East Meath - North Dublin Grid Upgrade Environmental Impact Assessment Report (EIAR): Volume 3

Appendix A10.2 – Desk Study and Field Data Collection Methodologies

EirGrid

March 2024

Contents

Appendix A10.2 – Desk Study and Field Survey Collection Methodologies

1. Desk-Based Study

A desk-based study was carried out to inform the scope of the field surveys for the baseline. The desktop study involved collection and review of relevant published and unpublished sources of data, collation of existing ecological information and consultation with relevant statutory bodies.

The following sources were consulted during the desk study to inform the scope of the ecological surveys:

- Online data available on European sites ('European site' replaced the term 'Natura 2000 site' under S.I. No. 473/2011 – European Union (Environmental Impact Assessment and Habitats) Regulations 2011) (as amended), and nationally designated sites (nationally designated sites are Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHAs)), as held by the National Parks and the National Parks and Wildlife Service (NPWS 2023);
- Online data records available on National Biodiversity Data Centre Database (NBDC 2023);
- Ordnance Survey Ireland (OSI) mapping and aerial photography utilised for desk review of potential habitats within the subject lands and their surroundings (OSI 2023);
- Irish Wetland Bird Survey (I-WeBS) data available on Birdwatch Ireland I-WeBS section (Birdwatch Ireland 2019);
- Records of rare and protected species for 2km around the study area, held by the NPWS (NPWS 2023);
- Habitat and species GIS datasets provided by the NPWS (NPWS 2023);
- Bat records from Bat Conservation Ireland's (BCI) database (BCI 2023);
- Records from the Botanical Society of Britain & Ireland (BSBI) (BSBI 2023);
- Information on Lowland Hay Meadows from BSBI Ireland Annex I Grassland Resources (BSBI 2020); and
- Environmental information / data for the area available from the Environmental Protection Agency website (EPA 2023).

2. Field Survey Methods

2.1 Habitat Survey

Habitat surveys were undertaken between January 2023 and August 2023. All habitats were mapped and classified using A Guide to Habitats in Ireland (The Heritage Council 2000). This classification is used to rapidly record habitats and the main species present. Plant species that were either representative of a habitat or considered to be of conservation interest were recorded, along with their relative abundances using the 'DAFOR' scale (i.e. dominant/abundant/frequent/occasional rare), although note this scale has no agreed quantitative meaning (Rodwell, 2006). The extent of habitat was mapped onto a tablet with Global Positioning System (GPS) and aerial imagery. Target notes are included in the habitat map to indicate any points of interest within the study area (e.g. describing a habitat in more detail, information on conservation interests or information on land use practices etc.). Vascular plant nomenclature follows that of the New Flora of the British Isles 3rd Edition (Stace 2010).

2.2 Aquatic Habitats

Aquatic habitats such as drainage ditches and water body crossing points and a minimum distance along waterbodies of 100m to either side of crossing points were visually assessed for their suitability to support aquatic flora and fauna species. Condition of aquatic habitats including substrate make-up, flow rates and notable species were recorded. These surveys were carried out between January 2023 and August 2023.

2.3 Invasive Plants

The presence of invasive plant species was recorded during initial ecological walkover surveys and during subsequent habitat surveys. Particular focus was placed on the species listed on the Third Schedule of S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011 (e.g. Japanese knotweed, Himalayan balsam) with further non-native plant species not included on the Third Schedule recorded in line with Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (National Roads Authority (NRA) 2010) (e.g., *Buddleja davidii* and winter heliotrope). Presence of invasive plant species was recorded between January 2023 and August 2023.

2.4 Habitat Suitability: Fish and White-Clawed Crayfish

Water body crossing points and a minimum distance along water bodies of 100m to either side of crossing points were visually assessed for their potential to support fish of conservation interest and white-clawed crayfish. Assessments identified sites that had appropriate fish spawning habitat and juvenile nursery areas including instream features such as substrates and flows (Hendry and Cragg-Hine 2003; Maitland 2003). White clawed crayfish habitat was assessed for features that provide suitable refuge such as substrates large enough to provide cover and not armoured. Other features favourable for white clawed crayfish included tree roots, woody debris and suitable flows as outlined in the Ecology of the White-clawed Crayfish (Holdich 2003). Sites identified as having appropriate habitat were selected for eDNA surveys to determine their presence or likely absence within each watercourse. The presence of macrophytes were also noted where present. This was carried out during the multi-disciplinary walkover undertaken between January 2023 and August 2023.

