
	Site description and source (<u>Previous site description UACC</u>)	Text box holding site description as reported by third party source(s).
	Comment on Previous surveys (<u>Comment box previous surveys UACC</u>)	Comment box.
<i>Site Conservation Designations</i>		Sub database holding information on the conservation status of a site.
	Site Designation (<u>Site designations MACC</u>)	<p>If the site has or was designated under one of the various conservation initiatives the appropriate designation was recorded.</p> <p>Choose from:</p> <ul style="list-style-type: none"> • NHA - Natural Heritage Area with legal protection • cNHA - candidate Natural Heritage Area no legal protection • pNHA - proposed Natural Heritage Area as advertised in 1995 some legal protection • SAC - Special Area of Conservation with legal protection • cSAC - candidate Special Area of Conservation open to appeal/ transmitted to EU • pcSAC - proposed candidate Special Area of Conservation open to appeal/ not yet transmitted to EU • SPA - Special Protection Area • cSPA - candidate Special Protection Area • NP - National Park with legal protection • WHS - World Heritage Site • NNR - National Nature Reserve with legal protection • BIO - Unesco Biosphere Reserve • RAM - Ramsar Site • ESA - Environmentally Sensitive Area • EDS - Eurodiploma Site • ASI - Area of Scientific Interest • BGR - Berne Convention Biogenetic Reserve • COR - Corine site • WS - Wildfowl Sanctuary • RFF - Refuge for Flora or Fauna • CBA - Coillte Biodiversity Area • CFP - Coillte Forest Park • Undesignated site - no known designation
<i>Site General Data Category</i>		Sub database holding a list of information categories under which data has been recorded on the site in previous reports or data sources.

	<p>General information available on site (<u>General information available on site MACC</u>)</p>	<p>Choose from:</p> <ul style="list-style-type: none"> • Vegetation Type - relevé data recorded from site • Species Data - recorded for general and/or on rare species • Habitat Data - habitat data in Fossitt format available for all or part of site • Habitat Map - map data of variable quality available (may include GIS habitat map) • Hydrochemical Data - water chemistry data available on site • Site Size - from published source • Ownership Data - owner information available on site • Detailed Site Description - detailed description of available in published report • Site Management - site management recommendations have been made in published report • Conservation Designation - site conservation recommendations have been made in published report • iWeBS Site - site is listed as a location for bird recording as part of the Irish Wetlands Birds Survey Scheme • Visitor & Recreation Facilities - wetland site with visitor and recreational facilities i.e. parking, walks and trails, picnic areas, seating, viewing platforms etc., other than angling facilities • Angling Lake - lake or river is used or managed as a location for angling, with or without angling facilities
<p><i>Site Specific Reports Publications</i></p>		<p>Sub database holding a list of reports and publications which refer to site; uses Wetland Bibliography database to get full citation.</p>
	<p>Reference Code (<u>Reference Code</u>)</p>	<p>Unique bibliography reference code.</p>
	<p>Amalgamated Reference (<u>Amalgamated ref</u>)</p>	<p>Full report or publication citation as text string; lookup from Wetland Bibliography database.</p>
<p><i>Site Rare Species Groups</i></p>		<p>Sub database holding information as reported from literature on groups recorded on site (e.g. rare plants, animals, EU spp etc.)</p>
	<p>Species rare groups present on site (<u>Species rare groups present on site MACC</u>)</p>	<p>Choose from:</p> <ul style="list-style-type: none"> • Botanical • Higher Plant • Fern • Bryological • Lichen • Algae • Fungi • Zoological

		<ul style="list-style-type: none"> • Invertebrates • Invertebrates Mollusc • Invertebrates Insect • Invertebrates Arachnid • Invertebrates Crustacean • Vertebrates • Birds • Mammals • Bats • Amphibian • Fish • Reptile
<i>Site Rare Species Publications</i>		Sub database holding a list of reports and publications which refer to rare species on a site; sub database uses Wetland Bibliography database to get full citation.
	Reference Code (<u>Reference Code</u>)	Unique bibliography reference code.
	Amalgamated Reference (<u>Amalgamated ref</u>)	Full report or publication citation; lookup from Wetland Bibliography database.
<i>Site Rare Flora Data</i>		Sub database holding information as reported from literature on rare flora recorded on site.
	Rare flora name Latin (<u>Rare flora Latin site list MACC</u>)	Drop down list of Latin wetland plant species names.
	Rare flora name English (<u>Rare flora name English</u>)	Sub database uses Irish Species database to get related English name.
<i>Site Rare Fauna Vertebrate</i>		Sub database holding information as reported from literature on rare vertebrate fauna recorded on site
	Rare vertebrate fauna English name (<u>Rare vertebrate fauna English site list MACC</u>)	Drop down list of English wetland invertebrate fauna species names.
	Latin Name (<u>Rare vertebrate fauna Latin site list MACC</u>)	Sub database uses Irish Species database to get related latin name.
<i>Site Rare Fauna Invertebrate</i>		Sub database holding information as reported from literature on rare vertebrate fauna recorded on site.
	Rare invertebrate fauna Latin name (<u>Rare invertebrate fauna site list MACC</u>)	Drop down list of English wetland Invertebrate fauna species names.
	English name (<u>Rare invertebrate fauna English site list MACC</u>)	Sub database holding information as reported from literature on rare invertebrate fauna recorded on site.
<i>Site Landuse Management</i>		Sub database holding a list of landuse management options occurring on site.
	Landuse Management on site (<u>Landuse Management on site MACC</u>)	NPWS list of landuse options. Drop down options list.
	Frequency Landuse Management (<u>Frequency Landuse Management on site</u>)	Drop down options list. Scale: 1 Rare (<5%) 2 Occasional (5-20%)

