



**DÚN LAOGHAIRE – RATHDOWN COUNTY  
COUNCIL**

**DLR HEDGEROW REVIEW AND  
EVALUATION**

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# 1 INTRODUCTION

## 1.1 Hedgerow Biodiversity and Value

### 1.1.1 Biodiversity

Hedgerows are important habitats in Dún Laoghaire-Rathdown (DLR) and throughout lowland regions of Ireland. In landscapes dominated by intensive agriculture or built land, they are often the only remnants of semi-natural habitat. They can act as refugia for species that cannot persist in intensively managed or highly modified landscapes. For example,



Hedgerow with wide grassy margin

a survey of hedgerows in Fingal found that

in such landscapes, hedgerows provided the only habitat for ferns and species of open woodland or woodland edges, such as primroses (*Primula vulgaris*), violets (*Viola* species) and wood sedge (*Carex sylvatica*) (McCourt and Kelly, 2007). Hedgerows with grassy margins or banks can also support species of unmanaged grassland. Where they are associated with drains or watercourses, wetland species are frequently present. In addition to plants, hedgerows can act as refuges or corridors for the dispersal of fauna, including beetles, butterflies, birds and small mammals (Hickie, 2004, Teagasc, 2004, McCourt and Kelly, 2007). For example, the value of hedgerows for several species of bats for commuting and feeding is well known (Foulkes *et al.*, 2013). Where woodland is scarce, hedgerows are the primary habitat for badger setts (National Roads Authority, 2005).



Townland boundary hedgerow – broad and dense with mature trees

There is significant variation among hedgerows in their value as habitats. The characteristics that increase their biodiversity benefits and make a “good” hedgerow are detailed by Hickie (2004) and Foulkes *et al.* (2013). Hedgerow structure is a critical factor, especially for providing cover and food for birds and small mammals. Hedges that are wide and dense at the base and are relatively tall (greater than 3 m) with some mature trees

are of higher value as habitats. The presence of grassy margins, ideally more than 2 m wide, increases the amount of invertebrate habitat and also cover and foraging opportunities for

birds and mammals. Wider margins increase the diversity of shade-intolerant grassland plant species associated with the hedgerow. A greater diversity of shrub and tree species – preferably four or more in a 30 m length – will provide greater diversity of microhabitats and other resources than a hedgerow consisting only of hawthorn (*Crataegus monogyna*). Additional features associated with hedgerows, such as drystone walls, wet drains, streams and rivers also increase hedgerow diversity. Older hedgerows are more valuable in large part because they have had a longer opportunity to be colonised. Townland boundary hedgerows are usually among the oldest. Roadside hedgerows are also often older and therefore more important than ordinary field boundary hedgerows (although in an urban context, field boundary hedgerows become more important in their role in terms of providing refuges and connectivity). Similarly, hedgerows that are well-connected to a wider network of hedges or to woodland tend to support greater biodiversity. They also have the potential to perform better as wildlife corridors.

### 1.1.2 Ecosystem Services

Hedgerows were originally planted to provide ecosystem services, primarily stock-proof fencing to improve livestock management. In an agricultural production context, they are also important for providing shelter and reducing the spread of airborne disease between fields and farms; they also act to prevent close contact between animals on neighbouring farms (Teagasc, 2004, Hickie, 2004, Foulkes, 2006). Additional provisioning services from hedgerows include firewood and fruit (Hickie, 2004) as well as providing habitat for pollinators (National Biodiversity Data Centre, 2015).



Hedgerow with mature trees sequestering carbon

In an urban or rural context, important regulation services include flood control and reducing soil erosion by intercepting surface water runoff. Percolation into the soil is enhanced by the rooting systems of hedgerow trees and shrubs. Intercepting runoff also enhances water quality by trapping sediment particles, capturing excess nutrients, and reducing inputs of other pollutants (Hickie, 2004, Teagasc, 2004, Foulkes, 2006). Hedgerows can also improve air and water quality by intercepting airborne particulates (Heritage Council, 2016). Hedgerows also provide many cultural services, including landscape character, visual amenity, screening, and historical/cultural heritage (Foulkes, 2006, Heritage Council, 2016, Teagasc, 2004). Townland boundary hedgerows are particularly important for the latter. Finally, the importance of hedgerows for carbon sequestration, both above and below-ground, is significant, especially

as they often represent the most abundant or only wooded habitat type in our urban landscapes.

## **1.2 Hedgerow Protection in DLR**

Hedgerows are protected in the DLR County Development Plan 2016-2022 under Policy LHB26, which states:

*It is Council policy to protect hedgerows in the County from development, which would impact adversely upon them. It is Council policy to promote the County's hedgerows by increasing coverage, where possible, using locally native species and to develop an appropriate code of practice for road hedgerow maintenance.*

Hedgerows are also included in Policy LHB19 on Protection of Natural Heritage and the Environment, which commits to "retention of trees, hedgerows and woodlands wherever practical."

Policy LHB23 on Non-Designated Areas of Biodiversity Importance also includes hedgerows in the policy "to protect and promote the conservation of biodiversity in areas of natural heritage importance outside Designated Areas...".

The role of hedgerows as ecological corridors is recognised in Policy LHB24 on the County-Wide Ecological Network.

## 2 METHODS

### 2.1 Hedgerow Mapping

Hedgerows in DLR were mapped using a combination of existing datasets and aerial photography review.

The largest and most detailed dataset on hedgerows in DLR was the 2008 Dun Laoghaire – Rathdown hedgerow survey (RSK Carter Ecological, 2008). This was a GIS linear data layer of 760 hedgerows and treelines imported from a “tree\_hedge mapping layer provided by Dún Laoghaire Rathdown County Council” (RSK Carter Ecological, 2008), presumably an OSI vector layer. Of these, 254 were surveyed in detail during 2008 field surveys. Field survey data on these hedgerows in an Excel spreadsheet were joined to the GIS layer based on common identification numbers called Hedge\_ID numbers. In a few cases, Hedge\_ID numbers were changed in the field and the changes not reflected in the GIS layer Hedge\_ID numbers. In these cases, field survey data were manually assigned to hedgerow GIS features where possible. Some hedgerows surveyed in 2008 were mapped with a significant bend or corner, i.e. two sides of a field were considered to consist of the same hedgerow. Where this would have implications for assessing conservation value (see Section 2.2 below), such as a hedgerow running partly along a townland boundary or watercourse, the hedgerow was split into two at the corner. These adjustments resulted in a final set of 266 hedgerows surveyed in the field in 2008.

A GIS dataset of 160 hedgerows and treelines was produced by biodiversity surveys of the Cherrywood Strategic Development Zone (SDZ) in 2010-2011 (Scott Cawley, 2012). In this dataset, hedgerows were mapped as polygon features. Hedgerows from this survey were added to those from the 2008 survey by manually digitizing a polyline feature through the centre of the hedgerow polygon. Where the Cherrywood SDZ hedgerow polygons were complex or included more than one hedgerow that clearly differed in appearance on 2019 aerial photography, more than one polyline feature was mapped for a given hedgerow polygon. If a hedgerow mapped in the 2008 occupied the same location as a 2010-2011 hedgerow polygon, the 2008 linear feature was retained. There were 130 hedgerows mapped by the Cherrywood SDZ project that were not also mapped in the 2008 DLR hedgerow survey. Where aerial imagery indicated that a previously existing hedgerow had been removed, it was not deleted but coded as `Lost` in the GIS dataset.

Biodiversity data layers were obtained from the National Parks and Wildlife Service (NPWS) for the DLR layer. These included habitat mapping data for parts of the Wicklow Mountains National Park within DLR in the Glencullen Mountain and Boranaraltry areas and for Booterstown Marsh. They also included data from the Irish Semi-natural Grassland Survey and the National Survey of Native Woodland. None of these GIS datasets had any information on hedgerows.

The draft hedgerow GIS layer based on the 2008 DLR survey and the 2010-2011 Cherrywood SDZ survey was then revised and updated based on review of 2019 aerial photography in conjunction with historical six-inch Cassini projection mapping. Where a previously unmapped hedgerow was apparent on aerial photography and this coincided with a historical field boundary, a hedgerow was manually digitised through the centre of the feature visible on aerial imagery. This



Remnant urban hedgerow

was not done for hedges around properties and along roads in developed parts of the study area, as the great majority of hedges in such settings are not native hedgerows. Exceptions were made for historical field boundaries and watercourses associated with green spaces, such as playing pitches or parks, large institutions, such as churches or hospitals, and drains running along the rear boundary of properties. Some hedgerows mapped by the 2008 DLR survey but not surveyed in the field did not coincide with any visible hedgerow in the 2019 aerial photography, and there was no evidence or likelihood of removal in the intervening period. These hedgerows were deleted from the dataset. A total of 1643 hedgerows were digitised during the aerial photography review.