2.5 Amphibian- Smooth Newt, Freshwater Fish and White-Clawed Crayfish eDNA

Fourteen waterbodies within the study area were assessed for the presence / likely absence of smooth newt, freshwater fish and white-clawed crayfish using the standard eDNA methodology. This included collecting 20 water samples from around the perimeter of the watercourse using a 40ml (millilitres) ladle, focusing on

areas most likely to be used by smooth newt. The water samples were then transferred into a whirl Pak bag. Before each sample was taken, the water was gently stirred using the ladle. This is because eDNA will often be present in larger quantities at the bottom of the watercourse as it tends to sink in water.

The whirl Pak bag was then gently shaken to mix eDNA across the whole water sample. A pipette was then used to transfer 15ml of water from the whirl Pak bag into each of the six conical tubes containing a preserving fluid. Each conical tube was then vigorously shaken for 10 seconds to mix the water sample and the preservative. The six conical tubes were then labelled and sent to the Sure Screen Scientifics lab for analysis.

2.6 Mammal Survey (Other Than Bats)

Surveys for large mammals (e.g., badger *Meles meles* and otter *Lutra lutra*) were carried out as part of the multi-disciplinary walkover survey undertaken between January 2023 and August 2023. Otter and badger were surveyed through the detection of field signs including resting sites (holts and setts) as well as mammal tracks, markings, feeding signs, and droppings.

Species-specific surveys were not undertaken for other protected mammal species which are harder to detect through field signs such as red squirrel (*Sciurus vulgaris*), hedgehog (*Erinaceus europaeus)*, Irish stoat (*Mustela erminea hibernica)* or pine marten (*Martes martes)*. Nevertheless, during all surveys, searches for any signs of these species such as footprints in soft muds and or droppings was carried out. Potential presence of these species within the study area was noted based on the species distribution and habitat preferences (Marnell *et al*., 2009).

2.7 Bats

All trees with potential roost features within the study area were visually assessed. Structures / trees not directly impacted were not subjected to survey. Only structures / trees to be directly impacted were subject to survey. A daytime ground assessment of trees determined their bat roost potential, and those with low, medium, or high potential were subject to emergence surveys. Where possible individual trees as well as tree lines were subject to dusk surveys. Additionally, static detectors were deployed along these tree lines. Further details are provided below. All bat surveys were designed taking into consideration the guidance set out in the Bat Surveys for Professional Ecologists. Good Practice Guidelines (Collins 2016) and the interim guidance provided by Bat Conservation Trust (BCT) (BCT 2022), which was the most up-to-date guidance at the time of survey, which is summarised in Table 1.

2.7.1 Bats: Assessment of Potential Roost Features (Initial Daytime Assessment)

Preliminary roost assessment surveys for trees and buildings within the study area were undertaken between January and April 2023 to identify their potential to support roosting bats. This daytime assessment comprised a ground level, external inspection of trees and buildings to identify potential roost features (PRFs) or signs of bat presence (bat droppings, insect remains etc.) using a pair of binoculars and a one million candle power torch. Each tree or building was assigned a roosting potential (high/moderate/low/negligible) according to good practice guidance, as described below (Collins, 2016; BCI 2022). Where possible, individual trees as well as treelines were subject to dawn and dusk surveys as the survey effort recommended by good practice guidelines.

PRFs of note included:

- Knot holes (cavities with a collar resulting from natural branch loss and fungal infection);
- Hazard beams (split spanning the limb/stem completely forming an elongated crevice that narrows at both ends);
- Thick ivy *Hedera helix* cover potentially obscuring PRFs beneath;

- Lifting bark (substantial areas of lifted bark typically resulting from fungal infection); and
- Tear outs (cavities within an inverted tear shape wound created when a limb was torn from the main stem or other limb).

