

Kilkenny Local Area Plan Habitat Assessments 2010

KNOCKTOPHER



Knocktopher Village from Knocktopher Abbey

Report prepared for Kilkenny County Council

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CONTENTS

Acknowledgements	1
Executive Summary	2
1.1 Study brief	4
1.2 Approach	4
2 Methodology	6
2.1 Introduction	6
2.2 Consultations and desk study	6
2.3 Fieldwork	7
2.4 Habitat mapping	8
2.5 Hedgerow survey	9
2.6 Map digitisation and database compilation	10
2.7 Reporting and data presentation	10
2.8 Study constraints	10
3 Results	12
3.1 Geodiversity	12
3.2 Ecological networks	12
3.3 Summary of biodiversity assessment/evaluation	28
4. Guidelines for Sustainable Development of Hedgerows and Drainage Ditches	
30	
Hedgerows	30
Drainage Ditches	31
Bibliography	32
Appendix 1 Information Leaflet	34
Appendix 2 Record sheets used in habitat mapping and hedgerow evaluation .	35
Appendix 3 Target notes	26
Appendix 4 Results of hedgerow evaluation	27
Appendix 5 Summary of Fossitt habitat classification	29
Appendix 6 Ecological evaluation criteria	31

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Executive Summary

This report contains the results and interpretation of a habitat mapping study which was carried out in Knocktopher to inform the Local Area Plan. It builds on a descriptive account of biodiversity which was prepared for the Local Area Plan in 2003 by CAAS Ltd.

A Green Infrastructure approach was taken to describing biodiversity, based on the identification of habitats and their relationship within ecological networks. Green Infrastructure highlights the provision of ecosystem services by biodiversity. These include food/timber production, mitigation of climate effects (e.g. flooding), quality of life and supporting services to agriculture. Fieldwork took place in January 2010 to map habitats to Level 3, following Heritage Council guidelines. Hedgerows were also assessed using a combination of structural and biodiversity criteria. This provided a numerical value for each hedgerow. Using an approach developed by the NRA, the relative value of habitats was also identified. To inform the account of Green Infrastructure further interpretation of the habitat map was carried out to identify “ecological networks”. Ecological networks are based on the core/corridor/buffer principle and emphasise the importance of linkages between habitats to maintain ecosystem functioning. Cores are areas/features of key biodiversity importance/ecosystem functioning, while corridors are land/watercourses which allow linkages between key areas or their expansion. Buffers comprise land adjacent to the key area whose management influences its quality. These networks were identified to assist the identification of functions provided by Green Infrastructure.

An annotated aerial photo shows the location of ecological networks in the Knocktopher area (Map 2). The habitat map accompanying the report (Map 1) shows the habitats present within them. Digital files which have been provided to Kilkenny County Council will allow habitat information to be imported into the council’s Geographic Information System (GIS).

All hedgerows are numbered on this map and their value for biodiversity is summarised in Table 2. This report contains a summary account and evaluation of biodiversity and its value as Green Infrastructure.

Two ecological networks have been identified in Knocktopher. The most important (KT1) is based around the tributary of the Little Arrigle River which flows through Knocktopher and connects the village to the River Nore/Barrow cSAC. The second ecological network (KT2) focuses on Knocktopher Church of Ireland.

The principal ecological network (KT1) which is part of a Special Area of Conservation has been divided into two sections based on biodiversity values. A section east (KT1a) of the road contains semi-natural habitat including wet

woodland, a habitat listed in the Habitats Directive. West of the road the network (KT1b) features planted woodlands, parkland associated with the Abbey and a small stream and associated wetlands to the north of the village. All parts of this network provide for flood attenuation, are important visual amenities and act as corridors for species some of which are rare.

Any development in or adjacent to this ecological network should be screened for its potential impact on the cSAC. Linking features/corridors associated with this network comprise hedgerows.

The second network (KT2) features Knocktopher Church of Ireland, in which bat roosts were found by CAAS (2003).

Twenty one hedgerows were surveyed. The majority were of high value and supported trees. One achieved the highest score among hedgerows surveyed in several settlement study areas in 2010. As Green Infrastructure features they are important for local biodiversity, provide cultural and visual amenities, support farming by providing reservoirs for species which support pollination of commercial crops and shelter for animals. Current management as stock proof barriers or for biodiversity is poor. There is potential for improved management in the countryside and adjacent to the village. The hedgerows of high value warrant protection from future development.

Other features of biodiversity interest include mature trees, stone buildings and stone walls. They are not rated highly as rare habitats or for rare species. They provide important visual amenities and enhance cultural values.

1 Introduction

1.1 Study brief

Kilkenny County Council is reviewing and preparing local area plans (LAPs) for settlements throughout the county. As part of this process, habitat assessments were undertaken as a source of information on local biodiversity, and to help assess future planning applications.

1.2 Approach

This habitat assessment uses a Green Infrastructure approach to identify the most important ecological features of the area and their functions.

A working definition of Green Infrastructure (GI), developed by a research project currently being undertaken for Comhar Sustainable Development Council, DOEHLG (Compass Informatics *et al*, 2010, in prep.) states that GI is a “strategically planned and managed network featuring areas with high quality biodiversity (uplands, wetlands, peatlands, rivers and coast), farmed and wooded lands and other green spaces that conserve ecosystem values which provide essential services to society”. Ecosystem services include *provisioning*, such as the production of food and water; *regulating*, such as the control of climate and disease; *supporting*, such as nutrient cycles and crop pollination; and *cultural*, such as spiritual and recreational benefits. Practical examples of services provided by Green Infrastructure include: the provision of food and wood through farming and forestry, water from rivers or aquifers; flood attenuation by rivers and natural wetlands, waste decomposition; transport routes, pollination of crops, interesting green spaces for recreation; air filtering and noise attenuation by vegetation and environmental education opportunities. A Green Infrastructure approach to spatial planning is being promoted by the Biodiversity Unit, DG Environment of the European Commission (2006), to support biodiversity management post 2010 as it allows for greater integration between biodiversity and development. This approach is supported by the numerous guidelines such as the Green City guidelines (Brennan and O’Connor, 2008). The study being undertaken for Comhar SDC explains the concept illustrated by case studies, describes a Green Infrastructure planning process and provides recommendations for its elaboration and promotion by Comhar SDC and DOEHLG.

Habitat mapping is at the core of Green Infrastructure assessment as it provides an account of almost all the features in the landscape which are responsible for ecosystem functioning. Habitat mapping following the Heritage Council’s *Best Practice Guidance for Habitat Survey and Mapping* (2010), allows for the identification of each example of a habitat type. It also allows for the evaluation

of biodiversity outside designated areas using an ecological evaluation technology developed by the National Roads Authority (NRA), based on criteria such as rarity, naturalness and statutory requirements for protection of particular species (NRA, 2009). As ecosystem services are rarely provided by individual examples of habitats but by groups of similar or related habitats, the Green Infrastructure approach requires that habitat mapping is further interpreted to identify “ecological networks”. Ecological networks consist of “cores” (habitats/features of key importance for biodiversity and ecosystem functioning), “buffers or nature rehabilitation areas” (habitats adjacent to the key area whose management influences its quality and require more appropriate management), and “corridors” (habitats which allow for the movement of species, particularly those associated with the core habitats). Rivers provide obvious examples of ecological networks where buffer or nature rehabilitation areas comprise their margins which have been drained and no longer function as wetlands. Core areas are surviving good quality habitats and corridors which allow for the movement of key species, such as salmon, otter, and bats, associated with them. Not all of these features will necessarily be found in any one area.

Ecological networks support the implementation of the EU Habitats Directive, as Article 10 stresses the importance of ecological corridors linking designated sites. It also highlights the maintenance of biodiversity throughout the wider landscape, not just in areas which are protected for nature conservation designations. It highlights linking features such as hedgerows, streams or small examples of semi-natural habitats. Identification of ecological networks allows consideration of the possible impacts of development on important nature conservation areas, which are outside the survey area but are linked to it through ecological networks. In areas where proposals may have an impact on EU designated nature conservation sites, the Planning Authority has an obligation to ensure that adequate screening takes place and, if necessary, that an appropriate assessment under Article 6 of the Habitats Directive is carried out. The identification of ecological networks can be of significant assistance in identifying any features in the LAP areas, outside designated areas that might trigger screening and risk pathways that could suggest the need for full appropriate assessment.

Information on hydrology, geology and soils are all important factors underpinning the quality of ecological networks and Green Infrastructure. As well as human management, these are the main features that explain why a particular habitat occurs in an area. Their consideration is important when examining Green Infrastructure as it allows a more robust analysis of the quality of current ecological networks, threats and opportunities for enhancement.

Habitat identification and assessment is at the core of ecological networks and Green Infrastructure. Greater connectivity increases the value of individual

habitats, the value of the network and ecosystem functioning. The more natural and connected a habitat, the more important it is as Green Infrastructure.

2 Methodology

2.1 Introduction

Preparation of this report can be broken down into three main parts: (i) consultations and desk study; (ii) field survey; and (iii) report writing and database compilation. In practice these phases all overlap to some extent.

Field survey and report-writing was carried out by Mary Tubridy, Mieke Muyliaert, Betsy Hickey and Michelle O'Neill. Mapping and GIS was carried out by Richard Jennings of Kilkenny Archaeology.

2.2 Consultations and desk study

An initial steering meeting was held with Kilkenny County Council Forward Planning and the County Heritage Officer to agree the approach to the assessment and the data sources to be used. Working maps were then produced to facilitate the desk study. An outline map was prepared using a combination of vector maps, aerial photographs, historic first edition Ordnance Survey maps, and a review of existing information.

Consultations were held with the local National Parks & Wildlife Service conservation ranger, the Southern Regional Fisheries Board, the county botanical recorder, and Kilkenny branch of Bird Watch Ireland, as well as local authority staff. Desk sources consulted included:

- Knocktopher Local Area Plan 2004
- Ecological Survey of Knocktopher to inform the local area plan (CAAS, 2003).
- National Parks & Wildlife Service online data (www.npws.ie)
- Site file for the Barrow Nore cSAC No.2162 inspected in NPWS, Ely Place, Dublin.
- Environmental Protection Agency data on soils and water quality <http://maps.epa.ie/InternetMapView/MapView.aspx> - Land/Soils; Land/Subsoils; Water Quality/Current River Data
- Geological Survey of Ireland geological data on geology, subsoils and hydrology. http://spatial.dcenr.gov.ie/imf/imf.jsp?site=GSI_Simple - Bedrock datasets/Bedrock 100k Solid Geology; Bedrock datasets/Faults 500k; Groundwater/Karst features; Groundwater/ National Draft Bedrock Aquifer

Map; Groundwater/National Draft Gravel Aquifer Map; Groundwater/Irish Interim Vulnerability.