Hedgerow mapping was done using QGIS 3.10 (QGIS Development Team, 2020).

## 2.2 Ecological Evaluation

### 2.2.1 Ecological Evaluation Scoring System

The 2008 DLR hedgerow survey evaluated hedgerows as Priority levels 1-3 or "Not Priority" according to the UK Hedgerow Regulations 1997. This methodology suffered from a number of drawbacks, including criteria and targets not adapted for Irish conditions and counting non-native species such as beech (*Fagus sylvatica*) as beneficial hedge components.

An Ecological Evaluation scoring system was developed based on the *Hedgerow Appraisal System* (Foulkes *et al.*, 2013). The *Hedgerow Appraisal System* assigns scores of 0-4 against several criteria: connectivity, historical significance, shrub/tree diversity, ground flora diversity, landscape value, and structures and other features. A hedgerow that scores 4 in any one category, a cumulative score of 6 or more in the historical, shrub/tree diversity and structural categories, or a cumulative score of 16 or more over "the five categories"<sup>1</sup> is considered to be a "heritage hedgerow" under that system. Several of the targets, however, are of limited value

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<sup>1</sup> As there are six criteria in the *Hedgerow Appraisal System*, this ranking scheme is unclear.

as proxy measures of biodiversity, such as evidence of coppicing, dimensions of banks or walls, or wind-shaped appearance. An edited list of criteria and targets with clearer links to biodiversity was prepared, and scores were assigned where possible to hedgerows in the GIS data layer (Table 1).

Several criteria and targets were possible to assess for a subset of hedges surveyed in the field by the 2008 DLR hedgerow survey. These included connectivity data and information on hedgerow outline, standard trees and hedgerow age. Detailed information on tree, shrub and woodland flora species present permitted the calculation of scores for tree/shrub diversity, woodland ground flora diversity following *Hedgerow Appraisal System* criteria (Foulkes *et al.*, 2013). Other criteria and targets could be assessed by spatial analysis of the hedgerow layer with other GIS datasets (Table 1). Presence of a hedgerow along a townland boundary or watercourse was assessed by buffering townland boundary or watercourse linear features by 15 m and identifying hedgerows entirely within the buffer. This permitted identification of hedgerows running along these features, while excluding those perpendicular to them. Other Foulkes *et al.* (2013) targets could theoretically be included in the Ecological Evaluation scoring system, but were not assessed in this project. Some require field survey data that were not collected by the 2008 DLR hedgerow survey, such as presence of badger setts or wet drains. Others would require manual data entry and comparison with land ownership and historical datasets that was beyond the scope and resources of this project.



Hedgerow associated with wet drain

Two additional Ecological Evaluation targets are proposed (Table 1) that should be assessed in future DLR hedgerow field surveys. The first is the presence of an otter holt, which is assigned a score of 3 in comparison to a score of 2 for the presence of a badger sett, as otters are listed on Annexes II and IV of the Habitats Directive. The second new target is the presence of a wet ecological feature other than a drain adjacent to the hedgerow. These may include natural wetland features, such as springs or seepage zones. They may also include artificial features, such as Sustainable Urban Drainage Systems (SuDS) measures like swales or constructed wetlands, if they support wetland communities.

Other criteria, such as hedgerow height, breadth and gappiness, have been used in some hedgerow evaluation schemes. These criteria have been separated in the *Hedgerow Appraisal System* (Foulkes *et al.*, 2013) as being measures of hedgerow condition rather than value or importance (see Section 2.3).



**Table 1.** Ecological Evaluation scoring system criteria, targets, rankings and assessment methods

Criterion	Target	Score	2008 Survey Data?	Assessment
Connectivity	none	0	yes	Habitat link data from 2008 survey
Connectivity	single habitat link	1	yes	
Connectivity	multiple habitat links	2	yes	
Connectivity	woodland/forest link	3	yes	
Connectivity	link with designated area	4	no	Spatial analysis: intersections with designated areas
Ground flora diversity <sup>a</sup>	ruderals dominant	0	no	Not assessed
Ground flora diversity	0-1 woodland species	0	yes	Compile species data from 2008 survey
Ground flora diversity	2-3 woodland species	1	yes	
Ground flora diversity	4-5 woodland species	2	yes	
Ground flora diversity	6-7 woodland species	3	yes	
Ground flora diversity	3-5 fern species	3	yes	
Ground flora diversity	8+ woodland species	4	yes	
Ground flora diversity	6+ fern species	4	yes	
Historical Significance	Established 0-25 yr	0	yes	2008 survey data on hedges <30 yr
Historical Significance	internal field boundary	1	no	Not assessed
Historical Significance	external farm boundary	2	no	Not assessed
Historical Significance	road, rail, canal boundary	2	no	Assessed for hedges in 2008 survey by review of historical six-inch Cassini projection mapping
Historical Significance	non-linear	3	yes	2008 survey data on hedgerow outline
Historical Significance	on 1st ed OS map	3	no	Not assessed
Historical Significance	connected to old woodland	4	no	Spatial analysis: intersections with ALEW <sup>b</sup>
Historical Significance	townland boundary	4	no	Spatial analysis: location along townland boundaries <sup>c</sup>

Criterion	Target	Score	2008 Survey Data?	Assessment
Landscape value <sup>d</sup>	mature trees	2	yes	2008 survey data on presence of "standard trees"
Tree/Shrub diversity <sup>e</sup>	1-3 species	0	yes	Compile species data from 2008 survey
Tree/Shrub diversity	4-5 species	1	yes	
Tree/Shrub diversity	6/7 species	2	yes	
Tree/Shrub diversity	8-9 species	3	yes	
Tree/Shrub diversity	10+ species	4	yes	
Structure & features	badger sett	2	no	Not assessed
Structure & features	otter holt <sup>f</sup>	3	no	Not assessed
Structure & features	green lane	2	yes	2008 survey data on "double line hedge"
Structure & features	wet drain	3	no	Not assessed
Structure & features	other wet ecological feature <sup>f</sup>	3	no	Not assessed
Structure & features	stream/river	4	no	Spatial analysis: location along rivers <sup>g</sup>

<sup>a</sup> Species listed in Appendix E of Foulkes *et al.* (2013).

<sup>b</sup> Woodlands considered ancient or long-established, according to Perrin and Daly (2010).

<sup>c</sup> Townlands.ie GIS layer (OpenStreetMap Ireland, 2019).

<sup>d</sup> Combined with Tree/Shrub diversity criterion in analysis (c.f. Section 2.2.2).

<sup>e</sup> Native and non-invasive naturalised species listed in Appendix D of Foulkes *et al.* (2013).

<sup>f</sup> New proposed target not in *Hedgerow Appraisal System* (Foulkes *et al.*, 2013)

<sup>g</sup> OSI Rivers and Lakes 06/02/20 GIS layer downloaded from the EPA GeoPortal (<http://gis.epa.ie/GetData/Download>).

### 2.2.2 Ranking Ecological Value

A score was generated for each criterion in Table 1 by using the maximum score applicable for all its targets. For example, a hedgerow with 5 woodland species, which scores 2, and 3 fern species, which scores 3, would score a 3 under the ground flora diversity criterion.

The landscape value criterion was integrated with tree/shrub diversity, as it had only one ecologically relevant target, presence of mature trees. This yielded five criteria for evaluation: connectivity, historical significance, shrub/tree diversity, ground flora diversity, and structures and other features.

For hedgerows surveyed in 2008, scores ranging from 0-4 were generated for connectivity, ground flora diversity and tree/shrub diversity. Where data were available, scores were also generated for the historical and structure criteria. A default value of 1 was used for the historical criterion if no other data were available (i.e. assuming an internal field boundary > 25 yr old), and a default score of 0 was assigned to structure (i.e. no special features). A cumulative score ranging from 0-20 was therefore possible. For unsurveyed hedgerows, scores were possible for certain targets assessed by spatial analysis (Table 1).

Following Foulkes *et al.* (2013), score of 4 in any one criterion earns a conservation ranking of County Value. In effect, this means that hedgerows along townland boundaries or rivers or streams are automatically of County Value. Otherwise, the conservation rankings for cumulative scores are detailed in Table 2.