Table 1: Assessing the Value of Trees and Buildings to Roosting Bats (Collins 2016; BCT 2022)

Category	Description	Recommended No. of Survey Visits*	Recommended Survey Timings**
High **Trees / buildings that are suitable for use by large numbers of bats on a regular basis.**	PRFs in trees include but are not limited to knotholes, wounds, frost cracks or split limbs (further detailed information on the type of PRFs found in trees is detailed in the Bat Tre Habitat Key – Database Report 2016 (Andrews 2016), that provide voids and/or crevices suitable for bats. In buildings, examples include eaves, barge boards, gable ends and corners of adjoining beams, ridge and hanging tiles, behind roofing felt or within cavity walls. Further survey is required to determine whether or not bats are present and if so, the bat species present. Appropriate mitigation and potentially licensing requirements may then be determined. Seasonal constraints may apply.	Buildings / trees – Three separate visits. Three dusk emergence surveys. NB. Multiple survey visits will be spread out as much as possible, with surveys at least two weeks apart, preferably more.	Buildings / trees – May to September (with at least two of the surveys between May and August).
Moderate **Moderate potential is assigned to trees / structures with potential to support bat roosts but supports fewer features than a high potential building / tree and is unlikely to support a roost of high conservation value.**	From the ground, building / tree appears to have features that may provide suitable roosting opportunity for bats. However, owing to the characteristics of the feature, they are deemed to be sub-optimal for large numbers of roosting bats. Further survey is required to determine whether or not bats are present and if so, the bat species present. Appropriate mitigation and potentially licensing requirements may then be determined. Seasonal constraints may apply.	Buildings / trees – Two separate visits. Two dusk emergence surveys. NB. Multiple survey visits will be spread out as much as possible, with surveys at least two weeks apart, preferably more.	Buildings / trees – May to September (with at least two of the surveys between May and August).
Low **Low potential is assigned to structures and trees with features that could support individual bats opportunistically.**	If no features are visible but owing to the size and age and structure, hidden features, sub-optimal for roosting bats may occur that only and elevated inspection may reveal. In respect of ivy cover this could be hiding a PRF. Further survey may be required for buildings only or works may proceed using reasonable precautions (e.g. controlled working methods, under licence or supervision of a bat worker. Seasonal constraints may apply.	Buildings– One survey visit. One dusk emergence survey. Trees – No further surveys required.	Buildings / trees – May to September (with at least two of the surveys between May and August).

Category	Description	Recommended No. of Survey Visits*	Recommended Survey Timings**
Negligible	Negligible habitat features on site likely to be used by roosting bats.	No further surveys required.	N/A

2.7.2 Bats: Transect Surveys

Transect surveys were not considered appropriate for the Proposed Development and no bat transects were done since the majority of linear features that will be impacted are located along existing roads (i.e., treelines / hedgerows). At off-road locations, the proposed cable route will punch through existing treelines. It is assumed that these features will be used by foraging and commuting bats. Static detector data was collected at 12 sites consisting of suitable habitat spread along the Proposed Development to provide a sufficient species assemblage for the area. As such, transect surveys were not considered appropriate.

2.7.3 Bats: Static Detector surveys

Eight static monitoring locations were selected along the Proposed Development aiming to provide a representative species assemblage for the area. Locations were chosen using the results from the ground-based habitat assessments to determine areas with the most suitable habitat and roosting opportunities for bats. Song Meter 2 (SM2) and Song Meter 4 Bat (SM4) detectors were positioned in the predetermined locations along the Proposed Development. They were set to record from half an hour before sunset until half an hour after sunrise for a minimum of five consecutive nights, with two deployments between May and July to capture seasonal changes in behaviour and habitat use along the route. Both detector types were set to record in full spectrum (an audio recording that includes time, frequency and amplitude).

