

County Kildare Hedgerow Appraisal Survey- 2022



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An Chomhairle Oidhreachta
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1. Introduction

Hedgerows are defined as:

“Linear strips of woody plants with a shrubby growth form that cover more than 25% of the length of a field of property boundary. They often have associated banks, walls, ditches (drains), or trees”.

According to John Feehan in his book ‘Farming in Ireland’, living hedgerows were not specifically referred to in the Brehon Laws of Gaelic Ireland. Four types of field boundaries were recognised: drystone walls, bank and ditch, wickerwork fence and oak fence. Drystone walls, banks and ditches are still with us today, and have often become hedgerows simply because trees and bushes have taken root there. Earthen banks are wide grassy margins that may contain a variety of plants, scrubby trees, shrubs, and stones. Ditches and drains once dug to drain waterlogged soils and to increase the amount of arable land may also now contain shrubby species. Today, many ditches receive little or no maintenance and as a result you may find species present that you would normally associate with a wetland habitat. Dry stone walls are synonymous with Irish rural and upland landscape features. It is estimated that the Irish countryside has over 400,000km of dry-stone walls. They support a variety of species such as mosses, lichens, ferns, frogs and mice. Hedgehogs and newts are often found hibernating within the thicker walls.

Hedgerow, scrub and treeline cover approximately 6% of the land area of Ireland (Teagasc, 2005) and represent a very significant aspect of Ireland’s heritage, especially as they possess features of archaeological, geological, social and natural heritage. They have a utility value, primarily in agricultural management as stockproof barriers and boundaries, as a tool in the management of grazing rotation and for the provision of shelter for livestock (and adjacent dwellings) during inclement weather. Yet they also serve as indicators of land-use history by possessing aspects of the past. Their values are multi-functional in both practical and spiritual terms, and enrich our understanding of history, ecology, rural society and farming practices. For example, hedgerows were used to demarcate townland boundaries, many of which date to the 8th century (Joyce, 1898). Also, the small fields and paddocks characteristic of marginal agricultural holdings in the West of Ireland reflect the extensive nature of agricultural practice in this region compared to the larger field sizes in the more productive South and East where agriculture is more intensive.

Hedgerow networks are perhaps the most characteristic feature of the Irish landscape and give character to an area, providing aesthetic appeal and creating a sense of place. They define agricultural and other lands and knit the landscape into a patchwork quilt. They also provide valuable refuges for biodiversity in a landscape dominated by large tracts of intensive agriculture and function as an alternative habitat for numerous woodland plant species. In addition, hedgerows have the potential to act as corridors for regular movements and dispersal of birds, mammals (especially bats) and invertebrates through the landscape. While older hedges certainly exist, the majority of the hedgerow network in Ireland was initially established in the middle of the 18th century to provide agricultural services, primarily land delineation, stock control, shade and shelter. In addition to their agricultural functions, hedgerows are one of the most widespread semi-natural habitats in the country, due to their extent, connectivity,

structure and composition, and require further research to quantify their biodiversity values. Additionally, the hedgerow network is acknowledged to provide a range of Ecosystem Services, including Provisioning Services (i.e. food and fuel), Regulation Services (i.e. air quality, climate moderation, water quality, soil erosion control, disease management, pest control and pollination), Cultural Services (i.e. aesthetic value, educational and recreational), and Support Services (i.e. soil formation, photosynthesis and nutrient cycling) (Land Use Consultants, 2009).



Figure 1: A gappy hedgerow

Ireland has made commitments to conserve biodiversity and to manage trees in a sustainable manner under a number of international agreements and policy frameworks, such as the Convention on Biological Diversity and the Ministerial Council on the Protection of Forests in Europe. Measures to conserve biodiversity need to be applied at a number of levels, from the international scale through to the local scale, in order to be effective. In recognition of this, Ireland has prepared a National Biodiversity Plan and the county hedgerow surveys carried out over the last two decades (in over 21 counties or sub-county regions) address the requirements of a number of the actions in this plan. The central aim of these surveys is to compile information on the extent, type, location and conservation status of hedgerows, and to use this information to develop recommendations for their conservation and management.

Foulkes & Murray (2006) provided a methodology, which had been followed across various Irish counties. This facilitates the collection of detailed data on the current extent, condition, species diversity and structural variation of our hedgerows. In the summer of 2006, a project to investigate hedgerow resources in County Kildare was commissioned by Kildare County Council and The Heritage Council. In the summer of 2006 field recording of hedgerows was carried out using a standard methodology in 18 sample 1 km squares distributed evenly around the county, covering approximately 1% of its total area. The focus of the survey was to record information on the extent, species composition, structure, condition and

management of hedgerows. This information can then be used to further the objectives of the County Kildare Heritage Plan 2005, which contains a number of actions, directly or indirectly, interrelated to hedgerow conservation.

The initial methodology developed for county wide hedgerow surveys in Ireland was produced by Murray (2003). This methodology was refined in 2004 by Foulkes and Murray in the course of hedgerow surveys carried out in Counties Westmeath and Roscommon (Foulkes and Murray, 2005b, 2005c). The initial methodology and any adaptations made during the field surveys were thoroughly reviewed and a new paper, "A Methodology for the recording of hedgerow extent, species composition, structure, and condition in Ireland" (Foulkes and Murray, 2005) was produced in the spring of 2005. The 2006 County Kildare Hedgerow Survey was carried out to the methodology described in this paper.

The Hedgerow Appraisal Survey or 'HAS' methodology was piloted as part of the County Monaghan Hedgerow Survey in 2010 (Foulkes, 2010). In 2012, WoI (Woodlands of Ireland) secured funding from the Heritage Council to finalise the project, develop the database and publish the HAS. The Sub-Group further refined the methodology, reviewing the interpretation criteria to ensure consistency and compatibility between the various elements of the HAS, carried out in over 21 counties or sub-county regions. This method has been used to carry out the current study, however there are overlaps on most sections.

The focus of this study was to determine the extent, composition, structure, condition and management of hedgerows in County Kildare 16 years on. In order to assess any significant deviations from the baseline survey, with the aim of understanding the current state and composition of our hedges and assess environmental trends for these habitats. To do this, the more updated Hedgerow Appraisal Methodology (Foulkes et al., 2012) was used to assess hedgerows. As the baseline assessment was done prior to the creation of this methodology some areas were not possible to compare. Hedgerow policies in local plans such as the County Development Plan and Climate Action Plan were examined, and recommendations made to guide future improvements for the protection of these biodiversity corridors and inform future iterations of hedgerow policies.

2. Executive Summary

The Kildare Hedgerow Survey was carried out during the months of July and August 2022 on hedges previously surveyed in 2006. The aim and intent were to assess these hedges over a decade on to review the state of hedgerows in the county. The methodology used during surveying has been set out by Foulkes et al. (2012) in the Hedgerow Appraisal Survey (HAS) methodology. The basis for the 2006 study was the paper “A Methodology for the recording of hedgerow extent, species composition, structure, and condition in Ireland” (Foulkes and Murray, 2005), while 2022 was based on the Hedgerow Appraisal Survey or ‘HAS’ methodology (Foulkes et al. 2012).

The total length of hedgerows recorded in the 2022 survey within the 18 1km grid squares sampled was approximately 114.3km. In 2006 the same area contained 121.2km of hedgerow. This indicates that 9.6km of hedgerow has been removed over a 16-year period. This represents an annual removal rate 0.5% of Kildare’s hedgerows per year since 2006. Much higher than an EPA estimate of between 0.16% and 0.3%.

Agriculture was responsible for over 41% of hedgerow removal since 2006. Conifer afforestation was also responsible for 41% of hedgerow removal/loss. Road and residential development were the next leading contributors to hedgerow removal at 11%.

Only 18.6% of hedges were classified as species-rich for woody shrubs in 2022. This is the same as in 2006. The average number of shrub species per 30m strip was 2.96 (2.45 for native species only). This is below that of 2006, when an average of 3.62 species were recorded in sampled hedges. 12.4% of hedges contained only 1 species, this is an increase from 2006 when only 6% of hedges had only one woody shrub species. These results point to less diverse hedges overall. Hedges with less than 4 species were more common in 2022 when compared with 2006.

26% of the hedges where trees were recorded had just one tree species in 2022, in comparison to where 31% had only one tree species. Hedges in 2022 were more likely to have three or more tree species in the canopy than in 2006. Pointing to an overall, but slight, increase in tree species diversity. Trees are more often recorded than woody shrubs showing an increase in relict hedges where the shrub layer has grown into the canopy.

This will be significant in Kildare’s hedgerows as Ash trees occurred in half of the hedgerows surveyed. The prevalence of Ash Dieback diseases is therefore likely to have a proportionally larger impact on Kildare’s hedgerows given the high percentage of Ash trees they contain.

As hedgerows were not surveyed for ground flora in 2006 a direct comparison cannot be made. However, species results do not speak well for hedge diversity. Nutrient-loving, fast-growing species like Nettle (77%) and Cleaver (62%) often dominated hedge ground flora, to the detriment of other species. Common hedgerow species such as Foxglove (1%), Woundwort (7%) and Speedwell (11%) were only present in low numbers. The average number of target herbs per 30m strip was 1.4. For comparison, the average number of target herbs in Monaghan hedges (found in the HAS carried out last year) was 2.42 species.

Cleaver was noted as the biggest problem for ground flora amongst surveyors, forming large mats at the base of hedges on arable land. Cleavers thrive on nutrient-rich soil. They are a competitive plant and can become very large using the shrub layer for support as they grow towards the light. Dense mats of cleaver block light from reaching other flora at the base of the hedge and prevent other plants from photosynthesising, thus winning the monopoly.

The most common land use type adjacent to the Kildare hedges surveyed was improved grassland, with a 6% increase since 2006. An increase in arable land was also noted (+7%). Semi-natural grasslands were only noted in 7% of the fields next to hedges in 2022, a reduction of 8%.

19.2% of hedgerows did not link to other semi-natural habitats. These results would indicate that the fragmentation of hedgerow networks in County Kildare is an issue that needs to be considered in any biodiversity strategy for the county.

Complete hedges were much more common in 2006 and made up 41% of the sampled hedges. Only 11% of hedges were noted as complete in 2022. Hedges were also more likely to have >50% gaps with a 10% increase since 2006. The majority (72%) of sampled hedges showed some degree of translucence (openness) in the lowest 1m of growth. 23% were classed as being open / translucent, up 15% from 2006.

11% of hedges were recorded as remnant hedges, which is defined as the remains of what used to be a hedge having no consistent profile. This is an increase of 6% since 2006. A remnant hedge is generally indicated by a (broken) line of mature or senescent plants in tree, rather than shrub form. Almost invariably it has a high percentage of gaps, although it may have bits of shrubby growth (including Brambles) along its length. Once the remains of a hedge covers <25% of the boundary, it is no longer classified as a remnant hedge and instead is classified as relict. 12% of hedges were classified as relict, double that of 2006.

25% of sampled hedges were classed as a line of Trees, where over 75% of the canopy is dominated by trees. This is an increase of 16% from 2006. Showing an overall increase in tree species in hedges in the county and a general increase in treelines over hedgerows.

Approximately 37.9% of hedges in the baseline survey can be classed as highly significant or Heritage Hedgerows in 1 category. 26.1% of hedges scored as highly significant due to their historical context. While 4.3% were found to be significant due to their species diversity. Only 1.2% of hedges scored highly significant based on structure, construction and associated features. Another 8.1% of hedges were significant hedges based on their habitat connectivity value or landscape significance.

88.2% of hedges fell into the category of unfavourable based on criteria which assessed structure, continuity and several other unfavourable indicators. Meaning only 13% of hedges were found to be in favourable condition.

Nutrient richness was the prevailing cause of hedges scoring as unfavourable, over half of the hedges failed in this regard. 62% of hedges with tillage as the adjacent land use were classified as nutrient-rich and 52% of hedges with agricultural grassland as their adjacent habitat were nutrient-rich. The second most common reason was the % of gaps. Profile and basal density

also contributed to this figure. Around 17% of hedges scored unfavourably due to the fact that >10% of woody growth volume comprised unfavourable species e.g., Sycamore, Beech and Snowberry

3. Background

The health of our planet depends on the health of our biodiversity. Kildare County Council has recognised that biodiversity underpins important economic sectors such as agriculture and tourism, as well as supplying a myriad of other benefits. A Climate and Biodiversity Loss Emergency was declared by the Irish Government in May 2019 and Kildare County Council declared a Climate Change and Biodiversity Loss Emergency in June 2019. Kildare County Council has recognised the role of green infrastructure in tackling this crisis.

Table 3.0.1. Some objectives from the County Development plan 2017-2023 are outlined below. The County Development Plan 2023-2029 is currently being drafted.

Policies: Trees, Woodlands, Hedgerow
GI 8: Contribute towards the protection of and manage existing networks of woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character, and to strengthen local networks.
GI 9: Ensure that proper provision is made for the consideration, protection and management of existing networks of woodlands, trees and hedgerows when undertaking, approving or authorising development
GI 11: Ensure that hedgerow removal to facilitate development is kept to an absolute minimum and, where unavoidable, a requirement for mitigation planting will be required comprising a hedge of similar length and species composition to the original, established as close as is practicable to the original and where possible linking in to existing adjacent hedges. Native plants of a local provenance should be used for any such planting.
GI 12: Restrict the cutting of hedges during the bird-nesting season (1st March until 31st August), except in certain legally defined circumstances, in accordance with the provisions of the Wildlife (Amendment) Act 2000.
GI 13: Recognise the biodiversity and archaeological importance of townland boundaries, including hedgerows, and promote their protection and retention
GI 15: Encourage the protection of historic hedgerows or significant hedgerows which serve to link habitat areas to each other and the surrounding countryside.
GI 16: Encourage the planting of woodlands, trees and hedgerows as part of new developments using native plants of local provenance
Objectives: Trees, Woodlands and Hedgerow
GIO 5: Seek to retain and supplement existing tree, woodland and hedgerow planting on Council-owned lands

Role of Local Authorities

In the formulation of development plans, local authorities are committed to designating landscapes and their associated characteristics, under the Planning & Development Act, 2000. Through the planning process local authorities can also ensure that hedgerows are given due regard with respect to hedgerow conservation. In recent years many local

authorities have been creatively managing roadside verges to ensure a diversity of plants can survive. This ideal can be broadened to include hedgerows abutting roads. Each local authority has a responsibility to road users and their safety on public roads. While some maintenance is required to hedgerows at certain locations, every effort must be made to ensure that best practice is exercised in this regard to ensure that over-management is not taking place.

3.1. The History of Hedgerows in Kildare

Many of Ireland's existing hedgerows are not very old, relative to ancient hedgerows. Most were planted from the mid-1700s up to the mid-1800s. But woven through this more modern landscape tapestry are older hedgerows which date from Gaelic Ireland, in the age before colonisation by England. They would have developed on top of banks which were dug to mark townland boundaries.

Under the old Gaelic system of joint landownership, permeant enclosures weren't necessary. Tillage plots were often protected for one season with fencing which could be disassembled and moved. However, some archaeological evidence points to the planting of Blackthorn and Whitethorn around ring forts. Permeant banks, with or without hedges, may also have existed. With the Normans, came the introduction of the Feudal System with the first seating of the parliament in 1297, in which landlords rented fixed plots to tenants. The enclosure of commons was encouraged and sometimes enforced by landlords and much resented by small stockowners.

The enforced division and confinement of commons with banks and ditches, often containing hedges, became commonplace in the Medieval Period (mid-14th to end of 15th centuries) with the sectioning of land into townlands. Often the land within these townland boundaries was open, lacking any internal boundaries. Larger banks and ditches are often found on townland boundaries. Their age adds to the diversity and richness of species often found in these hedges.

An Act of Parliament held at Drogheda in 1488 defined the area known as the Pale. It divided the counties of Dublin, Meath, Kildare and Uriel (Louth) from the rest of the country. In 1494 a further Act was passed for the construction and maintenance of a great double ditch or rampart, around the whole district. This boundary became known as the Pale Ditch and some portions of it still exist around Clongowes Wood College and dividing the parishes of Clane and Kilcock (Denis Murphy, Devitt).

The main period of land enclosure in Ireland was during the period 1740-1830. Acts of parliament passed in the 1700's made it obligatory for landowners to keep permanent boundaries between their properties. It was during this period that the familiar patchwork landscape of hedged fields largely came into being. These boundaries were usually 5 feet deep ditches, around 6 feet wide. Hawthorn (whitethorn), crab apple and other 'quick-sets' were commonly used. Ditches with dry stone walls or mud walls were also used and willows, alder and others were planted in wet ground banks.

Agricultural improvement through land rotation programmes necessitated protection of crops by restricting the movement of livestock to particular fields. It was during this period that the familiar patchwork landscape of hedged fields largely came into being.

The estate system emerged in the seventeenth century, resulting in major agrarian landscape change and the associated establishment of fields in the more prosperous agricultural regions of Ireland. Agricultural improvement through land rotation programmes necessitated the protection of crops by restricting the movement of livestock to particular fields. These boundaries were usually 5 feet-deep ditches, around 6 feet wide. Hawthorn (or Whitethorn), Crab apple and other 'quick-sets' were commonly used. Ditches with dry stone walls or mud walls were also used and Willows, Alder and other species were planted in wet ground banks.

Interestingly, hedgerows also played a part in warfare. Corrigan (website) relates that, in the 1798 rebellion, during an engagement near Ovidstown;

"William Aylmer and John Doorly quickly arranged their army of around 4,000 men, at the foot of Wiley's Hill. Some of the rebels lined the hedges on both sides of the road and fired on Irwin's advance guard."

"Aylmer ordered his pikemen to attack the cannon positions, but they sought refuge behind a quick-set hedge. The cannon was turned upon them and the grape-shot, according to Doorly, cut the quick-set hedge "as if lopped off by a clipping shears"."

Current townland boundaries were regularised by the first Ordnance Survey carried out in Kildare in 1837-8; although there is evidence to suggest that some current townland boundaries may exist as a result of relatively recent revisions and realignments. Also, some older boundaries that may have once formed part of townland boundaries in the past are no longer so (Murray 2001).

In 1801 Rawson produced his Statistical Survey of County Kildare. Numerous references are made to the condition and management of 'enclosures'. Samuel Lewis in his Topographical Dictionary (1837), noted:

"The districts around the towns of Kildare, Naas, Kill, and Clane are also fertile, well fenced, and tolerably well cultivated".



Figure 3.1.1. An old Townland boundary hedge (KE1504).

With reference to Rawson's earlier study, he notes:

"The fences generally are tolerably good, but they everywhere occupy too much ground; the usual kind is a bank of earth thrown up from a wide ditch, and covering five or six feet of surface, so that the bank and ditch seldom occupy less than nine feet in width: in the breast of this bank, about halfway up, a single row of quicksets is placed, sometimes accompanied by seedlings of forest timber."

The size and shape of some enclosures is also commented on, "In the smaller farms a very disadvantageous custom is prevalent of dividing the land into long narrow enclosures, which occasions an unnecessary and therefore injurious extent of fence in proportion to the land included."

The Grand Juries, forerunners to the County Councils, were responsible for many road building programmes in the late eighteenth and early nineteenth centuries. A measure of funding was often provided for the provision of roadside hedges. Other hedgerows in the county may owe their origin to other transport routes. The development of the Grand Canal between 1753 and 1830, and the building of Railways (1847-1860s), would also have involved the planting of many miles of hedgerow. Anecdotal evidence from landowners spoken to during the survey suggests that during the Second World War ('the emergency') men would travel the countryside cutting (coppicing) hedges and hedgerow trees. They were paid for their labours by taking the cut timber from the hedge to sell for firewood.

Intensification of farming and the development of larger machinery resulted in hedgerow removal on many farms, particularly during the 1960s and 1970s. The absence of any comparable survey data means that it is not possible to quantify the extent of the loss, but a comparison of the current status with field boundary patterns from the second edition Ordnance Survey maps from the early part of the twentieth century would suggest that hedgerow loss is a fraction of what occurred in Britain during a similar period.

3.2. The Value of our Hedgerows

Hedgerows are important wildlife habitats and ecological corridors, allowing the movement and dispersal of many species through the wider countryside. Their importance as wildlife corridors or green infrastructure is highlighted in article 10 of the European Habitats Directive. Hedgerows also provide invaluable wider ecosystem services; their regulatory functions include carbon sequestration, flood protection, protection from soil erosion and prevention of aquatic siltation.

They are an important cultural resource, and many mark old routeways, or green roads, form part of townland boundaries or are remnants of ancient woodlands. The landscape value of hedges in the Kildare landscape cannot be underestimated. They play important roles for agriculture, acting as stock barriers, providing shade and shelter, bolstering pollination, and playing host to many beneficial species of invertebrates.



Figure 3.2.1. Honeysuckle climber in a hedge.

Landscape

Patchworks of fields and hedgerows endow the Kildare countryside with a distinctive and attractive landscape. These hedges flower and fruit in the summer to give colour and fragrance to the countryside. They frame the passage through most of the countryside by lining the roads and giving the impression of a wooded landscape in some areas.

Agriculture

Although the hedgerow network dates back to 18th and 19th century farming, these hedges still hold an array of benefits for the modern farmer. They provide vital shelter for livestock and crops across the country and function as cheap and environmentally friendly stock-proof barriers. They prevent the spread of disease between farms by trapping airborne viruses and preventing animals coming into direct contact. Additionally, they act as wind barriers, protecting the soil from erosion and help alleviate flooding.

Folklore

Many of our native shrubs are important in Irish folklore. Hawthorn (*Sceach Gheal*) is commonly found in Kildare hedgerows. Classified in early Irish law as an *Aithig fedo* or 'Commoner of the Wood', the Hawthorn is known by a variety of different names: The May Tree, The Beltaine Tree, The May Blossom, The Whitethorn, The Quick, etc. In Irish it is *Sceach Gael* but we also know it as the 'Faerie Tree' for it is said to guard the entrance to the faerie realm and it is still considered bad luck to harm one. You may however collect sprigs of flowers during the month of May to place in and around the home to banish evil spirits or misfortune, but always ask the guardians of the tree first.

The Blackthorn is depicted in many fairytales throughout Europe as a tree of ill omen. Called *Straif* in the Ogham, this tree has the most sinister reputation in Celtic tree lore. On the other side, where Blackthorn grows near its sister plant the Hawthorn, the site is said to be magical. Blackthorn often topped the Maypole, entwined with Hawthorn, and is called "Mother of the Woods". At New Year, celebrants made Blackthorn crowns, which they burned in the New Year's fire. The ashes were used to fertilize the fields.

Climate

Murray and Foulkes (2005) estimated that if the average hedgerow width is two metres, then the hedgerow resource covers an approximate area of 764km² of Ireland. Our hedgerows are essentially ribbons of native woodland across the landscape. The woody vegetation type therefore plays a vital role in carbon sequestration in meeting Ireland's obligations under the Climate Action and Low Carbon Development (Amendment) Act 2021. The Act provides the framework for Ireland to meet its International and EU climate commitments. A 2019 EPA report estimates that hedgerow, together with non-forest woodland and scrub, can remove up to 1.4 Mt CO₂ per hectare per year – even after accounting for emissions used from equipment or machinery in the process of maintenance works (EPA, 2019).

Flora and Fauna

Hedgerows are an important wildlife habitat and may be the only significant refuge available to wildlife on the more intensively managed farms in County Kildare. They are home to a range of our native flora and fauna. They support flowering plants and mosses and invertebrates like butterflies, moths, ladybirds, beetles, bumblebees and hoverflies. Two-thirds of our bird species nest in hedgerows and rely on them for food and shelter. Birds of prey like the Kestrel, Merlin, Barn Owl and Sparrowhawk hunt along hedgerows. The Irish state is legally obliged to ensure there is no deterioration of bird habitats under EU law and the state has already faced legal repercussions in what became known as the 'Birds Case' in 2007. Bats are also protected by the Wildlife Act of 1976 and depend on hedgerows for shelter, food in the form of insects and for roosting. The National Roads Authority outlines the importance of hedgerows for bats in their best practice guidelines for the treatment of bats during the construction of national road schemes (NRA, 2005a) and guidelines for the conservation of bats in the planning of national road schemes (NRA, 2005b). Hedges can support substantial breeding Badger setts, one of Ireland's most recognisable animals which is protected under the Wildlife Act, as well as internationally, as a listed species in the Bern Convention (to which Ireland is a signatory). Hedges support many other species such as mice and hedgehogs.

Hedges as Habitat Corridors for Biodiversity

Well-managed dense, tall hedges across the country provide links between surviving fragments of other wildlife habitats, thereby allowing the movement and dispersal of species, especially small mammals such as bats, through otherwise hostile agriculturally-improved landscapes of tillage and improved grassland. A recent survey from the European Commission's Joint Research Centre found that planting hedgerows is one of the best ways to combat ecosystem fragmentation in intensively farmed landscapes. It is also important to ensure the continued pollination of crops.

Water Quality

Hedges play a role in helping to maintain and improve water quality. The root systems of hedgerow shrubs and trees regulate the movement of water through the landscape, absorbing and recycling nutrients, thus reducing the risk of pollution, whilst also reducing the potential for flooding. Hedges also stop sediment from moving down slope, preventing excessive siltation in waterways. 'Siltation' is the clogging up of riverbeds with fine grained particles like soil. It contributes to the deterioration of aquatic habitats, preventing salmon and trout from spawning.

Employment

A number of people derive at least part of their income directly or indirectly from the management of hedges. No estimate has been made of the economic impact of the management of the hedgerow resource in Ireland.

3.3. Threats to Hedgerows

The Heritage Council has laid out the following threats to hedgerows in Ireland:

- Hedges need regular maintenance in order to provide effective boundaries and shelter. Neglected hedges grow tall and gappy, so that they cease to function as effective barriers. A gappy hedge is bad both for wildlife and for farming.
- Neglected hedges may become overgrown with bramble so that they encroach on fields or roadways and become inaccessible for maintenance.
- Inappropriate management can damage hedges. This includes frequent (annual) cutting and cutting during the bird nesting period.
- Building developments in which all hedgerows are removed are a major threat to the hedgerow network.
- Road-widening programmes may threaten hedges. Although the removal of hedges may be necessary for public safety, in many cases it is possible to preserve the original boundary by moving it back from the road to a safer position.
- Disturbances of roadsides to lay and maintain services such as telecommunications, sewage and water can cause disruption to hedgerow root systems, or hedges may be completely removed. This can be avoided with proper planning.
- Poor roadside drainage can threaten hedges by rotting their root systems. It can also endanger road users. It is important to maintain drains, particularly to prevent blockage with plastic.
- Hedges may be removed because there is a wish to open up views from roads in scenic areas. This is usually unnecessary if proper hedge maintenance is practised.
- Field enlargement is a threat to hedges. Farmers need to remove hedges in some cases, but should be encouraged to retain and maintain hedges, particularly along roadsides, as vital links in wildlife corridors.



Figure 3.3.1. A remnant hedge (KE0909).

4. Survey Rationale

Hedgerows are living structures which change over time and in response to management activities and changing land-use objectives. Given the financial costs and the limited number of skilled operators available to appropriately manage hedgerows, it is unrealistic to expect that the entire hedgerow network in the country can be maintained at optimum condition. In order to achieve optimum condition, periodic renewal of hedges through coppicing or laying should occur which extends their lifespan and maximises their multi-functional attributes. Therefore, conservation strategies need to prioritise individual hedgerows and hedgerow networks on the basis of their significance in terms of agricultural, ecological, environmental, heritage and landscape value.

Hedgerow conservation initiatives should focus on measurable results, not only in terms of quantity, but also in terms of the hedgerow qualities and attributes that impact on their value to agriculture, biodiversity, heritage and the wider landscape functions. Hedgerow conservation policy in Ireland is embraced primarily through national legislation and incentive, especially agriculturally-related schemes. A number of County Councils also espouse hedgerow policy in County Development Plans. Nonetheless, hedgerow policy and legislation does not necessarily equate with protection and many hedgerows have been removed in recent years as a result of agricultural intensification, new road schemes and building developments.

In addition, management is generally poor due to a lack of skills-based knowledge and resources. For convenience and cost-effectiveness, management often entails flailing which,

if done without skill and due care, has a tendency to weaken the shrubs in the hedgerow. Therefore, any attempt to promote hedgerow conservation through management needs to be based on a systematic assessment of the current resource, a meaningful interpretation of the data collected and appropriate management.

As will be seen from section 4.3, hedgerow conservation in Ireland is embraced through legislation, policy and incentive. Legislation to protect habitats and species, including the protection of hedgerows, starts with EU Directives and has been transposed into Irish law via relevant Acts, Regulations, policies and plans. In addition, a succession of agri-environment schemes in the last couple of decades has helped to raise the profile of hedgerows, with a focus on their multiple benefits for farming, biodiversity and climate. However, while these schemes are mandatory for the Irish state to implement, they are usually voluntary for farmers to take up and are difficult to monitor.

In addition, it has been suggested that much of the annual roadside hedge cutting that takes place is overly extensive and often unnecessary. It could be argued that much of the legislation to protect hedgerows is not enforced for various reasons, including the fact that there are currently too few National Parks & Wildlife Service (NPWS) conservation rangers. However, at the time of writing this report, targeted efforts are being made to protect biodiversity, including increased prosecutions for wildlife crime, the hiring of more NPWS rangers and the establishment of a dedicated Wildlife Crime Unit by the Department of Housing, Local Government and Heritage. In terms of agri-environment schemes, the imminent Common Agricultural Policy (CAP) Reform is due to be launched in 2023, which will place more emphasis on biodiversity and results-based programmes.



Figure 4.0.1. A gappy hedge in square KE01.