**Table 2.** Hedgerow conservation ranks according to Ecological Evaluation scores

Rank	Score	Score Applies to
County Value	12-20	Cumulative score
	4	For any one criterion
Moderate (local) Value	6-11	Cumulative score
Low (local) Value	0-5	Cumulative score

The scoring bands were primarily determined based on the potential distribution of scores across criteria. A cumulative score of 12 or more implies at least two scores of 3 ("significant" according to Foulkes *et al.* (2013)) in two different criteria. A cumulative score of 6 or more would have at least one score of 2 ("moderately significant" according to Foulkes *et al.* (2013)). The scoring results in the DLR survey were also used to balance the scoring bands. The bands originally considered (0-7, 8-12, 13+) were found to be too strict when compared with the actual data: only 2.4% of hedges would have been ranked of County Value and more than 60% would have been ranked Low Value.

The Cherrywood SDZ hedgerow dataset did not include detailed field survey data; however, an evaluation of High, Moderate and Low is given for hedgerows (WL1), but not treelines (WL2). The evaluations were based on a qualitative assessment of a number of structural, connectivity, species richness criteria similar to those used in this Ecological Evaluation scoring scheme. As the 2008 DLR hedgerow survey provided more detailed data that were only 2-3 yr older than the Cherrywood SDZ, the conservation ranks derived from the former dataset were retained. Hedgerows that were not part of the 2008 field survey but were part of the Cherrywood SDZ dataset were assigned the Cherrywood SDZ evaluation (where High = County Value), in the absence of any other information.

## 2.3 Hedgerow Condition

Hedgerow condition is an assessment of the conservation condition of hedgerows separate to their ecological importance. Field survey data are essential in assessing condition. Criteria and targets in the *Hedgerow Appraisal System* (Foulkes *et al.*, 2013) are outlined in Table 3 along with the ways in which the 2008 DLR hedgerow survey data were adapted to assess them. In many cases, the same variables and values were used in the 2008 DLR hedgerow survey as are used in the *Hedgerow Appraisal System*. Where values differed, the 2008 DLR descriptions considered equivalent to the *Hedgerow Appraisal System* targets are indicated under the *Assessment* column in Table 3.

The score for all the characteristics within a criterion (structural, continuity and viability) was averaged to produce a combined condition score for each criterion. Scores were rounded to the nearest whole number, but with values of  $x.5$  rounded down to  $x-1$ . The criteria scores were in turn averaged to produce a single hedgerow condition score, rounding as above. A score of 0 in any criterion represents a hedgerow in Unfavourable condition, according to the *Hedgerow Appraisal System* (Foulkes *et al.*, 2013), and in these cases, the overall condition score was reassigned to 0.



Remnant hedgerow in poor condition

As an example of the calculations:

1. A sample hedgerow was assigned a scores of 2 under *hedge height* and *hedge width*, a score of 3 for *base*, and a score of 0 for *profile*. These scores were averaged for a combined score of 2 for the *Structure* criterion.
2. It was assigned a score of 0 for *percent gaps*, and as this was the only characteristic able to be assessed, the overall *Continuity* criterion was also scored 0.
3. For the *Viability* criterion, the hedgerow was assigned a score of 1.5 for *bank/wall degradation*, 0 for *unfavourable species composition*, and 3 for *margin*, averaged for a combined score of 1.5, which was rounded down to 1.
4. The overall condition score was calculated as 1, i.e.  $(2+0+1)/3$ , but was reassigned to 0 since the *Continuity* criterion was 0.

**Table 3.** Condition assessment criteria, targets and scores in *Hedgerow Appraisal System* and assessment methods

Criterion	Characteristic	Target	Score	2008 Survey Data?	Assessment
Structure	Hedge height	< 1.5 m high	0	yes	Height data from 2008 survey
		1.5 – 2.5 m high	1	yes	
		2.5 – 4 m high	2	yes	
		> 4m high	3	yes	
	Hedge width	< 1 m wide	0	yes	Width data from 2008 survey
		1 – 2 m wide	1	yes	
		2 – 3 m wide	2	yes	
		> 3 m wide	3	yes	
	Profile	Relict or Derelict	0	yes	2008 profile description: Relict or Remnant
		Wind shaped or Losing base structure	1	yes	2008 profile description: Losing structure
		Straight sided or Boxed / A-shaped	2	yes	2008 profile data
		Overgrown or Top heavy / Undercut or Outgrowths at base	3	yes	2008 profile data
	Base	Open	0	yes	2008 base description: Open or Open + veg
		Semi-translucent	1	yes	2008 base description: Scrawny + veg
		Semi-opaque	2	yes	2008 base description: Dense
		Opaque / Dense	3	yes	2008 base description: Very dense
Continuity	Percent gaps	> 10%	0	yes	2008 gappiness description: 25-50% or 10-25%
		5-10%	1	yes	2008 gappiness data
		< 5%	2	yes	2008 gappiness data
		Continuous	3	yes	2008 gappiness description: Complete
	Specific gaps	Presence and size of individual gaps	0-3	no	Not assessed

Criterion	Characteristic	Target	Score	2008 Survey Data?	Assessment
Viability	Bank/wall degradation	> 20% degraded	0	yes	2008 Bank/Wall Degradation description: Severely Eroded
		< 20% degraded	1	approximate	2008 Bank/Wall Degradation description: Eroded in parts. Assigned score of 1.5
		Minor degradation	2	approximate	
		No degradation	3	yes	2008 Bank/Wall Degradation description: Bank intact
	Ivy abundance in canopy	> 25%	0	no	Not assessed
	Unfavourable species composition	> 10% woody growth volume	0	yes	Compile species data with Domin abundance > 4 from 2008 survey
	Herbicide use	> 20% of ground layer showing evidence	0	no	Not assessed
	Eutrophication	> 20% abundance of nutrient-rich species	0	no	Not assessed
	Invasive species	Presence of non-native invasive species	0	yes*	Compile species data from 2008 survey*
	Margin	Ploughing or poaching up to base of hedge	0	approximate	2008 Verge description: None
		[no target given]	1	approximate	2008 Verge description: Less than 1 m or 1-2 m
		Margin 2 m+ on one side of hedge	2	approximate	2008 Verge description: 2-4 m
Margins 2 m+ on both sides of hedge		3	approximate	2008 Verge description: 4 m+	

\* This criterion was effectively not used, as no invasive species were recorded in the 2008 survey other than those listed by Foulkes *et al.* (2013) for *unfavourable species composition*, e.g. sycamore.

## 2.4 Ecosystem Services Scoring

The Ecosystem Services Scoring (ESS) developed as part of the National Ecosystem Service Mapping Pilot (Parker *et al.*, 2016) did not assign a score for hedgerows due to the large scale and data available for the project. The ESS scheme has been adapted by BEC Consultants for DLR for use at smaller scales, and in this, a score of 925 was assigned to hedgerows (Table 4). This project has made further adjustments to hedgerow ESS so that the variation in individual hedgerows is reflected in a range of scores.

**Table 4.** ESS assigned to hedgerows by BEC Consultants

	Water Quality	Soil carbon	Vegetation carbon	Terrestrial biodiversity	Food terrestrial	Temporary water storage
<b>Description</b>	High	Low-Moderate	High	Moderate-High	Very low	High
<b>Score</b>	200	100	200	175	50	200

The data available for hedgerows surveyed in the field in 2008 permitted the scores for three ecosystem services to be assigned more precisely: Water Quality, Vegetation Carbon and Terrestrial Biodiversity.

The score for Water Quality was increased to High-Very High (250) for hedgerows that run alongside watercourses in recognition of their greater function in intercepting surface water runoff, silts and pollutants.

The score for Vegetation Carbon was adjusted based on the size and continuity (or gappiness) of hedgerows. Larger hedgerows and those with more woody shrubs and trees, i.e. less gaps, store more carbon and were assigned higher scores, whereas smaller and gappier hedges were assigned lower scores. ESS scores were assigned by adding the hedgerow condition scores for structure and continuity (Table 5). In addition, where the 2008 DLR hedgerow survey data describes mature trees as "scattered", "abundant" or "line", the ESS was increased by one step.

**Table 5.** Adjusted ESS for Vegetation Carbon

Sum of Structural & Continuity Condition Scores	ESS Description	ESS Score
0-1	Moderate	150
2-3	Moderate-High	175
4	High	200
5-6	High-Very High	250

Where mature trees are described in the 2008 DLR hedgerow survey data as "scattered", "abundant" or "line", the ESS was increased by one step.

The score for Terrestrial Biodiversity was adjusted by adding the Ecological Evaluation scores for tree/shrub diversity and ground flora diversity (Table 6).