- County Kilkenny Groundwater Assessment (Kilkenny County Council and Geological Survey 2002)
- Kilkenny County Development Plan 2008-2014 (www.kilkennycoco.ie/cdp/index.html)
- Draft County Kilkenny Biodiversity Action Plan 2008

An information leaflet was produced explaining the project (Appendix 1). This was sent out to interested individuals and local groups e.g. Tidy Towns groups, in advance of fieldwork. It was also used in conjunction with a letter of introduction provided by Kilkenny County Council when approaching landowners to seek access.

2.3 Fieldwork

Following Heritage Council guidelines all habitats within the study area were mapped, the boundary of which is based on the development boundary of the 2004 Knocktopher Local Area Plan. Some areas outside the study area boundary were mapped where they supported important semi-natural habitats or were constituents of an ecological network whose core lay within the study area LAP boundary.

Standardised field survey and hedgerow recording cards (Appendix 2), were used to gather information on habitats and hedgerows. Wherever possible land was surveyed by direct inspection of the habitats. No land was entered without prior permission of the landowner. Where access was not possible, habitats were viewed from the nearest public road or other public land, and mapped and described using results of desk research.

In the case of habitats previously surveyed in detail for ecological reports for the 2004 LAP, it was sufficient in most cases to ground-truth the habitats to ensure that the new mapping is accurate, and draw on the previous work to complete the habitat descriptions. Previous reports were particularly useful to describe sites with difficult access.

‘Target notes’ were compiled for ecological networks of particular value. These are notes entered into record cards during the field survey and consisted of lists of species and notes on habitat features (Appendix 3). These were used to inform descriptions contained in this report. Photographs were taken of habitats within these areas.

2.4 Habitat mapping

The methodology followed the latest guidance produced by the Heritage Council (2010). Habitats were mapped according to Fossitt (2000).

Habitats are areas defined particularly by their flora. They may also have particular environmental characteristics, fauna, and vegetation structure or management history. For example a hedgerow is a habitat which must have native shrubs growing in a linear pattern. It may or may not have a dry bank or wet ditch.

Habitats vary in value for biodiversity depending on factors such as naturalness and habitat and species rarity. Habitats of high value are usually less modified by man. They may be associated with land, freshwaters or marine environments

The Fossitt classification system (summarised in Appendix 5), provides a hierarchal classification of habitats from Levels 1 to 3. Level 1 provides a gross classification, Level 2 is intermediate, and Level 3 is the most detailed. Habitats in Knocktopher were mapped to Level 3.

At Level 1 in the classification, eleven habitats are differentiated. These are Freshwater, Grassland and Marsh, Heath and Dense Bracken, Peatlands, Woodland and Scrub, Exposed Rock and Disturbed Ground, Cultivated and Built Land, Coastland, Littoral, Sub littoral and Marine Water Body.

Level 2 allows for a more detailed classification of the Level 1 types. For example Level 1 Freshwater habitats can be distinguished as either lakes, ponds, watercourses, springs or swamps and so on for all other Level 1 habitats.

Level 3 allows for further differentiation of these types. For example there are eight different lake habitats; four types of watercourses, two types of springs and two different kinds of swamps.

In Knocktopher habitat classification followed Fossitt conventions with the following modifications which have been developed through experience of habitat mapping studies elsewhere (Dublin, Laois and Kildare):

1. Hedgerows consisting of non-native shrubs, usually surrounding housing were identified as WS3A. This is a sub type of WS3 (Ornamental /non native shrubs) according to Fossitt 2000).
2. The Fossitt habitat category BL1 (Stone buildings) was subdivided into BL1A (stone walls) and BL1B (stone buildings).
3. Land under development (i.e. a building site) transitional between habitat types was mapped as BL3D.
4. Due to the difficulty of describing habitats in gardens three additional habitat types were identified in semi-urban areas to describe the characteristic biodiversity associated with houses and gardens. The majority of gardens were

observed from outside. These habitat types were developed from experience of fieldwork in Dublin where the recommended habitat type BC4 (Flower beds and borders), did not usefully describe habitat diversity. These new habitats were subsets of the habitat category BL3 (Buildings and built surfaces) and were BL3 1; BL3 2 and BL3 3. The three types are distinguished by size of garden; areas mapped as BL3 1 have houses and gardens occupying an area > 500 m². BL3 2 has gardens between 250 and 500 m² usually associated with semi-detached houses. The third category BL3 3 describes areas dominated by small gardens < 250 m². Experience elsewhere suggests that the largest gardens support a diversity of habitats often featuring mature trees. Medium size gardens usually have areas with ornamental non-native shrubbery and smaller gardens have a smaller number of habitats dominated by amenity grassland (GA2).

2.5 Hedgerow survey

A hedgerow survey methodology was devised for this project which enabled a ranking of hedgerows tailored to the rural/peri-urban focus of this study. The methodology is based on hedgerow assessments by Lyons & Tubridy (2006), Murray & Foulkes (2005), and Clements and Tofts (1992).

Hedgerows were inspected along their entire length where possible. Data was collected on their average height and width, gappiness, biodiversity value (number of native tree and shrub species), number of layers (herb, shrub, trees), structural features (bank, ditch, water), connections to other hedgerows, age (whether the hedgerow existed in the 1840s and whether it was a townland boundary), management, and other features of biodiversity interest (rare plants, badger sett etc).

The data was used to score the surveyed hedgerows so that the most important ones could be identified. Details of the scoring system for each characteristic are shown on the Hedgerow Record Card (Appendix 2). Scores under each characteristic were added to give an overall score for each hedgerow.

Under this system, the minimum possible score for any one hedgerow is 5; the maximum is 30. Following careful examination of the results from several settlements, each hedgerow was then allocated to one of the categories shown on Table 1.

Table 1. Hedgerow rating system

Score	Rating	Description
5-10	1 *	Low value – least important

11-19	2 **	Moderate value - of moderate importance
20-30	3 ***	High value – most important

2.6 Map digitisation and database compilation

Clean hard copy maps were marked up clearly with habitat polygons and line features and handed over to the GIS specialist for digitisation. Each feature was marked as being surveyed (S) where it was directly inspected in the field; validated (V) where it was checked from a distance if access was not possible, or assigned a habitat code based on the desk study (D), where no visual confirmation was possible. This information is contained in the GIS database.

All surveyed hedgerows were numbered and this number is shown on the habitat map. Unnumbered hedgerows are coded WL1 (Fossitt code for hedgerows) and this indicates that they were not surveyed due to access difficulties.

Information relating to each habitat area and hedgerow is stored in a separate Microsoft Access Database, allowing this information to be linked to Kilkenny County Council's GIS system. This allows the maps to be queried for information.

A standard hatching and map layout was agreed for final presentation. A hardcopy habitat map and ecological features map accompany this report. Ecological networks described in the report are given a unique identifier number on the map so that readers can easily find the feature in question.

2.7 Reporting and data presentation

This written report, a set of photographs, along with the maps and GIS database, gather together the information collected during the survey, desk study and consultations. The main body of this report contains descriptive accounts of habitats and ecological networks. This is based on species lists compiled for principal habitats within these networks (Appendix 3, Target Notes). The assessment of the habitat networks is based on that developed by the NRA.

2.8 Study constraints

The timeframe for carrying out the assessment required that fieldwork took place over a short time outside the optimum period for fieldwork which is late spring/summer. Accordingly, the list of plant species recorded from the habitats is incomplete. Seasonality did not affect the principal objectives of the study: to

map, assess the significance of the habitats present, identify ecological networks and comment on their significance as Green Infrastructure. These principal objectives were met despite the seasonal constraints, by using previous reports particularly CAAS, (2003) studies located for this project, targeted consultations, field survey and professional judgement.

3 Results

3.1 Geodiversity

In common with the central lowlands of County Kilkenny, the Knocktopher study area is underlain by limestone rock. These limestones were laid down at least 353 million years ago. The Ballymartin Formation which underlies most of the village is a type of limestone with dark-grey calcareous shale. The rocks of the Portersgate Formation are found south-west of the village. A small area of exposed rock can be seen in the south of the village overlooking the river.

Associated with the Ballymartin Formation is a locally important aquifer which is moderately productive only in local zones. A regionally important aquifer on fissured bedrock lies immediately west of the village. Vulnerability ranges from high to extreme, particularly where the bedrock is near the surface.

Soils are derived from limestone till with alluvium along the river. The main types are grey-brown podzolics and brown earths, with some calcareous gleys adjoining the village to the west. The area covered by alluvium shows the extent of the post-glacial floodplain beside the river.

A tributary of the Little Arrigle River flows through Knocktopher. Water quality in this watercourse is not currently monitored by the EPA. Flooding has been recorded in the vicinity of Knocktopher, west of the R699 and along the N10. (www.floodmaps.ie)

3.2 Ecological networks

KT1 Little Arrigle River

The principal ecological network in Knocktopher is associated with the tributary of the Little Arrigle River. Habitats are on Map 1. Map 2 shows the ecological networks. The tributary of the Little Arrigle River is within a designated site of international biodiversity importance (cSAC no. 002162) the River Barrow/Nore. The Fisheries Board has confirmed (F. O' Donoghue Southern Regional Fisheries Board) that the watercourses associated with the Little Arrigle are significant in terms of salmonid habitat.

The ecological network associated with this tributary was divided into two sections, both of which are largely within the Special Area of Conservation. One section, (KT1a) contains the river and land which supports a high cover of riparian vegetation along its northern side at Whitescastle,. A second section (KT1b) includes the river around Knocktopher Abbey where riparian vegetation is less common.

No invasive plant species were found within the networks or elsewhere in Knocktopher.

KT1a River at Whitescastle Lower

Aquatic habitats within the ecological network in the study area (shown on Map 1), include the river (FW2) and its associated drains (FW4), wet willow-alder-ash woodland (WN6), reed and large sedge swamps (FS1) and wet grassland (GS4). These five habitats principally support aquatic species associated with this site.

Non-aquatic habitats which complement the interest of these core features and are identified in the habitat map are hedgerows (H18,H19,H21), stone walls/bridges (BL1A), dry meadows and grassy verges (GS2), immature woodland (WS2) and recently planted conifer woodland (WD4).

The principal characteristics of many of the habitats within this network were described by CAAS (2003) and confirmed by fieldwork in 2010.