4.1. Need for Hedgerow Surveys

Any attempts to promote hedgerow conservation need to be based on an accurate and meaningful assessment of the current resource. The more data we have for important habitats like hedgerows, the easier they are to monitor, manage and protect. The Hedgerow Survey provides useful information in a variety of ways:

- It gives a snapshot of the quantity and character of the hedgerows in the county. This information serves as a benchmark for future surveys.
- Repeat surveys (using the same samples) will provide a useful tool in monitoring environmental change.
- It is possible to identify current and potential future threats facing the resource by assessing the results in light of current best practice in hedgerow conservation.
- The survey identifies plant life local to the county.
- Comparisons can be drawn between hedgerows under different management regimes.
- Detailed information collated as part of the County Kildare Hedgerow Survey can complement data collated from other habitat related studies, e.g. the Countryside Bird Survey (Birdwatch Ireland, ongoing study).
- The County Kildare Hedgerow Survey can be placed in its national context when viewed alongside other surveys based on the same methodology.
- Surveys provide valuable baseline data which will be essential in planning and implementing County Biodiversity action plans and heritage plans.
- The survey results and conclusions will also provide a useful tool for decision makers, advisory bodies and educational institutions including:
 - Local Authority Planners
 - National Roads Authority
 - Road Engineers
 - Landscape Planners
 - Environmental Consultants, particularly in drawing up Environmental Impact Statements
 - Department of Agriculture, Food and the Marine
 - Department of Housing, Local Government & Heritage
 - Department of Communications, Climate Action & Environment
 - National Biodiversity Data Centre (and its All-Ireland Pollinator Plan)
 - The Heritage Council
 - County Monaghan Heritage Office
 - Kildare County Council Environment Section
 - Teagasc
 - Farmers, land owners and estate managers
 - Foresters
 - Schools, Colleges, and Universities

- State Bodies – EPA, National Parks and Wildlife Service, CIE, Waterways Ireland, etc.
- Local Communities, Tidy Town and Development groups

An EPA study using aerial photography estimated a net removal of hedgerows of between 0.16% and 0.3% per year between 1995 and 2015. This suggest hundreds of kilometres of hedgerows may have been removed per year in Ireland.

Recent investigations by Noteworty.ie in relation to local authorities and hedgerow protections indicate that a systematic look at the framework that should be ensuring conservation of these habitats is required.

Emphasis on hedgerows is in the current Programme for Government: Our Shared Future:

- Review the protection (including enforcement of relevant legislation) of our natural heritage, including hedgerows, native woodland, and wetlands.
- Complete a national hedgerow survey.

4.2. Aims and Objectives

4.2.1 Objective

To gain an overview of hedgerows in County Kildare in terms of extent and condition from a biodiversity, historical and cultural perspective in order to inform conservation priorities and asses any changes in the last decade.

4.2.2 Aims

- To carry out a detailed field survey of hedgerows in County Kildare, quantifying extent, composition, structure, condition and management.
- To identify any rare or vulnerable species that may be present.
- To compile a species list, including ground flora
- Identify areas of the county which may have ancient hedgerows or hedgerows which are remnants of old woodlands.
- To compare townland boundary hedgerows with non-townland boundary hedgerows.
- To establish criteria to aid the identification of potential ancient hedgerow locations and composition.
- Collate and map the data in accordance with best practice.
- To prepare a Habitat Action Plan for hedgerows in County Kildare, to include recommendations on conservation and management priorities.
- To raise awareness of the ecological and cultural importance of hedgerows.

4.3 National and International Hedgerow Protection Policies and Legislation

The importance of hedgerows is recognized in national and international environmental policies and legislation. Various legislative Acts, Directives, and Guidelines (International, European, and National) reflect the importance of the hedgerow resource and its management. These are listed below with a summary given for those having the most direct relevance.

4.3.1 International

The Paris Agreement (or Paris Accord COP 21): This is a legally binding international treaty on climate change. Under the Paris Agreement, all countries of the world agreed to reduce global warming to well below 1.5-2 degrees Celsius, compared to pre-industrial levels. The signatories committed themselves to national climate and CO₂ reduction targets that they themselves came up with. As hedgerows and non-forest woodlands can sequester 1.4 Mt CO₂ per year CO₂/ha/year (EPA, 2019), hedgerows have the potential to play a key role in helping to reduce carbon emissions.

(EU) Habitats Directive (1992) Article 10 of the Directive states that, "Member States shall endeavour in their land-use planning and development policies, to encourage the management of features of the landscape which are of major importance for wild flora and fauna." Special Areas of Conservation (SACs) are designated under the Habitats Directive. Restrictions apply to hedgerows that fall within SACs.

(EU) Birds Directive (1979) Article 3 of the Directive states that "Member States shall take the requisite measures to preserve, maintain, or re-establish a sufficient diversity or area of habitats for all the species of birds referred to in Article 1" - i.e. -all species of naturally occurring birds in the wild state. Special Protection Areas (SPAs) are designated under the Birds Directive. Restrictions apply to hedgerows that fall within SPAs.

(EC) Council Regulations

Council Regulation (EEC) No 2078/92 of 30 June 1992 on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside. Since 1994, it has been compulsory for each EU state to have agri-environmental schemes in place. These have included various schemes in Ireland, such as REPS (1,2,3 & 4), the Agri-Environment Options Scheme (AEOS 1, 2 and 3) and the Green Low Carbon Agri-Environment (GLAS). The current 'bridge' agri-environmental scheme between the old and new Common Agricultural Policy (CAP), called REAP (Results Based Environment Agri-Pilot Programme, has several specifications on hedgerow maintenance and enhancement (DAFM, 2021). The new Agri-Climate Rural Environment Scheme (ACRES) was launched in the latter part of 2022 and will take effect from January 2023. It aims to be a 'farmer-friendly scheme to help address biodiversity decline while delivering an income support for up to 50,000 farm families in Ireland' (DAFM, 2022). Specifications in each of these schemes has set down the conditions by which participant farmers in the Scheme must manage their hedgerows. With more focus on biodiversity and results-based outcomes in ACRES, it is likely that there will be more focus on hedgerow maintenance from 2023 onwards.

Water Framework Directive (2000) The protection and enhancement of surface water and groundwater will be achieved through the application of the WFD's environmental objectives whereby hedgerows act as buffer zones to remove nutrients from entering waterbodies.

Nitrates Directive (1991) In order to reduce or prevent pollution of watercourses one of the objectives of the Nitrates Directive is to limit the losses of nitrates linked to agricultural activities. To this end the Nitrates Directive promotes the "Buffer" effect of non-fertilised grass strips and hedges along watercourses and ditches.

4.3.2 National

The Wildlife Act, (1976), as amended by the Wildlife (Amendment) Act, 2000 The purpose of Section 40 of the original Act, as amended by Section 46 of the Amendment, is to protect breeding birds during the nesting season by establishing a prohibition on the cutting of hedges during the period from 1st March to 31st August (inclusive) each year.

Heritage Act 2018 – In addition to The Wildlife Act, restrictions on cutting hedgerows are set out in the Heritage Act 2018. These Acts also stipulate that it is an offence to destroy vegetation on uncultivated land between the 1st of March and the 31st of August each year. While there were proposals, prior to 2018, to extend the cutting period under Ministerial powers, these have not been enacted.

The Roads Act, (1993) Owners or occupiers of land are obliged to take all reasonable steps to ensure that any roadside hedge is “not a hazard or potential hazard to persons using a public road and that it does not obstruct or interfere with the safe use of a public road or the maintenance of a public road”. Also, under this Act, a road authority must prepare an Environmental Impact Statement (EIS) for motorways and dual carriageways over 8km in rural areas.

Planning and Development Act (2000) Architectural Conservation Areas (ACAs) are designated under the Planning and Development Act. Development plans for ACAs may contain objectives and policies for any hedgerows within the ACA. Local Authorities can also make Tree Preservation Orders (TPOs), but currently there are no TPOs designated in respect of hedgerows (Hickie, 2004).

National Biodiversity Plan (2017-2021) Produced in response to the Convention on Biological Diversity (CBD, Rio de Janeiro, 1992), the plan has a number of actions that are relevant to hedgerow conservation. These include:

Action 2.1.3. Complete national terrestrial habitat, land cover, land use, and ecosystem service maps

Action 2.1.5. Support research on economic and societal valuations and non-economic valuations of ecosystem services and benefits and how biodiversity underpins these values

Action 2.1.6. Undertake surveys and assessments of status, trends and distribution of all habitats and species of EU interest and additional habitats and species of national and regional importance

Action 2.1.10. Continue forest research programme on forest biodiversity, the delivery of wider ecosystem services (e.g. protection of water), carbon accounting and the interaction of climate change and forest systems

Action 2.1.12. Hedgerow surveys will be continued by Local Authorities

Ireland's 4th National Biodiversity Action (2023-2027) plan is currently in its draft stages but looks to increase conservation goals for biodiversity in the coming years.

Heritage Ireland 2030 – The new national Heritage Plan includes prominent sections on biodiversity conservation. The previous National Heritage Plan (2002) recognised hedgerows as prominent and important features in terms of their ecological, archaeological and landscape values. For instance, Action 32 (Heritage in the Countryside) ensured the “protection and enhancement of hedgerows as a natural and archaeological heritage resource through the use of regulatory, educational and financial measures, as appropriate.”

Action 20 of Heritage Ireland 2030 is to ‘Review the protection (including enforcement of relevant legislation) of our natural heritage, including hedgerows, native woodland and wetlands.’

European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011 – These covers: the Restructuring of rural land holdings; Commencing to use uncultivated land or semi-natural areas for intensive agriculture and Land drainage works on lands used for agriculture. This includes several stipulations, including that a screening assessment must be carried out where hedgerows are planned for removal to create a field of over 5 hectares, or if field boundary hedgerows are to be removed over a length of 500 metres.

Nitrates Derogation – Since 2020 Derogation farms now have a Biodiversity Option on Hedgerow Management. They can choose one of two options, which are:

1. Leave at least one whitethorn or blackthorn tree within each 300 metres of hedgerow
2. Maintain hedgerows on a minimum 3-year cycle (as cutting annually stops flowering and fruiting).

Cross Compliance rules - Since 2009 Hedgerows cannot be removed unless a replacement hedge of similar length is planted at a suitable location on the holding in advance of the removal of the hedge. If farmers have removed hedges since 2009, they can be penalised at any stage.

Electricity Supply Act (1927) Article 98 of the above Acts permits any “authorised operator” to “lop or cut any tree, shrub or hedge which obstructs or interferes” with electric wires.

Communications Regulations Act (2002) Article 58 of the above Acts permit any “authorised operator” to “lop or cut any tree, shrub or hedge which obstructs or interferes” with the physical infrastructure of the network.

The Forestry Act (1946) Section 37 deals with the issue of the “Notice of intention to uproot or cut down trees”.

Sustainable Rural Housing Guidelines (2005) The guidelines on Roadside Boundaries state that “The removal of existing roadside boundaries, except to the extent that this is needed for a new entrance, should be avoided where at all possible except where required for traffic safety purposes.”

4.2.3 Local

Kildare Biodiversity & Heritage Strategic Plan 2019 – 2025

SO2-41: In conjunction with Teagasc, Tidy Towns groups and the Hedge Laying Association of Ireland, develop a hedge management course.

The aim of the County Kildare Heritage Plan is:

“To recognise by all, the value and opportunity of Kildare’s unique heritage resource and to manage, conserve and protect it, in partnership, for present and future generations”

The County Development plan 2017-2023 some objectives are outlined below. The County Development Plan 2023-2029 is currently being drafted.

PR 33: To work with local groups to identify natural infrastructure such as key hedgerows for protection and maintenance.

NH 1: To facilitate, maintain and enhance as far as is practicable the natural heritage and amenity of the county by seeking to encourage the preservation and retention of woodlands, hedgerows, stonewalls, rivers, streams and wetlands. Where the removal of such features is unavoidable appropriate measures to replace like with like should be considered, subject to safety considerations.

NH 3: To require compliance with Article 10 of the Habitats Directive with regard to encouraging the management of features in the landscape which are of major importance for wild fauna and flora. Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as steppingstones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species.

For section 13, Natural Heritage and Green infrastructure. Trees, woodlands and hedgerows are recognised as a valuable contribution to the landscape and visual amenity of County Kildare and provide wider environmental benefits that include carbon storage. Policies are outlined below.

Policies: Trees, Woodlands, Hedgerow

GI 8: Contribute towards the protection of and manage existing networks of woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character, and to strengthen local networks.

GI 9: Ensure that proper provision is made for the consideration, protection and management of existing networks of woodlands, trees and hedgerows when undertaking, approving or authorising development
GI 11: Ensure that hedgerow removal to facilitate development is kept to an absolute minimum and, where unavoidable, a requirement for mitigation planting will be required comprising a hedge of similar length and species composition to the original, established as close as is practicable to the original and where possible linking in to existing adjacent hedges. Native plants of a local provenance should be used for any such planting.
GI 12: Restrict the cutting of hedges during the bird-nesting season (1st March until 31st August), except in certain legally defined circumstances, in accordance with the provisions of the Wildlife (Amendment) Act 2000.
GI 13: Recognise the biodiversity and archaeological importance of townland boundaries, including hedgerows, and promote their protection and retention
GI 15: Encourage the protection of historic hedgerows or significant hedgerows which serve to link habitat areas to each other and the surrounding countryside.
GI 16: Encourage the planting of woodlands, trees and hedgerows as part of new developments using native plants of local provenance
Objectives: Trees, Woodlands and Hedgerow
GIO 5: Seek to retain and supplement existing tree, woodland and hedgerow planting on Council-owned lands

5. Methodology and Field Survey

The County Kildare Hedgerow Survey (2021) was carried out using the methodology of the Hedgerow Appraisal System (Foulkes *et al.*, 2012). The objective of the methodology is to record the extent (i.e. quantitative survey), and floristic composition, context, physical structure, condition, and management of hedgerows (i.e. qualitative survey) in any given locality, County or region of Ireland using a semi-random sample selection. The methodology was largely based on methodology devised by Murray and Foulkes (2006) with a number of additions, modifications and refinements to ensure compatibility with other elements of HAS.

5.1. Baseline Hedges Surveyed

5.1.1. Defining Hedges

For the purpose of this survey hedges are defined as “Linear strips of woody plants with a shrubby growth form that cover more than 25% of the length of a field or property boundary. They often have associated banks, walls, ditches (drains), or trees”. Sampled hedgerows were a minimum of 60m in length. The terms ‘hedge’ and ‘hedgerow’ are used inter-changeably throughout this report. In accordance with the methodology, garden hedges and those bordering curtilage (BL3 as fully defined by Fossitt, 2000) are not to be recorded unless they also border agricultural land. However, as 2006 data is being used this was not the case for hedges in our survey.

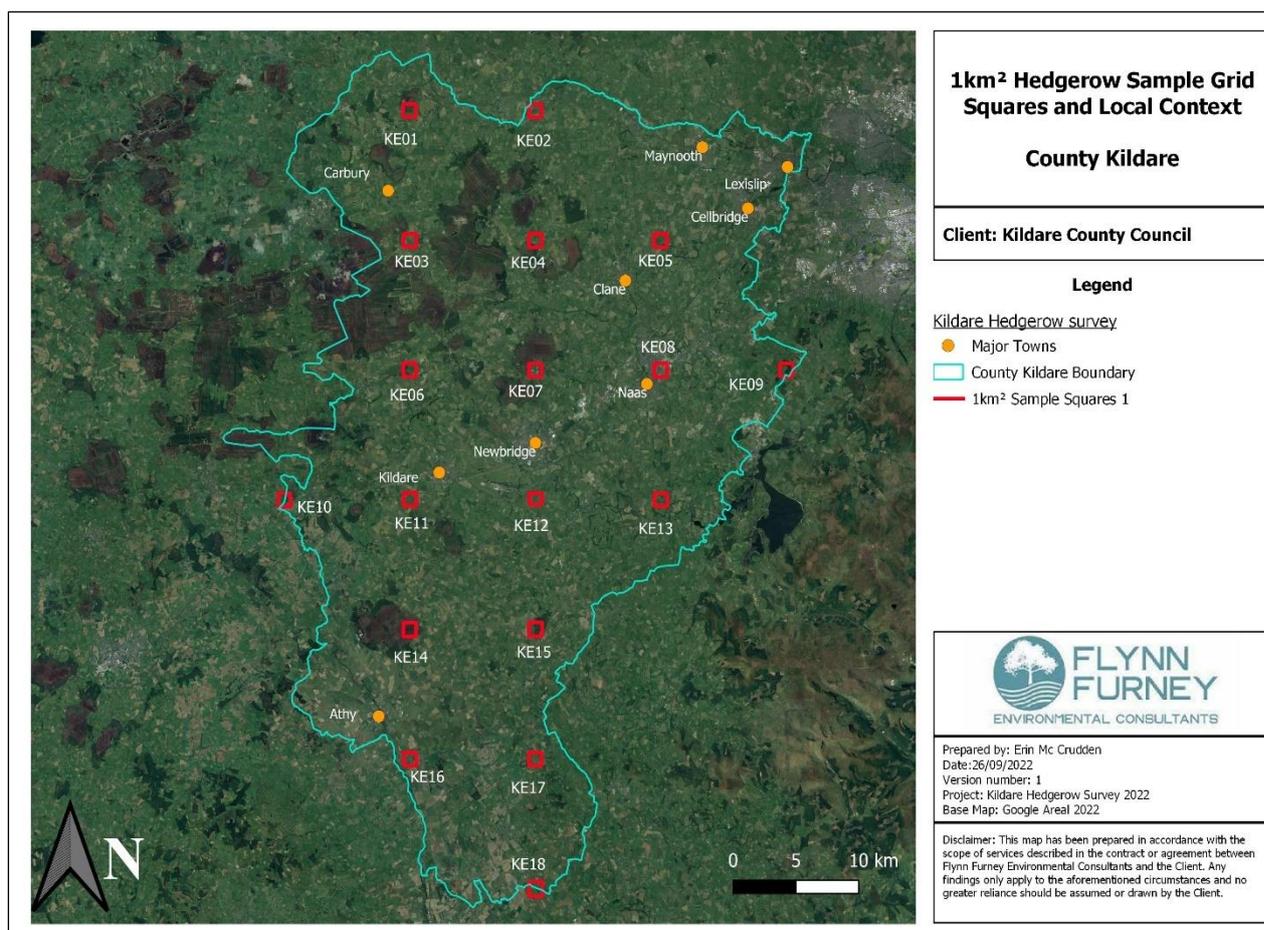
5.1.2. Selecting the Sample

The sample of hedges were chosen in the 2006 study. The methodology is outlined below, extracted from the Kildare hedgerow survey 2006. In some instances, the surveyed hedge was unclear given the less high-tech mapping systems available in 2006. In this instance, other hedges were chosen to make up the sample numbers.

The south-western (or “bottom left hand”) 1 km square of each of the Ordnance Survey ten-kilometre National Grid squares of the country was chosen for the Hedgerow Survey, in accordance with the sampling procedure used for the Badger and Habitats Survey of Ireland (Smal, 1995) and subsequently the Countryside Bird Survey (Birdwatch Ireland, ongoing study). This placement gives the potential for some joint assessment of these data sets in the future. Sample areas are 1 km square, with the exception of four part squares which fall on the county boundary (in which case only the area in County Kildare was surveyed).

A total of 18 samples (14 full squares and four part-squares) were selected in this way. The sample area is approximately 1% of the total area of the County. The Ordnance Survey National Grid references and townland details for each survey square in County Kildare are listed in Appendix 12.1. Within each sample square, a maximum of 10 hedges were selected for detailed study using randomly generated points on a transparent overlay. The points on the overlay were selected at random using a random number generator and an appropriately scaled, numbered grid marked by subdividing the square and then matching the randomly chosen numbers with points on this grid. The overlay was then placed on top of the relevant aerial photograph of each square, and the hedge nearest to each point on the overlay was chosen for detailed investigation. If there was no hedge within a fixed radius (equating to approximately 175m) of the randomly selected point, the number of sampled hedges was reduced by one. This was to ensure that the sample would not be skewed by a higher sampling density in certain areas.

Where the ‘hedge’ chosen on the aerial photograph was discovered on the ground to be something other than a hedge (e.g. a tree line, a colonised drain, a vegetated bank, or a wall covered in vegetation), the next hedge nearest to the relevant point on the overlay sheet was recorded instead, provided that it fell within the specified radius of the random point. Each hedge chosen for detailed investigation by the random selection process was clearly marked and labelled with a number on a copy of the relevant vector map (see Appendix 12.3), with beginning and end points also marked. A length of hedge was generally taken as one side of a field or enclosure. Endpoints were identified as the junction between adjacent sides of a field, or where three or more hedge lengths meet. In a few instances, endpoints were marked where the construction, management, or character of a hedge changed suddenly and conspicuously along its length, or where a clear and obvious difference in the origin of the hedge was apparent, but where no junction was evident. This was normally a result of boundary removal, where the two portions of a linear hedge once bounded separate fields.



5.1.2 No. 18 Sample squares surveyed

5.1.3. Structural Recordings of Hedges

For each hedge selected (a maximum of 10 hedges per sample square, as described above), two end points were marked on the map. End points were generally identified as field corners or by junctions with other hedges or boundary features (i.e., one side of a field). Each selected hedge was subjected to a detailed investigation along its whole length. Recordings were made in 25 categories grouped under the following headings: Context, Construction, Structure/Condition, and Management. Each category field has a corresponding code that is entered into the appropriate box on the data recording grid.

Context

Each hedge is placed in its 'context': noting the type of farm on which it is located, and the wider physical environment, in terms of adjacent land classification and links with other habitats. The data recorded is consistent with The Heritage Council's habitat classification 'A Guide to Habitats in Ireland' (Fossitt, 2000). Any potential indicators of hedgerow antiquity are also noted.

Construction

The basic ‘construction’ of the hedge relates to the linearity of the woody shrubs (single, double or random line) and the presence or absence of features such as drains, banks, walls or shelves (a ‘shelf’ is where there is a difference between the land height on either side of the hedge).

Structure/Condition

The ‘structure’ relates to the physical dimensions of the hedge (height, width, cross section, percentage of gaps, etc.). Condition is gauged by an assessment of the vigour of the hedgerow shrubs, and a record of the quantity and age profile of hedgerow trees. Any degradation to the basic construction is also noted.

Management

‘Management’ covers the type and method of hedgerow management, past and present. The nature of any fencing is also recorded.

5.1.4. Floristic Recordings of Hedgerows

Floristics (from ‘flora’) is a subdomain of botany and biogeography that studies distribution and relationships of plant species over geographic areas. Two 30-metre strips were measured along each hedge from two randomly-chosen points along the hedge. An average of these two strips was taken. The 30-metre strip is generally accepted as an adequately representative sample size for recording woody species in a hedge. By recording woody species along a standardised length, the comparison of hedges of different lengths is possible. As there can be much variation in species from one end of a hedge to the other, two strips are recorded. This increased sampling intensity for each hedge gives a more accurate picture of the overall species of each hedge.

The methodology used for this survey was the Hedgerow Appraisal System: Best Practise Guidance on Hedgerow Surveying, Data Collation and Appraisal (Foulkes *et al.*, 2012)

The Floristic target species list is presented in Appendix 2. Each native and non-native woody shrub species present within the length of each strip was allocated an appropriate value of abundance (i.e. percentage cover) using the DOMIN scale (Table 1).

Total percentage cover may add up to more than 100% because of layering of the vegetation. This scale has 10 levels of percentage cover as follows:

Table 5.1.4: Domin Scale used for woody shrubs.

Domin Value	% Cover
10	91-100
9	76-90
8	51-75
7	34-50
6	26-33

5	11-25
4	4-10
3	<4

5.1.5. Maps and Aerial Photographs

Comprehensive GIS mapping was used. This included the following layers – Aerial Photographs (2022), First Edition Ordnance Survey (6” to 1 mile), Second Edition Ordnance Survey (6” to 1 mile), Townland Boundaries, Sites and Monuments Records, and Vector maps. Datasets including the protected Sites and Monuments Records and Natura 2000 sites were downloaded from the EPA website. These datasets were used to identify features in the field and to record connecting features such as National Heritage Areas and protected Sites and Monuments. The second edition six-inch Ordnance Survey maps were used primarily for the identification of townland boundaries. Digital maps of the hedgerows within the sample areas were produced using ArcGIS Pro using aerial maps as a base. Aerial maps were used to attain the length of removed hedgerow since 2006 inside 1km grid squares. Reasons for removal were also obtained from overlaying data and visually inspecting up to date maps.

5.1.6. Period of Fieldwork

Fieldwork commenced on 25th of July 2022 and was concluded by 5th of August 2022.

5.1.7. Target Notes

Where appropriate, notes were made of irregularities, special features, or notable characteristics within the sample square or with regard to specific hedges.

5.1.8. Data Recording

Structural field data was recorded directly into an Excel spreadsheet using the Documents ToGo application on an iPad Touch. Floristic data was recorded manually onto specially designed field recording sheets. At the end of each recording session this data was transferred to an Excel spreadsheet. All data was backed up on a daily basis. Target Notes were referenced to the data in the spreadsheet. Digital photographs were uploaded, referenced, and stored in electronic folders relating to each sample square. Grid references were obtained in the field using a Google MyMaps.

5.2. Townland Boundary Hedges

In order to try and identify areas which may have hedgerows of high ecological value, recording of hedgerows was made in connection with Townland Boundaries.

All hedges which overlapped with townland boundaries were noted on QGIS. Each of these hedgerows were analysed under phase 1 of the survey but additionally under Phase 2. This phase 2 sample consisted of 16 hedges.

6. Results

The results from the Phase 1 survey are presented in sections 6.1 to 6.5, with the results from Phase 2 in section 6.6. Further analysis of the data and comments on its significance are discussed in section 7. All the data were subjected to standard statistical analyses (frequencies of species occurrence, mean species richness, frequency of structural characteristics, etc.) and graphed using a Microsoft Excel spreadsheet.

A total of 108 hedges were assessed for the baseline survey and with an average length of 113m.

6.1 The Extent of Hedgerows in Kildare and Hedgerow Removal

Table 6.1.1 shows the extent of hedgerows and hedgerows removed in the individual sample squares in the study area. The total area surveyed was 14.2km² which is approximately 1% of the total of the study area (1,695km²). Sample squares contained 719 hedgerows. Hedgerow lengths from 2006 were estimated from maps in the 2006 report. The length of hedgerows in the sample squares varies from 0 in a bogland square near Kilmead (KE14) up to 11.4km/km² in square KE07 (Kilmeage).

Table 6.1.1: Phase 1- Baseline Sample Survey

OS Grid reference	Square reference	Location	Area km ²	No. sample hedge recorded	Length of Hedgerow 2006 (km)	Total hedgerow length 2022 (km)	Length of Hedgerow removed (km)
N 70 40	KE01	Cadamstown	1.0	4	5.83	5.5	0.33
N 80 40	KE02	Enfield	0.99	9	8.82	9.52	0.8
N 70 30	KE03	Derrinturn	1.0	10	9.53	9.2	0.33
N 80 30	KE04	Staplestown	1.0	9	9.75	9.34	0.41
N 90 30	KE05	Clane	1.0	9	11.61	10	1.65
N 70 20	KE06	Rathangan	1.0	8	6.09	4.67	1.53
N 80 30	KE07	Kilmeage	1.0	9	12	11.4	0.632
N 90 20	KE08	Naas	1.0	0	1.78	1.78	0
N 00 20	KE09	Kilteel	0.93	3	3.6	1.5	2.1
N 60 10	KE10	Monasterevin	0.52	1	3.46	2.85	0.61
N 70 10	KE11	Kildare	1.0	10	11.34	11.04	0.37
N 80 10	KE12	Curragh	0.87	6	4.23	4.3	0.0
N 90 10	KE13	Ballymore Eustace	1.0	8	4.81	4.6	0.21
N 70 00	KE14	Kilmead	1.0	0	0	0	0
N 80 00	KE15	Narraghmore	1.0	6	6.37	5.87	0.5

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N 70 90	KE16	Athy	1.0	9	9.32	9.19	0.13
N 80 90	KE17	Moone	1.0	10	10.4	10.52	0
N 80 80	KE18	Knocknacree	0.49	3	2.24	3.09	0
Totals			14.2	114	121.2	114.37	9.602

A total of 9.602 km of hedgerow have been removed from the sample squares since the 2006 survey equalling 8% of the total hedgerow area within the study area. This percentage was found by dividing the removed hedgerows by the total hedgerow length of 2006. This would suggest that approximately 0.5% of hedgerows are being removed annually in County Kildare. A large number of hedges were removed in Clane (KE05) (2.1km) due to the afforestation and scrub encroachment (See figure 6.1.2.).

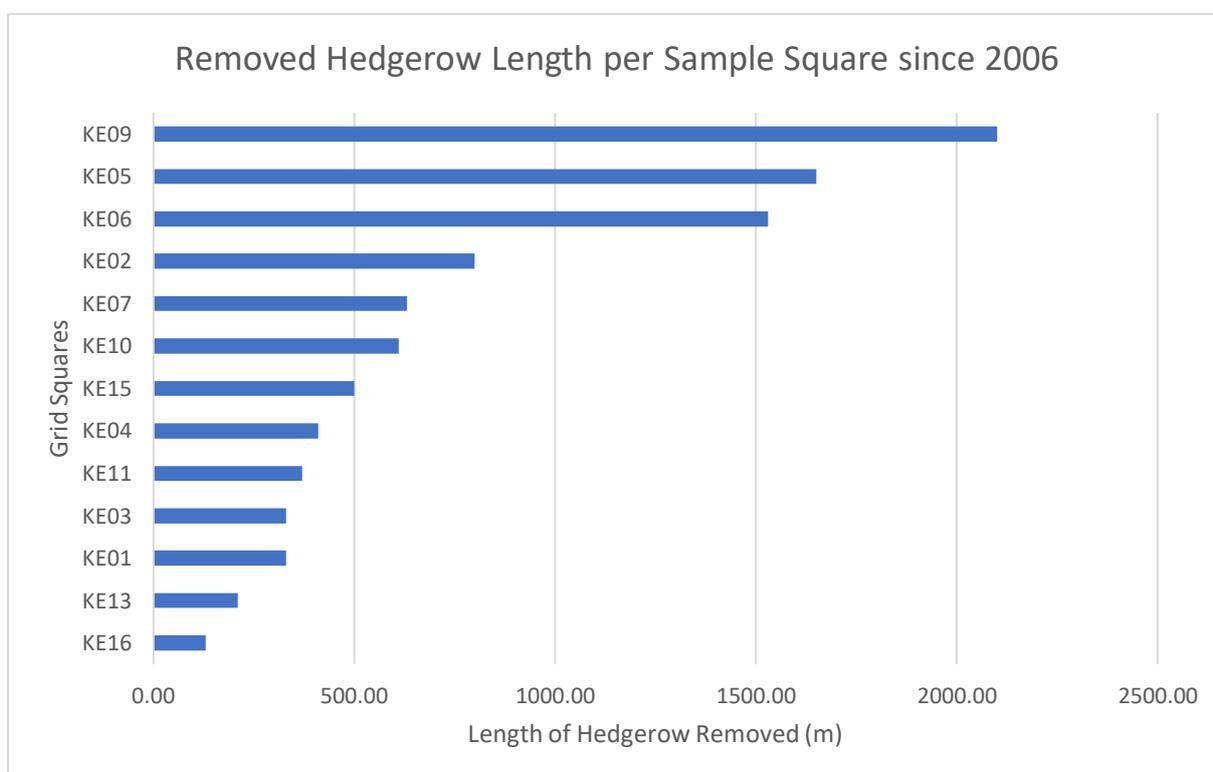


Figure 6.1.2.: Length of hedgerow removed in each grid square.