**Table 6.** Adjusted ESS for Terrestrial Biodiversity

Sum of Tree/shrub and ground flora diversity	ESS Descriptor	ESS Score
0	Low	75
1	Low-Moderate	100
2-3	Moderate	150
4	Moderate-High	175
5-6	High	200
7	High-Very High	250
8	Very High	300

These adjustments resulted in a potential ESS range for hedgerows from 775 for those providing the least ecosystem services to 1200 for those providing the most. In comparison, immature woodland (WS2) is assigned a score of 750 and dense bracken (HD1) is assigned a score of 775 in the DLR ESS scheme. At the high end of the scale, mixed broadleaf / conifer woodland (WD2) earns a score of 1250 and broadleaf woodland (WD1) earns a score of 1400. These greater values for woodlands reflect greater services in Water Quality, Soil Carbon and Temporary Water Storage, mainly due to the nature of woodland soils, which are typically less drained and compacted than in hedgerows. Note that the Terrestrial Biodiversity scores for mixed broadleaf / conifer woodland (WD2) and broadleaf woodland (WD1) are 200 and 250, respectively, which would be equal to those of the better hedgerows and less than the best.

## 2.5 Priority Hedgerow Systems

Priority hedgerow systems of high biodiversity interest in a landscape context were identified. These included County Value hedgerows as well as hedgerows identified for reasons other than their individual ecological value. Priority hedgerow systems are hedgerows:

- Of County Value for nature conservation,
- Within an area of international, national or county biodiversity importance (i.e. SACs, SPAs, pNHAs and Locally Important Biodiversity Sites),
- Associated with significant watercourses (defined as watercourses of 2<sup>nd</sup> or higher order, according to EPA GIS data),



- Acting as corridors between areas of biodiversity importance and/or significant watercourses, or
- Acting as corridors between significant areas of woodland, forest or scrub, or between wooded areas and the features above.

When assessing if a hedgerow can function as a corridor, small gaps such as field gates were permitted. Similarly, a corridor was allowed to cross over a minor road if hedgerows would have directly connected if it was not present. Hedgerows were also considered to function as a corridor if they were interrupted by a patch of woodland or scrub, but not other habitat types.

### 3 HEDGEROWS IN DUN LAOGHAIRE - RATHDOWN

#### 3.1 Conservation Value and Distribution

In the 2020 DLR hedgerow GIS dataset, 2370 hedgerows are mapped totalling 298.9 km, excluding hedgerows that are likely to have been lost in the past 12 years. There are no data available to evaluate the conservation value for most of these hedgerows (Table 7). Where there are data available to assess conservation value, the majority were evaluated as being of County Value (Table 7). This is because hedgerows not mapped in the field could be assessed as being of County Value if they were townland boundary hedgerows or hedgerows along watercourse. These hedgerows score a 4 under Historical Significance or Structures & Features, respectively, and are automatically assigned County Value. It was not possible to assign hedgerows to Moderate or Low Value in the absence of field data.

A more accurate assessment of the conservation value of hedgerows in DLR can be obtained by considering only those surveyed in the field by the 2008 DLR hedgerow survey or the Cherrywood SDZ survey. These data show that the majority of hedgerows and greatest total length are of Moderate Value, with County Value hedgerows the least abundant (Table 7).

**Table 7.** Number and total length of hedgerows mapped in DLR by conservation value

Conservation Value	All Hedgerows		Field Surveyed Hedgerows	
	Number of hedgerows	Length (km)	Number of hedgerows	Length (km)
County	474	62.4	67	9.0
Moderate	184	26.0	184	26.0
Low	102	12.9	102	12.9
no data	1610	197.5	–	–
<b>Total</b>	<b>2370</b>	<b>298.9</b>	<b>353</b>	<b>47.9</b>

On average, County Value hedgerows scored more highly than Moderate and Low Value hedgerows in Historical Significance and Structure & Features (Table 8). Low Value hedgerows scored poorly in Tree/Shrub diversity, Ground Flora diversity and Historical Significance. Hedgerow Connectivity did not appear to be an important factor in determining hedgerow conservation value in DLR.

**Table 8.** Median and mean scores for hedgerows surveyed in the field in 2008 for each evaluation criterion

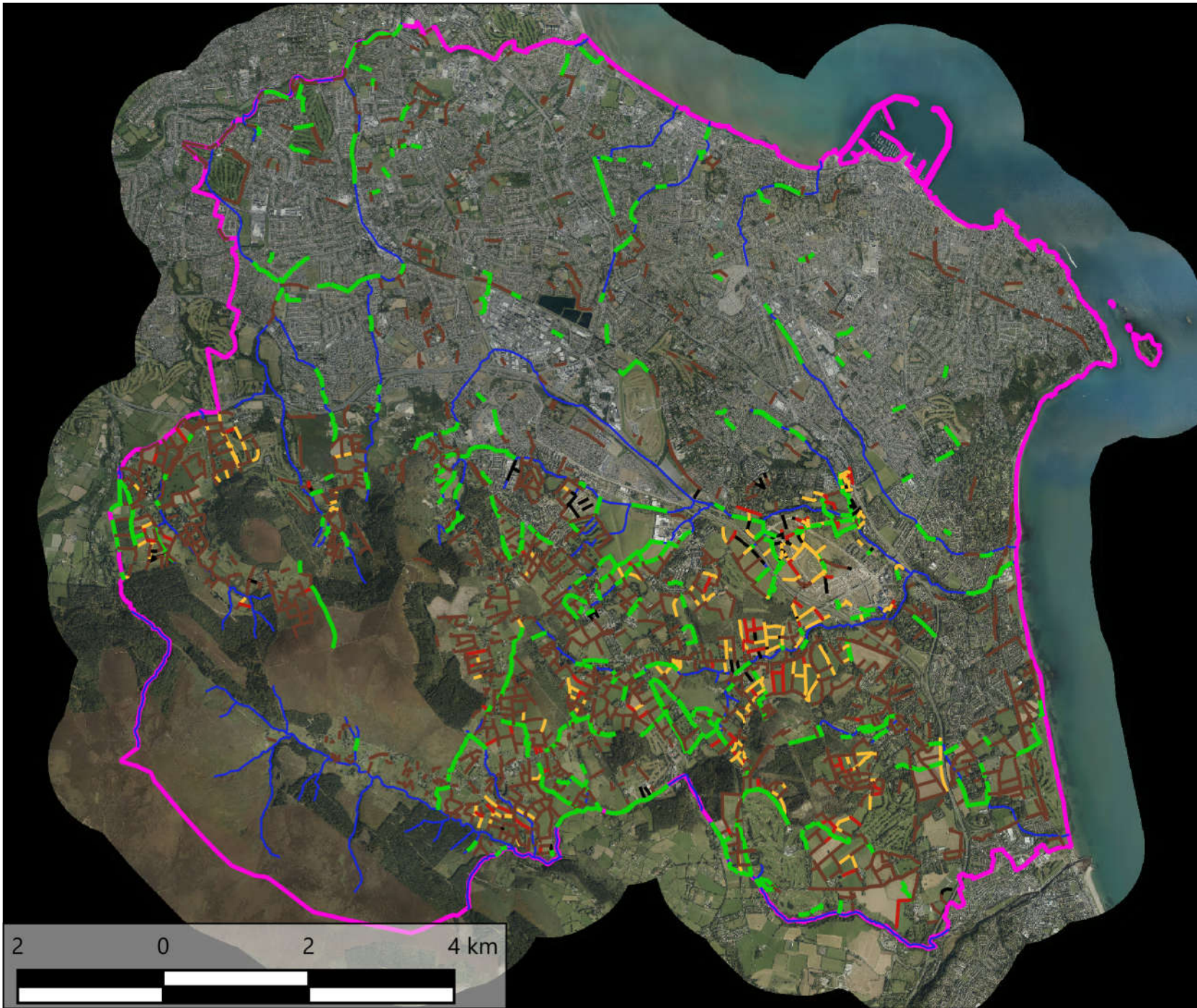
Rank	Connectivity		Ground Flora Diversity		Historical Significance		Tree/Shrub Diversity		Structure and Features	
	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean
<b>County</b>	2	2.1	1	1.2	4	3.5	2	2.0	0	1.0
<b>Moderate</b>	2	2.3	1	1.2	2	1.9	2	2.0	0	0.2
<b>Low</b>	2	1.7	0	0.2	1	1.1	1	1.2	0	0

Unsurprisingly, the hedgerows are most abundant in the lower-lying rural parts of the county, especially in the region between the Dublin Mountains and the M50 (Figure 1). There are also areas where hedgerows are abundant on the northern side of the Glencullen River valley and around the lower slopes of Kilmashogue Mountain. A scattering of hedgerows was mapped even in some of the more densely populated parts of the county. Despite a conservative approach in mapping from aerial photography, however, the distribution of semi-natural hedgerows in more urban settings should be treated with caution and subject to field verification.