BirdWatch Ireland member Pat Durkan has highlighted the importance of the river for the following species: grey wagtail, little egret, grey heron, dipper (which nest under the bridge) and kingfisher.

Of particular significance to habitat biodiversity is the presence of wet woodland (WN6). Wet woodlands around rivers are rare in Ireland. Other more common types of riparian habitats are patchy or non-existent upstream and downstream of Knocktopher. Wet woodland (Plate 1) is among the rarer types of wetland in the country and corresponds to a priority type (alluvial forests with *Alnus glutinosa* (alder) and ash, *Fraxinus excelsior* (91E0)) listed in the Habitats Directive.

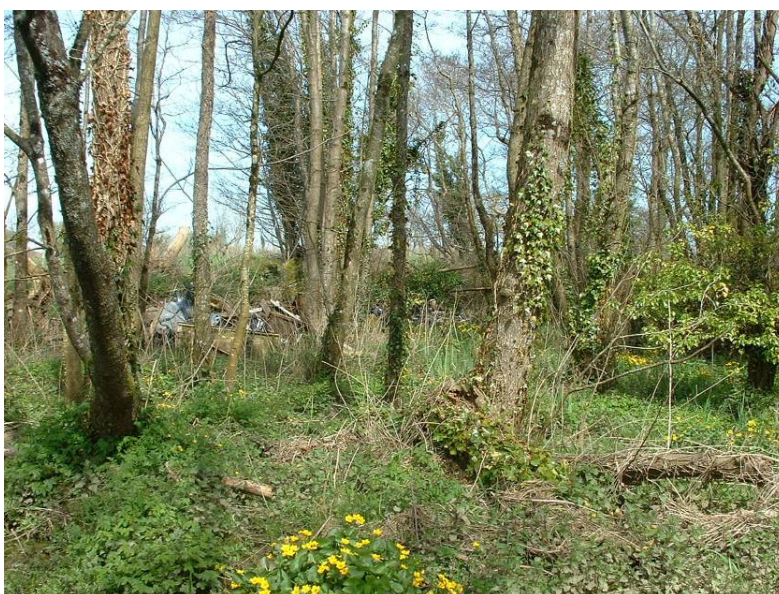


Plate 1 Wet woodland within Knocktopher LAP area

Throughout this narrow band of wet woodland (~7 m – 15 m wide) alder and willows are the main tree species, however horse chestnut are also present. Evidence of flooding was visible as was the dumping of household goods (Plate 1), which is on going at the edges of the woodland where the ground has been raised with fill. The remains of trees previously cut can be seen beside the western edge of the wood (Plate 2).



Plate 2 Remains of cut trees and in filled land to the west of within the Knocktopher study area

While the woodland has a poorly developed shrub layer with ivy, holly, brambles and the occasional currant, the herb layer contained at least twenty four different plant species including flag iris, reed canary grass and marsh marigold, opposite leaved golden saxifrage, meadowsweet and common figwort.

Other species found in the wet willow-alder-ash woodland (WN6) include:

Broad leaved dock	Hogweed
Bush vetch	Lords and ladies
Cleavers	Moss
Cow parsley	Nettle
Creeping buttercup	Soft shield fern
Fools watercress	Water cress
Hairy bittercress	Willowherb
Hard rush	Wood avens
Herb robert	

Wild angelica, bindweed and marsh woundwort were recorded by CAAS (2003).

Wet woodland is also found on a small island in the river (Plate 5), next to the picnic area. However it contains non-native species such as pampas grass and Cordyline.

East of the wet woodland are two fields with large sedge swamps (FS1), one of which is outside of the study area (Plate 3). These were dominated by reed canary grass and flag iris.



Plate 3 Large sedge swamp habitat within the Knocktopher study area.

The filled in area west of the woodland has now recolonised and contains species common to dry meadows and grassy verges (GS2). The field west of this contains wet grassland habitat (GS4), currently being colonised by alder (Plate 4). Typical wet grassland species such as mint, hard rush, lady's smock, meadow foxtail, meadow vetchling, wild angelica and marsh bedstraw are present.



Plate 4 Wet grassland with alder scrub developing in the background within the study area.

Several more species were recorded from the wet grassland in 2003 by Goodwillie, including greater pond sedge, lesser pond sedge, hairy sedge, brown sedge, and fleabane and marsh valerian.

Certain habitats within the network are associated with terrestrial (dry land) conditions. They are included in the network as they provide a habitat for common songbirds and native plant species, such as false oat grass and brambles which are shared with the key area. North of the wet woodland the field next to the road has recently been planted with ash (WS2). Recently planted conifer woodland is included as its vegetation is dominated by tall grass (similar to GS2) and it provides a buffer between the river and an industrial site.

Certain hedgerows (H18, H19 and H21) are included in this ecological network as they provide either an additional area of habitat similar to the woodland or/and they act as commuting corridors for species such as bats associated with important habitats in the core area.

Areas such as the amenity grassland in the picnic area next to the river (Plate 5), act as buffers to the main habitats.



Plate 5 Amenity Grassland-improved (GA2) near to wet woodland and the small island in the river, in Knocktopher.

The river is crossed by an ivy clad stone bridge (BL1A, Plate 6), which in addition to providing shelter and food for birds and insect species may contain bat roosts.

Green infrastructure assessment – KT1a Whitescastle Lower

The habitat complex of the river (FW2), wet woodland (WN6), wet grassland (GS4) and large sedge swamp (FS1) in Knocktopher is of international ecological value, as it contains an example of an EU Annex I habitat type (alluvial woodland).

The ecological network provides several services to society. It is an important reservoir of biodiversity, confirmed by its designation as a cSAC. It contains a habitat of international significance, wet woodland, listed in the Habitats Directive. The wetlands around the river perform a regulatory function as they absorb floodwaters and may have the potential to remove pollutants. They act as a natural attenuation area reducing the risk of flooding elsewhere in the catchment. The wet woodland is a carbon sink, mitigating for climate change. Any proposals for development in the vicinity of this network will require an Appropriate Assessment. This particularly includes any impacts on water quality, habitats within the river or wetland habitats linked to it.



Plate 6 The stone bridge (BL1A unmapped) over the Little Arrigle River, Knocktopher, viewed from the west.

Future development should seek to improve the quality of “buffer” areas by restoring riparian habitats adjacent to the river. This could involve the establishment of riparian woodland or wetlands.

KT1b Knocktopher Abbey

The other section of the principle ecological network in Knocktopher (KT1b) is associated principally with Knocktopher Abbey, part of which, near the river, is contained in the cSAC (see Map 2). As well as the river and tributary stream from the north (both FW2), habitats include trees and parkland (WD5), planted broadleaved woodland (WD1), scrub (WS1), dry grassland (GS2), wet grassland (GS4), amenity grassland (GA2), hedgerows (H13 and H12) stone walls (BL1A and stone buildings (BL1B) and drainage ditch (FW4).

Fewer trees exist today compared to the 1800's (based on a review of historic mapping) but of those that are present they are valuable for the number of bird and bat species they support (CAAS, 2003).



Plate 7 Mature trees (WD2) in Knocktopher Abbey

Trees in planted woodlands (WD1 and WD2) include ash, horse chestnut, sawara cypress, beech, Japanese cedar, Douglas fir, redwoods, oak, Holm oak, ash, sycamore and an avenue of yews (Plate 7).

The woodland near the road and bridge (mixed) broadleaved woodland (WD1) is dominated by ash, much of which has been planted, but there are also some naturally occurring wet woodland tree species such as alder and willow.

Woodland herbaceous species were plentiful and included the rarer goldilocks buttercup (*Ranunculus auricomus*), growing in association with lesser celandine near the entrance gate to the Abbey, while the introduced windflower (*Anemone blanda*), has become naturalised under trees next to the lawn east of the hotel entrance. Other herbaceous species include:

Bluebell	False brome
Butterbur	False forget-me-not
Cleavers	Ground ivy
Common polypody	Herb robert
Common thistle	Hogweed

Dog violet

Early dog violet

Elder

Lord's and ladies

Primrose

Wood dock

The Abbey is connected directly to the river via a grass mown path and a small stream (FW2). Horse chestnut, hawthorn, sycamore, oak and ash grow along the edges of the path while primroses, lesser celandine, dandelion, cocks' foot grass, fescue and cow parsley are among the herbaceous species (Plate 8). The stream starts approximately halfway down the path that leads to the river, and contains some clear running water, but it is becoming clogged with water cress. Goat willow, sycamore, bramble, nettle, willowherb and meadowsweet grow along its edges. It joins the river on the west side of a stone footbridge. The river bed of the Arrigle tributary in this location is stony and the water is clear. Irises can be found growing in shallower water at the edges of the river to the west of the bridge. Species such as ivy, wall rue, polypody fern, and maidenhair spleenwort are growing on the walls of the bridge (BL1A, Plate 9).

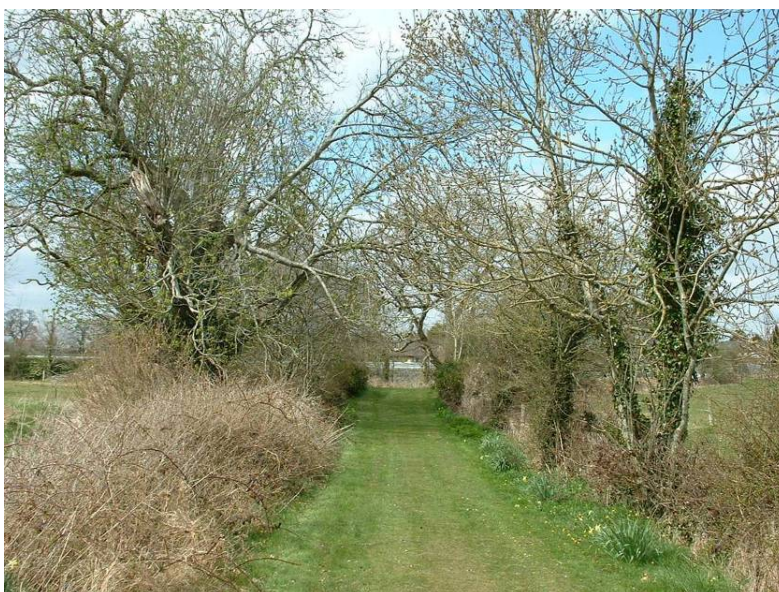


Plate 8 Tree lined grass path leading from Knocktopher Abbey to the river



Plate 9 Stone footbridge over the river north west of Knocktopher Abbey.

A small stream flows into the Arrigle tributary from the north. This drains fields with wet grassland (GS4) and scrub (WS1) in the vicinity of the study area boundary.