Total hedgerow length in 2006 was estimated to be around 14,467km, supposing the sample squares are accurate representations of the entire county area. Our study estimates the current hedgerow extent to be in the realm of 13,652km. These estimates were found by dividing the total hedgerow lengths of 2006 and 2022 by the total area of the grid squares and multiplying by the area of the county. Our estimates suggest around 1,146km of hedgerow has been removed across Kildare in the last sixteen years.

Total hedgerow extent has reduced by 7.92% and this is not including hedgerows which have been deemed remnant or relict which in many instances equates to the same thing. A [recent EPA study](#) using aerial photography estimated a net removal of hedgerows of between 0.16% and 0.3% per annum between 1995 and 2015 (EPA, 2019). Based on this data, the net

removal of hedges in Kildare is closer to 0.5% per annum putting Kildare above the national average.

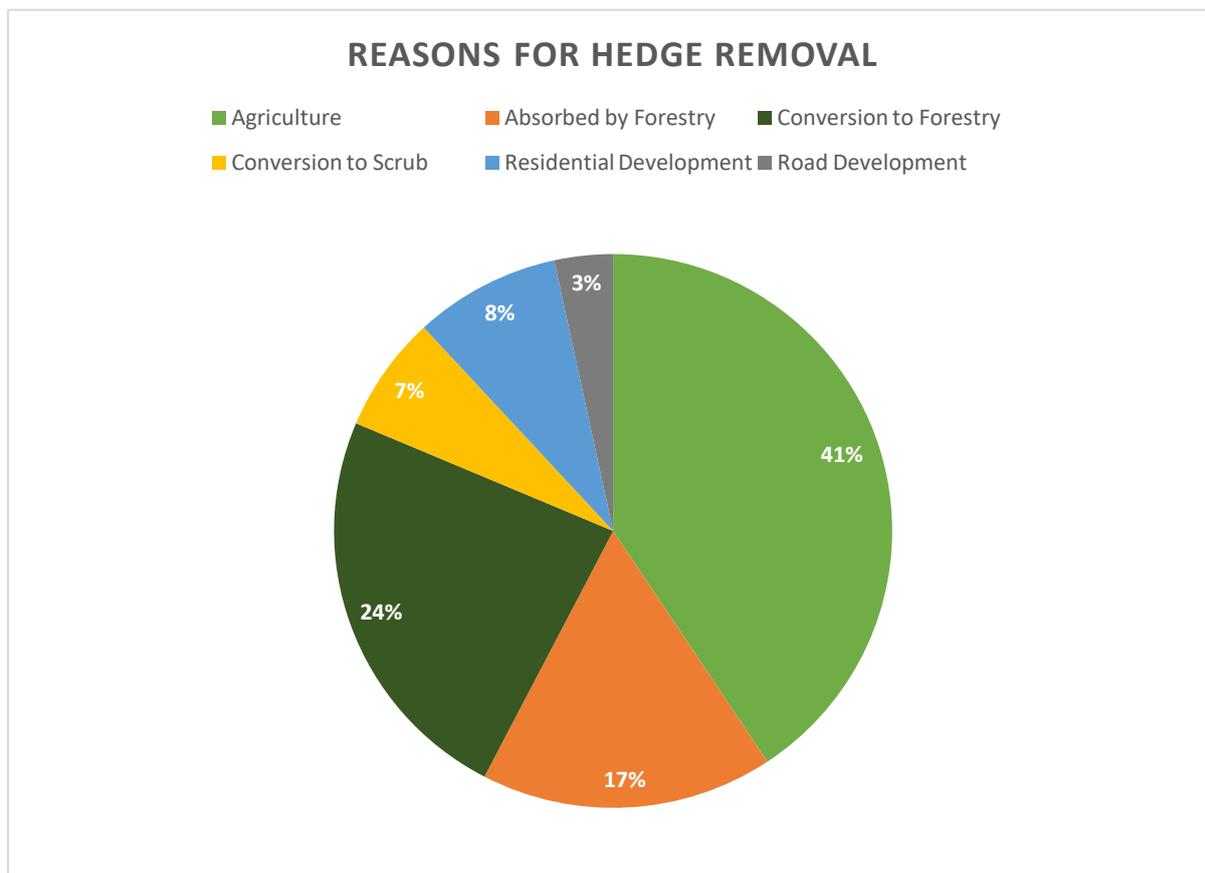


Figure 6.1.3.: Reasons for the removal of hedges in County Kildare.

The most significant cause for hedgerow removal was found to be agriculture, this contributed to the majority of hedge removal overall. The conversion and absorption of hedgerows into forestry¹ was also linked to the removal of large extents of hedgerows in Kildare. The development of residential and road developments was also associated with the removal of hedgerows in Kildare (See figure 6.1.3).

¹ Absorption of hedgerows occurs on the boundaries of Conifer plantations. Hedgerows become crowded and shaded out by maturing conifers plantation.

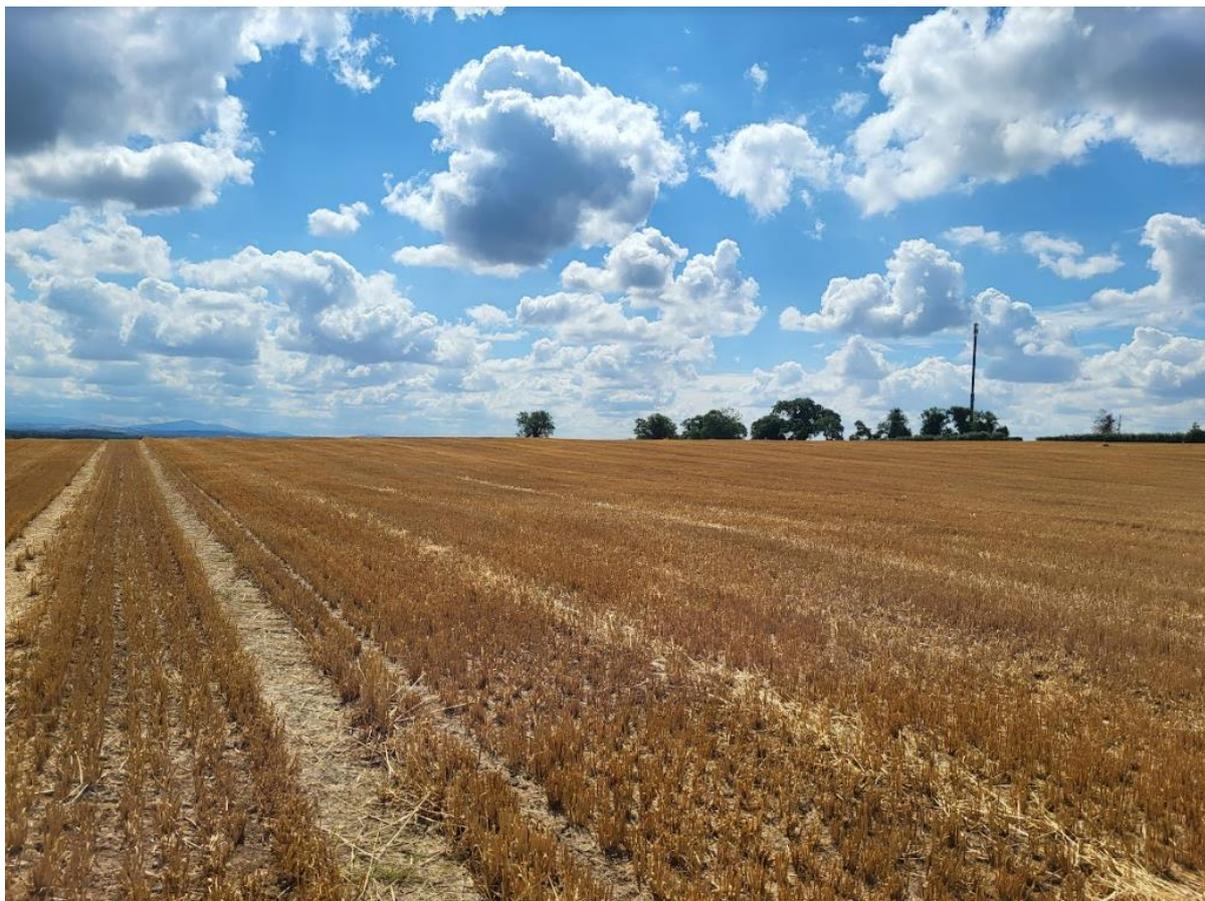


Figure 6.1.4. The view of a large field from KE1106, lacking internal hedges.

6.2 Composition of Hedgerows in County Kildare

The 'species composition' of hedgerows was individually examined in respect of

- i) the shrub layer;
- ii) the tree layer, and;
- iii) the ground flora or herb layer.

The shrub layer included shrubs such as thorns, woody climbers and tree species that had a shrubby growth form. The tree layer included any trees that had been deliberately or incidentally allowed to grow distinct from the shrub layer of the hedge. The ground flora layer was investigated for the presence of 31 herbaceous ground flora species and eight species of ferns (and allies) listed in the Woodlands of Ireland Hedgerow Appraisal System (see Appendix 2).

6.3 Shrub Layer

This category includes shrub species occurring in the hedge layer. 25 different species were recorded in the shrub layer of the sampled hedges. Only 15 of these species are native to Ireland, excluding Privet. Although native to southern Britain, it is not considered to be a native species in Ireland, except for a few counties where it has naturalised - Dublin, Galway, Tipperary and Waterford. Hawthorn was the most frequently recorded hedge at 88.2%,

followed by Elder (41.6), which has taken over Blackthorn (34.8) to be the second most common woody shrub in Kildare hedgerows. All species had a lower frequency of occurrence than in 2006, with the exception of Snowberry which increased by +1.7%. No Oak (-5%) or Birch (-2%) species were noted in the shrub layer in 2022. The ‘frequency of occurrence’ is the frequency with which each species is found in one or other of the two sampled 30m strips of each hedge. The “mean Domin abundance level” is a representation of the degree of cover of each species within the 30m sample strips. To arrive at the figure the average is taken of the relevant mid-point Domin percentage figure from each hedge in which the species occurs.



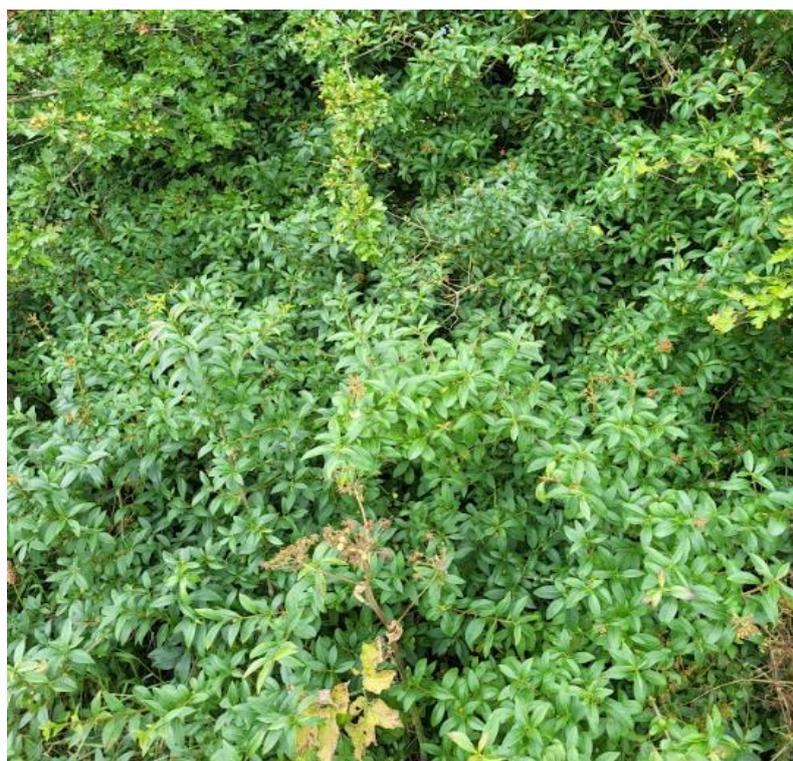
Figure 6.3: *Prunus domestica* is found in 6.2% of Kildare hedges.

Table 6.3.1. Frequency and abundance of woody shrub species occurrence in sampled hedges.

Botanical name *Denotes introduced species	Common name	Frequency of occurrence (%)	Mean Domin value	Frequency of occurrence in 2006 (%)
<i>Crataegus monogyna</i>	Hawthorn	88.2	7	93
<i>Sambucus nigra</i>	Elder	41.6	5	51
<i>Prunus spinosa</i>	Blackthorn	34.8	5	48
<i>Fraxinus excelsior</i>	Ash	31.7	4	57
<i>Ligustrum vulgare*</i>	Wild privet	21.1	5	43
<i>Ulex europaeus</i>	Gorse	9.9	4	10
<i>Ulmus spp.</i>	Elm	9.3	5	15
<i>Salix spp.</i>	Willow	8	5	15
<i>Acer pseduplatanus*</i>	Sycamore	7.5	5	12
<i>Illex aquifolium</i>	Holly	6.8	4	8

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<i>Prunus domestica</i>	Plum	6.2	5	6
<i>Corylus avellana</i>	Hazel	6.2	5	13
<i>Symphoricarpos albus*</i>	Snowberry	3.7	6	2
<i>Viburnum opulus</i>	Guelder rose	3.1	3	4
<i>Malus sylvestris</i>	Crab apple	2.5	6	6
<i>Euonymus Europa</i>	Spindle	1.9	4	5
<i>Fagus sylvatica *</i>	Beech	1.9	7	7
<i>Fuchsia magellanica *</i>	Fuchsia	1.2	2	0
<i>Lonicera nitida*</i>	Box hedge honeysuckle	1.2	2	1
<i>Prunus avium</i>	Wild cherry	0.6	3	2
<i>Populus tremula</i>	Quaking aspen	0.6	3	1
<i>Picea spp*</i>	Spruce	0.6	3	1
<i>Cornus sanguinea*</i>	Dogwood	0.6	3	1
<i>Buddleja davidii*</i>	Buddleia	0.6	3	0
<i>Cotoneaster spp. *</i>	Cotoneaster	0.6	3	0



Wild Privet is thought to be native only in counties Dublin, Galway, Tipperary and Waterford. However, it provides berries for our winter birds as well as cover for them and its leaves are the larval food for the beautiful large European moth, the Privet Hawk Moth. Its flowers are also much visited by bees in summer. It appears to be naturalised in Kildare hedges with a frequency of occurrence of 21.1%

Figure 6.3.1. Wild privet *Ligustrum vulgare* in hedge KE1501.



Figure 6.3.2. Snowberry in KE1610. It displaces native species by forming dense thickets by suckering. The berries are poisonous to humans.

6.4 Hedge Species Diversity

The ‘species diversity’ of an individual hedge is defined as the number of shrub species found in a representative sample strip (usually 30 metres) of a hedge. In cases where two strips were recorded (hedges over 100m in length), the average number of species from the two strips was considered to be the representative figure for species diversity for these sampled hedges.

6.4.1 Species Diversity Figures

The number (or average number) of shrub species per 30m strip was calculated. The breakdown of percentages for the different levels of species diversity found in the sample hedges is shown in Table 6.4.1.

Table 6.4.1: Average number of shrub species per 30m strip.

No. of target shrub species per sample of hedge	All species (% of hedges)	Native species only (% of hedges)	Native species only for 2006(%of hedges)
1	12.4	15.5	6
2	24.2	35.4	6
3	28.0	25.5	22
4	18.6	12.4	34
5	9.9	4.3	15
6	3.1	1.9	11

7	1.2	0	7
8	0	0	1

The average number of shrub species per 30m strip was 2.96 (2.45 for native species only). This is below that of 2006 in which an average of 3.62 species were recorded in sampled hedges. 12.4% of hedges contained only 1 species, this is an increase from 2006 when only 6% of hedges had only one woody shrub species. These results point to less diverse hedges overall. Hedges with less than 4 species were more common in 2022 when compared with 2006.

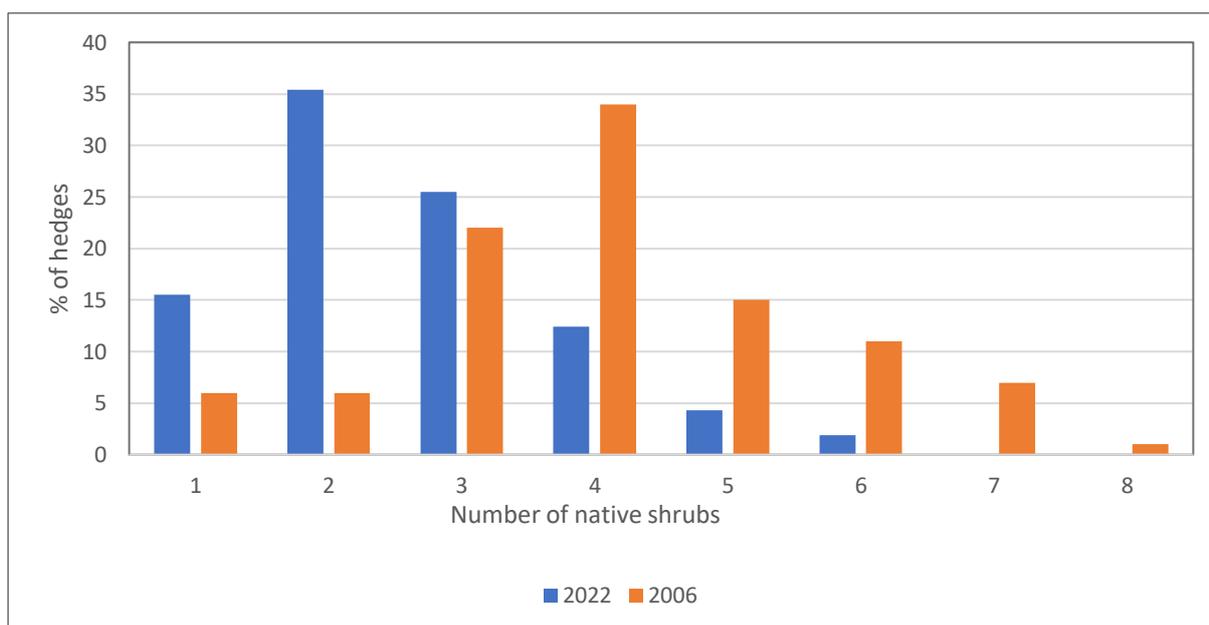


Figure 6.4.1. Number of native shrubs in hedges for 2022 and 2006.

6.5 Townland Boundary Hedges

20% of all hedges chosen were townland boundary hedges. More townland boundary hedges were surveyed in 2022 than in 2006. While the majority of hedges sampled were the same as previous years it was not always possible to determine the hedges surveyed in 2006 due to lack of conclusive information, so some figures such as these may be slightly different due to variations in the hedges surveyed. The average species diversity of the townland boundary hedges was also calculated.

Table 6.5.1.: Average shrubs in baseline and townland boundary hedges in 2022 and 2006.

2022 hedges	All shrubs	Native shrubs
All hedges	2.96	2.45
Townland boundary hedges	3.12	2.47
1 st ed. OS maps	3.02	2.60
2006 hedges	All shrubs	Native shrubs

All hedges	3.48	2.88
Townland boundary hedges	3.5	3.0
1 st edition OS maps		

Species diversity was higher for all categories in 2006. Similar to 2006, townland boundary hedges were more species diverse for their shrub layer. Hedges present in 1st edition OS maps were also more species diverse.

6.6 Species Rich Hedges

“In the UK a species rich hedge is defined as one that contains five or more native woody species on average in a 30m strip.”

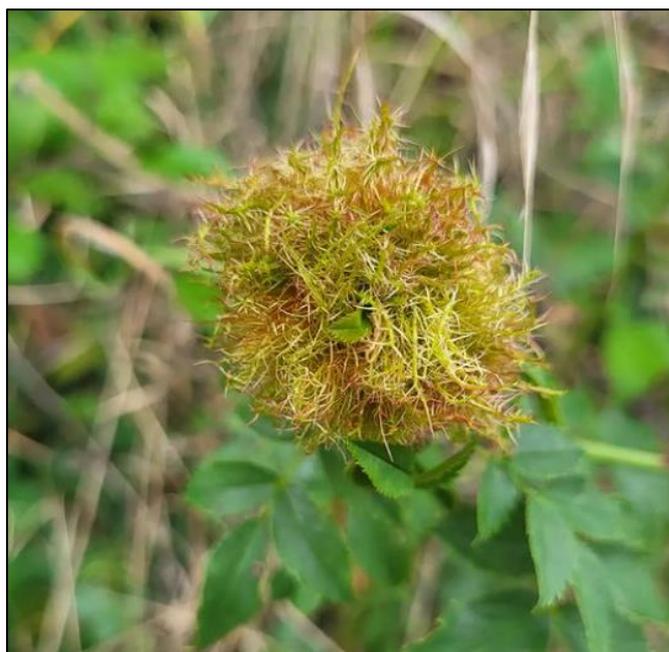
(UK Biodiversity Action Plan).

In the UK a species rich hedge is defined as one that contains five or more native woody species on average in a 30m strip (UK Biodiversity Action Plan). In northern England, upland Wales, or Scotland the presence of four or more native species qualifies as being species rich. As Ireland’s native flora overall is less diverse than that of England, Wales and Scotland, four species per 30m length could be considered as species rich here. To maintain consistency with most other County Hedgerow Surveys, Roses (*Rosa spp.*) were omitted from the count. 18.6% of the sample hedges recorded had an average of four native woody shrub species or more in the sample 30m strip/s.

In 2006, 18.6% of hedges had 4 or more species and would be classified as species-rich by this logic. This number has only reduced slightly to 18.6% of hedges classified as species-rich in 2022.

6.6.1 Climbers and Woody Non-hedge-forming Shrub Species

Bramble (*Rubus fruticosus agg.*) and Dog rose (*Rosa canina*) are widespread, thorny hedgerow shrubs which provide abundant nectar and fruit for animals which live in and visit the hedgerows. Bramble is an early coloniser of hedgerows, while Dog rose is often associated with those long-established. Bramble (*Rubus fruticosus agg.*) was recorded as being present in a total of 93.2% of the sample 30m strips in County Kildare hedges surveyed. Wild rose (*Rosa spp.*) was recorded in 62.1% and Honeysuckle (*Lonicera periclymenum*) recorded in only 6.8% of the County Kildare 30m sample strips. These figures are lower than 2006 when 94% Bramble, 62% Wild Rose and 11% Honeysuckle were recorded. Recordings of Climbers and Woody non-hedge-forming shrub species are presented in Table 6.6.1..



Diplolepis rosae on Dog rose (*Rosa canina*). It is a gall wasp which causes rose bedeguar gall or Robin's pincushion. The gall develops as a chemically induced distortion of an unopened leaf axillary or terminal bud. The female wasp lays up to 60 eggs within each leaf bud using her ovipositor. The grubs develop within the gall, and the wasps emerge in spring. The wasp has fewer than one percent being males. Wild rose species occurred in 62.1% of hedges in Kildare.

Figure 6.6.1 A gall on Dog rose in a hedge in square KE02.

Table 6.6.1. Frequency and abundance of woody non-shrub species occurrence in sampled hedges

Botanical Name	Common Name	Frequency of occurrence (%)	Level of Abundance (DAFOR) %				
			D	A	F	O	R
<i>Rubus fruticosus</i> agg	Bramble	93.2	1.2	13.7	19.9	54.0	1.9
<i>Rosa spp</i>	Wild Rose	62.1	0.0	0.0	14.3	85.7	10.6
<i>Lonicera</i>	Honeysuckle	6.8	0.0	0.0	0.6	3.1	3.1
<i>Pericylmenum</i>							
<i>Calystegia</i>	Bindweed	4.3	0.0	0.6	1.2	2.5	0
<i>Solanum dulcamara</i>	Bittersweet nightshade	3.1	0.0	0.0	0.0	2.5	0.6

6.7 Tree Layer

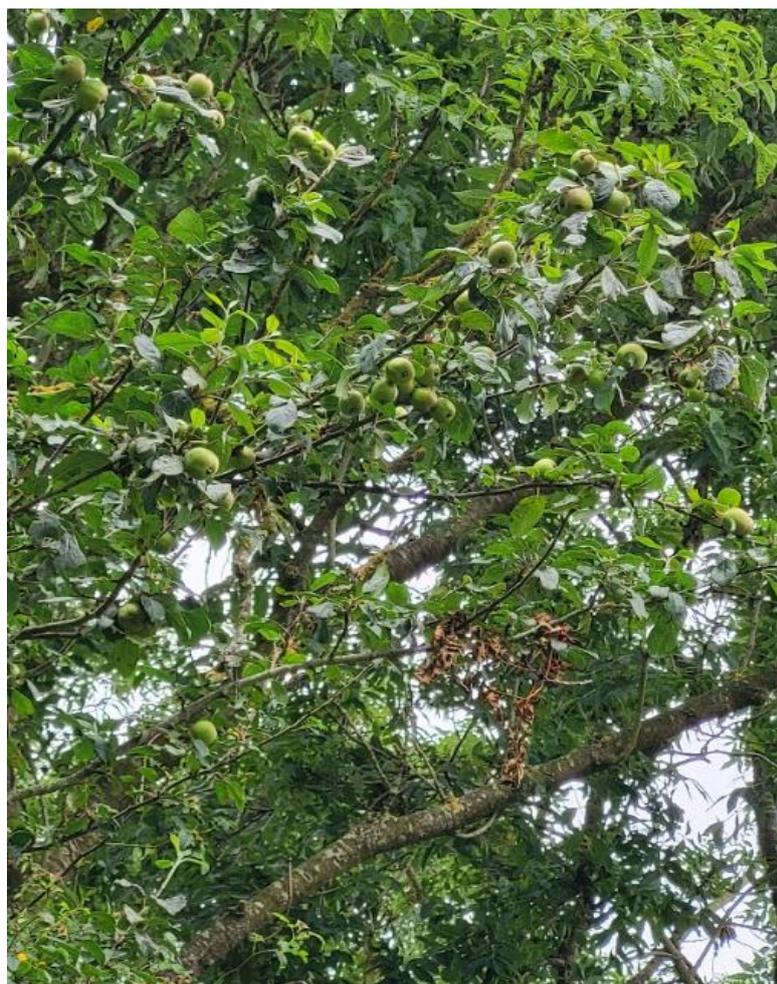
'Hedgerow trees' (tree layer) are any trees within the hedge that have been deliberately or incidentally allowed to grow distinct from the shrub layer of the hedge. Hedgerow trees were recorded as present in 75% of the recorded hedges in Kildare (increasing by 6%). A total of 24 tree species were found in sampled hedges in this survey. 12 of these tree species recorded were native species. The most commonly occurring hedgerow tree in County Kildare is Ash (*Fraxinus excelsior*) which is found in 50% of hedges. Hawthorn (29%) and Sycamore (17%) are the next most common tree species.

No Whitebeam or Hornbeam trees were present in this survey, in contrast to 2006 when they were identified as occurring once. Hazel (+4%) and Rowan (+2%) appeared in the canopy for the first time in 2022. Hawthorn, Sycamore and Willow trees were also more common in this study. Crab apple, Elm, Wild cherry, Alder and Oak occur less frequently than in 2006. The

frequency and abundance of woody shrub species recorded in 2022 and 2006 are laid out in Table 6.7.0.1 below.

Table 6.7.0.1. Frequency and abundance of woody tree species occurrence in sampled hedges.

Botanical name (* denotes introduced species)	Common name	Frequency of occurrence (%)	of	Frequency of occurrence 2006 (%)	of
Fraxinus excelsior	Ash	50		58	
Crataegus monogyna	Hawthorn	29		28	
Acer pseduaplatanus*	Sycamore	17		14	
Salix spp.	Willow	17		9	
Quercus app.	Oak	10		12	
Fagus sylvatica*	European beech	9		11	
Corylus avellana	Hazel	4		0	
Populus tremula	Quaking aspen	4		1	
Cupressus spp. *	Cypress	4		3	
Betula spp.	Birch spp.	4		4	
Aeculus hippocas tanum*	Horse chestnut	2		2	
Picea spp. *	Spruce species	2		2	
Malus sylvestris	Crab apple	2		5	
Sorbus aucuparia	Rowan	2		0	
Ulmus spp.	Elm	1		3	
Prunus avium	Wild cherry	1		5	
Alnus glutinosa	Alder	1		3	
Acer campestre*	Field maple	1		0	
Larix decidua *	European larch	1		2	
Fagus sylvatica f. purpurea*	Copper beech	1		0	
Eucalyptus globulus*	Eucalyptus	1		0	
Taxus baccata	Yew	1		1	
Acer rubrum *	Red maple	1		0	



In spring, the sweetly scented blossoms of Crab apple provide an important source of early pollen and nectar for insects, particularly bees, and other insects. In autumn, yellow-green apple-like fruits develop 2-3cm across. The fruits can be flushed with red or white spots when ripe. Many species of birds, such as blackbirds, thrushes and crows, and mammals, including mice, foxes and badgers eat the fruit and disperse the seeds.