	<u>MACC</u>)	3 Frequent (21-50%) 4 Dominant (>50%)
<i>Site Impacts Activities</i>		Sub database holding a list of impacts and activities influencing the conservation status of the site and the intensity and impact these are having on the site.
	Impact & Activities Influencing Conservation Status of site (<u>Damaging operations on site MACC</u>)	List of EU Natura 2000 site impacts and activities updated by NPWS in 2009. Drop down options list.
	Intensity (<u>Damage intensity on site MACC</u>)	Drop down options list. Intensity of the influence of an activity is rated as <ul style="list-style-type: none"> • A = high, • B = medium, • C = low influence • D = unknown
	Impact (<u>Damage Impact on site MACC</u>)	Drop down options list. Impact rating scale: Impact is rated as <ul style="list-style-type: none"> • -2 = irreparable negative influence • -1 = reparable negative influence • 0 = neutral • +1= natural positive influence • +2 = strongly managed positive influence • Unknown
<i>Site Threats</i>		Sub database holding a list of threats to site.
	Threats on site (<u>Threats on site MACC</u>)	List of EU Natura 2000 site impacts and activities updated by NPWS in 2009. Drop down options list.
<i>Site Indicative Fossitt Habitats</i>		Sub database holding a list of Fossitt habitats reported in published sources as occurring on the site.
	Habitats Present on site full Fossitt name (<u>Habitats present on site full Fossitt name MACC</u>)	List of Fossitt (2000) Irish habitat types. Drop down options list.
	Habitats Present on site Fossitt code only (<u>Habitats Present on site Fossitt code only MACC</u>)	Calculation results the Fossitt habitat code entered into data field is based on full Fossitt habitat name entered in field above.
<i>Site Indicative EU Habitats</i>		Sub database holding a list of EU habitats reported in published sources as occurring on the site.
	EU Directive Habitats on site (<u>Habitats EU Directive Habitats on site MACC</u>)	List of EU Habitats Directive habitat types. Drop down options list.
<i>Site Townlands</i>		Sub database holding a list of townlands occurring on the site.
	Site Townland (<u>Site Townlands MACC</u>)	Data imported from GIS. <i>(In the case of a main site (see definition below), all townland(s) recorded within the site polygon mapped are provided. For subsites</i>

		<i>only the townland directly at the grid reference point location is provided. Similar rules apply to information provided for site Solid Geology, Subsoil Type, River Catchment & Corine Landuse).</i>
Site Solid Geology		Sub database holding a list of rock types occurring on the site.
	Site Solid Geology (<u>Site Solid Geology</u> MACC)	Data imported from GIS.
Site Subsoils		Sub database holding a list of Sub-soil types occurring on the site.
	Site Subsoils (<u>Site Subsoils</u> MACC)	Subsoil (quaternary deposit) underlying the site. Obtained from the GIS. Code - Parent Material A - Alluvium undifferentiated AcEsk - Clayey esker sands and gravel BktPt - Blanket peat Cut - Cutover peat FenPt - Fen peat GDCSs- Sandstone sands and gravels (Devonian/Carboniferous) GLPSsS - Sandstone and shale sands and gravels (Lower Palaeozoic) GLs - Limestone sands and gravels (Carboniferous) KaRck - Karstified limestone bedrock at surface L - Lake sediments undifferentiated Made - Made ground Rck - Bedrock at surface TDCSs - Sandstone till (Devonian/Carboniferous) TDCSsS - Sandstone and shales till (Devonian/Carboniferous) TLs - Limestone till (Carboniferous) Water - Open water at the surface
Site River Catchment		Sub database holding a list of River Catchments occurring on the site.
	Site River Catchment (<u>Site River Catchment</u> MACC)	Data imported from GIS.
Site Corine Habitats		Sub database holding information on Corine habitats recording on a site.
	Site Corine Landuse (<u>Site Corine Landuse</u> MACC)	Data imported from GIS.