Dry grassland (GS1 unmapped) was found growing on a raised bank, on the eastern side of H03, above the amenity grassland of the Abbey lawns and in parts of the old graveyard beside Knocktopher Abbey. The former strip is c. 2 m wide. Moss was abundant and lady's smock, cowslip, primrose, lesser celandine, field woodrush, wood anemone, wild strawberry, violets and red fescue were included among the species. Both areas are managed by mowing.

The ecological survey carried out by CAAS in 2003 highlighted Knocktopher Abbey, the (mixed) broad leaved woodland (WD1) and the stone built tower (BL1B) of the old monastery as areas of biodiversity importance. Bird species associated with the woodland included spotted flycatcher, chiffchaff, stock dove, coal tit, tree creeper and winter siskin. The report also stated that stone buildings and mature trees are potential roosts for long eared-bats and pipistrelles. Crows were found nesting in abundance among the tops of the tall trees in 2010 and at least fifty nests were counted.

Stone walls and old stone buildings (BL1B), particularly those covered in ivy provide potential roosting sites for bats which are principally associated with wetlands and woodlands. According to CAAS the stone tower of the monastery is a potential hibernation site for bats. No bat surveys were undertaken for this report.

Survey work in 2010 has amended the boundary of the area of biodiversity interest in the vicinity of Knocktopher Abbey to include a hedgerow, semi-natural grassland, stone walls, parkland and scrub.

The trees and parkland habitat (WD5) in front of Knocktopher Abbey features mature oak trees. These trees are potential bat roosting sites as their bark has many hollows and cracks.

The old stone ruins east of the Abbey which are covered in ivy and traveller's-joy provide nesting sites for birds and potential roosts for bats.

Semi-natural grasslands such as dry meadows and grassy verges (GS2) provide seeds for birds and over wintering sites for invertebrates.

Green infrastructure – KT1b

This network is of significant biodiversity value confirmed by the designation of part of it within the SAC. The river and planted woodlands are the most important features. The scrub and ivy in and around the old buildings in the grounds of the abbey further add to the immediate value of these habitats as they may provide roosting sites for bats. Small streams and hedgerows act as corridors linking woodlands and wet grassland to the river. This ecological network provides several services to society.

The river and associated wetlands perform a regulatory function as they absorb floodwaters and may have the potential to remove pollutants. They act as a natural attenuation area reducing the risk of flooding elsewhere in the catchment. Tree dominated habitats provide visual amenities. The biodiversity of this area adds to the value of important features of cultural significance.

Any proposals for development in the vicinity of this network will require an Appropriate Assessment. This particularly includes any impacts on water quality, habitats within the river or wetland habitats linked to it.

KT2 Knocktopher Church

The second ecological network is focussed on Knocktopher Church (Church of Ireland, BL1B), its surrounding walls (BL1A), and graveyard (GA2).

CAAS (2003) found large bat roosts of long-eared and pipistrelles in the disused church. Stone walls surrounding the church grounds are potential roosting sites for bats. The amenity grassland may provide food for bats and has potential for enhancement through the adoption of a more appropriate mowing regime (mow twice a year (early and late) and cuttings removed).

Green infrastructure – KT2

The core green infrastructure feature is the church with its bat roost. Stone walls provide feeding and or minor roosts for bats. The value of this area is enhanced by its proximity to a range of habitats which potentially provide commuting and feeding for bats.

Additional features of interest

Additional habitats of biodiversity value are found within Knocktopher.

Of particular interest are the hedgerow (H16), areas with scrub (WS1) mixed woodland (WD2) and large gardens near Knocktopher Church.

Mature trees are found in the gardens, hedgerow near Knocktopher Church (H16) and the small mixed broadleaved/conifer woodland (WD2) to the south-east of H16.

Most mature gardens near the church contain vegetation likely to support invertebrates which are the prey of bats. To the north west of the church the garden is completely organic and has achieved accredited organic status (personal communication, owner).

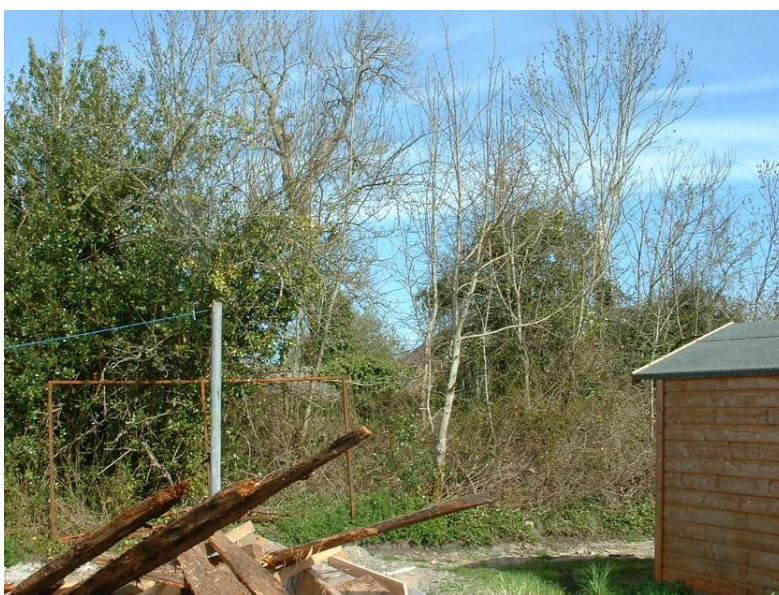


Plate 10 Organically certified garden within the Knocktopher LAP area.

A garden south of the church supports many native species including holly, elder, grey willow and ash. An adjacent garden associated with a derelict house has mixed scrub (Plate 11), dominated by bramble.



Plate 11 Scrub in garden.

Other features of biodiversity interest include mature trees outside mapped networks. They are found in a field on the other side of the river, northwest of the Abbey, in the housing estate off the Thomastown road, as well as hedgerows. They are valuable as potential roosting sites for bats, habitat for insects and food for birds.

Intensively managed grasslands (GA1) comprises most of the agricultural land around Knocktopher. Of limited biodiversity value for flora and fauna, they provide feeding for common birds.

Birds of interest associated with Knocktopher (Jimi Conroy, pers.comm.) include lapwing, fieldfare, redwing, yellowhammer, willow warbler, whitethroat, whinchat and stonchat, swallow, house martin and sand martins.

Green infrastructure value of other features (listed above)

Mature trees should be considered as being of potentially high local value as they may contain roosting sites for rare species such as bats. This would need to be confirmed by survey work.

The ecological network / green infrastructure associated with these features have the following values:

They provide corridors for wildlife.

They provide habitats of value to common and uncommon bird species and invertebrates.

Mature trees and publicly accessible green spaces improve the appearance of the streetscape and provide a passive amenity for the community.

Farmland has an important provisioning function in terms of food supply.

Hedgerows

Hedgerows form a particular type of ecological network important for trees, plants associated with woodlands, songbirds, small mammals and invertebrates including bees and butterflies.

Twenty one hedgerows were surveyed and evaluated. These comprised twenty hedgerows within or on the study area boundary and another (H12), outside the boundary. Some are associated with important ecological networks.

The extent of hedgerows reflects field patterns and history of land management. The presence of parkland, a planned demesne landscape, explains the low cover of hedgerows in one section of the study area. Examination of 1st ed OS mapping and direct inspection of hedgerows suggests that hedgerow length and quality have been reduced by development around the village.

Hedgerow numbers are shown on Map 1 and results of the evaluation of individual hedgerows are in Appendix 4. The numbers for hedgerows H18 and H21 appear twice as individual sections are separated by significant gaps.

Table 2 below summarises the results of the hedgerow evaluation for Knocktopher.

Table 2. Hedgerow Evaluation

Hedgerow Numbers	Rating	Description
-	1 *	Low value – least important
H06 H07, H08, H10, H11, H12, H15, H17	2 **	Moderate value - of moderate importance
H01, H02, H03, H04, H05, H09, H13, H14, H16, H18, H19, H20, H21	3 ***	High value – most important

The majority of hedgerows are of cultural value as they are shown on the 1st edition OS map (1837-1842). Two of these, H01, H19 partly lie along townland boundaries, suggesting greater antiquity. Most of the hedgerows surveyed in Knocktopher were found to be of high biodiversity value.

Eighty five percent are associated with banks, raised linear mounds of earth on which plants were originally established. The highest ranking hedgerow (H20) is part of KT1a and is associated with a wide drainage ditch. H19 and H21 are not associated with drainage ditches but are connected to the river network.

In contrast to hedgerows surveyed in other locations in Kilkenny in 2010 more than half of the hedgerows in Knocktopher have mature trees. These include

H01, H03, H04, H05, H06, H08, H09, H13, H14, H17, H18, H19, and H20. Ash is the main species of tree (found in eighteen hedgerows). English elm and oak are present in six hedgerows and yew in one. Alder is present in five hedgerows, three of which (H03, H13, H20), are associated with a drainage ditch or stream. The other two hedgerows with alder (H19, H21) have a direct connection with the river.

Ten different shrubs were recorded from the surveyed hedgerows. Hawthorn is present in all hedgerows and elder is present in more than half of the surveyed hedgerows. Blackthorn was the next most prevalent hedgerow shrub occurring in ten hedgerows. Other hedgerow shrubs included holly, hazel and grey willow. Yew and honeysuckle were found in just one hedgerow. Dog rose, field rose and bramble were also found. The non-natives sycamore, poplar sp. and Leyland cypress are present occasionally. The latter is found around the village.

The highest ranking hedgerow H20 scored 29. It is found on the east side of KT1a and in addition to being connected directly to the river it has a stream/drainage ditch and bank running along its length. It scored highly on structural and biodiversity characteristics and gappiness (0% gaps). Overall species diversity is high as it supports three tree species (oak, ash, and alder) and six shrub types including grey willow, holly and blackthorn in addition to hawthorn, bramble and ivy. It did not appear to have been managed recently. High scoring hedgerows (>20) were more likely to contain banks or ditches, have a better structure (with tree, shrub and herb layers) and fewer gaps. Total numbers of woody native species were usually high relative to lower ranked hedgerows. The other hedgerows that are of high value are: H01, H2, H03, H04, H05, H9, H13, H14, H16, H18, H19 and H21.

Moderately ranked hedgerows (H06, H07, H08, H10, H11, H12, H15, H17) were generally younger, had poor structural diversity (some had only a shrub layer), more gaps and were more likely to be directly affected by housing development.