Apple wood was burned by the Celts during fertility rites and festivals, and Shakespeare makes reference to Crab apples in 'A Midsummer Night's Dream' and 'Love's Labour Lost'.

Figure 6.7.0.1...: Crab apple was only found in 2% of hedges surveyed, a reduction of 4%. (KE1708).

6.7.1 Tree Species Diversity

26% of the hedges where trees were recorded had just one tree species in 2022, in comparison to 2006, where 31% had only one tree species. Hedges in 2022 were more likely to have three or more tree species in the canopy than 2006, pointing to an overall, but slight, increase in tree species diversity. An increase in tree species diversity may be due to the overall increase in relict hedges.

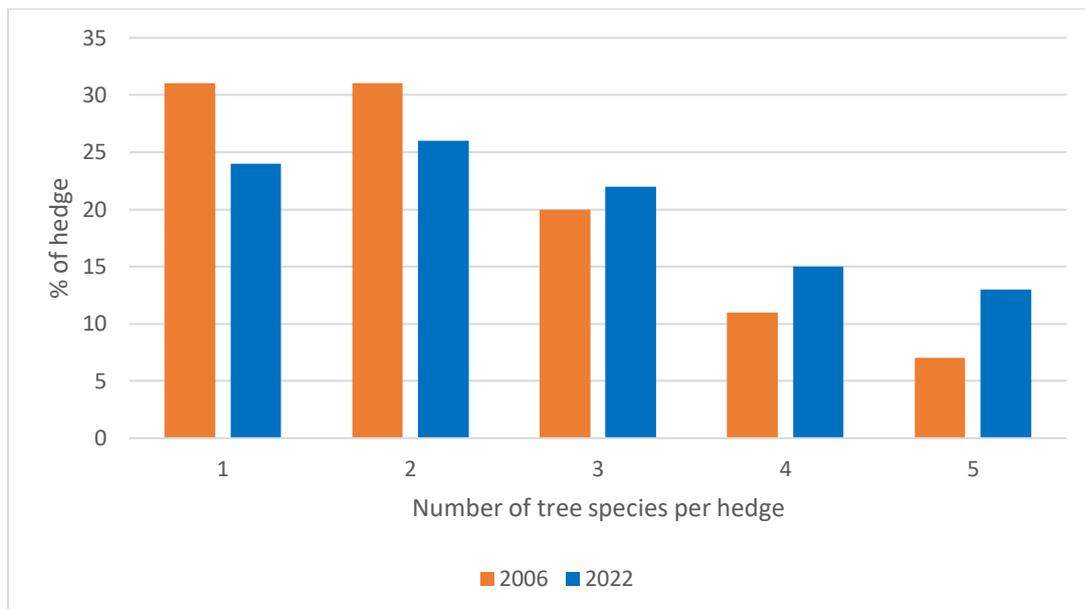


Figure 6.7.1.1. Number of tree species in hedges in 2022 and 2006.



Figure 6.7.1.2.. A relict hedge in square KE17.

6.7.2 Ash Dieback Disease

Ash Dieback disease is a highly destructive disease caused by the invasive fungal pathogen *Hymenoscyphus fraxineus*. It was first detected in the Republic of Ireland in October 2012 on plants imported from continental Europe. The disease is now prevalent throughout most of the island of Ireland and is likely to cause the death of the majority of Ash trees over the next two

decades. This will be significant in Kildare hedgerows as Ash trees occur in half of hedgerows across the county.

6.8 Ground Flora

The ground flora of each 30m sample strip was investigated for the presence of 32 herbaceous ground flora species and eight species of ferns (and allies) listed in the Heritage Council's Hedgerow Appraisal System by Neil Foulkes *et al.* (2012). Species counts form part of the Ecological Significance criteria in the Appraisal System. 21 of the 31 herbaceous species were recorded during the survey. The frequency of occurrence of each species recorded is detailed in Table 6.8.1. with the species counts per sample strip detailed in Table 6.8.1.

Table 6.8:1 Frequency and abundance of ground flora species occurrence in sampled hedges

Botanical name (* denotes introduced species)	Common name	Frequency of occurrence (%)
<i>Urtica dioica</i>	Nettle	77
<i>Galium aparine</i>	Cleaver	62
<i>Cirsium spp.</i>	Thistle species	56
<i>Heracleum sphondylium</i>	Hogweed	43
<i>Geranium robertianum</i>	Herb robert	29
<i>Vicia spp.</i>	Vetch species	29
<i>Rumex spp.</i>	Dock species	27
<i>Taraxacum vulgaria</i>	Dandelion	24
<i>Ranunculus repens</i>	Creeping buttercup	24
<i>Epibolium spp.</i> & <i>Chamaenerion angustifolium</i>	Rosebay willowherb & Willowherb species	21
<i>Veronica spp.</i>	Speedwell species	19
<i>Anthriscus sylvestris</i>	Cow parsley	19
<i>Geum urbanum</i>	Wood aven	16
<i>Plantago spp.</i>	Plantain species	15
<i>Potentilla repens</i>	Creeping cinquefoil	14
<i>Trifolium spp.</i>	Clover species	12
<i>Filipendula ulmaria</i>	Meadowsweet	11
<i>Viola spp.</i>	Violet species	11
<i>Achillea millefolium</i>	Yarrow	10
<i>Arum maculatum</i>	Lords and ladies	9
<i>Lapsana communis</i>	Nipplewort	9
<i>Nasturtium officinale</i>	Watercress	9
<i>Jacobaea vulgaris</i>	Ragwort	9
<i>Hieracium agg.</i>	Hawkweeds	9
<i>Stachys sylvatica</i>	Hedge woundwort	7
<i>Ranunculus acris</i>	Meadow buttercup	7
<i>Arctium minus</i>	Burdock	7
<i>Lathyrus pratensis</i>	Meadow vetchling	
<i>Oxalis acetosella</i>	Wood sorrel	6
<i>Centaurea nigra</i>	Knapweed	6
<i>Potentilla anserina</i>	Silverweed	6
<i>Lotus corniculatus</i>	Birds-foot-trefoil	6
<i>Hypericum spp.</i>	St. Johns wort species	6
<i>Galium verum</i>	Ladies bedstraw	
<i>Stellaria spp.</i>	Stitchwort species	4
<i>Fragaria vesca</i>	Wild strawberry	4

<i>Glechoma hederacea</i>	Wildflower ground ivy	4
<i>Prunella vulgaris</i>	Self heal	3
<i>Geranium pyrenaicum</i>	Hedgerow crane's-bill	3
<i>Primula vulgaris</i>	Primrose	3
<i>Hypochaeris radicata</i>	Cats ear	2
<i>Medicago lupulina</i>	Black medic	2
<i>Knautia arvensis</i>	Field scabious	2
<i>Tussilago farfara</i>	Coltsfoot	2
<i>Alliaria petiolate</i>	Ramson	1
<i>Conopodium majus</i>	Pignut	1
<i>Digitalis purpurea</i>	Foxglove	1
<i>Hypericum androsaemum</i>	Tutsan	1
<i>Aegopodium podagraria</i>	Ground elder	1
<i>Scrophularia nodosa</i>	Common figwort	1
<i>Leucanthemum vulgare</i>	Ox-eye daisy	1
<i>Lamium galeobdolon</i>	Yellow archangel	1
<i>Organium vulgare</i>	Wild marjoram	1
<i>Daucus carota</i>	Wild carrot	1
<i>Mentha aquatica</i>	Water mint	1
<i>Odontites verna</i>	Red bartsia	1
<i>Fumaria officinalis</i>	Common fumitory	1

As hedgerows were not surveyed for ground flora in 2006, a direct comparison cannot be made. However, species results do not speak well for hedge diversity in County Kildare. Nutrient-rich species were overwhelmingly dominant in Kildare's hedges. Nettle (77%) and Cleaver (62%) often dominated hedge ground flower, at the detriment of other species. Common hedgerow species such as Foxglove (1%), Woundwort (7%) and Speedwell (11%) were present in low numbers.

The average number of target species (set out in the Hedgerow Appraisal methodology) per 30 metre strip was calculated. Results are in Table 6.8.2. The average number of target herbs per 30m strip was 1.4. For comparison, the average number of target herbs in Monaghan hedges (found in the HAS survey carried out in 2021) was 2.42 species. Cleaver was noted as the biggest problem for ground flora amongst surveyors, forming large mats at the base of hedges on arable land. Cleavers thrive on nutrient-rich soil. They are a competitive plant and can become very large, using the shrub layer for support as they grow towards the light. Dense mats of cleaver block light from reaching other flora at the base of the hedge and prevent other plants from photosynthesising, thus winning the monopoly.



Figure 6.8.1.. Cleaver dominating the herb layer of KE1705.

33.5% of sampled hedges contained no species from the target list, triple that of a similar study on Monaghan hedges in 2022. 31.1% of hedges contained only one target herb.

The average number of ferns per 30m strip was only 0.33. Ferns were not common in Kildare hedges, with 75.8% of hedges containing no fern species.

Table 6.8.2: Average no. of target species % of sample 30m strips per 30m strip Herbaceous species Ferns and Allies

Average no. of target species	% of sample	
	Herbaceous species	Ferns and Allies
0	33.5	75.8
1	31.1	17.4
2	18.0	5.0
3	8.1	1.9
4	3.1	0.0
5	3.7	0.0
6	0.6	0.0
7	1.2	0.0
8	0.0	0.0
9	0.0	0.0
10	0.0	0.0

6.9. Adjacent Land

The biodiversity value of hedges is related to the general ecology of an area and their connection with other natural and semi-natural habitats. In order to examine the overall ecological context of County Kildare's hedgerow resource, a record is made of both the habitat classification of land adjacent to the sampled hedge and any link the hedge makes with other habitat types. Farming type on adjacent land was recorded and habitats were classified to level II Fossitt classification (Fossitt, 2000).

6.9.1 Farm / Land Use

In order to put the sampled hedgerows into their agricultural context, the type of farming / property use of the land adjacent to the hedge was noted. Figure 6.9.1.1. illustrates the results.

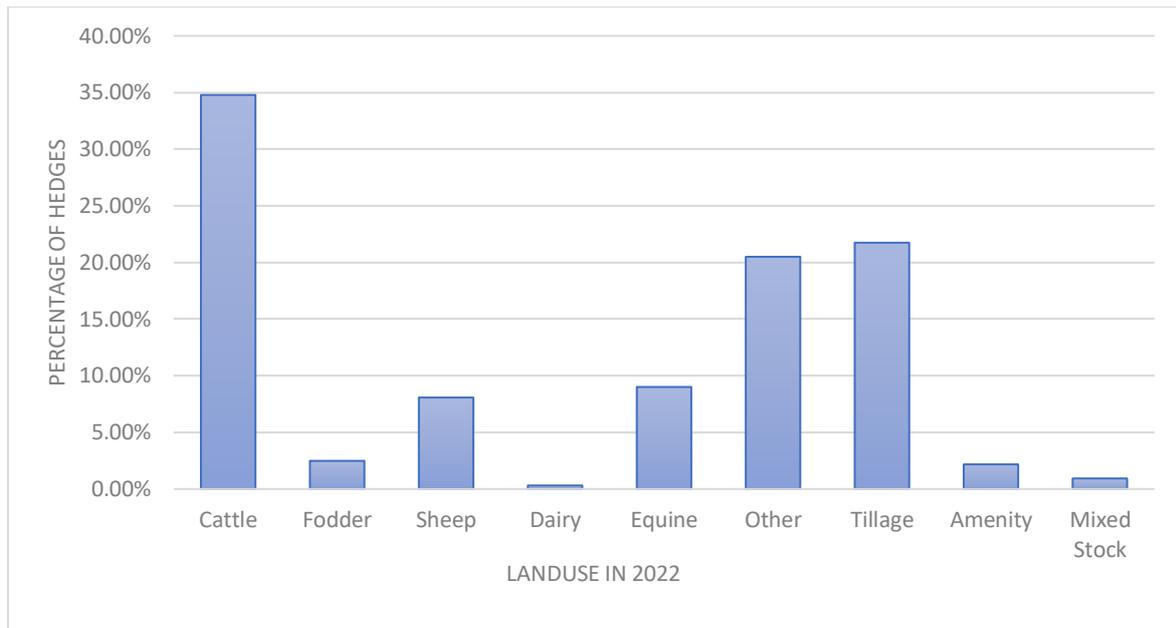


Figure 6.9.1.1. Adjacent landuse of surveyed hedges.

Around 35% of the adjacent landuse is for cattle. Tillage was the second highest landuse type at 22%. Some areas of landuse may not have been defined by the surveyors and instead added to the 'Other' category. The Other category includes roads and curtilage lands. Equine landuse was also common at 9%. This data was not available for 2006.



Figure 6.9.2 The second most common adjacent landuse was tillage.

6.9.2 Adjacent land class

The most common landuse type adjacent to the Kildare hedges surveyed was improved grassland, with a 6% increase since 2006. An increase in arable land was also noted (+7%). Semi-natural grasslands were only noted in 7% of the fields next to hedges in 2022, a reduction of 8%. 76% of hedges surveyed are bordered by arable land or improved agricultural grasslands. Curtilage/built land was the adjacent land class in 15% of hedges and 2% was non-native forestry. Leaving only 7% of hedges with a natural adjacent landuse class.

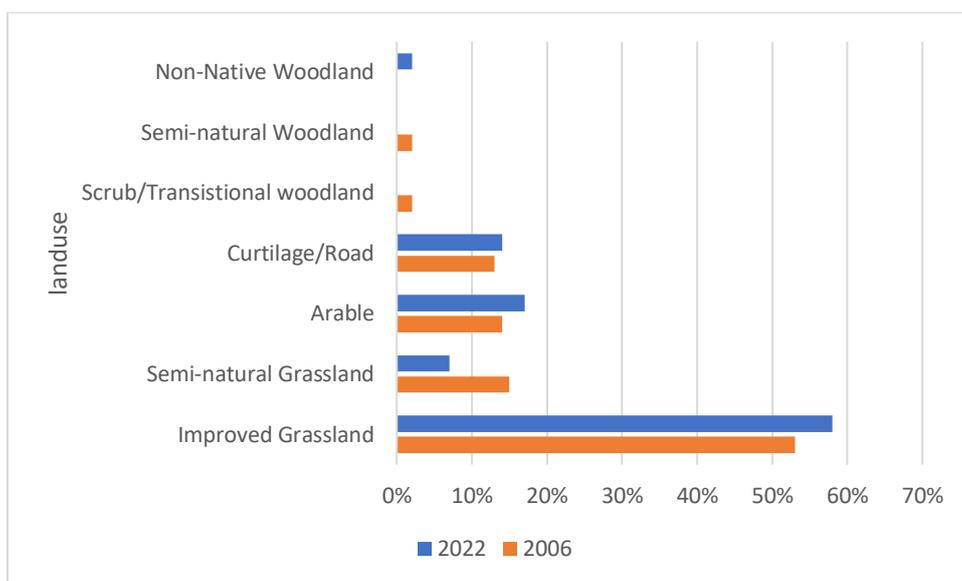


Figure 6.9.2.1. Comparing adjacent land class in 2006 and 2022.



Yellowhammer, or *Buíóg* as it's known in Irish, were commonly seen during surveying. Formerly a widespread breeding species in Ireland, now restricted mainly to the east and south. They are strongly linked with the cultivation of cereals and has declined in areas where these are no longer grown. The Yellowhammer is a red-listed species, of conservation concern.

Figure 6.9.2.2. A yellowhammer seen perched on the electricity cables in grid square KE17.

Links with Other Habitat Types

The corridor role of hedgerows in facilitating the movement and distribution of wild flora and fauna through the landscape, is believed to be enhanced significantly if hedgerows link into other (natural or semi-natural) habitat features. How the end points of the sampled hedges connected with other hedgerows and other habitat types was noted. Hedgerows sampled in County Kildare linked to eight different basic natural or semi-natural habitat types, principally other hedgerows or scrub. Although 23% of end links were with other hedgerows, 37% linked with treelines. Only 14.6% linked with linear woodland or scrub. 12.4% of hedgerows linked to improved grassland only. While 6.8% ended at curtilage or built land. This shows 19.2% of hedgerows did not link to other semi-natural habitats. These results would indicate that the fragmentation of hedgerow networks in County Kildare is an issue that needs to be considered in any biodiversity strategy for the county.

6.9.3 Historical context of sampled hedges

An examination of the first and second edition maps (6" to the mile) produced by the Ordnance Survey can give an indication as to the period of origin of individual hedgerows (Geohive, 2021). In County Kildare, the first edition of maps was produced in 1834-35, followed by the second edition in 1909-10.

Hedgerow History

In order to try and assess the period of origin of sampled hedgerows, all sample hedges were compared with boundaries marked on the first and second edition Ordnance Survey maps (6" to 1 mile) dating from 1834-35 and 1909-10 respectively. It cannot be known for certain if the boundaries marked on these maps were hedgerows, but the absence of any boundary marking would most likely indicate the absence of a hedgerow at that period. Hedges not present on the first edition maps from 1834-35 can safely be assumed to be less than 200 years old (Foulkes, 2010). 75% of Kildare hedges were present on 1st edition OS maps, 9% were present on 2nd edition maps and 15% of hedges in the survey were not present on either 1st (1834-35) or 2nd edition OS maps. Five hedges were linked to features on the Records of Monuments and Places (RMP), established under the National Monuments Amendment Act 1994.

Townland Boundary hedges

The data.gov townland boundary dataset (shapefile) was used to identify townland boundary hedges in GIS. Townland boundary hedges accounted for 21% of the surveyed hedgerows.

6.10 Construction of Hedgerows in County Kildare

'Construction' relates to the physical infrastructure of the hedge. This survey recorded details of the linear outline of sampled hedges, the linearity of the hedgerow shrubs, and details and dimensions of any associated features such as banks, walls and drains. The dominant form of hedgerow construction is a single line of shrubs with an associated hedge bank, sometimes

associated with an external drain. A single or double line of shrubs is generally an indicator of a planted origin for hedgerows. Most sampled hedges fell into these two categories, with a much greater proportion (85%) being of a single line construction. Around 71% of sampled hedges have an associated hedge bank. 0% of sampled hedges were classified as stone wall hedges and 14% were shelves. 35% of hedges sampled have an associated drain. 36% of hedgerows surveyed would now be categorised as treelines (Fossitt 2000).

6.11 Structure and Condition of Hedges in County Kildare

Detailing the ‘structure’ of the sampled hedgerows involved recording information on the average height, average width, the cross-sectional profile, the percentage of gaps, the woody structure of the hedge base, and the presence of hedgerow trees. These features are indicators of the agricultural, ecological and landscape status of the hedge. Assessing the ‘condition’ of the hedge involves qualities such as bank/wall degradation, tree age composition, and overall vigour. These factors can be indicators of the long-term viability or sustainability of the hedge.

6.11.1 Hedge Height

Research indicates that taller hedges are generally better from a wildlife perspective. Hedgerow height is largely determined by management methods, but height can also be influenced by altitude, exposure and soil quality. Only 1% of sampled hedges in County Kildare were recorded in the lowest height category. Around 53% had an average height greater than 2.5m. 39% of those hedges were over 5m in height. In 2006, only 23% of hedges were recorded as >4 metres in height. And the majority of hedges were between 1.5 and 4 metres. Overall, this shows hedges are more likely to be tall in County Kildare.

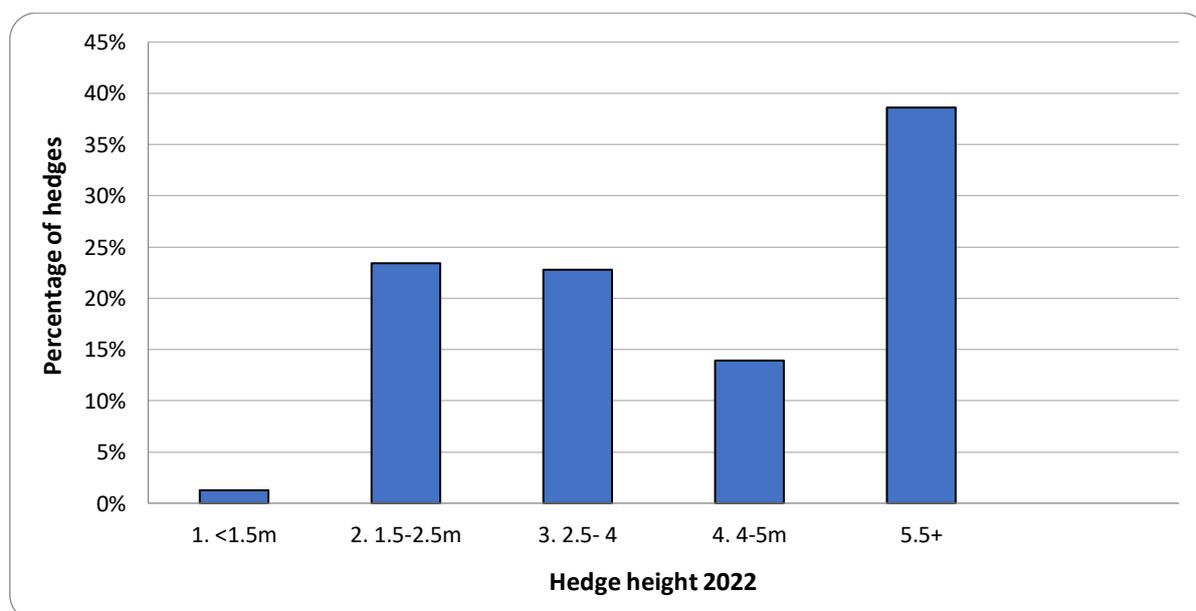


Figure 6.11.1.1. Hedge height in 2022.

6.11.2 Hedge Width

Increasing width generally correlates with improved biodiversity in hedgerows. As can be seen from Figure 6.11.2.1. the results of the survey show that 91% of hedges surveyed in County Kildare are over 1m wide, and this figure is the same as in 2006. 18% of hedges were in the largest width category of 3m+ (+2% from 2010). Hedges are more likely to be between 1-2 metres in 2022. The most common hedge width in 2006 was 2-3 metres.

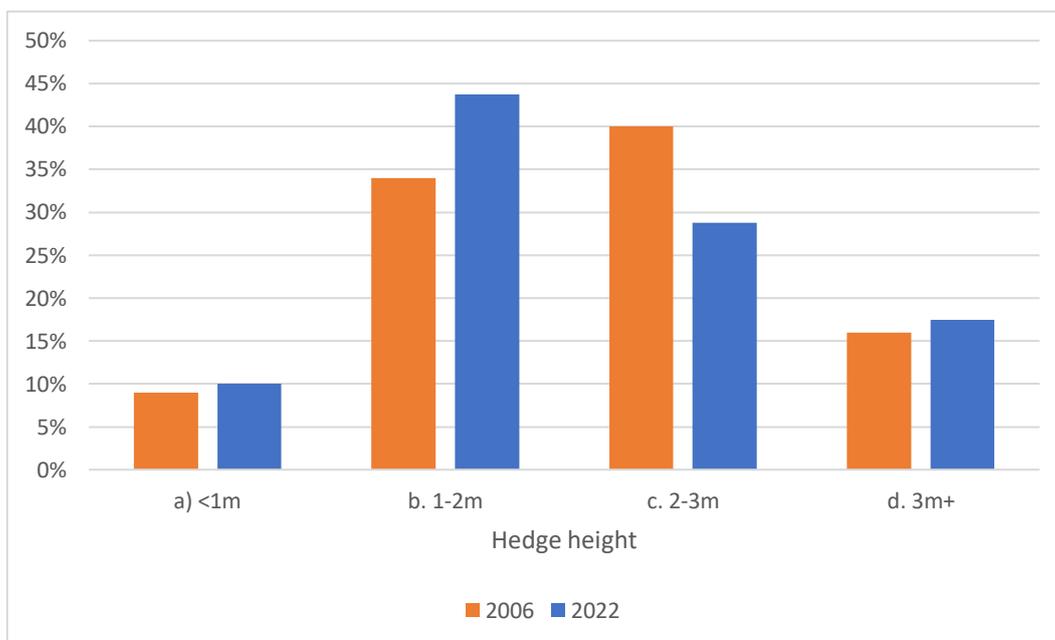


Figure 6.11.2.1. Comparing hedge width in 2006 and 2022.

6.11.3 Percentage of Gaps

‘Gappiness’ is an assessment of the percentage of the whole length of the hedge that no longer has a cover of hedgerow shrubs. Gaps are associated with a weak hedge structure and are often a symptom of the deterioration of the hedge, often caused by the demise of plants through age or inappropriate management. Figure 6.11.3.1. shows the breakdown of the sample in terms of percentage gaps over the length of the hedge. Complete hedges were much more common in 2006 and made up 41% of the sampled hedges. Only 11% of hedges were noted as complete in 2022. Hedges were also more likely to have >50% gaps with a 10% increase since 2006.

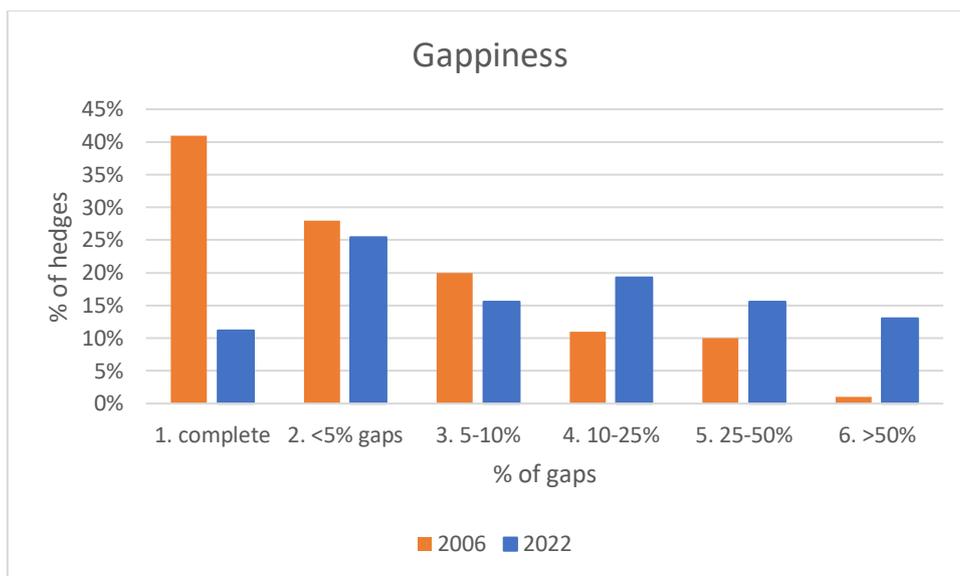


Figure 6.11.3.1. Comparing the percentage gaps in hedges from 2006 and 2022.

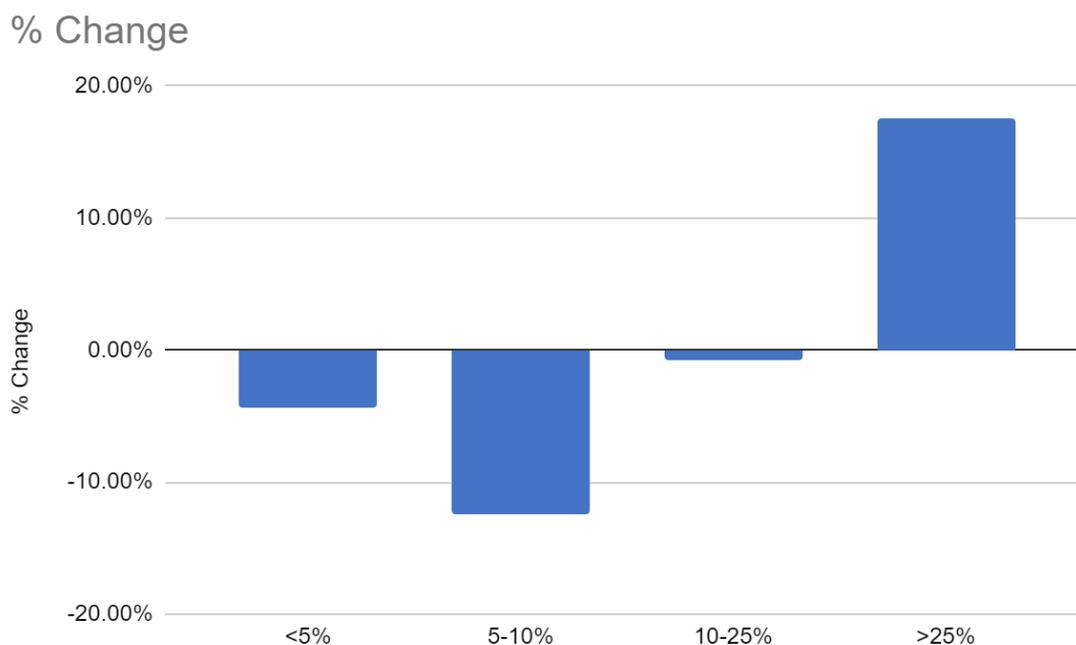


Figure 6.11.3.2. Changes in hedge gappiness.

6.11.4 Basal Density

Recording how dense the growth of woody hedge shrubs is in the bottom metre of the hedge is an important indicator of the hedge structure, both environmentally and agriculturally. A hedge where the woody shrub growth is dense at the base is obviously better from a stock control perspective, but it also considered beneficial for the hedge’s ability to support wildlife. Figure 6.11.4.1. shows the breakdown of how the samples fared in terms of the hedge base categories. Porosity to light can be a useful indicator of basal density. In 2006 hedge density

was only classed into three categories: open, scrawny, dense. For the updated HAS methodology, hedges have four categories: open/translucent, scrawny/semi-opaque, and dense opaque.