The density of County Value hedgerows reflects the abundance of hedgerows in general (Figure 2). There is a tendency for more County Value hedgerows to be present along the upper reaches of watercourses, perhaps where land is less improved. Other areas with a relatively higher density of County Value hedgerows include Kiltiernan, Stepside, Cherrywood and Tibbradden.

### 3.2 Hedgerow Removal

An estimated 3.6 km of hedgerow appear to have been lost in DLR in the 12 years since 2008 (Table 9). Where conservation value could be assessed, the majority of losses were to Moderate Value hedgerows, but a significant length of County Value hedgerows was also lost. Most hedgerows appear to have been removed as a result of development, but there was also evidence of removal for agricultural purposes. Hedgerow loss estimates should be treated with caution, however, as older aerial photography was not inspected to confirm losses, as this was outside the scope and resources of the project. Features mapped by the 2008 DLR hedgerow survey but not surveyed in the field may not have actually existed before being “lost”. On the other hand, some hedgerows lost to since 2008 may not have been omitted from 2008 mapping in error, and thus their loss would have been difficult to detect.



**Legend**

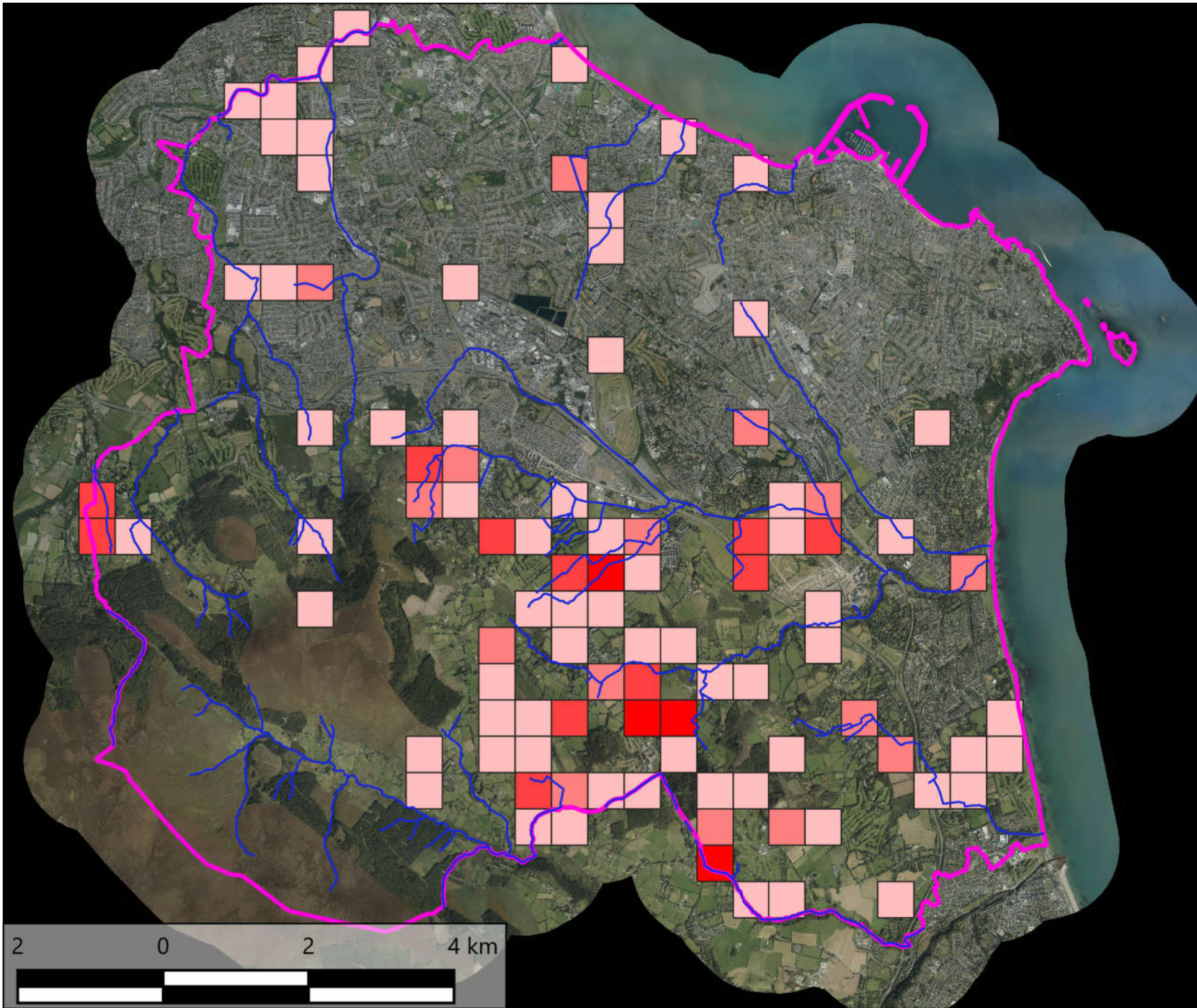
- Hedgerows
- County Value
- Moderate Value
- Low Value
- No data
- Destroyed
- DLR county boundary
- Watercourses

Figure 1. Conservation value of DLR hedgerows

Dún Laoghaire - Rathdown  
Hedgerow Review 2020

Scale 1:75,000  
04-01-2021  
Rev 1





### Legend

Total length of County Value hedgerows

0 - 253 m

253 - 505 m

505 - 758 m

758 - 1011 m

1011 - 1263 m

DLR county boundary

Watercourses

Figure 2. Density of County Value hedgerows

Dún Laoghaire - Rathdown Hedgerow Review 2020

Scale 1:75,000

26-11-2020

Rev 0



**Table 9.** Estimated length of hedgerow removed since 2008

Conservation Value	Length Lost (m)
County	476
Moderate	517
Low	217
No data	2365
<b>Total</b>	<b>3575</b>

### 3.3 Conservation Condition

Only one hedgerow, totalling 0.1 km in length or 0.4% of the total length of hedgerow where field data were available for assessing conservation condition, was ranked as being in *highly favourable* condition (Table 10). In contrast, a total of 15.2 km of hedgerow, or 42% of the total assessed, was in unfavourable conservation condition.

**Table 10.** Conservation condition of DLR hedgerows

Condition	Length (km)	Percentage of total length
Highly favourable	0.1	0.4%
Favourable	15.8	43.6%
Adequate	5.1	14.0%
Unfavourable	15.2	42.0%
no data	262.7	–

Most hedgerows in *unfavourable* condition failed the assessment due to the viability criterion (84 hedgerows) or the continuity criterion (60 hedgerows). Only two (2 hedgerows) failed due to the structural criterion; this was due to the generally good height and width characteristics of DLR hedgerows, which outweighed the significant numbers of hedgerows with open bases or that had become relict or derelict. Numbers of hedgerows with very poor condition characteristics (i.e. scoring 0) are summarised in Table 11. These represent the features most responsible for *unfavourable* condition. Absence of any grassy margin alongside hedgerows due to ploughing or poaching up to the base was the most common negative feature and was observed in 220 of the 266 hedgerows that were assessed. Hedgerows that had become relict or derelict and hedgerows with > 10% gaps were also frequent. Significant numbers of hedgerows also suffered from degraded hedgebanks or walls or species composition with >10% of unfavourable species, such as beech, cherry laurel or sycamore.