2.7.4 Bats: Dusk Emergence and Dawn Re-entry Surveys

Dusk emergence and dawn re-entry surveys were undertaken using handheld bat detectors on a selection of the trees that were identified as having potential to support roosting bats. The aim of these surveys was to confirm the presence or likely absence of roosting bats. Surveys were completed at 11 locations, with Location 1being the furthest south, Location 10 being the furthest north and Location 11 approximately in the middle. The survey locations are shown on Figure 10.6 in Volume 4 of this EIAR.

Trees were surveyed by experienced ecologists in teams of two or four surveyors depending on the number of trees to be surveyed. At least two surveyors were present at each location with four surveyors being at one location where there was a very long linear feature. Surveyors were positioned at potential roost access / egress point to identify any bats emerging from or returning to roost. Surveyors recorded bat activity using full spectrum SM4 bat detectors and made notes on bat activity including time of observation, bat behaviours and species recorded. Dusk emergence surveys commenced approximately 15 minutes before sunset and continued for approximately one and a half hours after sunset. Dawn re-entry surveys commenced 1.5 hours before sunrise and finished at 15 minutes after sunrise. Details of the dates, times and weather conditions for each survey are provided in Table 2.

Table 2: Details of Bat Emergence Surveys

Bat Survey Location	Date	Survey Type	Weather	Sunset Time	Survey Times
Location 1	23.05.2023	Dusk	11°C, light rain, light breeze, >50% cloud cover.	21:32	21:17 – 23:02
	19.06.2022	Dusk	18 °C, no rain, no wind, >10% cloud cover.	21:57	21:45 – 23:30
Location 2	22.05.2023	Dusk	15°C, no rain, light breeze, <50% cloud cover.	21:30	21:15-23:00
	19.06.2023	Dusk	14°C, no rain, light breeze, <30% cloud cover.	21:56	21:41 – 23:26
	03.07.2023	Dusk	11°C, light rain, light breeze, <80% cloud cover.	21:55	21:40-23:25
Location 3	23.05.2023	Dusk	11°C, light rain, light breeze, >50% cloud cover.	21:32	21:17 – 23:02
	20.06.2023	Dusk	13°C, no rain, light breeze, <30% cloud cover.	21:57	21:42-23:27
	04.07.2023	Dusk	8°C, no rain, no wind, >80% cloud cover.	21:55	21:40-23:25
Location 4	24.05.2023	Dusk	7°C, no rain, no wind, >50% cloud cover.	21:33	21:18 – 23:03
	20.06.2023	Dusk	13°C, no rain, light breeze, <30% cloud cover.	21:57	21:42-23:27
	05.07.2023	Dusk	9°C, light rain, moderate wind, >60% cloud cover.	21:54	21:39-23:24
Location 5	24.05.2023	Dusk	7°C, no rain, no wind, >50% cloud cover.	21:33	21:18 – 23:03
	21.06.2023	Dusk	12°C, no rain, light breeze, <10% cloud cover.	21:57	21:42-23:27
Location 6	25.05.2023	Dusk	8°C, no rain, strong breeze, 75% cloud cover.	21:34	21:19 – 23:04
	21.06.2023	Dusk	12°C, no rain, light breeze, <10% cloud cover.	21:57	21:42-23:27
	06.07.2023	Dusk	12°C, light to moderate rain, moderate wind, >80% cloud cover.	21:54	21:39-23:24
Location 7	22.05.2023	Dusk	11°C, light rain, light breeze, >50% cloud cover.	21:32	21:17 – 23:02
	22.06.2023	Dusk	10°C, no rain, light breeze, <20% cloud cover.	21:57	21:47-23:27
Location 8	25.05.2023	Dusk	8°C, no rain, strong breeze, 75% cloud cover.	21:34	21:19 – 23:04
	22.06.2023	Dusk	10°C, no rain, light breeze, <20% cloud cover.	21:57	21:47-23:27

2.7.5 Bats: Call Analysis

Bat call analysis was undertaken using Kaleidoscope software. Bat species identification was interpreted using known bat call parameters (Russ 2012) and existing literature on the ecology of Irish and UK bat species, including distribution, range, habitat associations and behavioural characteristics, in addition to professional judgement. Every attempt was made to identify bats to species level. However, bats in the genus *Myotis* have calls with peak frequencies which can overlap. Their calls cannot reliably be distinguished from each other without reference to specialist technology and expertise which was not readily available or deemed necessary for a robust assessment. Therefore, *Myotis* calls were not identified to species level and have been labelled Myotis *sp*. This limitation will not affect the assessment within this EIAR as impacts on all *Myotis* species are mitigated in the same way.