Semi-translucent is recorded where there is more light than woody hedge growth in the base of the hedge. Semi-opaque is where there is more hedge growth than light. Where there is a lot of vegetation in the base of the hedge an assessment is made substituting vegetation growth for light. The majority (72%) of sampled hedges showed some degree of translucence in the lowest 1m of growth. 23% were classed as being open / translucent, up 15% from 2006. In 2022, 22% of hedges were classed as having a dense base, which is the same as 2006, however this density is disregarding gaps outlined above and thus shows that with correct management of gaps, healthy hedgerows can form.

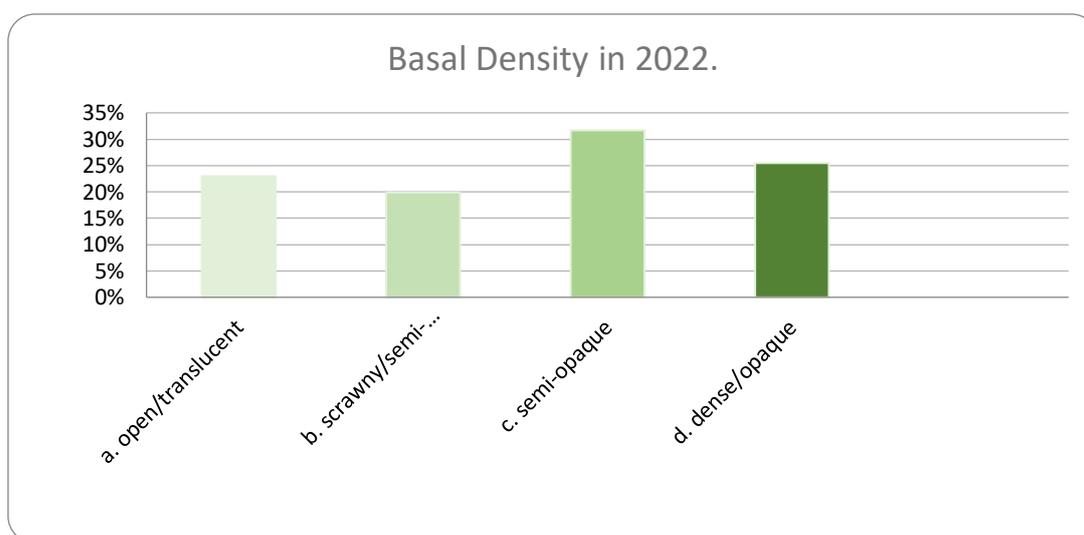


Figure 6.11.4.1 Basal density in 2022.

6.11.5 Hedge Profile (cross section)

The basic cross-sectional profile of each sampled hedgerow was recorded based on a number of defined categories. As hedgerow shrubs mature, growth near to the base generally declines as the plant is no longer threatened by browsing. This process is recorded as 'losing structure', and without management intervention plants can revert to their natural tree form with an empty or open base. Assessing the profile or cross-sectional area of a hedge can be a good indicator of this process and the hedge's potential need for rejuvenation. Hedgerows that contain a high proportion of spreading shrubs like blackthorn and gorse can eventually spread to a point where they are no longer considered to be hedges and are re-classified as other habitat types, most commonly scrub/ transitional woodland.

An assessment of the findings in the sample hedges is shown in Figure 6.11.5.1. Hedges with an overgrown or irregular profile in County Kildare decreased from 2006 by 7%. Overgrown profile is indicative of lack of management. 11% of hedges were recorded as remnant hedges, which is defined as the remains of what used to be a hedge having no consistent profile. This is an increase of 6% since 2006. A remnant hedge is generally indicated by a (broken) line of mature or senescent plants in tree, rather than shrub form. Almost invariably it has a high

percentage of gaps, although it may have bits of shrubby growth (including Brambles) along its length. Once the remains of a hedge cover <25% of the boundary, it is no longer classified as a remnant hedge and instead is classified as relict. 12% of hedges were classified as relict in the 2022 survey, double that of 2006.

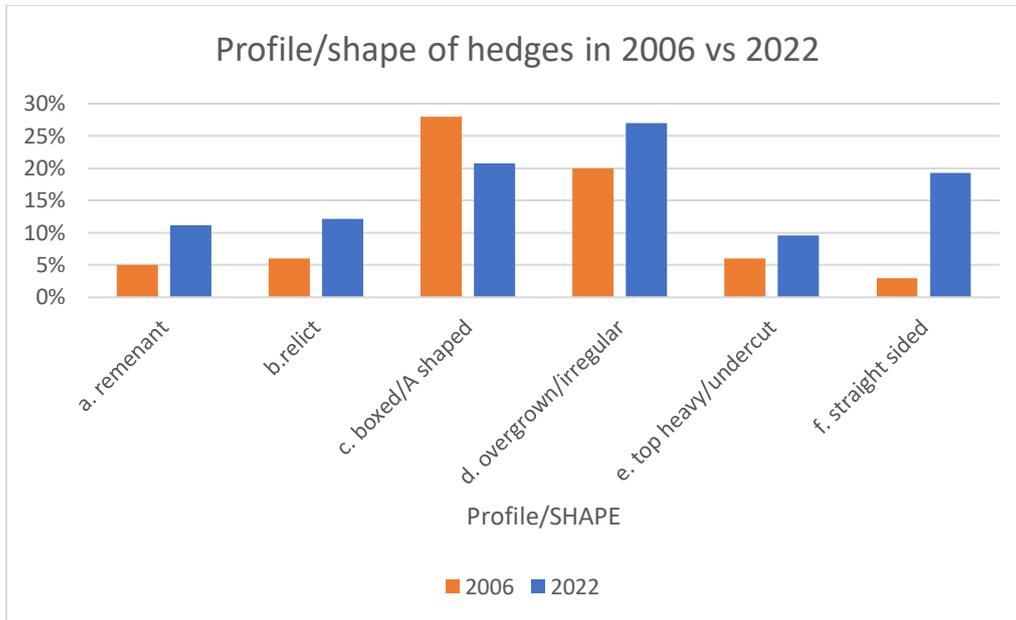


Figure 6.11.5.1. Profile/shape of hedges in 2006 vs. 2022.



Figure 6.11.5.2. A remnant hedge. KE0909.

6.11.6 Hedgerow Trees

This survey looked at both the abundance of trees in hedges (Figure 6.11.6.1) and also the age composition of the trees. Hedgerow trees can contribute significantly to the overall biodiversity of a hedgerow. Hedgerow trees can be the result of intent, where young (self-sown) trees have been purposefully allowed to grow and mature as part of a management regime, or they can be a consequence of lack of management. The proportion of hedgerow trees is assessed by their impact on the canopy of the hedge and the sample hedges were classified into four categories based on this. 28% of the sample hedges had no hedgerow trees (26% of hedges in 2006 had no trees), with a further 21% of hedges having Few Trees (up to 15% canopy cover). At the other end of the spectrum, 25% of sampled hedges were classed as a Line of Trees, where over 75% of the canopy is dominated by trees. This is an increase of 16% from 2006, showing an overall increase in tree species in hedges in the county and a general increase in treelines over hedgerows.

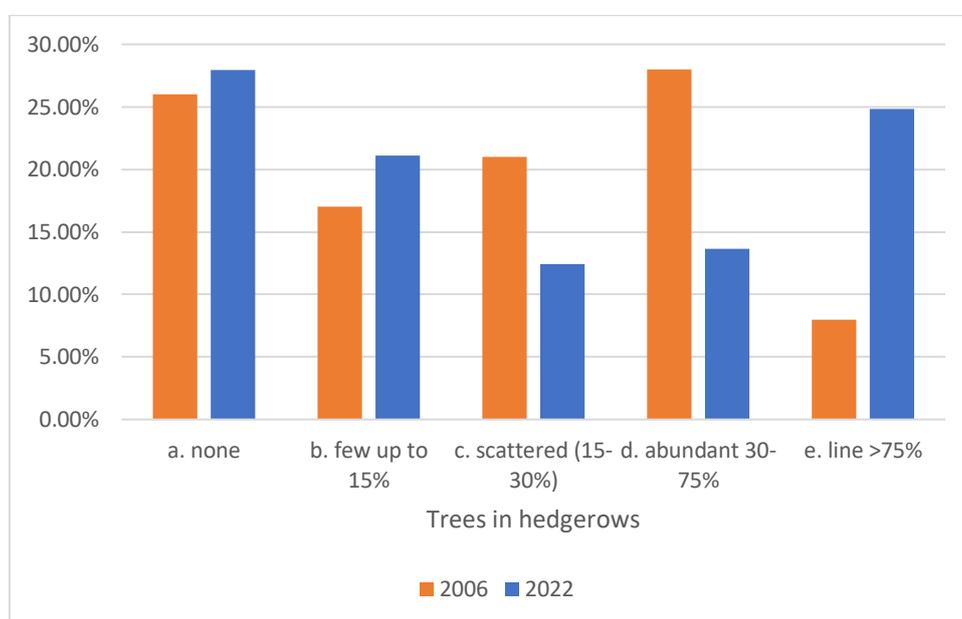


Figure 6.11.6.1. Trees in hedges in 2006 and 2022.

6.11.7 Tree Age Composition

It is generally considered that to achieve sustainable levels of hedgerow trees a balance between young, medium and older trees needs to be maintained. Young trees are defined as having a diameter at breast height of no more than 8cm. In 40% of sampled hedgerows, trees were either exclusively or predominantly mature. While 34.2% were either all or predominantly immature, 26% had no trees.

Different category types were used in 2006 so direct comparisons could not be made. 17% of trees in 2006 were all mature and 56% of hedges had young trees present.

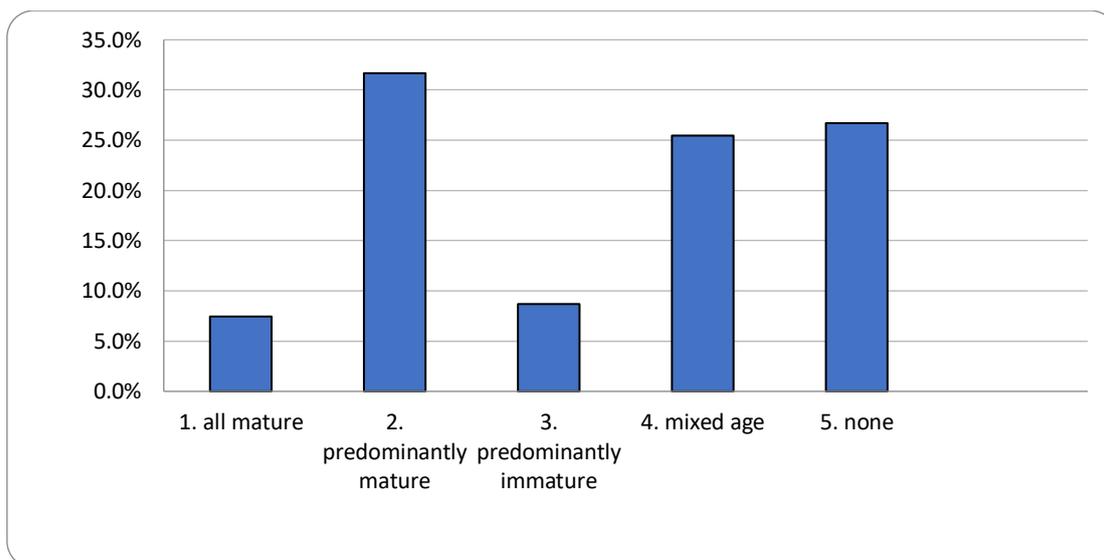


Figure 6.11.7.1. Hedgerow tree age structure.

6.11.8 Bank/Wall / Shelf Degradation

Where hedgerow shrubs are established in hedge banks, the viability of the hedge can be threatened if the bank is damaged. Root systems are exposed to damage, drying and infection with the result that overall stability can be reduced. Ground flora in particular is also compromised. Sampled hedges were examined for damage to the supporting structure and the results are shown in Figure 6.11.8.1. Minor damage involves exposure of bare earth on the hedge bank. The damage was considered severe where there was significant erosion of the bank or wall. If the degradation extended to greater than 10% of the length of the sample hedgerow it was considered as general, otherwise it was recorded as isolated. Bank degradation was similar for 2006 and 2022. With between 15% of banks severely eroded (16% in 2006) and 35% with minor damage (34% in 2006). Kildare hedges fared significantly better when it came to bank erosion than Monaghan hedges surveyed last year (2021), where 72% of hedges exhibited some degree of damage. Only 50% of banks/walls/ shelves had been damaged in Kildare hedgerows, which may be linked to a lower percentage of cattle farming, as poaching was the main cause of bank degradation in Monaghan hedges.



Figure 6.11.8.1. A severely degraded bank. KE1201.

6.11.9 Margins

The presence of a verge or margin was recorded for each sampled hedge. A verge / margin is a permanent strip of undisturbed vegetation. It refers to an uncultivated strip alongside the hedge. In grassland situations a verge is where the edge of the field is clearly not seeded, managed, or utilised like the rest of the field, such as where grazers are excluded by a fence. A fenced off area 1m in from a hedge would count as a verge, but a 1m strip left after mowing for hay/silage does not. Margins are particularly important for the ground flora component of the hedgerow, so any impact on the margin which could compromise ground flora was recorded; this included poaching and the use of herbicide. Both sides of the hedge were investigated and in County Kildare most hedges in the sample had a margin, 5% were noted as having no margin. 60% of verge margins were less than 1 metre. A 45% increase from 2006. Around one quarter of hedge margins were between 1-2metres, increasing by 16%. Only 7.5% of hedges had margins of over 2 metres.

On a positive note, 60% of hedges in 2006 were noted as having no margin. This number drastically reduced (with benefits to hedge health) to only 5% in 2022.

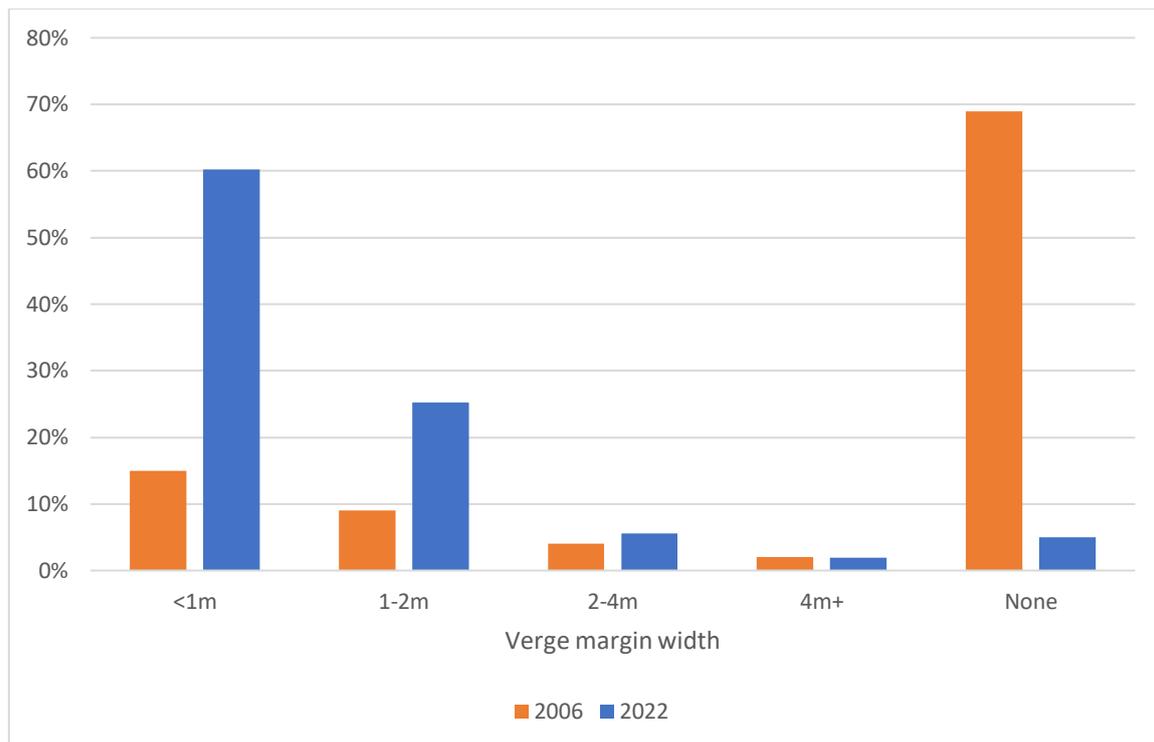


Figure 6.11.9.1. Comparing verge margin widths 2022 vs 2006.



Figure 6.11.9.2. A hedge with a margin of less than 1 metre. KE1509.

6.11.10 Vigour

With a view to long term viability an assessment was made of the overall vigour of the sampled hedges. This was assessed by examining the annual increment of new growth in the shoots of hedgerow shrubs. 10% of the sample was deemed to be of poor vigour and a further 12% of hedges were noted as having poor vigour in part. 49% of sampled hedges displayed average vigour, showing most hedges are in average health and are suitable for revival.

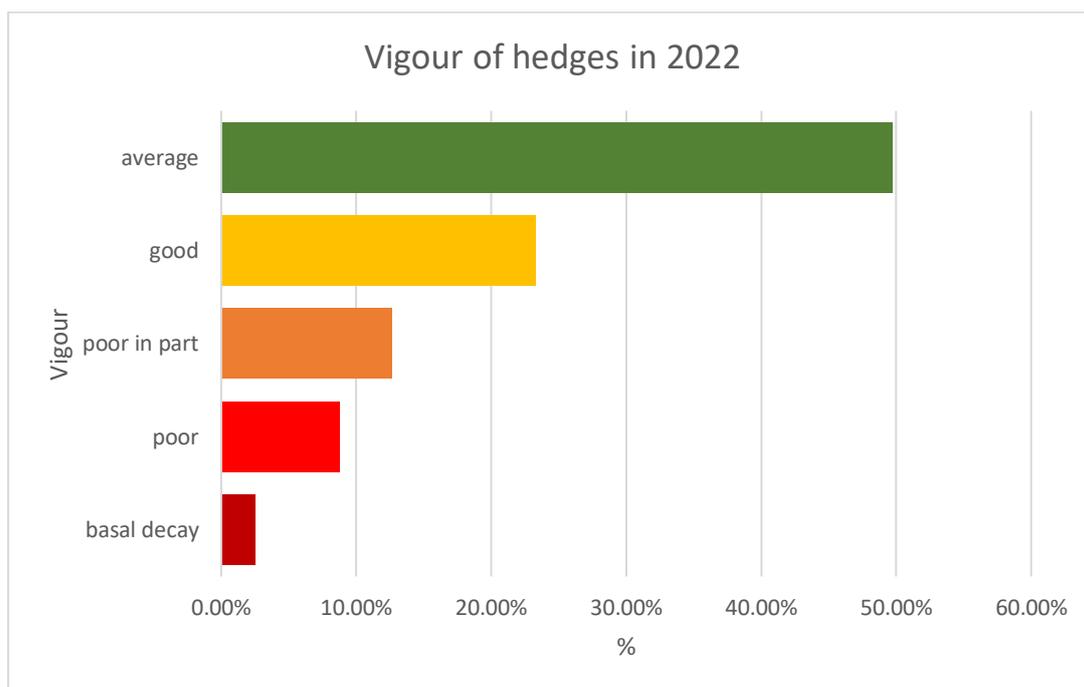


Figure 6.11.10.1. Vigour of hedges in 2022

6.12. Management of Hedgerows in County Kildare

The management of hedges affects the hedge structure, condition and sustainability which in turn impacts on functional, biodiversity and aesthetic values. The implications of management variables recorded have been presented in this section. 82.5% of hedges in County Kildare have received some degree of management intervention in the last 10 years.

None of the hedges sampled showed evidence of infill planting of gaps and none showed evidence of rejuvenation through laying.

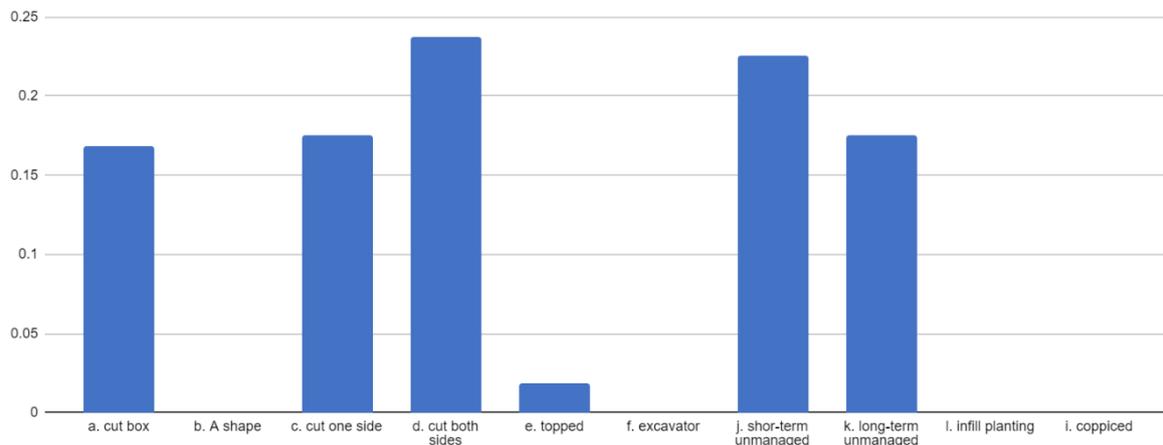


Figure 6.12.0.1 Management in 2022.

6.12.1 Fencing

The original function of hedges was to act as stock-proof barriers. The Hedgerow Appraisal System looks at to what extent the hedgerow network is being reinforced with additional fencing to maintain its stock retaining capacity. Each side of the hedge was assessed for the presence of fencing. The results are shown in Figure 6.12.1.1. This data was not part of the methodology in 2006. Just over half of hedges had no fencing in 2022. 21% of hedges had post and wire fencing (including barbed wire), 16% had sheep fencing, and only 8% used electric fences.

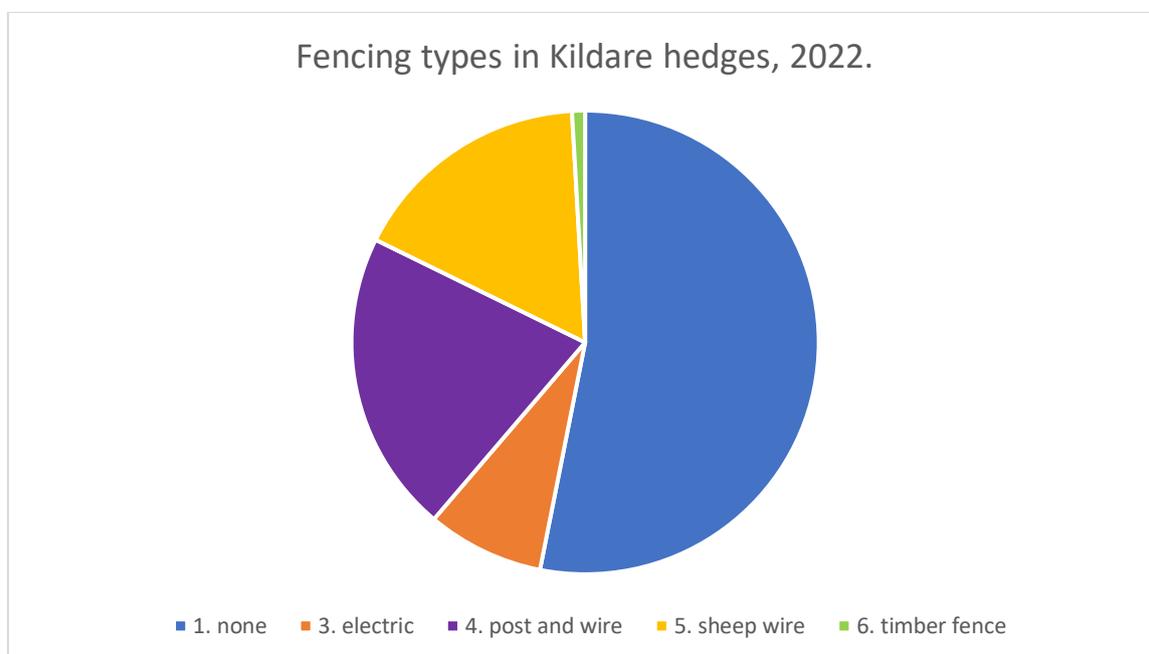


Figure 6.12.1.1. Fencing in 2022.

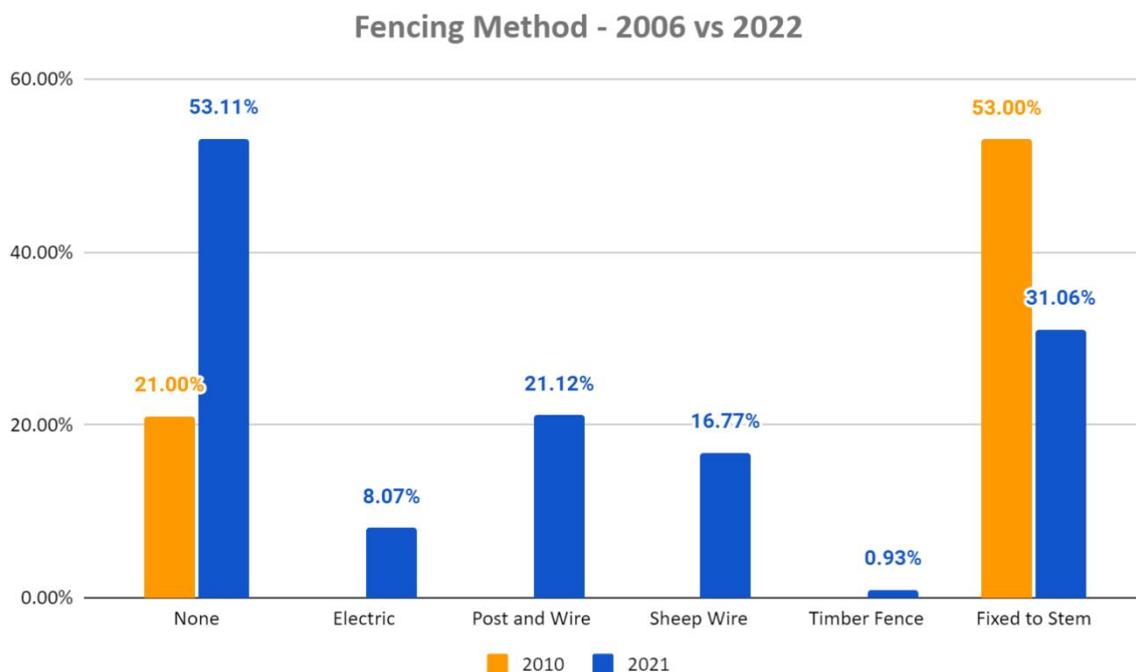


Figure 6.12.1.2. Fencing methods in 2022 vs. 2006.

6.13. Appraisal of Hedges in County Kildare.

A hedgerow sub-group of the Woodlands of Ireland (Wol) project developed a system using criteria based on data recorded to identify hedgerows of ecological, historical and landscape significance (termed Heritage Hedgerows). This hedgerow appraisal system was first piloted in County Monaghan in 2010. The system includes criteria for assessing the Favourable Condition status of individual hedges. In 2012, Wol secured funding from the Heritage Council to finalise the project, develop the database and publish the HAS. The Sub-Group further refined the methodology, reviewing the interpretation criteria to ensure consistency and compatibility between the various elements of the HAS. Compass Informatics were engaged to develop a database for the HAS.

6.13.1 Hedgerow Significance

The system is based on ranking the significance of hedges on a scale of 0-4 (0 being lowest) in five categories: Historical Significance, Species Diversity Significance, Structure, Construction and Associated Features, Habitat Connectivity Significance and Landscape Significance. A score of 4 in any category indicates a hedge of high significance (Heritage Hedgerow). Hedges can also be considered of high significance (Heritage Hedgerows) if they record a cumulative score of 6 or greater in the Historical, Species Diversity or Structural Categories, or a cumulative score of 16 or greater over the five categories. See Appendix 3 for scoring sheets. These hedges should be considered as high priority in terms of retention, management action, etc. Hedges recording lower scores may still be of value depending on the context. These results are published as standalone results due to the fact that the HAS was further refined in 2012, after the 2006 Kildare hedgerow survey. Modifications made prior

to the finalised publication in 2010 are not currently known to the consultants undertaking this report. Direct comparisons have been avoided to ensure incorrect assumptions are not made.

Approximately 37.9% of hedges in the baseline survey can be classed as highly significant or Heritage Hedgerows in 1 category. 86.4% can be classed as heritage hedges when considering a score of more than 6 across all categories. 26.1% of hedges scored as highly significant due to their historical context, while 4.3% were found to be significant due to their species diversity. Only 1.2% of hedges scored highly significant based on structure, construction and associated features. Another 8.1% of hedges were significant hedges based on their habitat connectivity value or landscape significance. This is due to the fact that that hedges had connections to designated sites (SPA, SAC, pNHA, NHA) in County Kildare.

Table 6.13.1.1. Percentage of baseline hedgerows scoring as Highly significant hedgerows.

% Baseline Hedgerows achieving Highly Significant Status	
Scoring category	Percentage (%)
Historical Significance	26.1
Species Diversity	4.3
Structure, Construction and Associated Features	1.2
Habitat Connectivity Significance	8.1
Overall >6 in categories history, species and structure	86.3

*See appendix 3 for significance scoring criteria.

For townland boundaries, more hedges were significant for species diversity (5.9%). 17.6% of those hedges were highly significant for their habitat connectivity and 100% were historically significant, based on their overlap with old boundaries on OS maps.

Table 6.13.1.2. Percentage of baseline hedgerows scoring as Highly significant hedgerows.