**Table 11.** Number of hedgerows scoring 0 under each condition characteristic (n = 266)

Condition Characteristic	Condition Scoring 0	Number of Hedgerows
Hedge height	< 1.5 m high	3
Hedge width	< 1 m wide	3
Profile	Relict or Derelict	68
Base	Open	38
Percent gaps	> 10% gaps	60
Bank/wall degradation	> 20% degraded	53
Unfavourable species composition	> 10% woody growth volume	44
Margin	Ploughing or poaching up to base of hedge	220

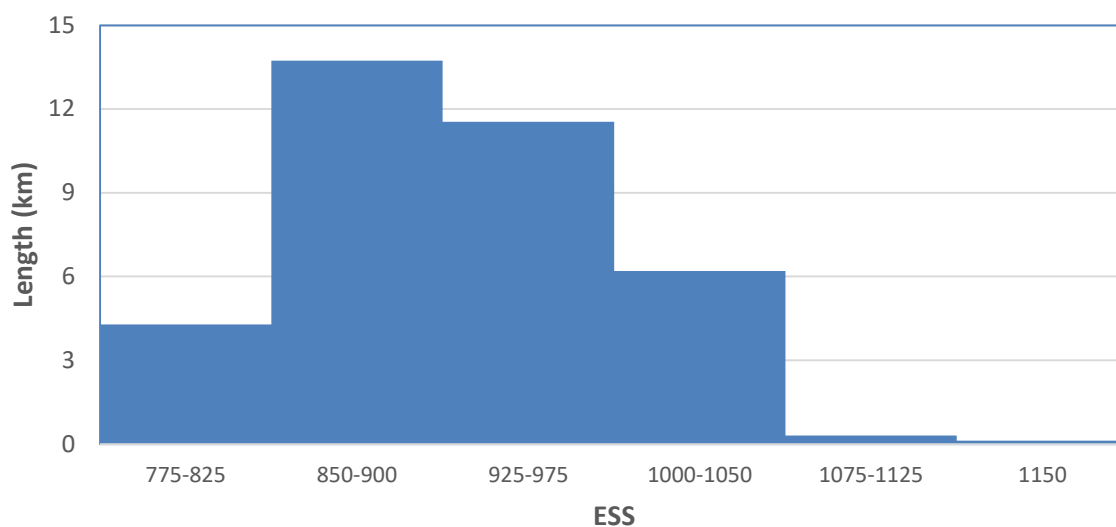
Unsurprisingly, there is a degree of correlation between hedgerow conservation value and condition. 52.4% of County Value hedgerows were in *favourable* or better condition as compared with 43.7% of Moderate Value hedgerows and only 30.1% of Low Value hedgerows (Table 12). **A total of 17 County Value hedgerows (40.5%), however, were in unfavourable condition.** The conservation value of these hedgerows is likely to decrease unless their condition improves.

**Table 12.** Number and percentage of hedgerows in different condition ranks divided according to conservation value

Conservation Value	Condition			
	Highly favourable	Favourable	Adequate	Unfavourable
<b>County</b>	0	22 (52.4%)	3 (7.1%)	17 (40.5%)
<b>Moderate</b>	1 (0.7%)	65 (43.0%)	17 (11.3%)	68 (45.0%)
<b>Low</b>	0	22 (30.1%)	12 (16.4%)	39 (53.4%)

### 3.4 Ecosystem Services Scoring

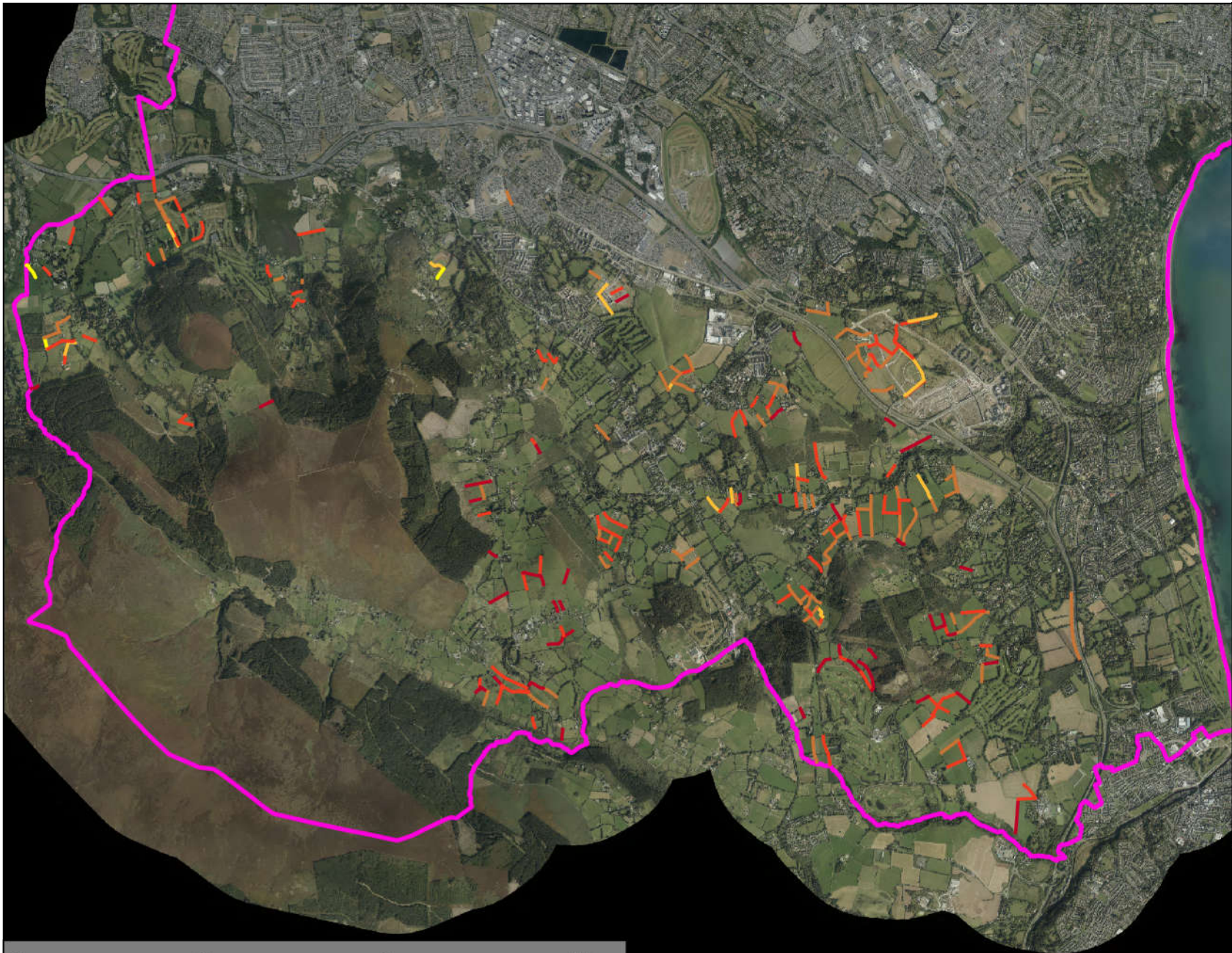
Approximately half of the total length of hedgerow assigned ESS scores received scores of 925 or better (Figure 3). (925 is the default ESS score for hedgerows in the absence of any other data.) There were few very high-scoring hedgerows. One hedgerow measuring 0.12 km in length scored 1150, which was the highest in the study. Two hedgerows totalling 0.30 km earned a score of 1100.

**Figure 3.** Ecosystem Services Scoring (ESS) for DLR hedgerows

Hedgerows with high ESS scores were widely distributed across the rural, lowland parts of DLR (Figure 4). There was a tendency for the more upland hedgerows around Glencullen to have lower ESS scores on average, as many were species-poor, gappy hedgerows primarily of gorse. Hedgerows of County Value tended to have higher ESS scores than those of Moderate or Low Value (Figure 5). The hedgerows with the highest ESS scores were all of County Value. In addition, most Low Value hedgerows scored less than the default hedgerow ESS score of 925. This is because some of the same factors that were used to produce hedgerow-specific ESS scores are those used to rank conservation value. **However, it also reflects the biological linkages between nature conservation attributes, such as species richness and hedgerow structure, with ecosystem services, such as carbon sequestration.** The mean ESS score for Vegetation Carbon for County Value hedgerows was 233.3 ( $\pm 7.4$  standard error), whereas the score for Low Value hedgerows was 202.4 ( $\pm 3.6$ ). There is no statistical linkage between ecological value and Vegetation Carbon ESS, as the hedgerow structural and continuity condition data used to adjust Vegetation Carbon ESS were not used to determine conservation value. **Therefore, the association between conservation value of DLR hedgerows and ecosystem services is real, rather than just a statistical artefact.**

Similarly, hedgerows in *favourable* condition tended to have higher ESS scores than those in *adequate* or *unfavourable* condition (Figure 6). **This suggests that hedgerows in poorer condition are less able to provide ecosystem services.** A significant number of hedgerows in *unfavourable* condition (38.8% of total hedgerow length) have ESS scores of 925 or above. It is likely that the ecosystem services provided by these hedgerows are under threat and will decline in the future.