2.7.6 Bats: Static Detector Analysis

The data recorded on the static detectors was standardised as the average number of bat passes per night for each static deployment as an index of activity.

2.8 Fish and White-Clawed Crayfish: eDNA Sampling

Non-invasive environmental DNA (eDNA) surveys were used to detect the presence / probable absence of Atlantic salmon (*Salmo salar*), European Eel (*Anguila anguila*) and White clawed crayfish (*Austropotamobius pallipes*) from 14 watercourses within the study area as follows:

- WB03
- WB04
- WB05
- WB06
- WB07
- WB10
- WB11
- WB12
- WB13
- WB16
- WB19
- WB22
- WB23
- DD26

eDNA sampling provides a tool for surveying aquatic communities without the need to catch the animals themselves. It has been shown to be effective in a wide variety of aquatic ecosystems (ponds, lakes, streams, rivers, estuaries and oceans) and can be used either to detect the presence of particular species, or to survey whole communities of organisms. Samples were collected on 9 August 2023 and 10 August 2023 and sent to Nature Metrics for subsequent analysis. This sampling was undertaken inside the optimal survey period for these species which is taken to be April to October inclusive.

2.9 Birds

2.9.1 Wintering Birds

Wintering bird surveys were undertaken over two - three consecutive days each month during October, November and December 2022 and January, February, March, and April 2023. The survey area ('buffer') extended to 800m either side of the red line boundary. This survey buffer ensured that the disturbance distances of the wariest bird species likely to be encountered in the area was sufficiently covered.

In general, the approach was a 'look-see' methodology as per the Wetland Bird Survey (WeBS) core count methodology (Gilbert et al. 1998; Bibby et al., 2000). All birds present within the study area were identified with reference to Collins Bird Guide (Svensson 2009) to confirm identification (where necessary) and species were recorded using the BTO species codes. The total flock size of birds present, their general location within the site and any activity exhibited were also recorded. Surveys involved non-intrusive, visual recordings of

wintering birds with the aid of binoculars and a spotting telescope and recorded and mapped using a digital tablet. Surveys were undertaken during daylight hours and in weather conditions that were mostly favourable with good visibility. Following a comprehensive desk study and the initial site visit, a list of 'Target species' likely to occur at the site was compiled. The survey work carried out on the site was specifically designed to survey for these identified target species. The target species list was drawn from:

- Annex I of the Birds Directive;
- Special Conservation Interests (SCI) of Special Protection Areas (SPA) within the zone of likely significant effects;
- Red listed birds of Conservation Concern in Ireland; and
- Species with the potential to be impacted by this type of development.

All species within these categories were considered as target species for the purpose of these surveys.

Within the 800m buffer from the Proposed Development boundary, all wetland and water bodies were noted and assessed for their suitability to supporting wintering birds. Where the sites were deemed as suitable, they were visited each month during the surveys.

Following the initial scoping survey, unsuitable habitat (woodland, dense vegetation, steep fields etc.) and urban areas were assessed and discounted where necessary to allow a focus to be placed on suitable habitats for Target Species birds including agricultural grassland fields, arable fields, flooded land and wetlands. In addition, several wetland/waterbodies outside of the survey area were surveyed to check for the presence of Target Species potentially within commuting distance of the survey area. Monthly visits were timed to be at least three weeks apart. Surveys consisted of drive-overs with short stops at suitable vantage points. Surveys remained flexible allowing surveyors to react to conditions within the survey area, including notable observations of bird behaviour. Where vantage points were used, they were selected to provide the least obstructed view of the entire survey area. Two surveyors (one driving and one experienced ornithologist) drove along the available roads within the survey area while scanning for flocks of foraging waders and wildfowl. Upon observing waders and/or wildfowl, surveyors stopped in a safe location to record and map flock sizes and behaviour. Surveyors also stopped at locations that provided good views over wide areas of suitable habitat to observe for any birds which were not observed during the drive-by survey. Meteorological data was also recorded on each day of survey.