With few exceptions management of hedgerows as stock-proof barriers and for biodiversity is poor. This is typical of the situation throughout the country. While half of the hedgerows had received some attention in the last five years few showed signs of appropriate management. Only one hedgerow had been cut on both sides and this was H10, which divided a business from a private house. However no herb layer was associated with it as car parking has been provided on one side and amenity grassland on the other.

Green infrastructure – hedgerows

Hedgerows in the study area primarily function as ecological corridors. They comprise semi-natural habitats and are important for nesting birds (protected under the Wildlife Acts). According to Jimi Conroy (pers.comm.) all common garden and farm birds are found around Knocktopher. In winter – lapwing,

fieldfare, redwing are seen in the fields. Yellowhammer, willow warbler and whitethroat occur, as well as whinchat and stonechat.

This type of green infrastructure has the following values:

Hedgerows act as ecological corridors, comprising semi-natural habitats and are important for native shrubs and nesting birds. Certain hedgerows are important constituents of ecological networks (i.e. H03, H15, H19, H20, H21)

All hedgerows which score >20 are of high local importance.

They have potential for development as landscaped amenity areas and more effective stock proof barriers.

They are important features of the cultural landscape.

They provide habitat for pollinating insects and predators of crop pests for commercial crops.

Priorities for development should be the promotion of higher standards of management by owners and greater consideration of hedgerow values by planners if development is proposed adjacent to them. Guidelines are provided to inform planning around hedgerows.

3.3 Summary of biodiversity assessment/evaluation

Supported by criteria contained in guidelines produced by the NRA (www.nra.ie, Appendix 6) the relative significance of the principal habitats and ecological networks within the study area was assessed. These results are summarised in Table 3, which should be used in conjunction with Maps 1 and 2.

Table 3. Summary of biodiversity assessment/evaluation in Knocktopher

Ecological network/Habitats	Ecological network element	Ecological evaluation
KT1a: River (FW2), wet woodland (WN6), drainage ditches (FW4), wet grassland (GS4) and reedswamp (FS1)	Core area	Internationally important
KT1a : Hedgerows, (H18,H19, H20,H21) and treeline (WL2)	Corridors linked to core area	County value
KT1a: Dry grassland (GS2), immature woodland (WS2), amenity grassland (GA2), stone walls and bridges (BL1A)	Buffer to core area/nature rehabilitation areas	Local importance (higher value)
Coniferous woodland (WD4)	Buffer area	Local importance (lower value)
KT1b River (FW2), woodland (WD1), parkland (WD5)	Core and buffer area	County value
KT1b: Grasslands (GS2), (GS4), GA2 dry stone structures (BL1A and BL1B), hedgerows	Core and corridor	Local importance (higher value)

Kilkenny LAP Habitat Assessment KNOCKTOPHER

(H03 H12, H13), drainage ditch (FW4),treeline (WL2) and scrub (WS1)		
KT1b: Built surfaces (BL3), garden shrubbery (WS3A),	Corridor	Local importance (lower value)
KT2 : Stone structures (BL1A, BL1B)	Core area and corridors	Local importance (higher value)
KT2: Amenity grassland (GA2)	Buffer	Local importance (lower value)
Other hedgerows >20;H01, H02, H04, H05, H09, H14	Corridors	Local importance (higher value)
Hedgerows>10<20 H06, H07, H08, H10, H11, H15,H17	Corridors in need of rehabilitation	Local importance (lower value)
Other feature of biodiversity interest: Dry stone walls (BL1A), stone buildings (BL1B), mature trees (WL2 where mapped)	Corridor features	Local importance (lower value)

4. Guidelines for Sustainable Development of Hedgerows and Drainage Ditches

The Green City Guidelines (Brennan and O'Connor 2008) contain many other suggestions for integrating biodiversity and development.

Hedgerows

Spatial planning should protect best-quality hedgerows (those which score between 20 and 30). If a dense network of such hedgerows is present within fields proposed for development, those with highest values and which function as connecting features/wildlife corridors should be retained. The objective should be to retain a connected network, which links to other types of semi-natural areas, provides a wildlife or green corridor, particularly from countryside into the town centre, and has a sustainable use within the new development.

No development should be allowed within 5m of retained hedgerows.

Developers and local groups should be reminded of their obligations under the Wildlife Act i.e. not to remove or interfere with hedgerows between March 1st and 31st August.

Boundary hedgerows should be retained unless there is an imperative reason of public safety. Prospective developers should be reminded that hedgerows require little management, look more appropriate in rural locations than garden hedges and are a ready made green feature of particular value to birds.

If a new boundary has to be established encouragement should be given to replace the original semi-natural feature (hedgerow, dry stone wall) with another type of semi-natural boundary. It is preferable to use native species, particularly the locally occurring ones mentioned in the hedgerow section of this report. This will provide alternative habitat for displaced species, be more compatible with local landscape values and maintain connectivity for species which relied on such features for commuting or feeding.

Spatial planning for large scale developments should integrate retained hedgerows into the design of roads, pedestrian/cycleways routes or open spaces. A grass margin should be retained around all retained hedgerows. By cutting grass regularly within this margin the hedgerow will appear to be managed.

Landscaping plans should retain hedgerows by incorporating them within new shrubberies or woodlands. Hedgerows (or individual mature trees contained within them) could become a nucleus for a new woodland developed by planting native trees/shrubs. Instead of retaining a straight line, gaps (for roads, paths, views) could be created and resulting smaller lengths could become the focii of woodlands/shrubberies of more varied shapes. Depending on the potential risks of anti-social activity or requirements for a more garden look the

margins of these new hedgerows cum-woodlands/shrubberies could be planted with spiny shrubs or species of horticultural value.

Drainage Ditches

Drainage ditches provide a habitat for aquatic species, allow for connectivity and provide for flood attenuation. Drainage ditches which form part of the catchment of salmonid rivers and are adjacent to hedgerows are most valuable.

Drainage ditches should be retained, unless there is an imperative reason of public safety, by ensuring that their hydrology is protected, culverting does not occur and new development does not drastically alter the physical environment within 5m.

Spatial planning should attempt to integrate drainage ditches into new designs.

Drainage ditches could become amenity type wetland features through reprofiling and landscaping. Landscaping should involve native species, particularly those occurring locally to maximise biodiversity and amenity values.

In large-scale developments drainage ditches could be enlarged to become the nuclei of Sustainable Urban Drainage Systems. If used as receiving waters for surface water drainage, or SUDS, monitoring should occur to ensure no deterioration occurs.

If a barrier is required around a drainage ditch, spiny shrubs (hawthorn, blackthorn) rather than a fence, should be planted. If a fence is erected a type should be chosen which would allow for the movement of small mammals.

Bibliography

Brennan, C. & O'Connor, D. (2008). *Green City Guidelines. Advice for the protection and enhancement of biodiversity in medium to high-density urban developments*. UCD Urban Institute Ireland, Dún Laoghaire-Rathdown County Council, Fingal County Council.

CAAS Environmental Services Ltd., (2003). *Ecological Survey of the Area to be Included in the Knocktopher Local Area Plan*. Prepared for Kilkenny County Council.

Clements, D. K., & Tofts, R. J. (1992). *Hedgerow evaluation and grading system (HEGS). A Methodology for the Ecological Survey, Evaluation and Grading of Hedgerows*. Countryside Planning and Management.

Compass Informatics Limited in association with Mary Tubridy & Associates, Keith Simpson & Associates (KSA) and Cunnane Stratton Reynolds (2010, in prep). *Green Infrastructure Baseline Research Study*. Report prepared for Comhar Sustainable Development Council, DOEHLG.

Department of Environment, Heritage and Local Government (2009) *Appropriate Assessment of Plans & Projects – Guidance for Planning Authorities*. DoEHLG, Dublin.

European Commission (2006) Communication from the Commission – *Halting the loss of biodiversity by 2010 – and beyond – Sustaining ecosystem services for human well-being* {SEC (2006) 607} {SEC (2006) 621}.

http://ec.europa.eu/environment/nature/biodiversity/comm2006/bap_2006.htm

European Commission (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive).

European Commission (2007). Interpretation Manual of European Union Habitats – EUR27.

Fossitt, J. A. (2000) *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny.

Kilkenny County Council (2008) *Kilkenny County Development Plan 2008-2014*.

Kilkenny County Council (2003). *Knocktopher Local Area Plan 2004*.

Kilkenny County Council (2008) *Draft County Kilkenny Biodiversity Action Plan 2008*.

Kilkenny County Council and Geological Survey of Ireland (2002). *County Kilkenny Groundwater Assessment. Volume I: Main Report*. Geological Survey of Ireland, Dublin.

Lyons, M. & Tubridy, M. (2006). *A Survey of Ancient and Species Rich Hedgerows in Dublin City*. Mary Tubridy & Associates, Dublin.

Murray, A. & Foulkes, N. (2005). *A Methodology for the Recording of Hedgerow Extent, Species Composition, Structure and Condition in Ireland*. Unpublished report.

National Parks & Wildlife Service (2003) *River Barrow and River Nore site synopsis*. Dublin.

National Roads Authority (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*. Revision 2, 1st June 2009. NRA, Dublin.

Smith, G. F., O'Donoghue, P., O'Hara, K., and Delaney, E. (2010) *Best Practice Guidance for Habitat Survey and Mapping*. Heritage Council, Kilkenny.

Webb, D. A., Parnell, J. & Doogue, D. (1996) *An Irish Flora*. Dundalgan Press, Dundalk.