### Legend

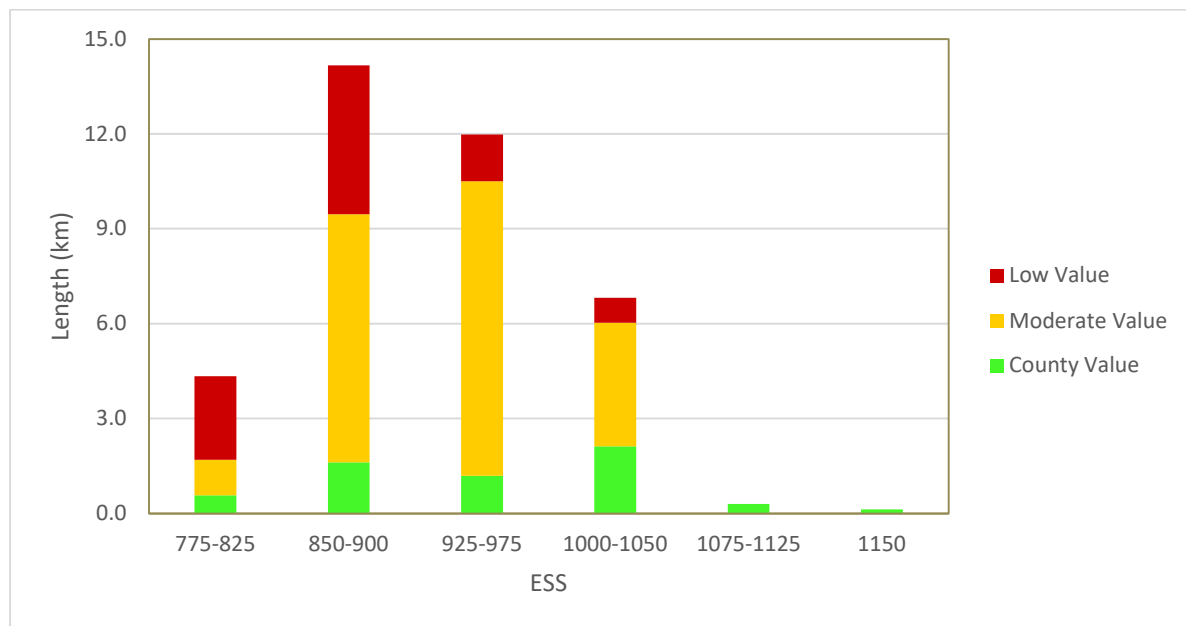
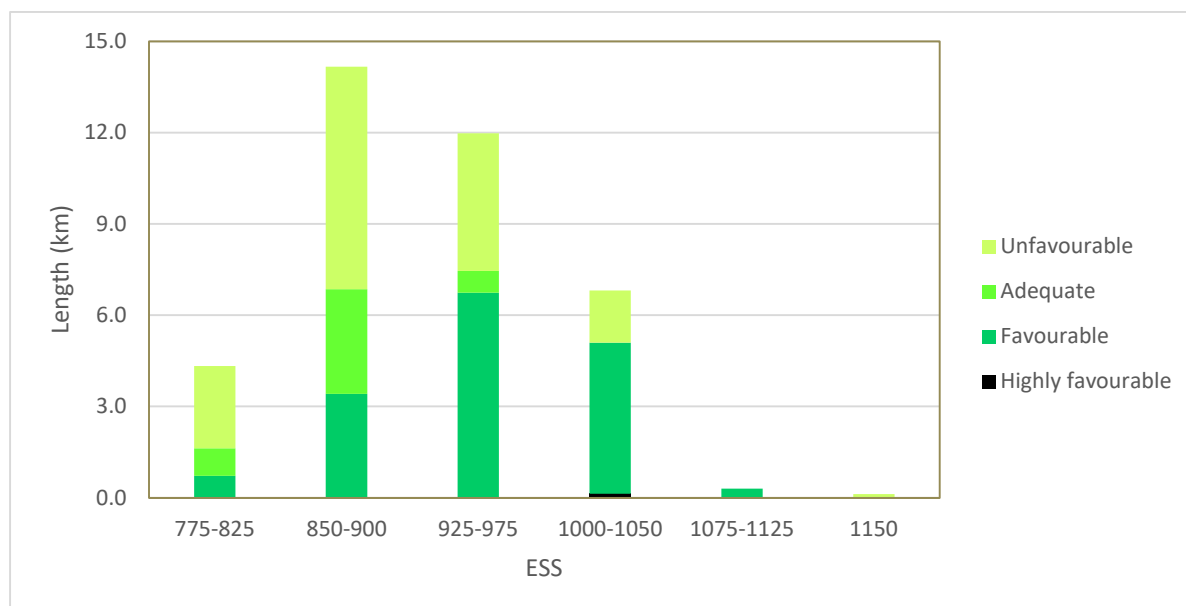
- Hedgerow ESS scores
- 775 - 850
  - 850 - 925
  - 925 - 1000
  - 1000 - 1075
  - 1075 - 1150
- DLR county boundary

Figure 4. Ecosystem Services Scoring (ESS) of DLR hedgerows

Dún Laoghaire - Rathdown Hedgerow Review 2020

Scale 1:60,000  
04-01-2021  
Rev 0



**Figure 5.** Distribution of Ecosystem Services Scoring (ESS) by conservation evaluation**Figure 6.** Distribution of Ecosystem Services Scoring (ESS) by condition

### 3.5 Priority Hedgerow Systems

A total of 89.6 km of priority hedgerow systems were identified in DLR (Table 13; Figure 7). These hedgerows are of County Value for biodiversity or are important in the landscape context of DLR, either as components of areas of biodiversity value, such as Locally Important Biodiversity Sites, or as corridors linking them. Priority hedgerow systems also include riparian corridor hedgerows and hedgerows linking woodland, forest or scrub habitats. The latter are

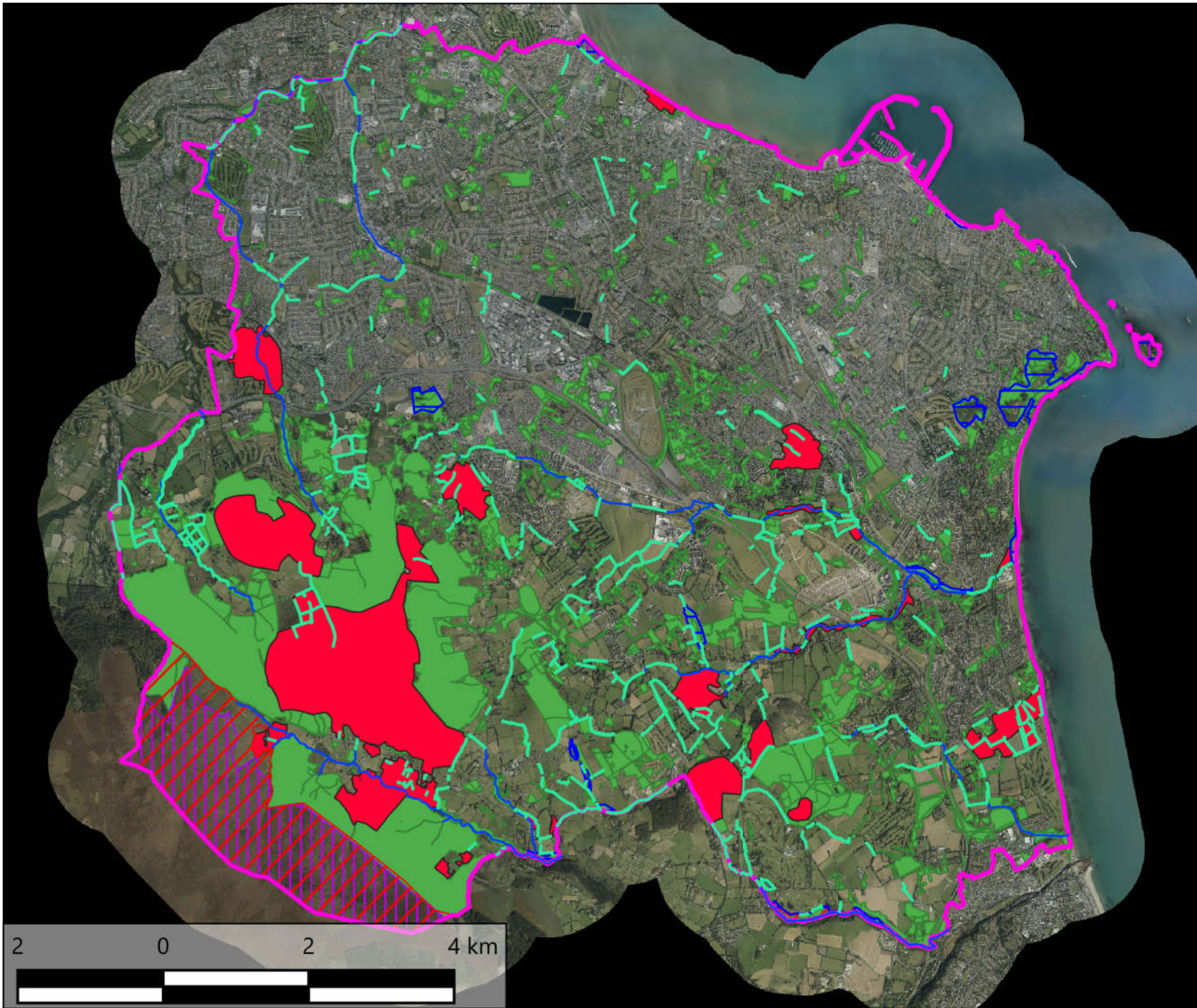
particularly important as refugia and commuting routes for woodland species in an otherwise intensively managed landscape.