4. County Wicklow Wetland Survey (WWS) database suite version 2.0

To hold data from the 2012 survey the County Wicklow Wetland Survey (MWS) database was re-designed. This **County Wicklow Wetland Survey (WWS) Database** (version 2.0) was linked to the WWM Site database via the **site record number** and **survey record number**.

Details of the data fields (name as it appears in operational mode within various database layouts; and in brackets the field name within database) in the County Wicklow Wetland Survey (WWS) survey database are provided below.

Once survey information has been incorporated into the WWS survey database, and by selecting the “Show complete site report” button, a full survey report for the site can be viewed on screen. By selecting the “Create final PDF of complete site report - description, maps and habitat map” button a PDF of the complete site report, as included in the final report of the 2012 survey, is created and can be saved to a PDF file.

A series of database layouts, containing site survey information, form the main structure and content of the WWS survey database. These layouts were used when adding or reviewing survey data on a site. These layouts are accessed via the green or yellow link buttons along the top of the WWS database window.

An explanation of the data fields used in the survey database is provided below. The appearance of the various iPad field survey layouts in the WWS survey database is presented in Appendix 6.

4.2.1 Data fields held in the WWS Survey database suit (version 2.0)

** Name in bold is the name applied to database fields as seen when accessing the database in browse/operating mode; the underlined name is the actual field name assigned within the database (used when exporting data, performing calculations etc.).*

Database name <i>(sub database names are italicised)</i>	Field name *	Comment
Database Fields Common to the Core Site Survey Database (WWS) and all associated sub-databases listed here		
	Site Code (<u>Site Code UACC</u>)	Unique site code for the site as assigned in Core Site database and used by the Core Site Survey database each of the sub-databases to relate site records.
	Database Record number (<u>Database Record number</u>)	Unique record number for each record entry within each database and sub-database.
	Survey Code Number (<u>Survey Code number</u>)	Unique survey code number as assigned in Core Site database and used by the Core Site Survey database each of the sub-databases to relate site records for a particular survey.
	Created by (<u>Created by</u>)	Name of person who created record within each database and sub-database.
	Date Created (<u>Date Created</u>)	Date record was created within each database and sub-database.
	Modified by (<u>Modified by</u>)	Name of person who last modified record within each database and sub-database.

	Date modified (<u>Date modified</u>)	Date record was last modified within each database and sub-database
	Time modified (<u>Time modified</u>)	Time record was last modified within each database and sub-database.
Core Site Survey Database (WWS)		Site Survey database holding information on wetlands where a detailed field survey has been undertaken. Only data fields held within the database are described here, lookups of fields from related databases or sub-databases are described elsewhere.
	Site Name (<u>Site Name UACC</u>)	Name as provided in the Core Site database.
	Survey full title (<u>Survey full title UACC</u>)	Full title of survey (with year). Drop down menu selection.
	Survey code (<u>Survey code UACC</u>)	Abbreviated code for field survey (includes the year survey was undertaken). Drop down menu selection.
	Date of wetland survey (<u>Date of Field Survey UACC</u>)	Date detailed field survey undertaken. Format dd/mm/yyyy.
	Name of Wetland Surveyors (<u>Name of Wetland Surveyors UACC</u>)	Name of field surveyors who surveyed site. Drop down menu selection.
	Survey photographic no. (<u>Survey Photographic Numbers UACC</u>)	Photographic image code from survey together with initials of photographer.
	Conservation Ranking following Survey (<u>Conservation Ranking after survey UACC</u>)	Conservation ranking for site based on results of field survey and subsequent conservation assessment. One check box option to be selected following survey. <ul style="list-style-type: none"> • A Rating: Internationally Important • B Rating: Nationally Important • C+ Rating: County Conservation value • C Rating: Local conservation value (high value) • D Rating: Local conservation value (moderate value) • E Rating: Local conservation value (low value) • F Rating: Unknown value - survey required • No conservation value
	Altitude (<u>Site altitude mOD UACC</u>)	Altitude of site meters above Ordnance datum.
	Water table (cm) (<u>Water table depth cm UACC</u>)	Water table depth within wetland site. Recorded in cm.
	Substrate depth (cm) (<u>Site substrate depth UACC</u>)	Substrate depth under wetland area recorded in cm.
	Damaging Operations/ Threats on site comments (<u>Damaging operations comments UACC</u>)	Comment box.
	Site location (<u>Report Survey Site</u>)	In this field include information on