Websites

Environmental Protection Agency www.epa.ie

Geological Survey of Ireland www.gsi.ie

National Parks & Wildlife Service www.npws.ie

Study Area
 (based on 2004 Knocktopher LAP boundary)

Habitats

- Arable crops (BC1)
- Stone building (BL1B)
- Buildings and artificial surfaces (BL3)
- Houses with big gardens (BL31)
- Houses with medium gardens (BL32)
- Houses with small gardens (BL33)
- Land under development (BL3D)
- Spoil and bare ground (ED2)
- Recolonising bare ground (ED3)
- Reed and large sedge swamps (FS1)
- Depositing/lowland rivers (FW2)
- Improved agricultural grassland (GA1)
- Amenity grassland (improved) (GA2)
- Dry meadows and grassy verges (GS2)
- Wet grassland (GS4)
- (Mixed) broadleaved woodland (WD1)
- Mixed broadleaved/conifer woodland (WD2)
- Conifer plantation (WD4)
- Scattered trees and parkland (WD5)
- Riparian woodland (WN5)
- Wet willow-alder-ash woodland (WN6)
- Scrub (WS1)
- Immature woodland (WS2)
- Ornamental/non-native shrub (WS3)

Drainage

- Drainage ditches (FW4)

Hedgerows & Treelines

- Hedgerows (H00: surveyed; WL1: unsurveyed)
- Treelines (WL2)
- Non-native hedge (WS3A)

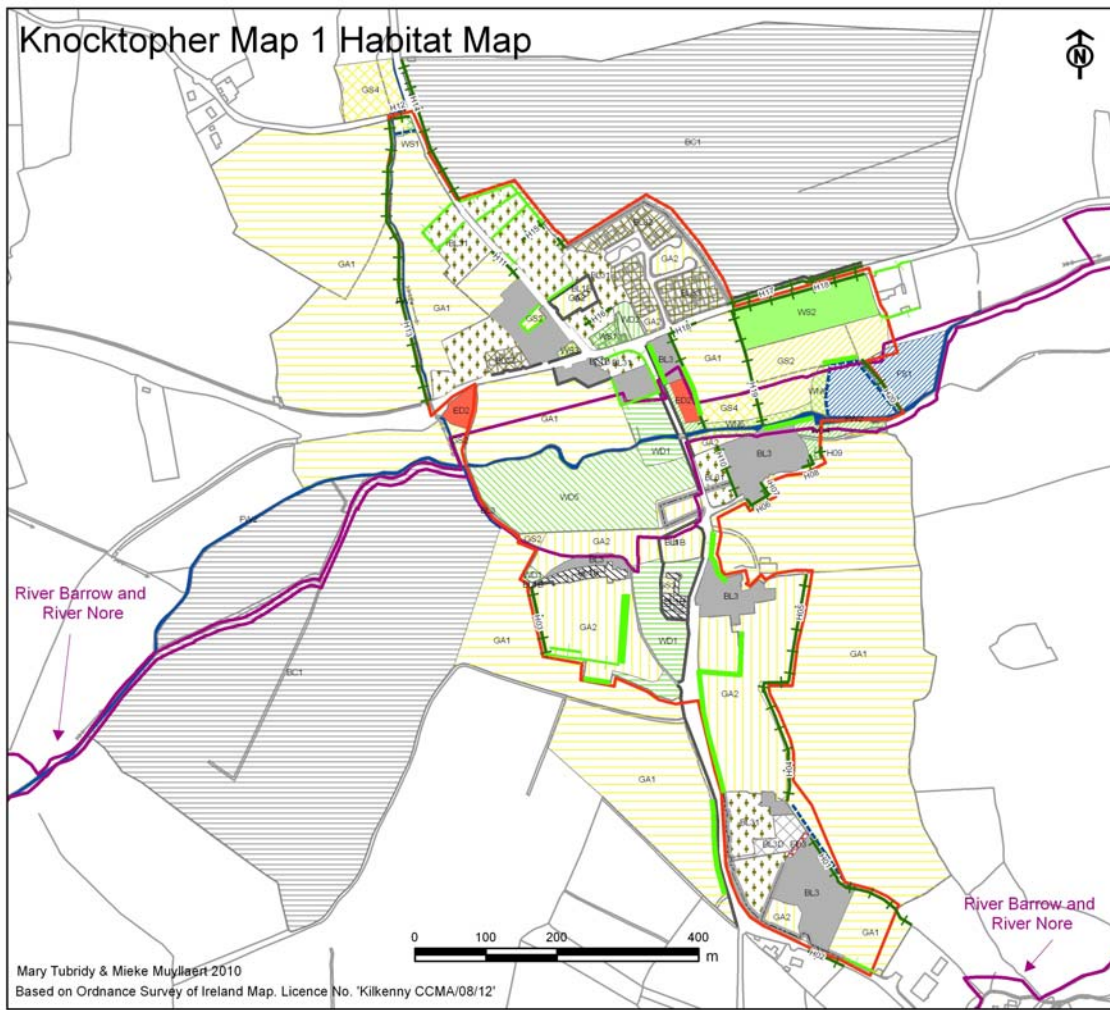
Walls

- Stone wall (BL1A)
- Earth Bank (BL2)
- Block/Concrete wall (BL3W)

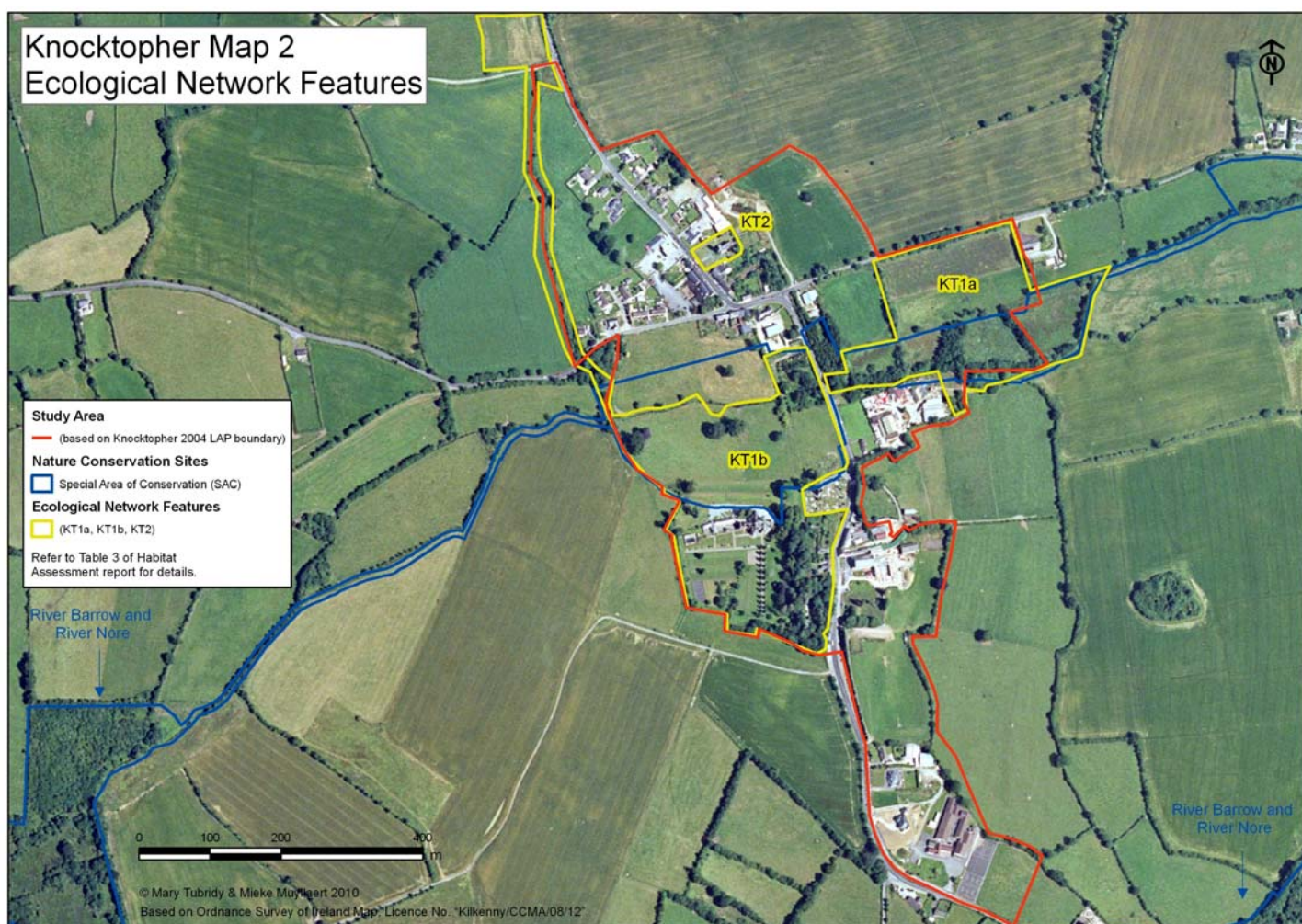
Nature Conservation Sites

- Special Area of Conservation (SAC)