Bird data parameters recorded during surveys included the following:

- Surveyor;
- Date;
- Time;
- BTO code of recorded species;
- Common name of species;
- Number of individual recorded;
- Behaviour;
- Weather;
- Habitat; and
- Other notes.

Winter bird data survey results were captured and digitised onto a digital tablet using point, polyline, and polygon shapefiles. Survey dates are provided in Table 3.

Table 3: Wintering Bird Survey Dates and Surveyors

Survey Number	Survey Dates	Surveyors
1	24, 25 and 27 October 2022	EW/MH/LON
2	21, 22 and 24 November 2022	RW/LP
3	12, 13 and 15 December 2022	LP/LON/CK
4	23, 24 and 26 January 2023	RW/MH
5	20, 21 and 23 February 2023	EW/CK
6	20, 21 and 23 March 2023	SC, CK

2.9.2 Breeding Birds

Breeding bird surveys were conducted over three visits between March and June 2023 using a methodology adapted from the Breeding Bird Survey (Gilbert *et al.* 1998) combined with the Common Bird Census (CBS) survey methodology (Marchant, J.H. 1983). These survey methods target potential breeding territories of raptors, waterbirds and passerines of conservation concern (e.g. waders and red / amber-listed species). Other species of note were also recorded to assess the importance of the study area for breeding bird species. Seventeen transects routes were carried out on each visit. Transect routes were chosen to sample suitable breeding bird habitat representative of the habitat types present along and adjacent to the entire footprint of the Proposed Development and in surrounding areas predominantly within 250m of it. Transect routes occasionally went beyond 250m to include suitable habitats of interest or because transects along the Proposed Development were unsafe. Transects were distributed along the length of the Proposed Development. Transects were walked slowly in a manner allowing the surveyor to come within 50m of all habitat features. Bird species were identified by sight and sound, and general location and activity were recorded using the British Trust for Ornithology (BTO 2023) species and activity codes.

On 16 June 2023, a kingfisher survey was performed along the TOLKA_20 watercourses to be crossed were assessed for their suitability to support nesting kingfisher. Where possible, watercourses were walked for approximately 500m either side of river crossing or alternatively viewed for a short period from a pre-selected vantage point and signs of kingfisher / riparian bird species including burrow entrances were searched for.

Meteorological data was also recorded on each day of survey. The conservation status of the bird species was recorded as per:

- Birds of Conservation Concern in Ireland (BoCCI): Red List contains birds of high conservation concern; Amber List contains birds of medium conservation concern;
- Bird species listed on Annex I of Council Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds; and
- Special Conservation Interest (SCI) species of Special Protection Areas (SPAs) within the ZoI of the Proposed Development.

Bird data parameters recorded during surveys included the following:

- Surveyor;
- Date;
- Time;
- Transect no.;
- Map no.;
- BTO code of recorded species;
- Common name of species;
- Number of individual recorded;
- Gender;
- Behaviour / breeding evidence;

- Weather;
- Habitat; and
- Other notes.

Breeding bird data survey results were captured and recorded on sperate field maps and recording forms. Survey dates are provided in Table 4.