	<u>location UACC)</u>	the location of the site relative to nearest town etc. Text field with maximum character allowance of 250.
	Survey site description with reference to wetlands present (<u>Report Site description UACC)</u>	In this field include general site description, and/or comment on habitats present, substrate type, stability, depth and water table. Text field with maximum character allowance of 250.
	Comments on potential occurrence of EU habitats on site (<u>Report Survey Site EU habitats comments UACC)</u>	EU Habitats Directive habitats recorded for the site; EU rare species information etc. Text field with maximum character allowance of 250.
	Management recommendations following survey (<u>Report Management recommendations UACC)</u>	Wetland enhancement or management recommendations for site following survey. Text field with maximum character allowance of 250.
	Future survey recommendations (<u>Report Future Survey recommendations UACC)</u>	Additional survey recommendations for site following survey. Text field with maximum character allowance of 250.
	Landowner information comments (<u>Report Landowner information comments UACC)</u>	Comments provided by landowners on site history, ownership, management etc. Text field with maximum character allowance of 250.
<i>Survey Substrate Type</i>		Sub database holding a list of soil types on the site observed during survey.
	Site Substrate Type (<u>Site substrate type MACC)</u>	Drop down list options: <ul style="list-style-type: none"> • Mineral Soil • Clay • Silt • Alluvial deposit • Bedrock • Loose Rock • Rocky Till • Peat • Tufa • Made Ground • Other
<i>Survey Substrate Stability</i>		Sub database holding a list of substrate stability options observed during survey.
	Site Substrate Stability (<u>Site substrate stability MACC)</u>	Drop down list options: <ul style="list-style-type: none"> • Very firm • Firm • Some quaking • Quaking • Floating mat
<i>Survey Fossitt Habitats</i>		Sub database holding a list of Fossitt habitats as occurring on the site following survey.
	Habitats Present on site full Fossitt name (<u>Habitats present on site full Fossitt name MACC)</u>	List of Fossitt (2000) Irish habitat types. Drop down menu list.

	Fossitt code (<u>Habitats Present on site Fossitt code only MACC</u>)	Calculation results the Fossitt habitat code entered into data field is based on full Fossitt habitat name entered in field above.
<i>Survey Fossitt Habitats Surrounding</i>		Sub database holding a list of Fossitt habitats as occur surrounding the site following survey.
	Habitats Present surrounding site full Fossitt name (<u>Habitats present surrounding site full Fossitt name MACC</u>)	List of Fossitt (2000) Irish habitat types. Drop down menu list.
	Fossitt code (<u>Habitats Present surrounding site Fossitt code only MACC</u>)	Calculation which results in Fossitt habitat code being entered into data field based on full habitat name.
<i>Survey Flora Data</i>		Sub database holding a list of flora species recorded during the survey.
	Species Flora (Latin name) (<u>Species Flora site list MACC</u>)	List of flora recorded on site. Higher and lower plants, mosses and lichens. Drop down menu list.
	English name (<u>English Flora species name</u>)	Sub database uses Irish Species database to get related English name.
	Species temporary survey comment box (<u>Species temporary survey comment box</u>)	Comment box for use on field survey or to allow recording of DAFOR species abundance.
<i>Survey Fauna Data</i>		Sub database holding a list of flora species recorded during the survey.
	Species Fauna site list (<u>Species Fauna English name site list MACC</u>)	List of fauna (vertebrates and invertebrates) recorded on site. Drop down menu list.
	Species Fauna latin name (<u>Species Fauna latin name site list MACC</u>)	Sub database uses Irish Species database to get related Latin name.
	Species temporary survey comment box (<u>Species temporary survey comment box</u>)	Comment box for use on field survey or to allow recording of species abundance information.
<i>Survey Note Numbers</i>		Sub database holding survey note number, note type and descriptive data.
	Note Number (<u>Report target notes numbers MACC</u>)	Drop down menu selection. N1, N2 etc.
	Note Category (<u>Report target notes category MACC</u>)	Drop down menu selection: <ul style="list-style-type: none"> • Habitat • Damage • Boundary • Relevé • Hydrology • Flora • Fauna • Ownership • Management • Photograph • General
	Note (<u>Report target notes MACC</u>)	Text field with maximum character allowance of 250.
<i>Survey Landuse</i>		Sub database holding a list of