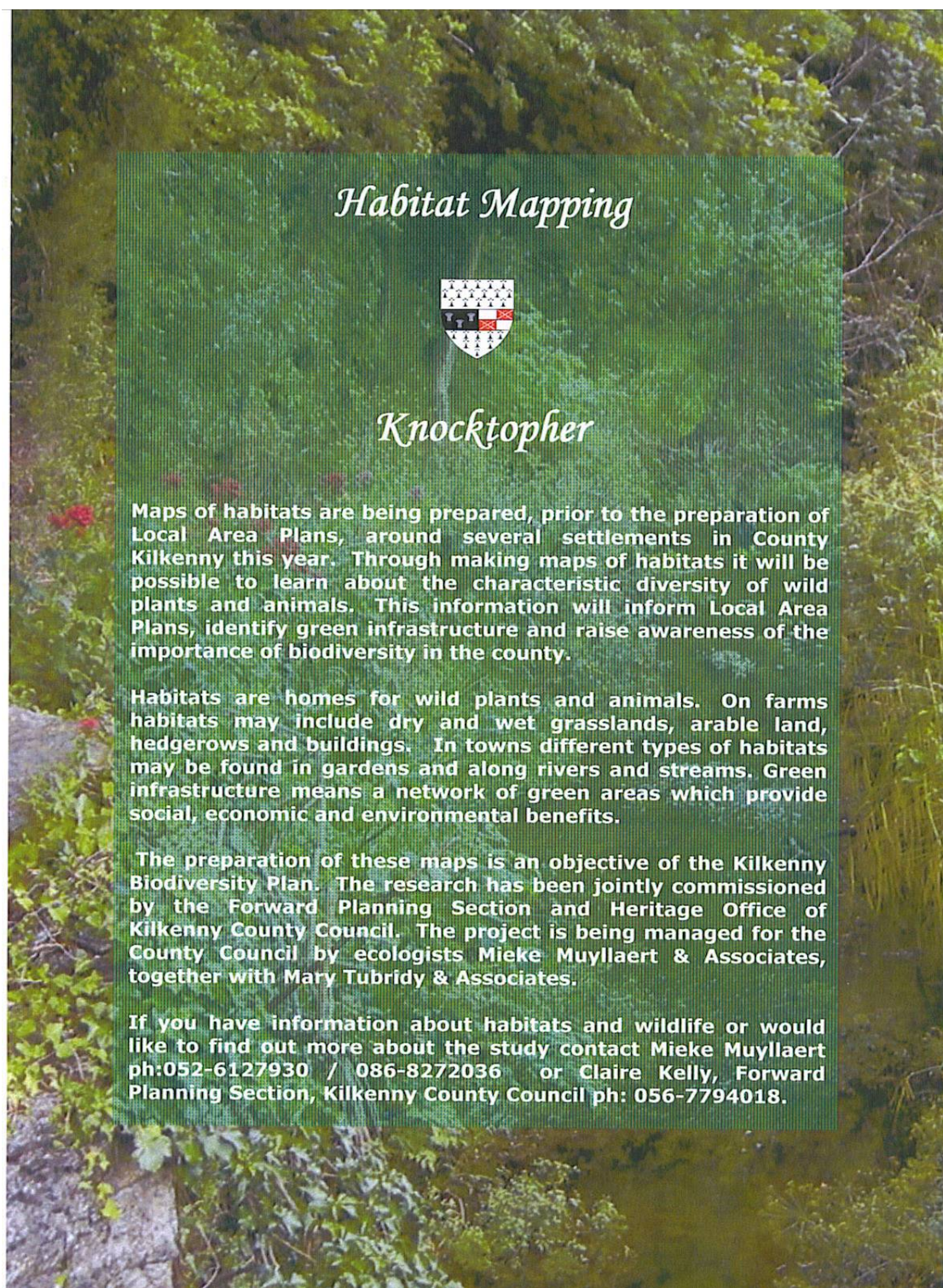
Base Map



Knocktopher Map 2 Ecological Network Features



Appendix 1 Information Leaflet



Appendix 2 Record sheets used in habitat mapping and hedgerow evaluation

Kilkenny LAP habitat survey 2010

Target areas

Settlement: _____ Recorder: _____ Date: _____

Target note ID no.	List species, describe features, management, invasives

Settlement:	Surveyor:
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No .	Height	Width	Gaps	Biodiversity value	Structure	Structural diversity	Management	Notes
	1 <1.5m 2 1.5-2.5m 3 2.5-4m 4 >4m	1 <1m 2 1.2m 3 2-3m 4 3m+	0 50%+ 1 25-50% 2 10-25% 3 5-10% 4 <5% 5 no gaps	List tree and shrub species	1 Shrub layer only 2 Shrub + herbs 3 Tree, shrub + herbs, open base 4 Tree, shrub + herbs, dense base	0 No bank/ditch 1 Bank only 2 Bank + ditch 3 Bank, ditch, stagnant water 4 Bank, ditch, flowing water	1 Short-term unmgd (5 yrs) 2 Long-term unmgd 3 Box profile 4 Cut one side 5 Cut both sides 6 A-shape	Include notable spp., signs of fauna

NB Connectivity and Cultural value are entered directly to spreadsheet afterwards using field map and 1st ed. map.

Appendix 3 Target notes

Ecological network feature: KT1a

Habitat codes FW2,WN6, FW4,GS4, FS1,WL1,WL2, GS2, WS2,GA2,WD4

Scientific name Common name

<i>Acer pseudoplatanus</i>	Sycamore
<i>Aesculus hippocastanum</i>	Horse chestnut
<i>Alnus glutinosa</i>	Alder
<i>Alopecurus pratensis</i>	Meadow foxtail
<i>Angelica sylvestris</i>	Wild angelica
<i>Anthriscus sylvestris</i>	Cow parsley
<i>Apium nodiflorum</i>	Fools watercress
<i>Arum maculatum</i>	Lords and ladies
Bryophytes	Moss
<i>Caltha palustris</i>	Marsh marigold
<i>Cardamine flexuosa</i>	Hairy bittercress
<i>Cardamine pratensis</i>	Ladies smock
<i>Carex</i> sp.	Sedge
<i>Chrysosplenium oppositifolium</i>	Opposite leaved golden saxifrage
<i>Cirsium dissectum</i>	Marsh thistle
<i>Crataegus monogyna</i>	Hawthorn
<i>Dactylis glomerata</i>	Cock'sfoot
<i>Elytrigia repens</i>	Scutch grass
<i>Epilobium angustifolium</i>	Rosebay willowherb
<i>Epilobium</i> sp.	Willowherb
<i>Filipendula ulmaria</i>	Meadowsweet
<i>Fraxinus excelsior</i>	Ash
<i>Galium aparine</i>	Cleavers
<i>Galium palustris</i>	Common marsh-bedstraw
<i>Geranium robertianum</i>	Herb robert
<i>Geum urbanum</i>	Wood avens
<i>Heracleum sphondylium</i>	Hogweed
<i>Herder helix</i>	Ivy
<i>Ilex aquifolium</i>	Holly
<i>Iris pseudacorus</i>	Flag iris
<i>Juncus effusus</i>	Soft rush
<i>Juncus inflexus</i>	Hard rush
<i>Lathyrus pratensis</i>	Meadow vetchling
<i>Mentha</i> sp.	Mint
<i>Phalaris arundinacea</i>	Reed canary grass
<i>Polystichum setiferum</i>	Soft shield fern
<i>Populus</i> sp.	Poplar
<i>Prunus spinosa</i>	Blackthorn
<i>Quercus robur</i>	Pedunculate oak
<i>Ranunculus repens</i>	Creeping buttercup
<i>Ribes</i> sp.	Currant
<i>Rorippa officinale</i>	Water cress
<i>Rosa arvensis</i>	Field rose
<i>Rubus fruticosus</i> agg.	Bramble
<i>Rumex obtusifolius</i>	Broad leaved dock
<i>Salix cinerea</i>	Grey willow
<i>Sambucus nigra</i>	Elder
<i>Scrophularia nodosa</i>	Figwort
<i>Taraxacum officinale</i>	Dandelion
<i>Ulmus glabra</i>	Wych elm
<i>Urtica dioica</i>	Nettle
<i>Vicia sepium</i>	Bush vetch

Ecological network feature: KT1b

Habitat codes

FW2, FW4, WS1,WD1,WD5,GS2, GS4, GA2, BL1a and BL1b

Scientific name Common name

<i>Acer pseudoplatanus</i>	Sycamore
<i>Aegopodium podagraria</i>	Ground elder
<i>Aesculus hippocastanum</i>	Horse chestnut
<i>Allium</i>	Chives
<i>Anemone blanda</i>	Windflower
<i>Anemone nemorosa</i>	Wood anemone
<i>Anthriscus sylvestris</i>	Cow parsley
<i>Arum maculatum</i>	Lord's and ladies
<i>Bellis perennis</i>	Daisy
<i>Brachypodium sylvaticum</i>	False brome
<i>Brunnera</i> sp.	Siberian Bugloss
<i>Cardamine pratensis</i>	Lady's smock
<i>Chamaecyparis pisifera</i>	Sawara cypress
<i>Cirsium vulgare</i>	Common thistle
<i>Clematis vitalba</i>	Traveller's-joy
<i>Corylus avellana</i>	Hazel
<i>Crataegus monogyna</i>	Hawthorn
<i>Cryptomeria japonica</i>	Japanese cedar
<i>Dactylis glomerata</i>	Cock's foot
<i>Epilobium</i> sp.	Willowherb
<i>Fagus sylvatica</i>	Beech
<i>Festuca rubra</i>	Red fescue
<i>Filipendula ulmaria</i>	Meadowsweet
<i>Fragaria vesca</i>	Strawberry
<i>Fraxinus excelsior</i>	Ash
<i>Galium aparine</i>	Cleavers
<i>Geranium robertianum</i>	Herb robert
<i>Glechoma hederacea</i>	Ground ivy
<i>Hedera helix</i>	Ivy
<i>Heracleum sphondylium</i>	Hogweed
<i>Hyacinthoides non-scriptus</i>	Bluebell
<i>Ligustrum ovalifolium</i>	Privet
<i>Lonicera periclymenum</i>	Honeysuckle
<i>Luzula campestris</i>	Field woodrush
<i>Narcissus</i> sp.	Daffodil
<i>Petasites hybridus</i>	Butterbur
<i>Plantago major</i>	Broad leaved plantain
<i>Polypodium vulgare</i>	Common polypody
<i>Polystichum setiferum</i>	Soft shield fern
<i>Pseudosuga menzeii</i>	Douglas fir
<i>Primula veris</i>	Cowslip
<i>Primula vulgaris</i>	Primrose
<i>Prunus spinosa</i>	Blackthorn
<i>Pseudosuga menziesii</i>	Douglas fir
<i>Quercus ilex</i>	Holm oak
<i>Quercus robur</i>	Oak
<i>Ranunculus acris</i>	Meadow buttercup
<i>Ranunculus ficaria</i>	Lesser celandine
<i>Ranunculus repens</i>	Creeping buttercup
<i>Rubus fruticosus</i> agg.	Bramble
<i>Rubus idaeus</i>	Raspberry
<i>Rumex acetosa</i>	Common sorrel
<i>Rumex sanguineum</i>	Wood dock
<i>Salix caprea</i>	Goat willow

Kilkenny LAP Habitat Assessment KNOCKTOPHER

<i>Sambucus nigra</i>	Elder
<i>Sequoia</i> sp.	Redwood
<i>Symphoricarpos orbiculatus</i>	Snowberry
<i>Taraxacum officinale</i>	Dandelion
<i>Taxus baccata</i>	Yew
<i>Urtica dioica</i>	Nettle
<i>Veronica chamaedrys</i>	Germander speedwell
<i>Vicia sepium</i>	Bush vetch
<i>Viola canina</i>	Dog violet
<i>Viola</i> sp.	Violet

Ecological network feature: KT2

Habitat codes

BL1A, BL1B, GA2

Scientific name	Common name
<i>Bellis perennis</i>	Daisy
<i>Bryophytes</i>	Moss
<i>Cirsium vulgare</i>	Common thistle
<i>Dactylis glomerata</i>	Cocksfoot
<i>Herdera helix</i>	Ivy
<i>Ranunculus repens</i>	Creeping buttercup
<i>Taraxacum officinale</i>	Dandelion
<i>Urtica dioica</i>	Nettle