% Baseline Hedgerows achieving Highly Significant Status	
Scoring category	Percentage (%)
Historical Significance	100.0
Species Diversity	5.9
Structure, Construction and Associated Features	0.0
Habitat Connectivity Significance	17.6
Overall >6 in all categories history, species and structure	100.00

6.13.2 Condition Assessment

For a qualitative assessment of hedgerow condition, criteria have been set for desirable and undesirable attributes. These criteria are open to amendment based on further research. Hedgerows are ranked from 0-3 (0- unfavourable to 3- highly favourable) in 3 categories representing the Structural Variables, Continuity and other Negative Indicators. The higher

the recorded score, the more favourable the condition. A score of 0 in any category represents a hedgerow in Unfavourable Condition.

Table 6.13.2.1. Condition Assessments.

Conditions Assessment	Unfavourable %	Adequate %	Favourable %	Highly Favourable %
Structural Variable				
Height	1.2	23	22.4	51.6
Width	9.9	43.5	28.6	17.4
Profile	21.7	14.9	34.8	21.7
Basal density	23	19.9	31.7	25.5
Continuity				
% gaps	47.8	15.5	25.5	11.2
Negative Indicators				
Bank/Wall/Shelf Degradation	16.1		34.8	49.1
% ivy in canopy	35.4		34.8	49.1
Ground Flora (nutrient rich)	54.7			
Verge margin poached within 2 metres	10.9			
>20% evidence of herbicide use	5			
Unfavourable species (>10%)	16.8			

88.2% of hedges fell into the category of Unfavourable based on criteria which assessed structure, profile, margins and a number of other indicators. This means only 13% of hedges were found to be in adequate or favourable condition in Kildare in 2022. Figure 6.13.2.2. shows the main categories which resulted in a hedge scoring as unfavourable. No hedges scored highly favourable in all categories, only 1 hedge scored as favourable in all categories.

Nutrient richness was the prevailing cause of hedges scoring as unfavourable, and over half of hedges failed in this regard. 62% of hedges with tillage as the adjacent landuse were classified as nutrient-rich and 52% of hedges with agricultural grassland as their adjacent habitat were nutrient-rich. The second most common reason for scoring unfavourable was the % of gaps. Profile and basal density also contributed to this figure. Around 17% of hedges scored unfavourable due to the fact that >10% of woody growth volume comprised of unfavourable species e.g., Sycamore, Beech and Snowberry.

Hedges scored better when it came to height and bank/shelf/wall degradation.

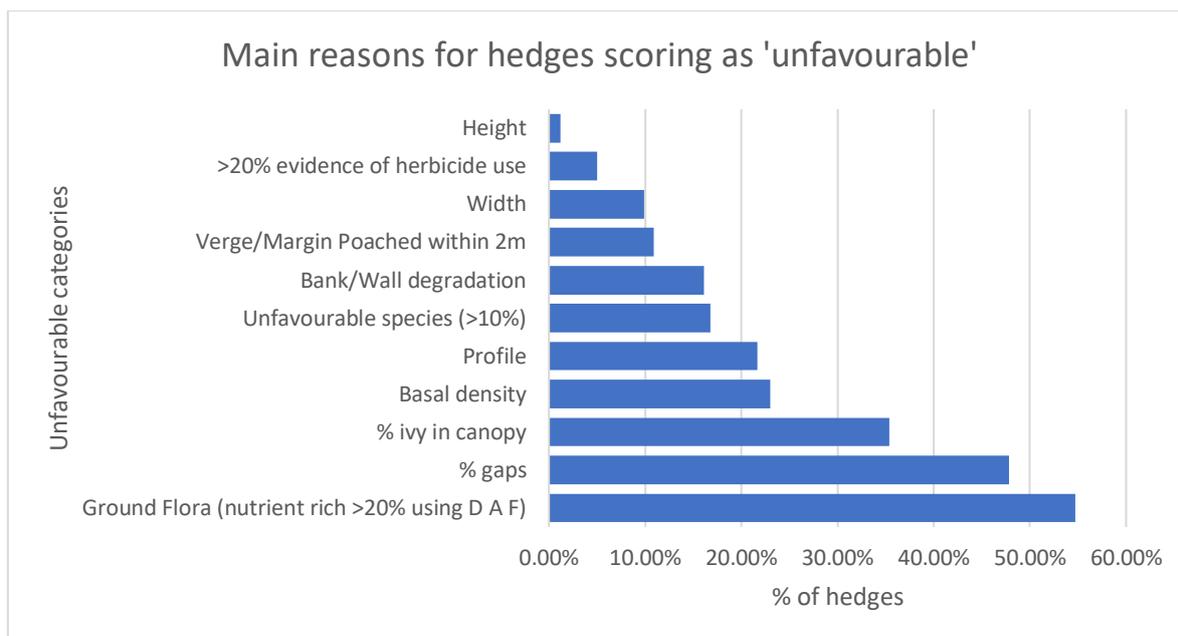


Figure 6.13.2.2. Main reasons Kildare hedges scored unfavourable.

7. Discussion

7.1 Main Points

This section will discuss some key and significant points from the results section. Remarks will be made on certain categories which have resulted in Kildare hedges failing to be deemed in favourable condition. Just 23% of Kildare’s hedges were considered in ‘Favourable’ Condition in 2006. This has decreased to 13% in the 2022 survey.

The total length of hedgerows recorded in 2022 was approximately 114.3km. In 2006 the same area contained 121.2km of hedgerow. This indicates that 9.6km of hedgerow has been removed over a 16-year period. Agriculture was responsible for over 41% of hedgerow removal since 2006. Conifer afforestation was also responsible for 41% of hedgerow removal/loss. Road and residential development were the next leading contributors to hedgerow removal at 11%.

The most prevalent issue that came to light in the 2022 survey, is that over half of Kildare hedges (54.7%) failed due to being nutrient rich (that is, having >20% nutrient rich species). This aspect was not focused on in the 2006 survey, though the following was stated on page 68 of that report: “Numerous sample hedges have high proportions of nettles (*Urtica dioica*) in the base of the hedge. This is generally an indication of high nutrient levels and can often be a result of slurry/fertiliser applications too close to the hedge”. When compared with the 2021 Monaghan hedgerow survey, which scored a significant 40% for nutrient rich hedges, Kildare was almost 15% higher than this again. Issues associated with the overuse of fertilisers will be discussed in Section 7.3. and issues surrounding loss of semi-natural grasslands in Section 7.6.

The prevalence of gaps is the second most significant issue addressed in the 2022 survey. Complete hedges were much more common in 2006 and made up 41% of the sampled hedges. Only 11% of hedges were noted as complete in 2022. Around 48% of hedges scored unfavourable in the category of gaps in 2022. In 2006, of the hedges surveyed, just 11% of hedges were recorded as having over 25% 'gappiness'. The implication for wildlife is severe and actions should be taken to prevent the decline of these vital wildlife corridors. The percentage of gaps in hedges is increasing and will be discussed in Section 7.4.

The unfavourable category for degraded margins (due to poaching/erosion and ploughing up to the hedge base) stands at 10.9% for Kildare, compared to 35.7% in Monaghan. This may be explained by the fact that Monaghan has a higher number of livestock, such as cattle on farms, compared with Kildare, which has significantly more sheep and tillage farming.

Degradation of banks/shelves/walls fared better in that around 84% scored Favourable or Highly Favourable. This is fairly similar to results from 2006. Again, this could possibly be due to the lower incidence of cattle in Kildare compared with other counties.

Around 17% of hedges scored unfavourable in Kildare due to the fact that >10% of woody growth volume comprised of unfavourable species e.g., Sycamore, Beech and Snowberry. This is a substantial figure and suggests that certain non-native species are taking their opportunity to fill gaps and emerge where our own native shrubs/trees are unhealthy, notably in the case of Snowberry, Sycamore and Fuchsia, for instance.

Ivy in the canopy has become an issue as just over 35% of hedges failed to meet favourable condition in this category. This may be related to the prevalence of Ash dieback disease, and other issues associated with the disease are outline in Section 7.2. Hedge profile was deemed unfavourable in almost 22% of hedges and some aspects of this will be laid out in Section 7.8. Other significant issues are deliberated such as hedge loss and removal (Section 7.7.), High Ecological value hedges (7.10) and the management (7.11) and creation (7.12) of hedgerows.

7.2 Species Composition

7.2.1 Shrubs

Hawthorn, Whitethorn, or 'Sceach gheal' in Irish, is a common feature of hedgerows throughout the country. Hawthorn (*Crataegus monogyna*) was found in 88.2% of hedges sampled in Co. Kildare, making it by far the most common shrub species in the county. Hawthorn is easily recognisable in the month of May when its thorny branches are smothered in white flowers; the Autumn brings an abundance of its famous red haws. It will grow in most soils, will take wind and coastal exposure and is an important species for wildlife. Supplying berries, supporting pollinators and housing nesting birds. It has tough, thorny branches which grow into a dense bush, stopping animals straying from fields. Blackthorn (*Prunus Spinosa*) is generally the second most common shrub after Hawthorn across Ireland, however the Kildare survey turned out to be different. Elder *Sambucus nigra* emerged as the second most common shrub (41.6%) after Hawthorn, which has taken over Blackthorn (34.8%) to be the second most common woody shrub in County Kildare hedgerows.

Elder is a native shrub which can grow up to a height of 10m in hedges. In May it is laden with creamy-white, fragrant flowers that attract pollinators, while in the autumn these form into dark berries, loved by birds. The flowers can be used to flavour drinks while the berries can be used for making preserves and wines. While bitter tasting, the berries are packed with Vitamin C. The Elder tree is immersed in Celtic folklore – it was considered sacred, lauded for its many uses, and was forbidden to be cut down. Blackthorn is often found growing in conjunction with Hawthorn (found in around 65% of Ireland’s hedges). It flowers during April, providing an earlier source of nectar. Similar to Hawthorn, Blackthorn has thorny stems which create a secure shelter for birds even after the foliage has dropped. The foliage makes a tasty treat for moth caterpillars and the blue sloes that emerge in late summer are a great addition to the diets of birds like the Thrush. Grown together, these shrubs provide for a diversity of wildlife. Young Ash (*Fraxinus excelsior*) emerging in hedgerows is counted as a shrub in this instance. It was the next most common shrub species at 31.7%. Following this was Wild Privet (*Ligustrum vulgare*) at a significant 21.1%, which suggests it appears to be naturalised in County Kildare hedges. Wild Privet is not a native Irish species for most of the country but is now considered native in certain counties, including Dublin, Galway, Tipperary and Waterford.

An interesting mix of other shrub species also emerged from the Kildare study. Gorse (*Ulex europaeus*) was recorded at 9.9%, Elm (*Ulmus spp.*) at 9.3%, Willow (*Salix spp.*) at 8% and Sycamore (*Acer pseudoplatanus*) at 7.5%. Gorse is an important species for wildlife but seeds freely and can readily colonise disturbed ground. However, it has a high nutritional value and can be kept in check with grazers when young. Elm, notably Wych Elm (*Ulmus glabra*) has been badly affected by Dutch Elm Disease over the years, caused by a fungus, *Ophiostoma spp.*, therefore it is positive to see Elm existing in relative abundance in Kildare hedges. Sycamores are non-native but have naturalised in Ireland over the centuries, since being introduced in the 1600s. They rapidly self-seed and thus can be considered quite invasive. It was noted that Holly (*Ilex aquifolium*) is present in relatively low numbers at 6.8%, which contrasts with the recent 2021 Monaghan hedgerow survey, where Holly exists in 41.1% of hedges, making it the third most common shrub there. It is one of Ireland’s few native evergreen shrubs, it is shade tolerant and grows naturally in the murky under-story of native broadleaf trees. It is interesting that native Plum (*Prunus domestica*) was recorded in 6.2% of the sampled Kildare hedgerows. Its early flowers are great for pollinators, while the sweet plums that come in late summer/early autumn are enjoyed by birds and humans! The invasive Snowberry shrub was found in only 3.7% of sampled Kildare hedgerows but this has increased from 2% since 2006. It often displaces native species by forming dense thickets by suckering. Its berries are poisonous to humans and provide little nutrition to birds.

The frequency of occurrence of numerous woody shrubs has declined noticeably in Kildare hedgerows between 2006 and 2022, especially in the case of Hawthorn, Elder, Blackthorn, Ash, Wild Privet, Elm, Willow, Sycamore, Holly, Hazel, Crab apple, Spindle and Beech. In some cases, this may be because the species originally recorded as shrubs have grown into trees in the intervening years and are recorded as such now. This may explain the change in frequency for many of these species, except for Blackthorn, Wild Privet, Holly and Spindle, which are not recorded as trees. Other explanations may be down to loss of species through continuous lack of management or removal. It is interesting to note that an increase in frequency of occurrence was recorded for introduced shrub species Snowberry, Fuchsia and Box hedge honeysuckle (*Lonicera nitida*). One explanation for this could be that these non-

native species take over where opportunities arise, e.g. where there are gaps or where existing native shrubs are unhealthy.

Species rich hedges are defined as those which contain four or more woody species on average per 30m strip. As explained earlier Roses (*Rosa spp.*) were omitted from the count, to maintain consistency with other counties. In 2022, only 18.6% of the hedges recorded in County Kildare had an average of four native woody shrub species or more in the sample 30m strip/s, which is a stark contrast to 2006, when 68% of hedges had 4 or more species and would be classified as species-rich by this logic.

At the same time, there was an overall increase in hedges containing only one shrub species, at 12.4%, which is 6% more than was recorded in 2006. Increased livestock, particularly of sheep, can lead to hedgerow damage and reduced diversity. Hedges should be fenced off during summer months. Neglect of management can lead to conversion into treelines and a reduction in shrub diversity. The use of incorrect machinery along with overcutting or cutting at the wrong time leads to poor structure which in turn can affect species diversity. The use of chemicals (including fertilisers, herbicides and pesticides) up to the base of the hedge leads to nutrient enrichment and a decline in diversity. Hedges which may have been species rich previously are being removed for several reasons, notably for conversion to forestry and to accommodate more intensive farming practices, especially in the case of tillage farming in County Kildare.

7.2.2 Woody Climbers

Bramble (*Rubus fruticosus agg.*) was recorded as being present in a total of 93.2% of the sample 30m strips in County Kildare hedges surveyed. This has declined slightly by 0.8%, since 2006, when 94% was recorded. Honeysuckle (*Lonicera periclymenum*) has declined by 4.2% in sampled Kildare hedgerows since 2006 (dropping from 11% to 6.8%). Wild Rose (*Rosa spp.*) has stayed in and around the same figure of 62% for both the 2006 and 2022 surveys.

Another woody climber, Ivy, often evokes polarised views due to its value for wildlife and sometimes destructive potential. It is often associated with trees in poor condition and therefore many assume it is the cause of declining health. The correlation here however may be merely opportunistic, as Ivy species make the most out of a thinned canopy cover and climb towards a source of light. Regardless of the reasons, where a large degree of ivy can be found in the canopy of a tree, that tree is often in danger of entering more rapid decline. Ivy can be a negative in the case of unhealthy trees, which now includes Ashes with Ash Dieback disease. Unhealthy Ash trees laden with Ivy are in danger of being toppled in strong winds, and as adverse weather events are predicted to increase in frequency in the coming years, they can pose a major health and safety risk.

7.2.3 Trees

Tree species diversity has actually increased by 6% since the 2006 survey, which seems logical due to an overall decrease in hedge management. Ash is the main tree species in 50% of Kildare hedges. Hedges which are dominated by Ash that is suffering from Ash dieback

have a reduced canopy cover, allowing other tree species to take hold. This is especially the case with Willows in Kildare hedgerows, with an increase of 8% in *Salix spp.* trees since 2006. This increase in tree species is followed by Hazel at 4% (from 0), Sycamore at 3%, Aspen at 3%, Rowan at 2% (from 0) and Hawthorn and Cypresses at 1%. As also recognised in the 2021 Monaghan survey, it is possible that the native Willow will take the place of Ash across the county of Kildare more readily than the non-native Sycamore. Like Hazel and Rowan, Field Maple, Copper Beech, Eucalyptus and Red Maple were also recorded as trees for the first time, up 1% each.

7.3 Ash Dieback

Ash Dieback will likely have the larger negative ecological impact on Irish hedgerows over the next decade than any other impact source. It is believed that Ash dieback will lead to the eventual loss of up to 30% of Irelands mature native trees. Ash occurred in over half of all hedgerows surveyed across the county. Anecdotally Ash is also the most commonly observed tree in all hedgerows in the county. All Ash trees recorded showed some signs of this disease. The amenity, landscape and recreational impacts of Ash dieback are yet to be fully understood. Changes to the look and feel of protected scenic areas and landscapes will result from the loss of tree cover. Fallen trees and the risk of wind thrown branches and tree limbs damaging property or injuring people will all need to be considered by those responsible for trees both in public and private areas.

Landowners, public authorities and farmers are required to remove effected Ash trees under the Roads Act 1993. This states that landowners must ensure that a tree, shrub, hedge or other vegetation on the land is not a hazard or potentially hazard to persons using a public road. Dying Ash with a heavy infestation of ivy in the canopy or heavy upper branches are most at risk of being toppled during adverse weather conditions. There are currently calls from bodies such as the ICMSA for a government scheme to support farmers to remove dead or infected trees but as of yet none have been implemented.

Society wide we need to understand the ecological implications of the loss of our Ash and make appropriate plans and guidelines for the sustainable and ecologically sound removal of dead and dying Ash and also for the replacement of Ash with other appropriate species.

Dead and decaying trees are a vital component of a properly functioning ecosystems and play a key role in sustaining biodiversity and soil fertility. A wide range of plant and animal species depend on dead or dying wood for refuge and as a food source. Instead of clear felling trees from their base, trees can be cut from the top down, removing all possible wind sheer risk and leaving a stable trunk to rot away over time. This may also help reduce some of the visual impacts of clear felling. An example of this is shown in figure 7.3.1.



Figure 7.3.1. Pruning down of a 30m veteran Ash. 5m of trunk retained for biodiversity

Appropriate replanting and encouragement of existing hedgerow trees are also likely to be important to help offset Ash dieback. Allowing other trees in a hedgerow to grow out will be the quickest and cheapest means to replace lost trees. This will require the identification of other Sycamores, Willows, Oaks, Alders etc already growing in the hedgerow and avoiding hedge cutting around these trees. Where significant gaps exist in a hedge replanting with other native species, particularly Oak would be most appropriate.

7.4 Nutrient Rich Hedges

Wildflowers are generally more abundant in low fertility soils. When soil is rich in highly available nutrients, particularly nitrogen and phosphorus many flowering plants find it difficult to compete with grasses and nutrient loving plants such as Nettle, Thistles and Cleavers. Nitrogen is relatively easy to deplete from soils if no fertiliser is added. It is very 'mobile' and easily taken up by plants and grasses. It is also easily flushed from soils into freshwaters and thus regulated by EU Law through The Nitrates Directive (91/676/EEC). The most difficult soil nutrient to strip is phosphorous, as it is taken up by plants in relatively small quantities and can easily become locked up in inorganic compounds in the soil.

Nutrient-rich species were overwhelmingly dominant in Kildare hedges. Nettle (77%) and Cleaver (62%) dominated hedge ground flora layers in over two thirds of all hedgerows visited, at the detriment of other species: Common hedgerow species such as Foxglove (1%), Woundwort (7%) and Speedwell (11%) were only present in low numbers. This is likely due to a combination of changes in land use towards more intensive farm management and also the conversion to tillage. In fields under tillage overgrown nutrient rich understories were common. An absence of grazing, to remove overgrown vegetation; continual tilling of the soil, encouraging weed species germination and the application of highly available fertilisers, all encourage the development of species like Cleaver and Nettle. Once these species become established the volume of seed they produce means that their proliferation over long periods is almost guaranteed.

This overuse of fertilisers has negative impacts on water quality, causing the over-enrichment of freshwater bodies. Hedges have long been hailed for their role as buffer vegetation, protecting these water sources. However, ground flora diversity can suffer the negative effects of this over-enrichment. It is very important when spreading fertiliser, to shut off the disc on the hedgerow side to prevent fertiliser from reaching the field margin, to use direct drilled fertilisers where possible and to manage hedgerow verge habitat through annual cutting. Teagasc has launched a study to examine the long-term trends in fertilizer use on Irish farms. The study is based on an analysis of over a decade's worth of data collected by the Teagasc National Farm Survey. It covers the years 2005 to 2015, a period when Ireland has been bound by the EU Nitrates Directive regulations governing fertilizer use (Buckley et al., 2020). This study indicated a drop in fertiliser use of around 11-16%. The impacts of agri-environmental scheme membership on fertilizer usage are also evident in the study as fertilizer application rates on grassland were on average 36% lower for farms participating in agri-environment schemes. This highlights the importance of these schemes in shaping farming practices.

7.5 Hedge structure and construction

7.5.1 Height and Width

Studies have found that taller, wider, denser, and structurally more intact hedgerows are preferred by most wildlife, including small woodland plants (Hegarty and Cooper, 1994; Corbit and Marks, 1999; Murray 2001); invertebrates (Burel, 1989), and hedgerow birds (Chamberlain et al, 2001, Arnold, 1983, and Lysaght, 1990). Average height and width characteristics were relatively favourable in Kildare hedges, with the majority of hedges being between 1.5 and 4 metres tall. Around 53% have an average height greater than 2.5m and 39% are over 5m in height. This contrasts with the 2006 survey, when only 23% of hedges were recorded as >4m in height. While hedge width is still relatively favourable of the hedges surveyed in Kildare, hedges are more likely to be narrower (between 1-2m) in 2022 than in 2006, when the most common hedge width was 2-3m. Maintaining hedges below 1.5m in height is not considered a desirable feature from a biodiversity perspective and has been shown to be least beneficial to nesting birds (Foulkes, 2007). Roadside hedges are often seen to be kept at this height, and many of the roadside hedges which were seen during surveying that were cut back out of season were cut to around 1.5m. Although cutting is necessary to keep a hedge thick, if it is cut back to the same point every year it will produce fewer flowers or berries. Hedges should be cut just once every two or three years, each time letting the hedge grow out and up a little. Larger hedges, with greater total areas of foliage, will generally support larger populations of phytophagous insects. This should, consequently, have benefits for species higher in the food chain. And research indicates increasing hedgerow height correlates positively with bird species diversity (Arnold, 1983; Lack, 1987) and taller hedges provide more shelter for farm animals.

7.5.2 Gaps

A large percentage of hedges in Kildare had over 50% gaps. Complete hedges were much more common in 2006 and made up 41% of the sampled hedges, compared with only 11% of hedges noted as complete in 2022. Hedges with >50% gaps have increased by 10% since

2006. This shows there is plenty of opportunity for infill planting of gaps across the county. Infill planting or coppicing is preferable to the planting of new hedgerows and should be prioritised in agri-environmental schemes. Whilst tall old hedges provide an excellent nectar source from flowers and perhaps ivy and can be an important source of fruit, they will ultimately become unstable and start to collapse. It may also be the case that they turn into a line of trees if trees species are able to colonize. These lines of trees can be important for bats and larger tree nesting birds, but a balance has to be found between losing the rich habitat of a dense hedge through neglect and allowing some hedges to develop into trees. Close interwoven branches in hedges provide safe nesting and roosting places for small birds like Thrushes, Finches, Robins, Hedge Sparrows and Wrens, while open hedges tend to attract Magpies, Crows and Pigeons (Hickie *et al.*, 2004). Species such as Holly are very good hedging plants, forming compact dense bushes that give excellent protection during the winter.

7.5.3 Profile

In the 2022 Kildare hedgerow study, 72% of hedges were noted as having some degree of translucency. 23% of hedges were classed as being open / translucent, an increase of 15% since 2006. However, gaps were not taken into account and hedges may have scored as dense regardless of gaps. 22% of sample hedges were designated as dense, the same as recorded in 2006. As these categories are subjective, shifting baseline syndrome should also be taken into account, whereby hedges are classed as dense merely as they are comparatively denser than others sampled (Guerro-Gatica *et al.*, 2019).

Around 12% of sampled Kildare hedges were classified as 'relict' in 2022, which is double that of 2006. A relict hedge is where individual shrubs have grown up into single stem of mature trees with full canopies and lots of gaps in between. It has lost its stockproof function and is of little value to wildlife at ground level. However, this hedge can still serve as a fantastic landscape feature and can be full of flowers for bees and fruit for birds. These 'relict' hedgerows are very important wildlife refuges and may be best left alone and preferably fenced to exclude livestock. Advice from Teagasc is not to attempt rejuvenation and not to top such hedges as they may not survive (Teagasc, 2020). Remnant hedges have no consistent profile and are indicated by a broken line of mature or senescent trees. 11% of hedges were designated in this category for the 2022 Kildare survey, which is an increase of 6% on the 2006 survey. It is important to note, however, that remnant hedges still have much potential for rejuvenation!

7.5.4. Hedgerow Margins and Banks

The hedgerow margin is a strip of uncultivated, grassy vegetation adjoining a hedge, which can be rich in flowering plants if protected from excessive grazing, fertiliser, slurry or pesticides. This grassy strip is very important for the wildlife potential of a hedgerow. One of the most visible flowering plants, especially on roadside verges in spring, is Cow parsley. In the same family are Hogweed and Wild angelica, which tower above the grasses in the spring and summer. They support a wide range of wildlife, namely pollinators. Nettles, for example, are the food plant for caterpillars of butterflies such as the Peacock and Small Tortoiseshell, while grasses support the caterpillars of the Meadow Brown and Speckled Wood. Seed eating birds such as the Goldfinch feed on small seeds in Thistles and Teasels. Grasses along the

base and margins give cover for small mammals such as Wood Mice and Pygmy Shrews and food and cover for a host of invertebrates. Tussocky grasses in hedge margins are an ideal nesting spot for bees (All-Ireland Pollinator Plan, 2016).

Poaching by livestock can remove grass and vegetation cover on these margins if left unchecked. This can make land more susceptible to runoff, erosion and in severe instances may lead to bank collapse, especially during periods of wet weather. When banks are damaged, root systems are exposed to damage, drying and infection with consequences for overall health. Increased field runoff can take soil particles, nutrients, pesticides and faecal bacteria (harmful to human and livestock health) into watercourses.

In the 2022 Kildare hedgerow survey, 15% of hedges were recorded as having severe bank degradation and 35% with minor degradation (in other words, 50% had some form of degradation), which is similar to 2006 figures. While these figures are worrying, they fare better than other counties. For instance, 72% of hedges in the 2021 Monaghan hedgerow survey displayed damage to banks. This is probably linked to the greater incidence of heavier livestock present in fields causing poaching, (e.g. beef cattle and dairy cows) in Monaghan than in Kildare, where the main farming types are sheep and tillage.

In terms of hedge margins, just 5% of Kildare hedges in 2022 were noted as having no margin, while the figure was 60% in 2006, which suggests an improvement. Also, around one quarter of hedge margins were between 1-2metres in 2022, which is an increase of 16% since 2006. Hedgerows with a 1-2m, fenced off margin which separates the hedge from farmland is considered optimum for biodiversity. Selective grazing of livestock on these margins has huge benefits to hedgerow health but should be limited to certain times of the year. However, a significant 60% of verge margins were less than 1 metre in 2022, which is a 45% increase on 2006. Only 7.5% of hedges had margins of over 2 metres. The tendency to maximise land use has led to many field margins becoming smaller or non-existent.

7.6 Disappearance of Semi-natural Grasslands and an Increase in Nutrient-rich Species

The term 'semi-natural', when applied to grasslands, implies that it hasn't been altered by human agricultural or pastoral activity, generally grazing or mowing, but without the input of fertilisers or reseeding with high-yielding species such as *Lolium perenne* and *Trifolium repens*. 65% of the land surface in Ireland is farmland and given that this farmland is predominantly pasture-based, the ecological status of semi-natural grasslands is particularly important for biodiversity. The majority of the remaining areas of semi-natural grassland within Ireland owe their existence to either a continuation of traditional extensive farming practices by some landowners, conservation measures, or edaphic and topographical conditions that make them unsuitable for fertiliser application, reseeding or drainage. In grasslands with high fertility, a small number of very competitive and rapidly growing species take over, excluding many other less competitive species. In soils where nutrients are restricted these plants do not gain a strong foothold, giving other species a chance to establish themselves. A wide range of flowering plants attracts a wider range of invertebrates and a wider range of animals which prey upon them.

In 2006 15% of adjacent lands recorded were classified as Semi-natural grasslands by 2022 this had halved to 7.7% indicating a further loss of areas of high biodiversity and replacement with intensively managed grasslands or arable crops. This again is a reflection of the intensification of land management throughout the county. Healthy grasslands can store carbon, maintain good soil structure and well-managed grasslands, reduce waterlogging and the impacts of droughts, and at the same time supplying a food source for livestock and wildlife (Farming for Nature, 2010).

Results-based agri-environmental schemes aim to create a new market for the ecosystem services produced by farmers who manage semi-natural grasslands and other habitats and species. Payment are awarded to the farmer depending on the condition of the biodiversity maintained, rather than for carrying out specific management actions, as was the case with traditional agri-environmental schemes. These will be applied through the New CAP Payment Scheme and the ACRES which will replace GLAS (formally REPS). Further detail on these schemes is provided in section 7.12.

7.7 Impacts of Hedge Removal and Hedgerow Loss

The total length of hedgerows recorded in 2022 was approximately 114.3km. In 2006 the same area contained 121.2km of hedgerow. This indicates that 9.6km of hedgerow has been removed over a 16 year period. Worryingly Kildare has a hedgerow removal rate which is almost 5 times the national average. This may in some ways be unsurprising given Kildare's proximity to Dublin, the high-quality agricultural lands and the prevalence of afforestation over the period, particularly around worked and formally worked bogs.

These figures only provide a portion of the picture and do not account for hedgerow condition as this cannot be mapped at this scale. Hedgerows which have become relict and remnant also increased in our survey area by 6% over this period. Another major contributing factor which this figure does not capture is the impact and extent of severely box cut hedgerows. Hedges which are cut to less than 1.5m and cut on an annual basis are effectively redundant from a biodiversity perspective and may also be considered removed.