<i>Management</i>		landuse management options occurring on site as observed during survey
	Landuse Management on site (<u>Landuse Management on site MACC</u>)	NPWS list of landuse options. Drop down list.
	Frequency Landuse Management (<u>Frequency Landuse Management on site MACC</u>)	Drop down list options. Scale: 1 Rare (<5%) 2 Occasional (5-20%) 3 Frequent (21-50%) 4 Dominant (>50%)
<i>Survey Impacts Activities</i>		Sub database holding a list of impacts and activities influencing the conservation status of the site and the intensity and impact these are having on the site, as observed during survey.
	Impact & Activities Influencing Conservation Status of site (<u>Damaging operations on site MACC</u>)	List of EU Natura 2000 site impacts and activities updated by NPWS in 2009. Drop down list.
	Intensity (<u>Damage intensity on site MACC</u>)	Intensity of the influence of an activity is rated as: <ul style="list-style-type: none"> • A = high, • B = medium, • C = low influence • D = unknown
	Impact (<u>Damage Impact on site MACC</u>)	Impact rating scale: <ul style="list-style-type: none"> • -2 = irreparable negative influence • -1 = reparable negative influence • 0 = neutral • +1= natural positive influence • +2 = strongly managed positive influence • Unknown
<i>Survey Threats</i>		Sub database holding a list of threats to site, as observed during the survey.
	Threats on site (<u>Threats on site MACC</u>)	List of EU Natura 2000 site impacts and activities updated by NPWS in 2009. Drop down list.
<i>Survey Information</i>		Sub database holding a list of information categories for the site.
	Site survey information (<u>Site field survey information MACC</u>)	Editable drop down list options: <ul style="list-style-type: none"> • Detailed site survey undertaken • Limited site inspection only • No survey yet undertaken • Additional Survey may be required • NHA Ranger Survey exists • NHA Ecologists Survey exists • Site boundary defined • Releve data collected • Water chemistry samples collected Etc.

5. Other related databases used by the WWM Site and WWS Survey databases

In addition to the two main databases (WWM & WWS) used to hold site related data a number of secondary databases, holding a list of publications and references, Irish flora and fauna species names, Site Photographs and Site Maps (habitat, aerial photographs etc.) complete the suite of databases used in the preparation of site reports and data storage for the WWM and WWS database suites. These are explained in more detail below.

Database name	Comment
Wetland Bibliography	Secondary database containing a list of publication and report citations. Linked to Site Rare Species Publications and Site Specific Reports and Publications sub-database via the unique bibliography code number.
Site Photography	<p>Secondary database containing up to 3 site photographs from the field survey and associated photograph captions. Linked to WWS and WWM database via the unique site code number and unique site survey code number.</p> <p>Site Photographs 1, 2 & 3 (Survey Site Photograph 1, 2 & 3) Layout allows 3 site photographs to be imported to represent wetlands on site.</p> <p>Site Photograph Captions 1, 2 & 3 (Survey Site Photograph Caption 1, 2 & 3 UACC). Layout allows 3 site photograph captions to be recorded.</p>
Site Maps and Airphoto	<p>Secondary database containing 3 site maps produced and exported from the WWM GIS dataset after survey was completed (Locations map showing site on OS Discovery Map; Aerial photograph showing site boundary and Habitat Map of the site. Linked to WWS and WWM database via the unique site code number and unique site survey code number.</p> <p>Site location Discovery Map (Survey Site locations map image) Layout allows image of wetland site location map based on OS Discovery map to be imported. A caption field for the map is also included (Site Discovery Map Caption UACC).</p> <p>Air photograph site location (Air aerial photograph image) Layout allows image of wetland site location map based on Aerial photograph to be imported. A caption field for the photograph is also included (Site Aerial Photograph Caption UACC).</p> <p>Site Habitat Map (Site habitat map image) Layout allows image of wetland habitat map to be imported. A caption field for the habitat map is also included (Site habitat map image caption UACC).</p> <p>All three of the above can be viewed as enlarged images by selecting the appropriate "Go to enlarged layout" button.</p>
Site Maps Key and Airphoto Copyright	Secondary database with key to habitat maps; OS copyright permission for use of aerial photographs and maps on project and overall site locations map for the survey. Linked to WWS database via the unique site survey code number.
Irish Species Names	Secondary database holding a list of Irish Flora and Fauna names, in English and Latin, used in the compilation of species records from sites and in the compilation of final site reports. Linked to Site Rare Flora , Site Rare Fauna Vertebrate and Site Rare Fauna

	Invertebrate sub-databases (used by WWM database) and the Survey Fauna and Survey Flora sub-databases (used by WWS database).
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Appendix 6: County Wickow Wetland Survey II iPad Survey Database Layouts

Introduction


Wetland Field Survey Database

Designed by Peter Foss

The layouts which follow include fields to hold data captured as part of a full wetland field survey of a given site. The seven layouts were created and formatted for the iPad so that field survey data can be recorded directly in digital format during the site survey. An eight layout contains aerial photograph of the site and the selected survey boundary for reference during the survey. To move between layouts during the survey simply click on the various layout buttons along the top of each layout window.

The data recorded feeds into the appropriate fields within the main site database, and when completed, allow a detailed site report to be generated. The layout are as follows:

- SDetail** - General site details including site name, grid ref, date of survey, surveyors, photographs and conservation assessment following survey.
- Soils** - Information on the site substrate and water table.
- SurHa** - List of Fossitt (level 3) habitats recorded within a 200m radius surrounding the site boundary.
- HoS** - List of Fossitt (level 3) habitats recorded within the site boundary.
- Threat** - Landuse on site; Impact & Activities affecting conservation value of site and threats to site recorded during the survey.
- Com** - Site location and site description, target notes, landowner information and recommendations from the field survey.
- Spp** - Flora and Fauna species recorded during the field survey.
- Air Ph** - Air photograph of site and survey boundary for reference during survey.