Appendix 4 Hedgerow Evaluation

No.	Height	Width	Gaps	Biodiversity value	Structure	Structural diversity	Connectivity	Cultural value	Score	Management
	1 <1.5m 2 1.5-2.5m 3 2.5-4m 4 >4m	1 <1m 2 1.2m 3 2-3m 4 3m+	0 50%+ 1 25-50% 2 10-25% 3 5-10% 4 <5% 5 no gaps	No. of native tree & shrub species 1 One-two 2 Three 4 Four+	1 Shrub layer only 2 Shrub + herbs 3 Tree, shrub + herbs, open base 4 Tree, shrub + herbs, dense base	0 No bank/ ditch 1 Bank only 2 Bank + ditch 3 Bank, ditch, stagnant water 4 Bank, ditch, flowing water	0 No direct connections 1 Connection by water (ditch only) 2 1 connection 3 2 connections 4 3 connections 5 4 or more connections	1 Not on 1 st ed map 2 On 1 st ed map (but not tld bdry) 4 Townland boundary		1 Short-term unmgd (5 yrs) 2 Long-term unmgd 3 Box profile 4 Cut one side 5 Cut both sides 6 A-shape
H01	4	2	3	4	3	3	4	4	27	2
H02	2	2	4	4	3	1	3	2	21	1
H03	2	2	5	4	3	4	2	2	24	1
H04	4	2	4	4	4	1	3	2	24	1
H05	4	3	2	4	4	0	3	2	22	1
H06	1	2	4	4	1	1	2	1	16	1
H07	2	2	2	2	1	1	2	1	13	2
H08	4	2	2	4	3	1	0	1	17	2
H09	4	3	3	4	4	1	1	1	21	2
H10	1	2	4	4	2	1	0	1	15	1
H11	2	2	4	4	2	1	0	2	17	1
H12	1	3	0	4	2	1	3	2	16	1
H13	4	4	2	4	4	4	4	2	28	1
H14	4	3	4	4	4	4	2	2	27	1

Kilkenny LAP Habitat Assessment KNOCKTOPHER

H15	2	2	0	4	3	0	2	1	14	1
H16	4	4	4	4	4	0	0	1	21	2
H17	3	2	0	4	3	1	4	2	19	2
H18	4	3	1	4	3	2	2	2	21	2
No.	Height	Width	Gaps	Biodiversity value	Structure	Structural diversity	Connectivity	Cultural value	Score	Management
	1 <1.5m 2 1.5-2.5m 3 2.5-4m 4 >4m	1 <1m 2 1.2m 3 2-3m 4 3m+	0 50%+ 1 25-50% 2 10-25% 3 5-10% 4 <5% 5 no gaps	No. of native tree & shrub species 1 One-two 2 Three 4 Four+	1 Shrub layer only 2 Shrub + herbs 3 Tree, shrub + herbs, open base 4 Tree, shrub + herbs, dense base	0 No bank/ ditch 1 Bank only 2 Bank + ditch 3 Bank, ditch, stagnant water 4 Bank, ditch, flowing water	0 No direct connections 1 Connection by water (ditch only) 2 1 connection 3 2 connections 4 3 connections 5 4 or more connections	1 Not on 1 st ed map 2 On 1 st ed map (but not tld bdry) 4 Townland boundary		1 Short-term unmgd (5 yrs) 2 Long-term unmgd 3 Box profile 4 Cut one side 5 Cut both sides 6 A-shape
H19	4	3	3	4	3	1	2	1	21	2
H20	4	4	5	4	3	4	4	1	29	2
H21	4	4	1	4	4	0	3	4	24	2

Appendix 5 Summary of Fossitt habitat classification

Summary of the habitat classification scheme in *A Guide to Habitats in Ireland* (Fossitt, 2000) with standard alphanumeric habitat codes.

NON-MARINE		NON-MARINE	
F	FRESHWATER		Peatlands contd.
FL	Lakes and ponds	PB4	Cutover bog
FL1	Dystrophic lakes	PB5	Eroding blanket bog
FL2	Acid oligotrophic lakes	PF	Fens and flushes
FL3	Limestone/marl lakes	PF1	Rich fen and flush
FL4	Mesotrophic lakes	PF2	Poor fen and flush
FL5	Eutrophic lakes	PF3	Transition mire and quaking bog
FL6	Turloughs		
FL7	Reservoirs	W	WOODLAND AND SCRUB
FL8	Other artificial lakes and ponds	WN	Semi-natural woodland
FW	Watercourses	WN1	Oak-birch-holly woodland
FW1	Eroding/upland rivers	WN2	Oak-ash-hazel woodland
FW2	Depositing/lowland rivers	WN3	Yew woodland
FW3	Canals	WN4	Wet pedunculate oak-ash woodland
FW4	Drainage ditches	WN5	Riparian woodland
FP	Springs	WN6	Wet willow-alder-ash woodland
FP1	Calcareous springs	WN7	Bog woodland
FP2	Non-calcareous springs	WD	Highly modified/non-native woodland
FS	Swamps	WD1	(Mixed) broadleaved woodland
FS1	Reed and large sedge swamps	WD2	Mixed broadleaved/conifer woodland
FS2	Tall-herb swamps	WD3	(Mixed) conifer woodland
		WD4	Conifer plantation
		WD5	Scattered trees and parkland
G	GRASSLAND AND MARSH	WS	Scrub/transitional woodland
GA	Improved grassland (highly modified)	WS1	Scrub
GA1	Improved agricultural grassland	WS2	Immature woodland
GA2	Amenity grassland (improved)	WS3	Ornamental/non-native shrub
GS	Semi-natural grassland	WS4	Short rotation coppice
GS1	Dry calcareous and neutral grassland	WS5	Recently-felled woodland
GS2	Dry meadows and grassy verges	WL	Linear woodland and scrub
GS3	Dry-humid acid grassland	WL1	Hedgerows
GS4	Wet grassland	WL2	Treelines
GM	Freshwater marsh		
GM1	Marsh	E	EXPOSED ROCK/DISTURBED GROUND
H	HEATH AND DENSE BRACKEN	ER	Exposed rock
HH	Heath	ER1	Exposed siliceous rock
HH1	Dry siliceous heath	ER2	Exposed calcareous rock
HH2	Dry calcareous heath	ER3	Siliceous scree and loose rock
HH3	Wet heath	ER4	Calcareous scree and loose rock
HH4	Montane heath	EU	Underground rock and caves
HD	Dense bracken	EU1	Non-marine caves
HD1	Dense bracken	EU2	Artificial underground habitats

P	PEATLANDS	ED	<i>Disturbed ground</i>
PB	<i>Bogs</i>	ED1	Exposed sand, gravel or till
PB1	Raised bog	ED2	Spoil and bare ground
PB2	Upland blanket bog	ED3	Recolonising bare ground
PB3	Lowland blanket bog	ED4	Active quarries and mines
		ED5	Refuse and other waste
<hr/>			
	NON-MARINE		MARINE
B	CULTIVATED AND BUILT LAND	L	LITTORAL (INTERTIDAL)
BC	<i>Cultivated land</i>	LR	<i>Littoral rock</i>
BC1	Arable crops	LR1	Exposed rocky shores
BC2	Horticultural land	LR2	Moderately exposed rocky shores
BC3	Tilled land	LR3	Sheltered rocky shores
BC4	Flower beds and borders	LR4	Mixed substrata shores
BL	<i>Built land</i>	LR5	Sea caves
BL1	Stone walls and other stonework	LS	<i>Littoral sediment</i>
BL2	Earth banks	LS1	Shingle and gravel shores
BL3	Buildings and artificial surfaces	LS2	Sand shores
		LS3	Muddy sand shores
C	COASTLAND	LS4	Mud shores
CS	<i>Sea cliffs and islets</i>	LS5	Mixed sediment shores
CS1	Rocky sea cliffs		
CS2	Sea stacks and islets	S	SUBLITTORAL (SUBTIDAL)
CS3	Sedimentary sea cliffs	SR	<i>Sublittoral rock</i>
CW	<i>Brackish waters</i>	SR1	Exposed infralittoral rock
CW1	Lagoons and saline lakes	SR2	Moderately exposed infralittoral rock
CW2	Tidal rivers	SR3	Sheltered infralittoral rock
CM	<i>Salt marshes</i>	SR4	Exposed circalittoral rock
CM1	Lower salt marsh	SR5	Moderately exposed circalittoral rock
CM2	Upper salt marsh	SR6	Sheltered circalittoral rock
CB	<i>Shingle and gravel banks</i>	SS	<i>Sublittoral sediment</i>
CB1	Shingle and gravel banks	SS1	Infralittoral gravels and sands
CD	<i>Sand dune systems</i>	SS2	Infralittoral muddy sands
CD1	Embryonic dunes	SS3	Infralittoral muds
CD2	Marram dunes	SS4	Infralittoral mixed sediments
CD3	Fixed dunes	SS5	Circalittoral gravels and sands
CD4	Dune scrub and woodland	SS6	Circalittoral muddy sands
CD5	Dune slacks	SS7	Circalittoral muds
CD6	Machair	SS8	Circalittoral mixed sediments
CC	<i>Coastal constructions</i>		
CC1	Sea walls, piers and jetties	MW	MARINE WATER BODY
CC2	Fish cages and rafts	MW1	Open marine water
		MW2	Sea inlets and bays
		MW3	Straits and sounds
		MW4	Estuaries

Appendix 6 Ecological evaluation criteria

Taken from NRA (2009)

International Importance:

‘European Site’ including Special Area of Conservation (SAC), Site of Community Importance

(SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.

Proposed Special Protection Area (pSPA).

Site that fulfills the criteria for designation as a ‘European Site’ (see Annex III of the Habitats Directive, as amended).

Features essential to maintaining the coherence of the Natura 2000 Network¹.

Site containing ‘best examples’ of the habitat types listed in Annex I of the Habitats Directive.

Resident or regularly occurring populations (assessed to be important at the national level)² of the following:

Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or

Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.

Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).

World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).

Biosphere Reserve (UNESCO Man & The Biosphere Programme).

Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).

Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).

Biogenetic Reserve under the Council of Europe.

European Diploma Site under the Council of Europe.

Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988)³.

National Importance:

Site designated or proposed as a Natural Heritage Area (NHA).

Statutory Nature Reserve.

Refuge for Fauna and Flora protected under the Wildlife Acts.

National Park.

Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA);

Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.

Resident or regularly occurring populations (assessed to be important at the national level)⁴ of the following:

Species protected under the Wildlife Acts; and/or

¹ See Articles 3 and 10 of the Habitats Directive.

² It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

³ Note that such waters are designated based on these waters’ capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

⁴ It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

<p>Species listed on the relevant Red Data list.</p> <p>Site containing 'viable areas'⁵ of the habitat types listed in Annex I of the Habitats Directive.</p>
<p>County Importance:</p> <p>Area of Special Amenity.⁶</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)⁷ 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 BAP⁸, if this has been prepared.</p> <p>Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.</p> <p>Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.</p>
<p>Local Importance (higher value):</p> <p>Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;</p> <p>Resident or regularly occurring populations (assessed to be important at the Local level)⁹ 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>Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;</p> <p>Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.</p>
<p>Local Importance (lower value):</p>

⁵ A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

⁶ It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

⁷ It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

⁸ BAP: Biodiversity Action Plan

⁹ It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

Kilkenny LAP Habitat Assessment KNOCKTOPHER

Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
Sites or features containing non-native species that are of some importance in maintaining habitat links.