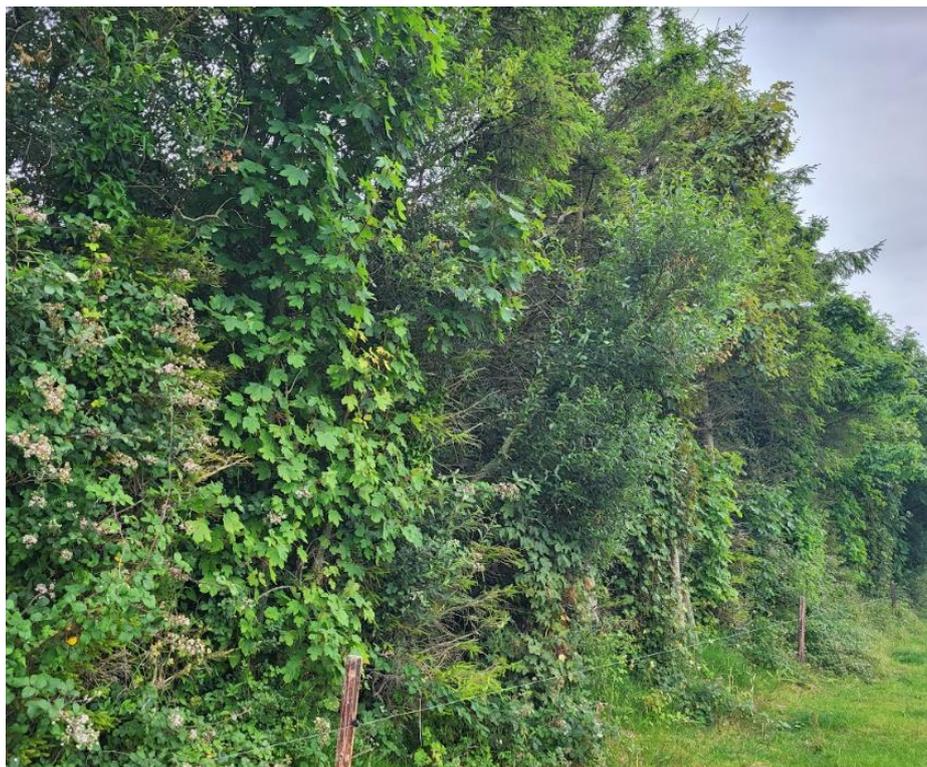


Figure 7.7.1. A hedgerow in KE10 which has been absorbed by forestry. No margin has been left between the plantation and the hedge and non-native conifers are taking over the canopy and shrub layer.

7.8 Potential High Ecological Value Hedgerows

100% of townland boundary hedges were classed as Highly Significant compared with 86.3% in the baseline survey. This was primarily due to the fact that townland boundary hedges, by definition, are Historically Significant. 5.9% of TB hedges were highly significant for species richness compared to 4.3% for baseline hedges. There were 9.5% more TB hedges classified as significant for habitat connectivity than baseline hedges.

Overall, there is a very slight increase in species diversity in the woody shrubs category for townland boundary hedges. Baseline hedges averaged 2.45 species in a 30m strip while TB hedges averaged 2.47. While all hedgerows are of great importance in terms of historical and ecological significance, townland boundary hedgerows tend to display more vegetative species diversity in other counties, however, this is only fractionally more in Kildare. In terms of heritage, townland boundaries date back to medieval times, and even as far back as the Bronze Age. These hedgerow types were often planted on prominent banks and ditches and contain a more diverse range of species. Townland boundaries often differ in species and structure than typical farmland boundaries, and the latter were established primarily between the 17th to 19th Centuries under a series of Enclosure Acts (Foulkes and Murray, 2005). As townland boundaries have been in place for longer than most, many of their original features still persist. According to Foulkes and Murray, 2005, Townland boundary hedgerows tend to be older than other hedgerows and may therefore be richer in species. This was found to be true for the shrub layer but only by as small amount for native shrubs. When considering all shrubs (which includes Privet) the difference was slightly more (+0.16).

Townland Boundary Hedgerows from other County Surveys Hedgerow surveys from other counties suggest that townland boundary hedgerows have more species diversity, including the Louth and Galway studies. For instance, Townland hedgerows across County Galway had a significantly higher species richness than other hedgerows in east Galway, and consequently recommendations were made on how best to conserve Galway's hedgerow heritage in their 2007 report. This also correlates with the 2010 & 2022 Monaghan Hedgerow Surveys. Both Monaghan surveys also included a greater proportion of townland boundary hedgerows than others, such as those from Donegal, Mayo and Louth, meaning there is a more substantial body of data gathered for the county over the last two surveys than for others.

Heritage hedgerows are those of historical, ecological and/or landscape significance. In essence, townland boundary and native woodland linked hedgerows surveyed are notably more species rich than baseline hedgerows, considering the shrub layer only for TB hedges, which makes them more important in terms of ecological diversity. They also have historical significance which is a major reason for their classification as heritage hedges.

7.9 Hedgerow Management

Hedge management is key for the long-term sustainability of our hedgerows. Management or a lack of management can impact a hedgerow's structure, continuity and functionality both as a stock proof barrier and as an ecological resource. This survey recorded a decrease in hedgerow management and an increase in hedgerow degradation. Hedge gaspiness increased both in the percentage of gaps in each hedge and also in the size of hedgerow gaps. An increase in remnant, relict², overgrown and top-heavy hedges was observed since 2006. Box cut hedge cutting also increased in this period.

A general trend towards more treeline type linear corridors and away from hedgerow characteristics was observed. Hedgerows were generally noted as losing basal density and becoming opaque and open in character. This all indicates a move away from traditional hedgerow management and a decreased reliance on hedgerows for stock proof fields boundaries. Flailing is now almost the exclusive hedgerow management technique employed. This is unsurprising as it provides the cheapest means of managing hedge growth. This may also in part be due to the increased number of contractors cutting hedges to maintain cashflow during the quieter winter months. Flail cutting when carried out with consideration can produce positive results for both hedgerow function and biodiversity. However, in most instances where box cutting was noted this was carried out in an unsympathetic fashion. Depending on the function of the hedgerow and its requirement for providing shelter or as a stock proof fence, under management is likely to be a better result for biodiversity than over management.

If a single strand electric wire or post and wire fence is used, the need for a stock proof hedge is removed. Top heavy breasted hedgerows are more similar to treelines or linear woodlands

² A remnant hedge is generally indicated by a (broken) line of mature or senescent plants in tree, rather than shrub form. Almost invariably it has a high percentage of gaps, although it may have bits of shrubby growth (including Brambles) along its length. Once the remains of a hedge covers <25% of the boundary, it is no longer classified as a remnant hedge and instead is classified as relict hedge.

and are likely to allow more opportunities for plants to flower and fruit than low box cut hedges. Greater light into the ground layer can also encourage spring flowers.

On most dairy and beef farms today, hedgerows are fronted with an electric fence or post and wire fence. To achieve the greatest benefits from biodiversity on the farm enterprise, these fences should be kept at least 2 meters from the base of the hedgerow. (Payments are now available for this through ARCES). This creates a grassy verge which is important for predatory invertebrates, pollinators and small mammals. Without management these areas would become scrubby, and this scrub would begin to push on the fence and into the field. In stock-based systems this area and hedge should be made available to stock to graze toward the end of the summer and into autumn. This allows new growth to be grazed back or trampled into the ground, keeping the ground clear for next year's grasses and flowering plants. In stockless systems or where this cannot be achieved, a flail can be used to cut the grassy verge and to face the hedge. This should only be done up to 2 meters or no more than half the hedgerow's total height.

Key summary point for those managing hedgerows:

- Hedge cut on a rotation of every 2 – 4 years
- 1-3 wide verge maintained as a separate habitat area
- Hedge cut and maintained at a minimum of 1.5m but incrementally increased
- A-shaped profile, with a bushy top if the hedge is tall and overgrown
- Mature trees scattered throughout the hedgerow
- **Incremental cutting is key.** This is cutting slightly (10cm/cut) higher and wider at each cut³. This means 2-year-old⁴ wood is always available for fruiting and flowering and it also encourages hedgerow density.

Key to a healthy undermanaged hedge is however stock exclusion. Stock with unfettered access to a hedgerow will degrade the understory flora and impact upon the health of shrubs and trees, as seen in hedges around the Curragh.

³ Hedgerow growth doesn't have to be indefinite. At 10cm/ cut on a 2 year rotation that will mean it will take 20 year to increase by 1m.

⁴ Most of our hedgerow species will not flower or fruit on 1 year old growth. Cutting incrementally wider at each cut ensures that there is always 2+ year-old wood available for fruiting and flowering. .



Figure 7.9.1. A knuckled hedge in KE0909.

7.10 Creation of New Hedges

A recent survey from the European Commission's Joint Research Centre also found that planting hedgerows is one of the best ways to combat ecosystem fragmentation in intensively farmed landscapes. This is important to ensure the continued pollination of crops (Dondina et al., 2018). Designing and planting a new hedgerow should be done with consideration of the long-term outcomes and with the purpose of the hedgerow in mind. Hedgerows should be sighted based on how stock are moved around the farm or with consideration for machinery access. The following steps should be followed for rapid growth and establishment and for the greatest benefits to biodiversity. If being planted for biodiversity as the main objective, try and achieve at least 2 metres in width with 2 metres of a grassy verge on at least one side.

Ground preparation

Ground preparation should be carried out prior to tree establishment. The ground should firstly be dug up with a digger or ploughed and harrowed to break up the soil. This creates the best conditions for rapid root growth. If digging a drain, consider creating an open drain instead of a piped drain with the hedge then established on a bank made from the excavated material.

Mulching

Add a mulch material of old straw, wood chip or mature compost. This will help insulate the trees from drought conditions, introduce a range of fungal and invertebrate species to the area and act as a slow-release nutrient source. Avoid farmyard manure and hay as the former is

too high in nitrogen while the latter will introduce too much grass into the area. If possible, ground preparation and mulching should be done in late summer or autumn with trees, then planted in the winter or the following spring.

Planting

Plant a diverse range of trees and shrubs. Aim to plant at least 10 species including Hawthorn, Oak, Hazel, Wild Cherry, Crab apple, Holly and Guelder Rose. Plant density is an important consideration. Aim for at least 3 trees/m². This encourages competition between the trees above ground and the establishment of interconnected root systems below ground. To further add to the diversity, native wildflower seed can also be spread around the trees and along the verges at establishment.

7.11 Agri-Environment Schemes

ACRES (Agri-Climate Rural Environment Scheme) is Ireland's new agri-environment climate scheme proposed as part of Ireland's draft CAP Strategic Plan. This new €1.5 billion agri-environment scheme to help address biodiversity decline while delivering an income for farmers.

ARCES provides a 3-tiered system that includes basic payments for results-based actions in priority areas that include: Natura 2000 sites, sensitive waterways and catchments and areas where semi-natural grasslands and on all other farms. This scheme provides for a number of annual payments for a range of Hedgerow and grassy verge maintenance and establishment practises including⁵:

Table 7.11: Hedgerow and grassy verge actions and associated payments under the new ACRES Scheme.

Action	Margin width	Payment €per metre/year	€per unit/year
<i>Grass margin arable</i>	3m	0.38	
	4m	0.51	
	6m	0.76	
	8m	1.01	
<i>Grass margin grassland</i>	2m	1	
	3m	1.1	
	6m	1.37	
<i>Coppicing of Hedgerows</i>		2.87	
<i>Laying of Hedgerow</i>		5.47	
<i>Planting a new hedgerow</i>		5.29	
<i>Tree Planting</i>			6.21

This scheme is open to applicants from October 2022 with the first payments likely to be made available to farmers from early 2023.

⁵ gov.ie - Agri-Climate Rural Environment Scheme (ACRES) (www.gov.ie)

8. Recommendations

A list of recommendations below are proposed below based on the results of this survey and in light of current best conservation practise.

- All relevant stakeholders need to commit to eliminating the cutting of hedges during the period laid down in the Wildlife Amendment Act (2000) (1st March to 31st August) except where absolutely necessary for safety reasons.
- The public should be encouraged to report damage to, and removal of, hedgerows, including out-of-season cutting.
- Stakeholders should ensure all relevant staff (and any contractors used) have the necessary skills and data sources to implement or evaluate best practice hedgerow conservation.
- Kildare County Council should produce and adopt a 'Hedgerow Conservation Policy'.
- Strategic objectives concerning hedgerows and trees in the Monaghan Biodiversity & Heritage Strategic Plan - 'Hedgerows & Trees' and 'High Nature Value Farming' need to be highlighted, promoted and considered by all relevant parties.
- The concept of "Heritage Hedgerow" should be introduced for hedgerows which have notable historical, structural, or species composition characteristics. This should be taken into account when planning infrastructure and could be incorporated into new developments and landscaping.
- Local groups and individuals should be encouraged to carry out local hedgerow surveys
- National legislation and policies should be put in place to protect hedgerows and there is a need for stricter monitoring in County Kildare, including:
 1. Wildlife (Amendment) Act 2000 and Heritage Act 2018, which stipulate that hedgerow must not be cut between 1st March and 31st August (unless in specific circumstances such as road safety), to avoid harm to wildlife.
 2. EIA (Agriculture) Screening Regulations 2011 are adhered to for removal of large sections of hedgerows for farming purposes across County Monaghan. Monaghan is the only county to date which has no record of applications for EIA screening under these regulations.
 3. CAP Cross Compliance requirements, which mean that since 2009, hedges cannot be removed unless a replacement hedge of similar length is planted at a suitable location on the holding in advance of the removal of the hedge. If farmers have removed hedges since 2009, they can be penalised any stage.

4. Nitrates Derogation, where a Biodiversity Option includes either leaving at least one mature blackthorn/whitethorn tree within each 300m of hedgerow, or maintaining hedgerows on a three-year cycle.
 5. Liases with the The Forest Service of the Department of Agriculture, Food and the Marine on forestry requirements in relation to a habitat setback (5 metres minimum).
- A review of roadside hedge cutting practices, in regard to the necessity and the manner in which hedges are cut annually.
 - Local authorities already manage roadside verges, but this should be extended hedgerows abutting roads. While local authorities have a responsibility to road users and their safety regarding hedgerow maintenance, more effort must be made to ensure best practise is exercised and only experienced hedge cutters are contracted.
 - Local advertising campaigns and projects (e.g. with community groups & schools) to highlight the importance of hedgerows and their benefits for nature, farming and as beautiful landscape features.
 - Guidelines should be produced for planners and road engineers dealing with hedgerows in planning applications.
 - The use of locally provenanced native plant species should be specified for any hedgerow planting (including hedgerow trees). Encouraging a diversity of native hedge species consistent with the findings of this survey is recommended.
 - A number of showcase sites of best practice covering different aspects of conservation and management should be developed around County Kildare. This might be done in conjunction with the Hedge Laying Association of Ireland.
 - A repeat hedgerow survey for the county should be carried out no later than 2032.

9. Conclusion

This Hedgerow Appraisal Study assessed the condition of a representative sample set of hedgerows within the county against baseline data collected in 2006. This study found that 88.2% of hedgerows surveyed were of unfavourable condition based their structure, continuity and a number of other unfavourable indicators. As such on 13% of hedges were found to be in adequate or favourable condition. Nutrient richness was the prevailing cause of hedges scoring as unfavourable. The second most common reason was the % of gaps. Profile and basal density also contributed to this figure. Around 17% of hedges scored unfavourable due to the fact that >10% of woody growth volume comprised of unfavourable species e.g., Sycamore, Beech and Snowberry. The condition of hedgerows highlights how the changing role of hedgerows within a farming context is leading to their degradation and disappearance.

The intensification of farming practices, the use of post and wire fencing and the lack of appropriate management practises are all contributing to the degradation in the quality of this natural and cultural resource. Changes in management are also altering the structural and floristic features of the county's hedgerows. Long-term unmanaged hedgerows have become commonplace with hedgerows becoming more like treelines and linear woodlands. The full implications of this for hedgerows as biodiversity corridors is difficult to predict with possible benefits for some species including birds and negative implications for others like small mammals and ground flora. 18.6% of hedges classified as species-rich for woody shrubs in 2022 which was the same in 2006. Hedgerows were not surveyed for ground flora in 2006. However, species diversity was low and often dominated by species associated with nutrification that out compete many smaller flowering plants. The average number of target herbs per 30m strip was 1.4. For comparison, the average number of target herbs in Monaghan hedges (found in the HAS study carried out in 2021) was 2.42 species.

Unfortunately, Ash Dieback is likely to have a significant impact on the proportion and volume of mature woody species in hedgerows over the next decade. Ash was recorded in 50% of all hedgerows with signs of the disease found on all Ash trees recorded. The impact of the loss of mature Ash from our hedgerows, treelines and woodlands will have far reaching consequences for biodiversity in rural Irish landscapes. Targeted appropriate responses are required to manage Ash dieback at all levels from individual farms to nationally, to ensure the worst of the impacts are mitigated. Key for this is the appropriate removal (and retention, where appropriate) of dead and dying Ash in the interests of public safety. Planting and allowing new hedgerow trees to develop is key to ensuring the short and medium-term impacts of this disease do not become long-term and permanent effects.

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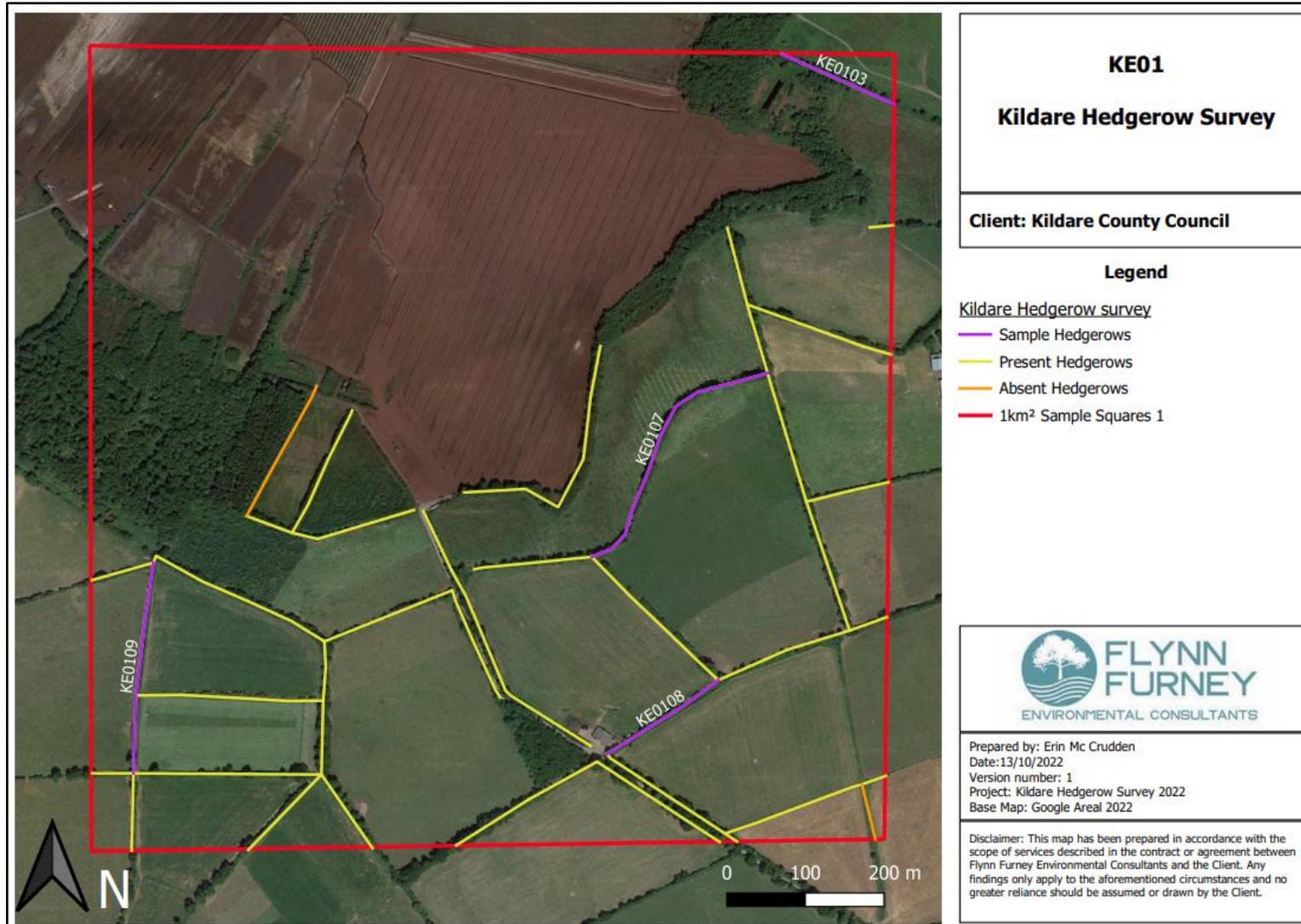
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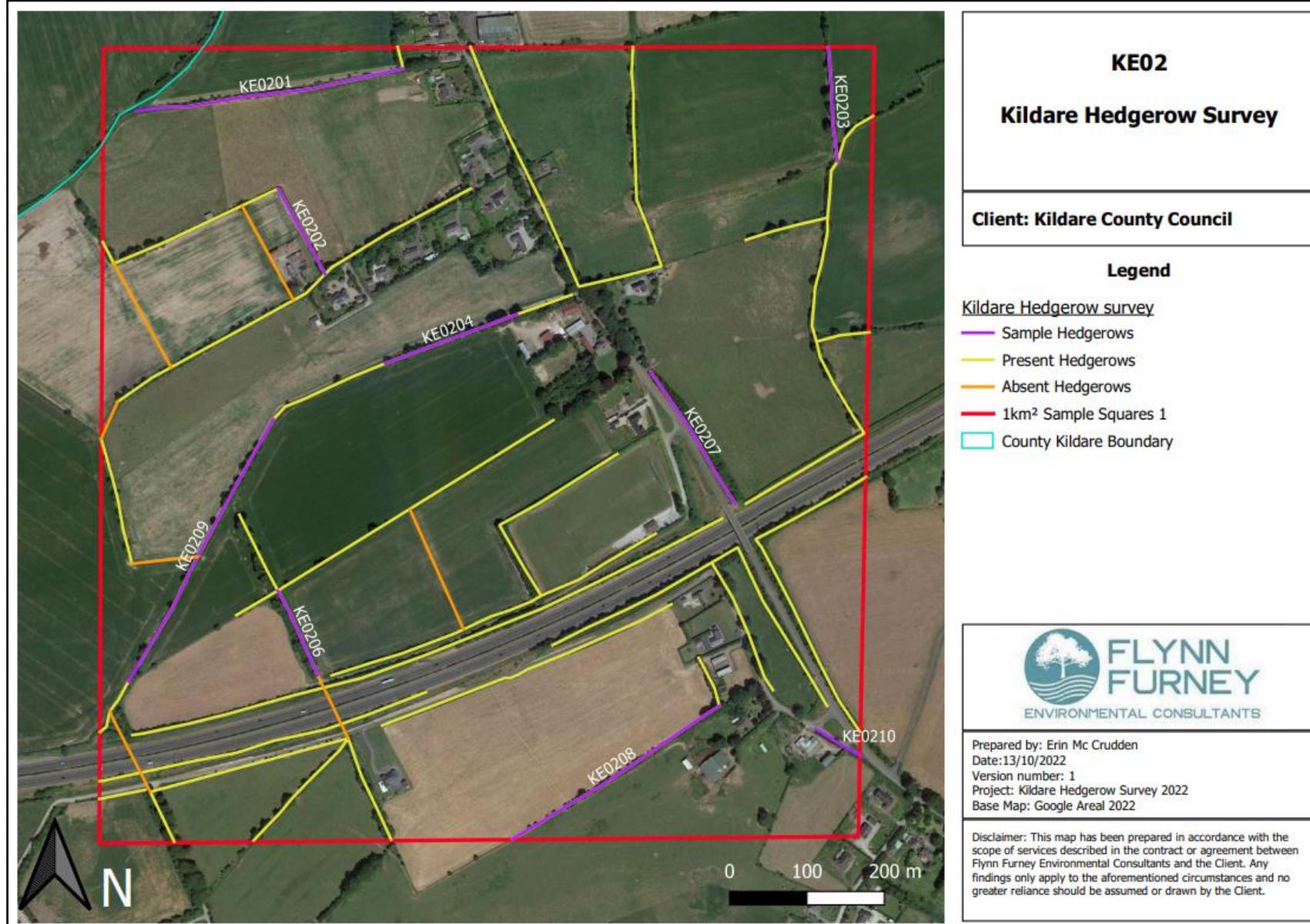
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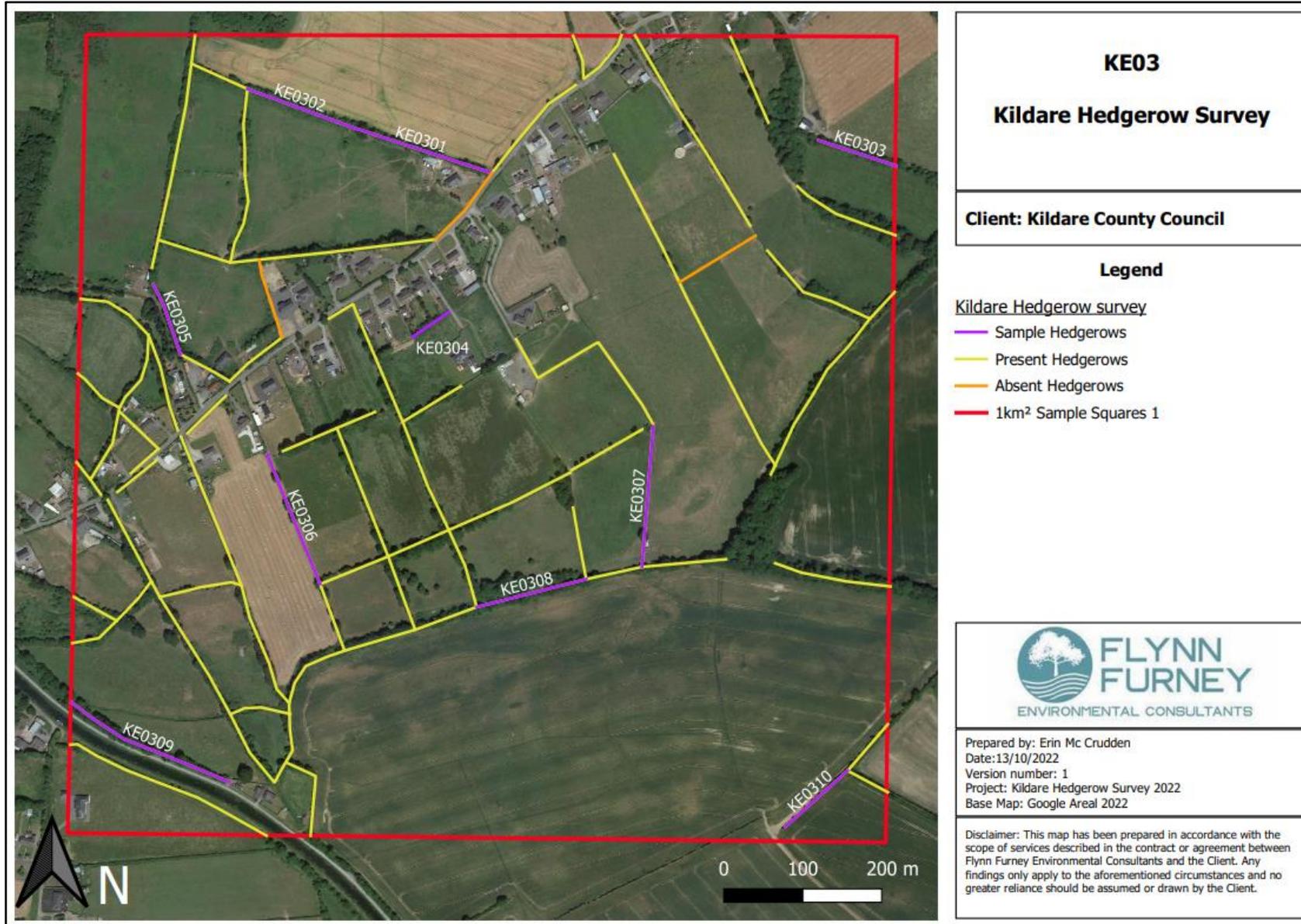
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Appendix 1: Maps of 1km Grid Square Survey Areas









<p style="text-align: center;">KE04</p> <p style="text-align: center;">Kildare Hedgerow Survey</p>
<p>Client: Kildare County Council</p>
<p style="text-align: center;">Legend</p> <p><u>Kildare Hedgerow survey</u></p> <ul style="list-style-type: none">— Sample Hedgerows— Present Hedgerows— Absent Hedgerows— Unsurveyed in 2022— 1km² Sample Squares 1
<div style="text-align: center;"><p>FLYNN FURNEY ENVIRONMENTAL CONSULTANTS</p></div>
<p>Prepared by: Erin Mc Crudden Date: 13/10/2022 Version number: 1 Project: Kildare Hedgerow Survey 2022 Base Map: Google Aerial 2022</p>
<p><small>Disclaimer: This map has been prepared in accordance with the scope of services described in the contract or agreement between Flynn Furney Environmental Consultants and the Client. Any findings only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.</small></p>



KE05
Kildare Hedgerow Survey

Client: Kildare County Council

Legend

Kildare Hedgerow survey

- Sample Hedgerows
- Present Hedgerows
- Absent Hedgerows
- 1km² Sample Squares 1



Prepared by: Erin Mc Cruden
Date:13/10/2022
Version number: 1
Project: Kildare Hedgerow Survey 2022
Base Map: Google Areal 2022

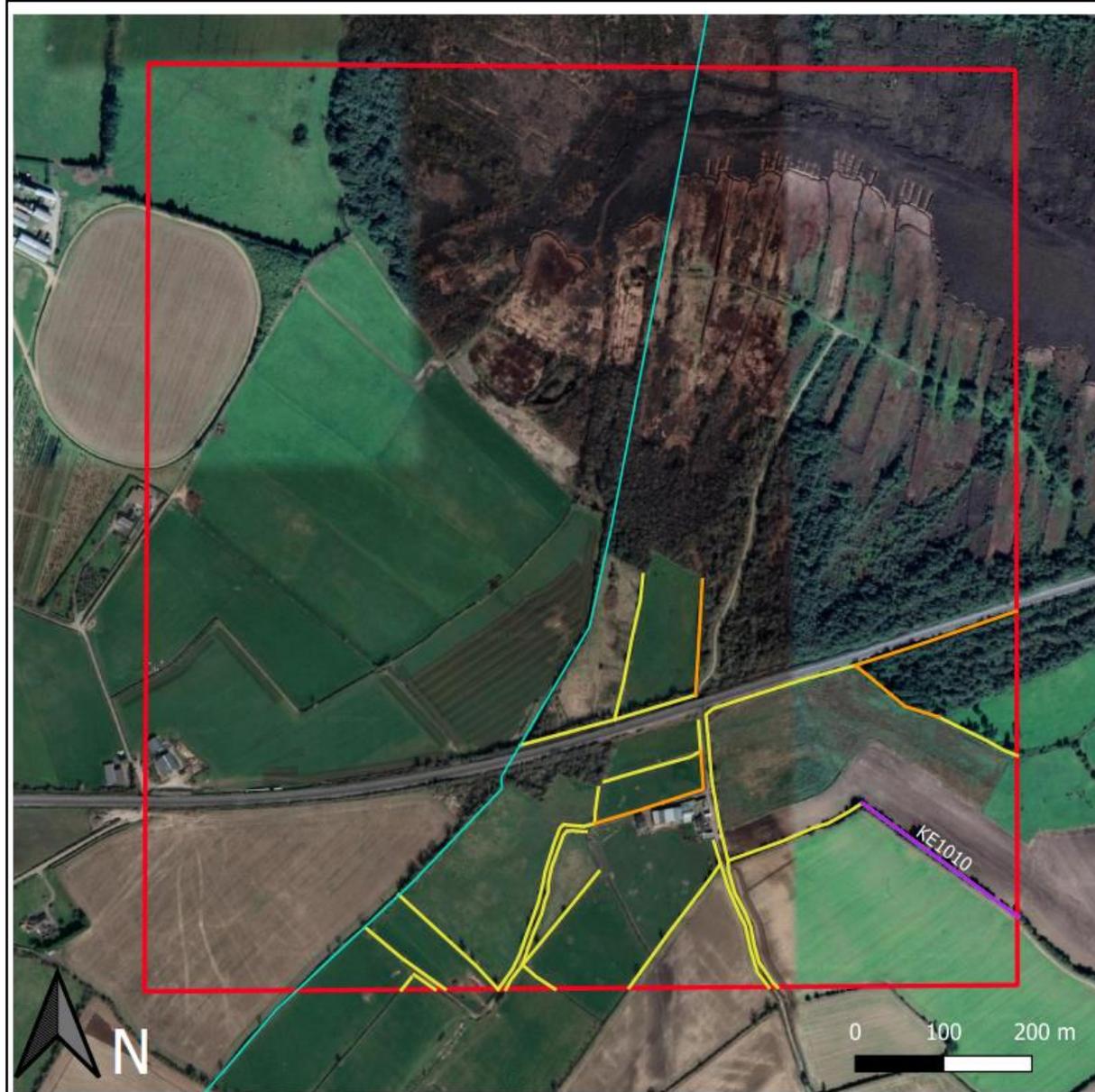
Disclaimer: This map has been prepared in accordance with the scope of services described in the contract or agreement between Flynn Furney Environmental Consultants and the Client. Any findings only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.