Site Details

Login

Site name MOYLAN LOUGH
Site code MN8

Survey Code Number MFS2007

SDetail
Soils
SurHa
HoS
Threat
Com
Spp
Air Ph

Site Type	Wetland Areas on the Site	County Name	Site designation
<input checked="" type="checkbox"/> Main Site <input type="checkbox"/> Sub-site <small>(Choose one option)</small>	<input checked="" type="checkbox"/> YES <small>(Choose one option)</small> <input type="checkbox"/> No wetland present <input type="checkbox"/> No Data - wetland possible <input type="checkbox"/> No Data - wetland unlikely <input type="checkbox"/> Other...	MO	cNHA

Date of wetland survey
24/05/2007

Survey Full Title
Monaghan Fen Survey 2007

Name of wetland surveyors
Peter Foss & Patrick Crushell

Easting Centre 285429
Northing Centre 308863
Altitude (mOD) (format: 20; 50 etc from GPS)

Survey Photographic Numbers
DSC 145-161
(format: Initials of photographer followed by photo numbers e.g. dsc 001-005)

Conservation ranking following survey (Choose one option following survey)

A Rating: Internationally Important
 B Rating: Nationally Important
 C+ Rating: County Conservation value
 C Rating: Local conservation value (high value)
 D Rating: Local conservation value (moderate value)
 E Rating: Local conservation value (low value)
 F Rating: Unknown value - survey required
 No Conservation Value

Field Type Colour Coding Convention on all Layouts

Pink fields are variable character fields (UACC) type/enter what u like or select 1 option from available lists/ pull down menus

Blue fields are filled from pre set value lists in a related survey sub database (MACC)

Yellow fields are lookups from the Core Site database

Soils Layout

Survey Card - Site Soils (Soils)

Site name Site code

Survey Code Number

Water table (cm) (format: 0=surface; -20; > -50 etc)

Substrate type (Choose from drop down list)

Clay

Silt

Substrate depth (cm) (format: 20; >150 etc)

Substrate stability (Choose from drop down list)

Surrounding Habitats

Survey Card - Surrounding Habitats (SurHa)

Site name **AGHAVILLA SPRING** Site code **MN527**
Survey Code Number **MWS2011**

SDetail **Soils** **SurHa** **HoS** **Threat** **Com** **Spp** **Air Ph**

Habitats Present Around Site Fossitt (Choose from drop down list)

Add **Change**

B Cultivated & built land
BL Built land
BL3 Buildings and artificial surfaces
G Grassland & Marsh
GA Improved Grassland
GA1 Improved agricultural grassland
GS Semi-Natural Grassland
GS2 Dry meadows and grassy verges
W Woodland and scrub
WS Scrub/transitional woodland
WS2 Immature woodland

Habitats on Site

Survey Card - Habitats on Site (HoS)

Site name Site code

Survey Code Number

Main Fossitt Habitat(s) Present on Site full name
(Choose from drop down list)

B Cultivated & built land	FP1
BL Built land	GA1
BL3 Buildings and artificial surfaces	WL1
F Freshwater	BL3
FL Lakes & Ponds	GS4
FL6 Turloughs	FL6
FP Springs	B
FP1 Calcareous springs	BL
G Grassland & Marsh	F
GA Improved Grassland	FL
GA1 Improved agricultural grassland	FP
GS Semi-Natural Grassland	G
GS4 Wet grassland	GA
W Woodland and scrub	GS
WL Linear woodland/scrub	W
WL1 Hedgerows	WL

EU Habs
see below
↓

Landuse Impacts & Threats

Survey Card - Landuse Impacts Threats (Threat)

Site name MOYLAN LOUGH Site code MN8

Survey Code Number MFS2007

SDetail
Soils
SurHa
HoS
Threat
Com
Spp
Air Ph

Add
Change

Landuse / Management Activity on site	Frequency of use

Impact & Activities Influencing Conservation Status of site

Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.

Impact is rated as -2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence, unknown

Impact & Activities quick guide:

Drainage - J02.05

Drainage agriculture - J02.06

Enrichment - H04.02

Pollution - H01.01 / .05

Grazing - A04

Infill - J02.01.03

Dumping - E03 / .01 to .03

Peat Extraction - C01.03

Reclamation - A10 / A10.01

Invasive species - I01

Afforestation - B01.02

(Choose from drop down list)

Add
Change

Activity code & title	Intensity	Impact

Threats to site

Add
Change

Damaging Operations / Threats on site Comments (250 character max.)