There is considerable fragmentation in the priority hedgerow systems (Figure 7), particularly along watercourses. Along some rivers, broader bands of riparian woodland link hedgerows. In general, however, the connectivity provided by hedgerows among areas of biodiversity interest in DLR is low. **Many Locally Important Biodiversity Sites are isolated, due in part to hedgerow fragmentation.** For example, there are several hedgerows that extend from Ballyman Glen SAC towards the Barnaslingan Forest Locally Important Biodiversity Site and that could potentially provide connectivity between the two sites. Connectivity, however, is interrupted by a series of improved grassland fields that lack hedgerows.

Most priority hedgerows are of County Value, but a significant proportion are of Moderate Value or have not yet been surveyed to assess biodiversity value (Table 13). Many County Value hedgerows were assigned this ranking by virtue of being riparian hedgerows and are thus also riparian corridors.

**Table 13.** Priority hedgerow systems

Conservation Value	Length (km)
County	62.4
Moderate	2.7
Low	0.6
No data	23.8
<b>Total</b>	<b>46.4</b>



**Legend**

- Priority hedgerow systems
- Main watercourses
- DLR county boundary
- SACs
- SPAs
- pNHAs
- DLR Locally Important Biodiversity Sites
- Woodland, forest & scrub

Figure 7. Priority hedgerow systems

Dún Laoghaire - Rathdown Hedgerow Review 2020

Scale 1:75,000  
19-01-2021  
Rev 1



## 4 CONCLUSIONS

The hedgerows of DLR are an important biodiversity resource and provide significant ecosystem services. Their value is increased by the highly managed and built-up nature of much of the county. The total length of hedgerow in the county (298.9 km) is relatively low compared with nearby counties that are more rural in nature, such as Kildare (10,305 km, Foulkes, 2006) and even Fingal (2,660 km, McCourt and Kelly, 2007). Despite this, there are still a significant number of hedgerows of County Value for biodiversity, particularly along watercourses and townland boundaries. **Hedgerow loss to development and agricultural improvement appears to remain an issue, which underlines the importance of robust local policies to encourage their retention and to promote planting new hedgerows.**

**The conservation condition of DLR hedgerows is a concern, with less than 1% rated as in highly favourable condition and 42% rated as unfavourable.** Key issues include management issues, such as failure to retain grassy margins at the base of hedges and bank or wall degradation, and long-term structural issues leading to gappy and relict hedges. Over 40% of County Value hedgerows are in unfavourable condition, which indicates that they will suffer losses of biodiversity and ecosystem services in the future unless management improves. Hedgerows provide important ecosystem services, such as carbon sequestration, flood control and water quality regulation. County Value hedgerows and those in favourable conservation condition typically provide greater ecosystem services.

Priority hedgerow systems associated with areas of biodiversity importance, riparian corridors, and corridors linking these with each other and with wooded habitats have been mapped. The corridor functionality potentially offered by hedgerows is reduced, however, by fragmentation. There is ample scope, however, to improve hedgerow connectivity in conjunction with the planned new DLR Green Infrastructure strategy and new Ecological Network Map which will form part of the next DLR County Development Plan 2022-2028 (in draft).

## 5 REFERENCES

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## **APPENDIX A      GIS LAYER METADATA**

## **Metadata**

### **Title**

DLR Hedgerow Review and Evaluation 2020

### **Abstract**

A review of existing data on hedgerows in Dún Laoghaire-Rathdown and evaluation of ecological value, conservation condition and ecosystem services.

### **Resource Type**

Spatial dataset

### **Resource Locator**

TBC

### **Unique Resource Identifier**

DLR\_hedgerow\_evaluation\_2020.shp

### **Topic Category**

Biota

Environment

### **Dataset Language**

English

### **Keywords**

Biodiversity, hedgerow, ecosystem services, nature conservation

### **Software Format**

ESRI shapefile

### **Related Datasets**

none

### **Related Documents**

Project report: "DLR Hedgerow Review and Evaluation"

### **Distributor Name**

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**Coordinate Reference System**

ITM (EPSG: 2157)

**Geographic Boundary North**

730790

**Geographic Boundary East**

726941

**Geographic Boundary South**

718395

**Geographic Boundary West**

713503

**Date Begun**

2020-02-12

**Date End**

2021-01-20

**Date Created**

2020-02-12

**Date of Last Revision**

2021-01-20

**Lineage**

Imported 2008 Dún Laoghaire-Rathdown hedgerow survey polyline shapefile layer derived from OSI vector mapping. Joined attribute data from Excel spreadsheet from same project. Manually digitised polylines through centre of polygon dataset of 160 hedgerows from Cherrywood Strategic Development Zone surveys in 2010-2011. Edited data and added new hedgerow polylines by manually digitising over 2019 aerial photography. See project report for further details.

**Base Mapping**

2019 aerial photography from DLR

**Data Sources**

2008 DLR hedgerow survey

2010-2011 Cherrywood SDZ survey

Interpretation of 2019 aerial imagery aided by comparison with historical six-inch mapping

### **Thematic Accuracy**

Dependent on field survey data from data sources above. Identification of features on 2019 aerial photography as hedgerows aided by historical mapping and experience in aerial imagery interpretation. Errors are likely, however, in omitting real hedgerows and in mapping hedgerows that are not actually present. Field validation required to increase accuracy.

### **Positional Accuracy**

2008 data from OSI vector mapping, likely to be 1:5000.

Digitising over aerial photography and Cherrywood SDZ polygons done at 1:2500 or 1:1000 scale.

### **Completeness**

Complete subject to caveats above on thematic accuracy.

### **Conformity**

INSPIRE conformant when outstanding entries filled by DLR.

### **Conditions for Access**

TBC

### **Attribute Fields**

fid	Unique feature ID
RSK_ID	ID used in 2008 hedgerow survey by RSK Carter
Length	Length in m
Centroid_X	Centroid X coordinate
Centroid_Y	Centroid Y coordinate
SurveyDate	Date of last field survey
DataSource	Data source
Lost	1 = hedgerow lost or removed between 2008 and 2019
HAB_TYPE	Codes as per Fossitt (2000): WLI = hedgerow WL2 = treeline
EVAL_CNXXN	Ecological evaluation score (0-4) for Connectivity
EVAL_GFLOR	Ecological evaluation score (0-4) for Ground Flora Diversity
EVAL_HIST	Ecological evaluation score (0-4) for Historical Significance
EVAL_SHRUB	Ecological evaluation score (0-4) for Tree/Shrub Diversity
EVAL_STRC	Ecological evaluation score (0-4) for Structure & Features
EvalScore	Combined ecological evaluation score (0-20)
EcoEval	Conservation value rank: County Value Moderate Value Low Value
COND_STRC	Condition score (0-3) for Structure
COND_CONT	Condition score (0-3) for Continuity
COND_VIAB	Condition score (0-3) for Viability
CondScore	Combined condition score (0-3)

Condition	Condition rating: unfavourable adequate favourable highly favourable
ESS_VCarb	Ecosystem Services Scoring score for Vegetation Carbon
ESS_Biod	Ecosystem Services Scoring score for Terrestrial Biodiversity
ESS_WQ	Ecosystem Services Scoring score for Water Quality
ESS_Score	Total Ecosystem Services Scoring score
PRIORITY_HR	I = hedgerow is (part of) a priority hedgerow system
PrioDesc	Priority description: LIA corridor = hedgerow is a corridor connecting to a Locally Important Biodiversity Site pNHA corridor = hedgerow is a corridor connecting to a pNHA River corridor = hedgerow is a corridor along a 2nd or higher order watercourse Within Locally Important Biodiversity Site = hedgerow is (partly) within a Locally Important Biodiversity Site Within Natura 2000 site = hedgerow is (partly) within a Natura 2000 site Within pNHA = hedgerow is (partly) within a pNHA Woodland corridor = hedgerow is a corridor connecting to woodland, forest or scrub County value = hedgerow is of County value for biodiversity

#### **Metadata Contact**

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#### **Metadata Date**

2021-01-20

#### **Metadata Language**

English



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