Table 4: Bird Survey Dates and Surveyors

Survey Number	Survey Dates	Surveyors	Transect No.	Survey Time
1	04/04/2023	LP, HC	T1	07:08 – 08:25
1	04/04/2023	LP, HC	T2	08:33 – 09:04
1	04/04/2023	LP, HC	T3	09:33 – 10:00
1	05/04/2023	LP, HC	T5	07:17 – 08:04
1	05/04/2023	LP, HC	T9	08:35 – 10:55
1	05/04/2023	LP, HC	T10	09:44 – 10:38
1	04/05/2023	LP, HC	T4	06:27 – 07:26
1	05/05/2023	LP, HC	T7	06:28 – 07:20
1	08/05/2023	LP, MH	T11	08:29 – 09:39
2	03/05/2023	LP, HC	T1	06:27 – 07:30
2	03/05/2023	LP, HC	T2	07:54 – 08:26
2	03/05/2023	LP, HC	T3	08:51 – 09:12
2	04/05/2023	LP, HC	T5	07:55 – 08:20
2	05/05/2023	LP, HC	T9	08:02 – 08:37
2	08/05/2023	LP, MH	T10	06:08 – 06:56
2	13/06/2023	LP, HC	T4	07:17 – 07:49
2	14/06/2023	LP HC	T7	06:14 – 06:50
2	15/06/2023	LP, HC	T11	08:50 – 09:36
3	12/06/2023	LP, HC	T1	08:05 – 08:47
3	12/06/2023	LP, HC	T2	07:13 – 07:47
3	12/06/2023	LP, HC	T3	06:15 – 06:52
3	13/06/2023	LP, HC	T5	06:33 – 06:58
3	14/06/2023	LP, HC	T9	07:26 – 07:50
3	15/06/2023	LP, HC	T10	06:27 – 07:03

3. References

Andrews, H., and Gardener, M. (2016). Bat Tree Habitat Key – Database Report 2016. AEcol, Bridgwater

Birdwatch Ireland (2019). Irish Wetland Birds Survey.

Bat Conservation Ireland, BCI. (2022) Managing Hedgerows for Bats, Available at: https://www.batconservationireland.org/wp-content/uploads/2022/07/Managing-Hedgerows-for-Bats.pdf (Accessed 23 January 2024).

Bibby, C.J., Burgess, N.D., Hill, D.A. and Mustoe, S.H. (2000). Bird Census Techniques. 2nd Edition. Academic Press: London.

Botanical Society of Britain and Ireland (BSBI). (2020). Lowland Hay Meadows (EU Habitats Directive Code 6510) BSBI Ireland Annex I Grassland Resources. [Online] Available from: Lowland_Hay_Meadows_6510-1.pdf (bsbi.org) (Accessed February 2023).

BTO (2023) Download forms & instructions. {Online} Available from Download forms & instructions | BTO - British Trust for Ornithology.

Collins, J. (ed). (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). The Bat Conservation Trust, London.

Environmental Protection Agency (2023). Online environmental information/data held by the Environmental Protection Agency Unified GIS Application. Available from: gis.epa.ie/EPAMaps [Accessed February 2023].

Gilbert G., Gibbons D.W. and Evans J. (1998). Bird Monitoring Methods: A Manual of Techniques for Key UK Species. RSPB, Sandy.

Hendry, K. and Cragg-Hine, D. (2003). Ecology of the Atlantic Salmon. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough

The Heritage Council (2000). A Guide to Habitats in Ireland

Holdich, D. (2003). Ecology of the White-clawed Crayfish. Conserving Natura 2000 Rivers Ecology Series No. 1. English Nature, Peterborough.

Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Marchant, J.H. (1983). BTO Common Birds Census instructions. BTO, Tring.

Marnell, F., Kingston, N. and Looney, D. (2009). Ireland Red List No. 3: Terrestrial Mammals, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NPWS (2023). Habitat and Species data. [Online] Available from Habitat and Species data | National Parks & Wildlife Service (npws.ie) (Accessed February 2023).

Rodwell, J.R. (2006). National Vegetation Classification: Users' handbook.

Russ, J. (2012). British Bat Calls: A Guide to Species Identification. Pelagic Publishing, Exeter.

Stace, C.A. (2010). New flora of the British Isles, 3rd ed. Cambridge: Cambridge University Press.

Svensson, L., Mullarney, K. and Grant, P. (2009). Collins Bird Guide. Harper Collins, London.

Transport Infrastructure Ireland (TII) (2010). Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads.

National Roads Authority (NRA) (2010). Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads.

Directives and Legislation

Council Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011.