Description

Survey Card - Descriptions

Site name MOYLAN LOUGH Site code MN8
 Survey Code Number MFS2007

SDetail
Soils
SurHa
HoS
Threat
Com
Spp
Air Ph

See below for further information on how to complete this section of card - all fields set to 250 character length maximum.

Site Location

Moylan Lough turlough is located 5 km north of Carrickmacross.

Survey site description with reference to wetlands present

Turlough site with large spring and channel leading into the lake on the north western corner. There is little lake shore vegetation fringing the lake, presumably due to the large fluctuations in water level indicated likely to be in the range 5-8 m. Most of the area is covered in bare mud with a

Comments on potential occurrence of EU habitats on site

Turlough site.

Management Recommendations following Survey

Grazing and other agricultural pressures should be addressed.

Future Survey Recommendations

Landowner Information Comments

Survey Target Notes Select note number; note category and type up comments

Add

Change

Formatting note: If the intention is to take target notes into GIS then text should not exceed 250 characters.

No.	Category	Note

Air Photograph

Survey Card - Air Photograph

Site name **MOYLAN LOUGH** Site code **MN8**
Survey Code Number **MFS2007**

SDetail **Soils** **SurHa** **HoS** **Threat** **Com** **Spp** **Air Ph**

Zoom In
100%

Site 2531 Moylan Lough

Appendix 7: Individual Site Reports from sites surveyed in 2012 during the County Wicklow Wetland Survey II

Sites are listed in alphabetical order by site name.

Site Code	Site name	Page Number
323	AGHINREE	1
308	ANNALECKY DONARD	6
333	ARDNABOY	11
193	ARKLOW TOWN MARSH pNHA	16
326	AVOCA RIVER - KILBALLYOWEN	21
318	BALLINEDDAN BOG	25
297	BALLINROAN LOWER	31
321	BALLYBEG	37
299	BALLYKILLMURRY LOWER	42
339	BALLYKNOCKAN WET HEATH	46
337	BLACK BANKS	49
267	BLESSINGTON DEMESNE POND	54
294	BOLEYLUG	59
245	BRITTAS GOLF COURSE PONDS	65
330	BRITTAS RIVER	70
310	COLVINSTOWN	75
306	COOLHARBOUR LOWER	80
315	COOLINARRIG UPPER	85
305	DONARD LOWER	90
296	ENGLISHTOWN	96
336	FAIRY LAKE	101
335	FORTGRANITE POND	105
233	HIGHPARK POND	110
252	HOLDENSTOWN POND	115
324	HOLLYWOOD MARSH	120
302	KILLALISH LOWER	125
301	KILLALISH UPPER	130
300	KILLAMOAT	135
303	KILLAMULLIM AND BURGAGE	140
338	KILMACREA TRANSITION MIRE	145
328	KILMACURRAGH QUARRY POND	150
50	KNOCKANANNA BOG	154
290	KNOCKANOCKER	161
289	KNOCKNASHAMROGE	167
320	LUGDUFF TRANSITION MIRE NORTH	173
319	LUGDUFF TRANSITION MIRE SOUTH	178
329	MANOR KILBRIDE PONDS	183
307	MERGINSTOWN	187
298	MERVILLE AND MILLTOWN	192
327	MOANASPICK	198
325	MUCKLAGH	202
334	RATHATTIN	207
332	RATHBANE	212
62	RATHCON FISHING LAKE	218
311	RATHCOYLE	223

314	RATHDUFF BEG	229
313	RATHDUFF BOG NORTH	235
312	RATHDUFF BOG SOUTH	240
291	RATHTOOLE	245
272	RUSSBOROUGH HOUSE POND	251
288	SHEILSTOWN	256
234	SLIEVENAMOUGH WET FLUSH	262
6	THE MURROUGH WETLANDS pNHA/SAC/SPA	268
224	TOBER DEMESNE FISH POND	282
316	TOBER DEMESNE WETLANDS	287
295	WOODFIELD GLEN	292

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Key to Subsoil Types – IFS* Soil categories

* Irish Forest Soils (IFS) element of the Forest Inventory and Planning System (FIPS)

IFS soil abbreviation	Included Great Soil Groups	IFS Soil Description	IFS Code
		Deep well drained mineral	1
AminDW	Acid Brown Earths Brown Podzolics	Derived from mainly non-calcareous parent materials	11
BminDW	Grey Brown Podzolics Brown Earths (medium-high base status)	Derived from mainly calcareous parent materials	12
		Shallow well drained mineral	2
AminSW	Lithosols Regosols	Derived from mainly non-calcareous parent materials	21
BminSW	Renzinas Lithosols	Derived from mainly calcareous parent materials	22
		Deep poorly drained mineral	3
AminPD	Surface water Gleys Ground water Gleys	Derived from mainly non-calcareous parent materials	31
BminPD	Surface water Gleys Ground water Gleys	Derived from mainly calcareous parent materials	32
		Shallow poorly drained mineral	
AminSP	Surface water Gleys (Shallow) Ground water Gleys (Shallow)	Derived from mainly non-calcareous parent materials	33
BminSP	Surface water Gleys (Shallow) Ground water Gleys (Shallow)	Derived from mainly calcareous parent materials	34
		Poorly drained mineral soils with peaty topsoil	4
AminPDPT	Peaty Gleys	Derived from mainly non-calcareous parent materials	41
BminPDPT	Peaty Gleys	Derived from mainly calcareous parent materials	42
AminSPPT	Peaty Gleys (Shallow)	Derived from mainly non-calcareous parent materials	45
BminSPPT	Peaty Gleys (Shallow)	Derived from mainly calcareous parent materials	44
		Shallow, lithosolic-podzolic type soils potentially with peaty topsoil	
AminSRPT	Podzols (Peaty) Lithosols Peats	Predominantly shallow soils derived from non-calcareous rock or gravels with/without peaty surface horizon	43
BminSRPT	Lithosols Peats	Predominantly shallow soils derived from calcareous rock or gravels with/without peaty surface horizon	46
		Alluviums	5
AlluvMIN	Variable	Mineral alluvium	51
AlluvMRL	Variable	Marl type soils	53
Lac	Variable	Lacustrine-type soils	56
		Peats	6
RsPt	Basin Peats	Raised bog	61
BktPt	Blanket Peats	Blanket peat	63
Cut	Basin Peats Blanket Peats (some)	Cutaway/cutover peat	65
FenPt	Basin Peats	Fen peat	66

IFS soil abbreviation	Included Great Soil Groups	IFS Soil Description	IFS Code
		Miscellaneous	7
Scree		Scree	70
AeoUND		Aeolian undifferentiated	71
MarSands		Beach sand and gravels	72
MarSed		Marine/ Estuarine sediments	73
Swamp		Reed Swamp/Marsh	75
Made		Made/Built land	74
Water		Lake (including reservoirs)	76
Unclass		Unclassified	77

Notes:

*The IFS code 63 is the default code used for blanket peat. Currently blanket peat is not discriminated into mountain or lowland categories in the soil modelling process






































































Key to Habitat Map Symbols

Wicklow Wetland Survey 2012

Legend:

-  Site Code
-  Site Boundary

Fossitt Habitat Codes (Level 3)

 BL1	 FL5	 MW1
 FW1	 FL7	 PB1
 FW2	 FL8	 PB2
 FW4	 FP1	 PB3
 WL1	 FS1	 PB4
 WL2	 FS2	 PF1
 BL1	 FW1	 PF2
 BL3	 FW2	 PF3
 CB1	 FW4	 WD
 CD3	 GA1	 WD1
 CD5	 GA2	 WD2
 CM2	 GM1	 WD4
 CS1	 GM2	 WD5
 CS3	 GS1	 WL1
 CW1	 GS2	 WN1
 CW2	 GS3	 WN2
 ED1	 GS4	 WN4
 ED2	 HD1	 WN6
 ED3	 HH/PB/GS	 WN7
 ER1	 HH1	 WS1
 FL1	 HH3	 WS2
 FL2	 HH4	 WS4
 FL4	 LR1	 WS5

The County Wicklow Wetland Survey (WWS) 2012 CD ROM Contents

by Faith Wilson, Patrick Crushell, Tom Curtis & Peter Foss

Contents:

- 1. The County Wicklow Wetland Survey II 2012 by Wilson, F., Crushell, P., Curtis, T. & Foss, P.J.** Report for Wicklow County Council & The Heritage Council. (In PDF format, requires Adobe Acrobat to view).
 - 2. WWS Wetland Site & Survey Database Version 2.0** (Filemaker Pro 11.0 format). Wetland site records from the WWS 2011 project for which site information exists recorded by third party sources.
 - 3. WWS Wetland Site Database Version 1.0** (ACCESS format).
 - 4. Selected Excel tables to accompany the County Wicklow Wetland Survey report including appendices.**
 1. Summary list of wetlands in County Wicklow held in the WWS Site Database.
 2. Total data export on all site records and fields from the list of wetland sites held in the WWS Site Database
 - 4. GIS Shape files from the County Wicklow Wetland Survey 2012.**
 - a. ArcView GIS dataset with Heritage Council mapping convention (Requires ArcView 10 GIS Software)
 - b. MapInfo GIS dataset with Wicklow County Council mapping convention (Requires MapInfo GIS Software)
 - 5. CD box cover for The County Wicklow Wetland Survey 2012** (PDF format)
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