KE10
Kildare Hedgerow Survey

Client: Kildare County Council

Legend

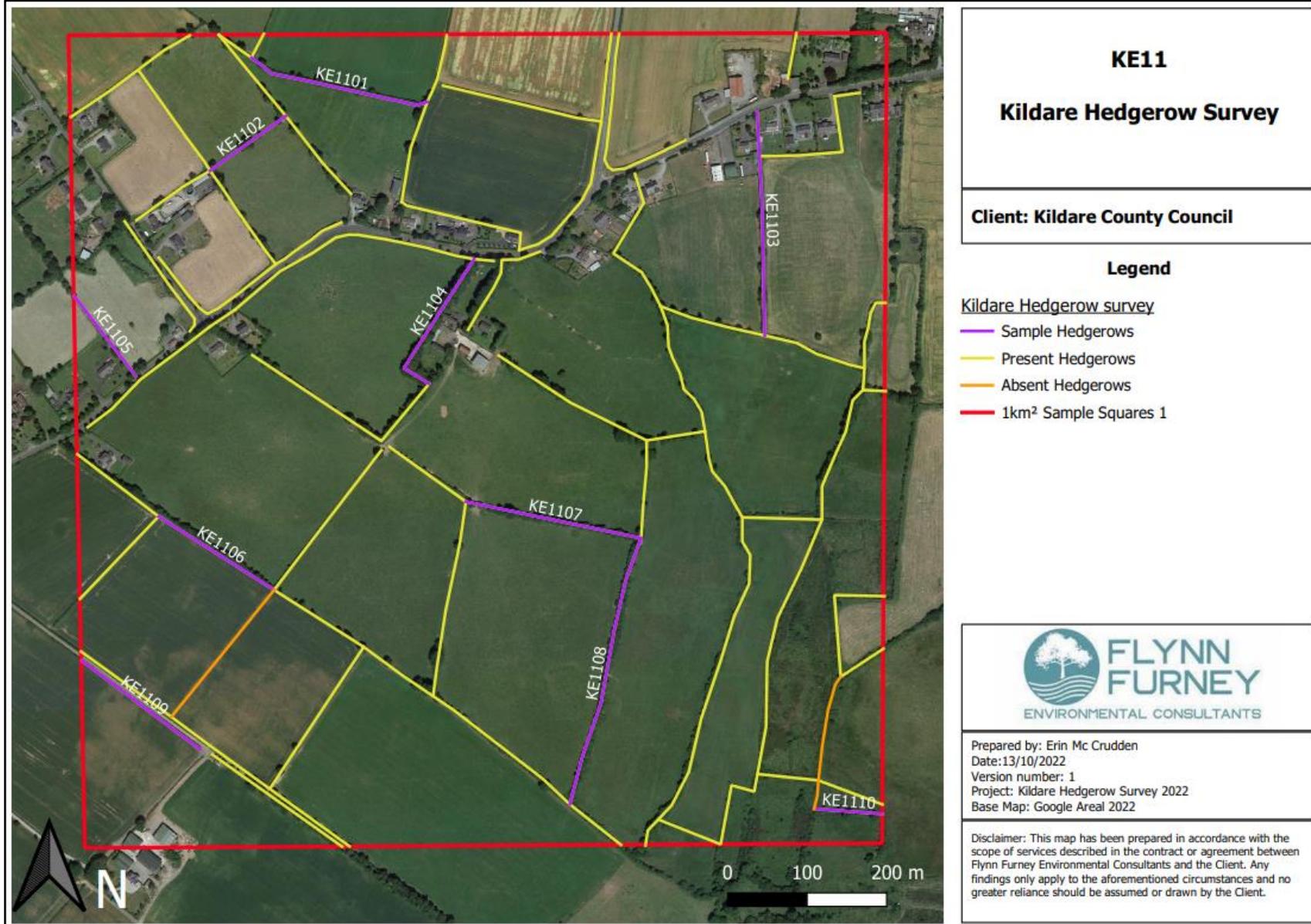
Kildare Hedgerow survey

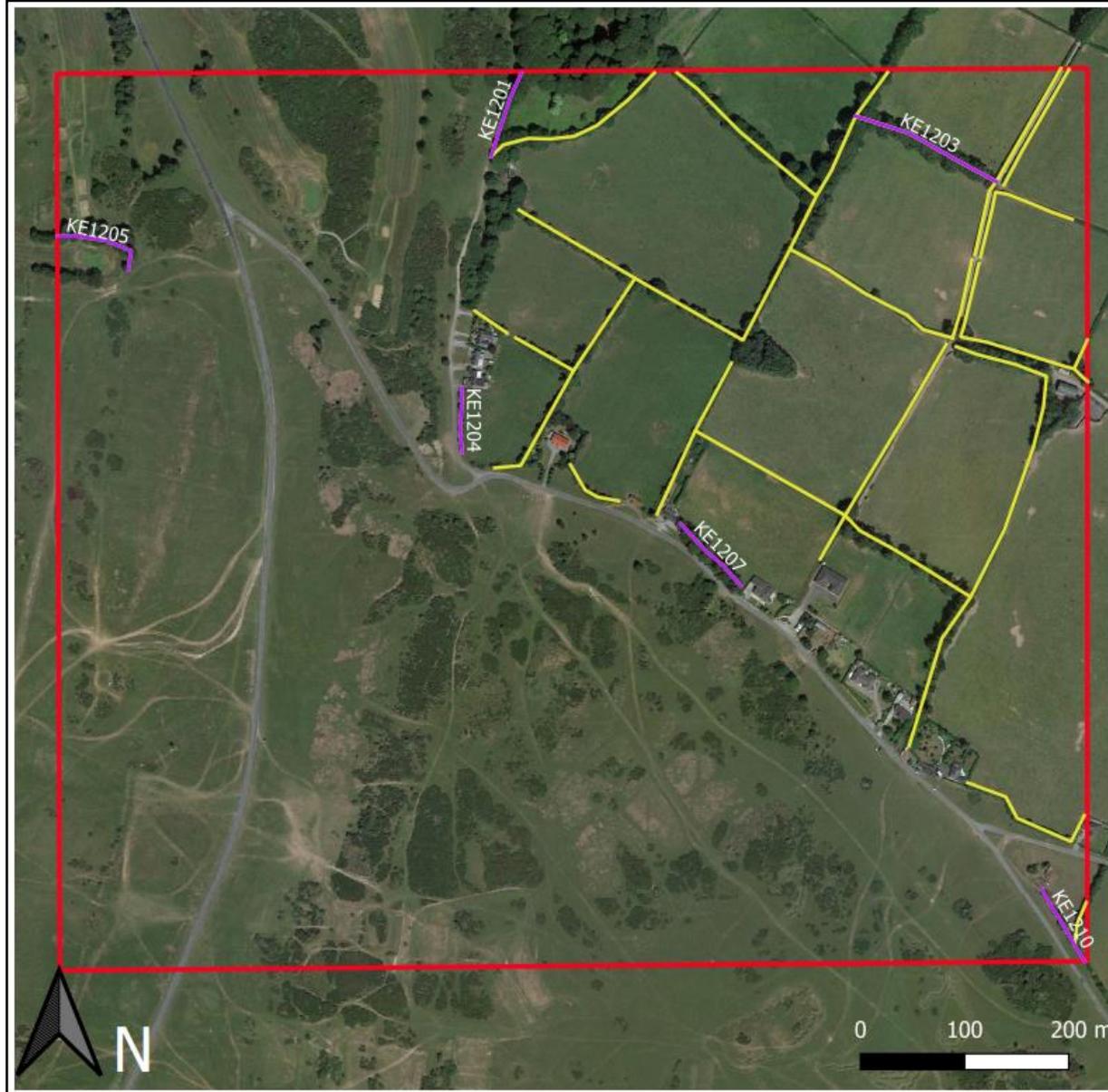
-  Sample Hedgerows
-  Present Hedgerows
-  Absent Hedgerows
-  1km² Sample Squares 1
-  County Kildare Boundary



Prepared by: Erin Mc Crudden
Date: 13/10/2022
Version number: 1
Project: Kildare Hedgerow Survey 2022
Base Map: Google Aerial 2022

Disclaimer: This map has been prepared in accordance with the scope of services described in the contract or agreement between Flynn Furney Environmental Consultants and the Client. Any findings only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.





<p style="text-align: center;">KE12</p> <p style="text-align: center;">Kildare Hedgerow Survey</p>
<p>Client: Kildare County Council</p>
<p style="text-align: center;">Legend</p> <p><u>Kildare Hedgerow survey</u></p> <ul style="list-style-type: none">— Sample Hedgerows— Present Hedgerows— Absent Hedgerows— 1km² Sample Squares 1
<p style="text-align: center;"> FLYNN FURNEY ENVIRONMENTAL CONSULTANTS</p>
<p>Prepared by: Erin Mc Crudden Date: 13/10/2022 Version number: 1 Project: Kildare Hedgerow Survey 2022 Base Map: Google Aerial 2022</p>
<p><small>Disclaimer: This map has been prepared in accordance with the scope of services described in the contract or agreement between Flynn Furney Environmental Consultants and the Client. Any findings only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.</small></p>



KE13
Kildare Hedgerow Survey

Client: Kildare County Council

Legend

Kildare Hedgerow survey

- Sample Hedgerows
- Present Hedgerows
- Absent Hedgerows
- 1km² Sample Squares 1

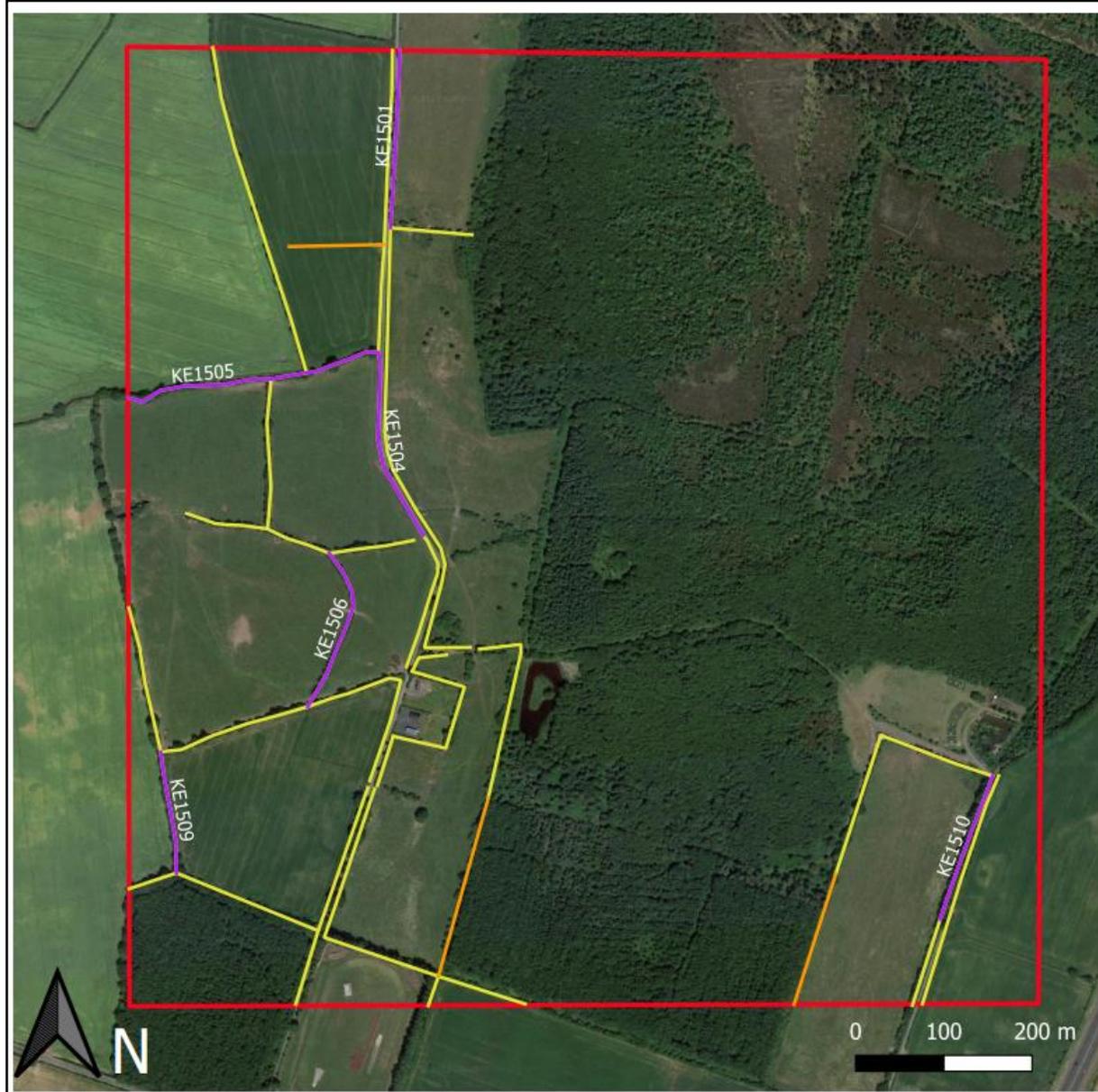


Prepared by: Erin Mc Crudden
Date: 13/10/2022
Version number: 1
Project: Kildare Hedgerow Survey 2022
Base Map: Google Aerial 2022

Disclaimer: This map has been prepared in accordance with the scope of services described in the contract or agreement between Flynn Furney Environmental Consultants and the Client. Any findings only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.



<p>KE14</p> <p>Kildare Hedgerow Survey</p>
<p>Client: Kildare County Council</p>
<p>Legend</p> <p><u>Kildare Hedgerow survey</u></p> <ul style="list-style-type: none">Sample HedgerowsPresent HedgerowsAbsent Hedgerows1km² Sample Squares 1
 <p>FLYNN FURNEY ENVIRONMENTAL CONSULTANTS</p>
<p>Prepared by: Erin Mc Crudden Date:13/10/2022 Version number: 1 Project: Kildare Hedgerow Survey 2022 Base Map: Google Areal 2022</p>
<p>Disclaimer: This map has been prepared in accordance with the scope of services described in the contract or agreement between Flynn Furney Environmental Consultants and the Client. Any findings only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.</p>



KE15
Kildare Hedgerow Survey

Client: Kildare County Council

Legend

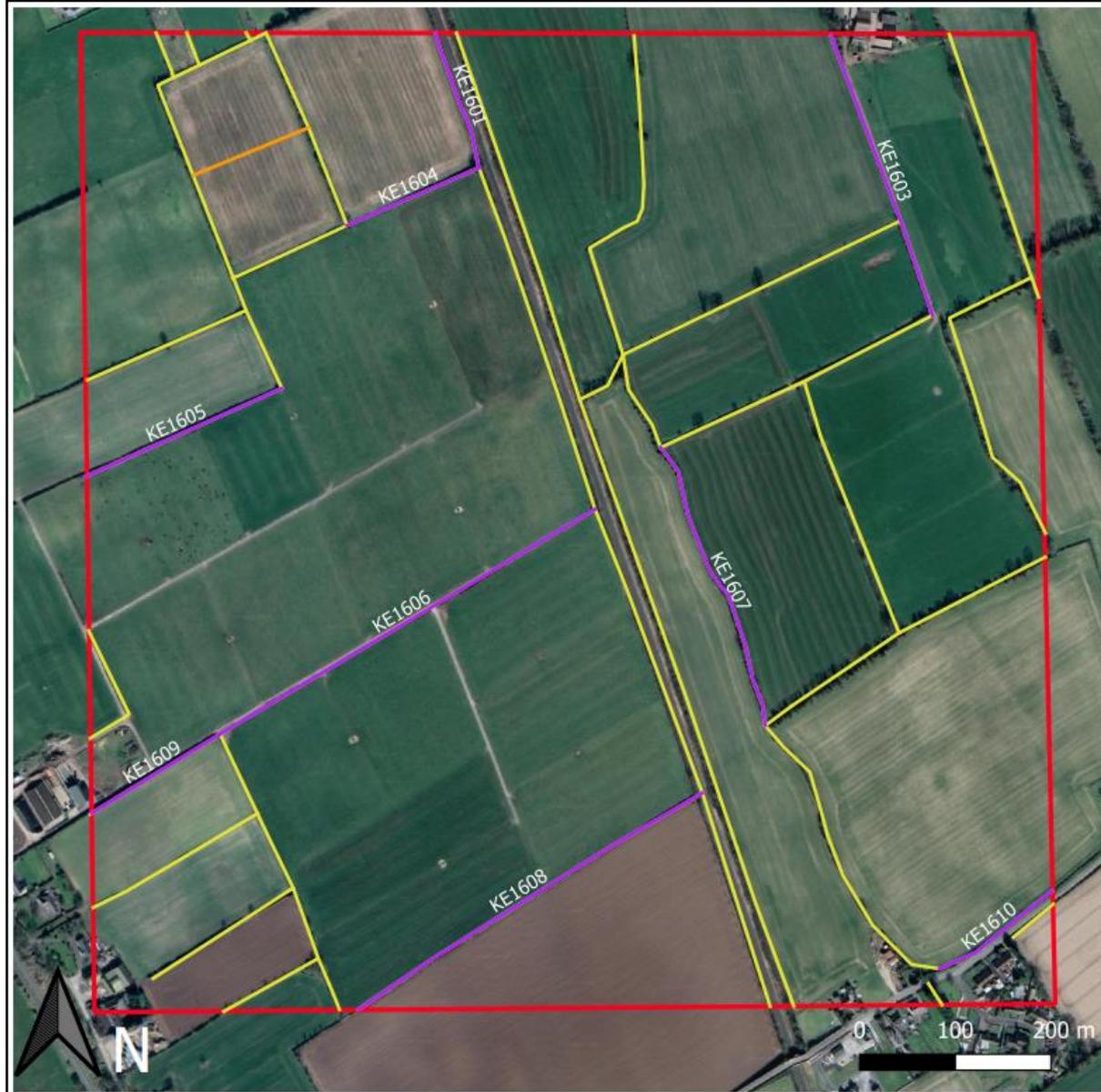
Kildare Hedgerow survey

-  Sample Hedgerows
-  Present Hedgerows
-  Absent Hedgerows
-  1km² Sample Squares 1



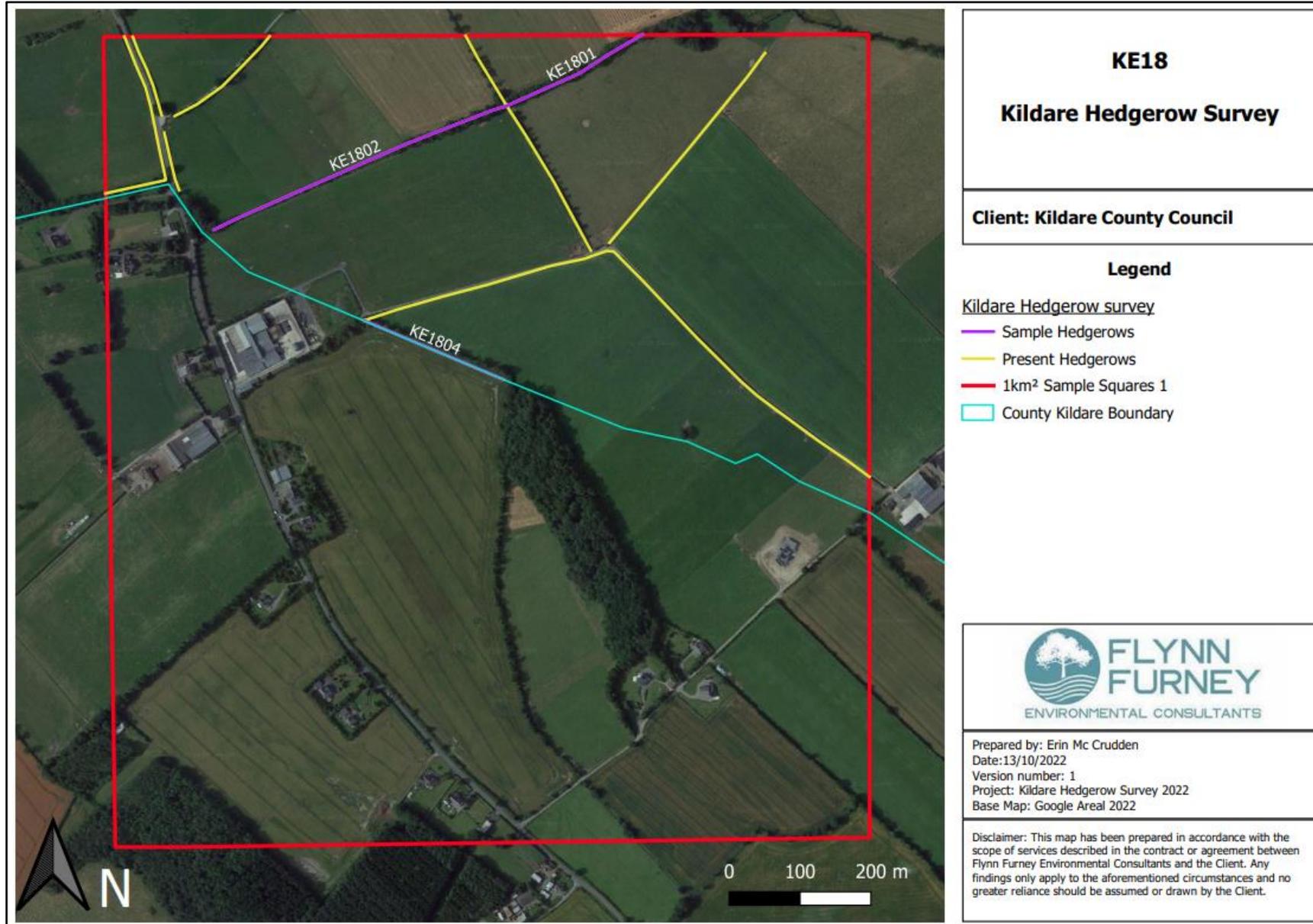
Prepared by: Erin Mc Crudden
Date: 13/10/2022
Version number: 1
Project: Kildare Hedgerow Survey 2022
Base Map: Google Aerial 2022

Disclaimer: This map has been prepared in accordance with the scope of services described in the contract or agreement between Flynn Furney Environmental Consultants and the Client. Any findings only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.



KE16 Kildare Hedgerow Survey
Client: Kildare County Council
Legend
<u>Kildare Hedgerow survey</u>
— Sample Hedgerows
— Present Hedgerows
— Absent Hedgerows
— 1km ² Sample Squares 1
 FLYNN FURNEY ENVIRONMENTAL CONSULTANTS
Prepared by: Erin Mc Crudden Date: 13/10/2022 Version number: 1 Project: Kildare Hedgerow Survey 2022 Base Map: Google Aerial 2022
<small>Disclaimer: This map has been prepared in accordance with the scope of services described in the contract or agreement between Flynn Furney Environmental Consultants and the Client. Any findings only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.</small>





Appendix 2: Floristic Recordings: target species

From The Hedgerow Appraisal System (Foulkes *et al.*, 2012).

Favourable tree, shrub and woody climber species		Unfavourable tree, shrub and woody climber species	
Scientific Name	Common Name	Scientific Name	Common Name
* Native		* Native	
^ Naturalised		^ Naturalised	
# Non-native		# Non-native	
* <i>Alnus glutinosa</i>	Alder		All coniferous species (except Scots pine)
* <i>Betula pendula</i>	Silver birch	# <i>Acer campestre</i>	Field Maple
* <i>Betula pubescens</i>	Downy birch	^ <i>Acer pseduplatanus</i>	Sycamore
# <i>Castanea sativa</i>	Spanish Chestnut	^ <i>Aesculus hippocastanum</i>	Horse Chestnut
* <i>Cornus sanguinea</i>	Dogwood	^ <i>Carpinus betulus</i>	Hornbeam
* <i>Corylus avellana</i>	Hazel	^ <i>Clematis alba</i>	Clematis
* <i>Crataegus monogyna</i>	Hawthorn	^ <i>Fagus sylvatica</i>	Beech
* <i>Cytisus scoparius</i>	Broom	# <i>Fuchsia magellanica</i>	Fuchsia
* <i>Euonymus europaeus</i>	Spindle-tree	# <i>Laburnum anagyroides</i>	Laburnum
* <i>Fraxinus excelsior</i>	Ash	# <i>Ligustrum ovalifolium</i>	Japanese Privet
* <i>Hedera helix</i>	Ivy	^ <i>Lonicera nitida</i>	Dwarf Box
* <i>Ilex aquifolium</i>	Holly	# <i>Populus alba</i>	White Poplar
# <i>Juglans regia</i>	English Walnut	^ <i>Prunus laurocerasus</i>	Cherry laurel
^ <i>Ligustrum vulgare</i>	Wild Privet	^ <i>Rhododendron ponticum</i>	Rhododendron
* <i>Lonicera periclymenum</i>	Honeysuckle	^ <i>Salix alba</i>	White willow
^ <i>Malus domestica</i>	Wild Apple	^ <i>Salix fragilis</i>	Crack willow
* <i>Malus sylvestris</i>	Crab Apple	^ <i>Symphoricarpos albus</i>	Snowberry
* <i>Myrica gale</i>	Bog Myrtle	# <i>Syringa vulgaris</i>	Lilac
* <i>Pinus sylvestris</i>	Scots pine	# <i>Tilia spp.</i>	Lime
* <i>Populus nigra</i>	Black poplar	^ <i>Viburnum lantana</i>	Wayfaring tree
* <i>Populus tremula</i>	Aspen		
* <i>Prunus avium</i>	Wild cherry		

<i>^Prunus cerasus</i>	Sour Cherry		
<i>^Prunus domestica</i>	Wild Plum		
<i>*Prunus padus</i>	Bird Cherry		
<i>*Prunus spinosa</i>	Blackthorn, sloe		
<i>#Pyrus communis</i>	Wild Pear		
<i>*Quercus petraea</i>	Sessile oak		
<i>*Quercus robur</i>	Pedunculate oak		
<i>*Rhamnus cathartica</i>	Purging Buckthorn		
<i>*Rosa spp.</i>	Wild Rose		
<i>*Rubus idaeus</i>	Raspberry		
<i>*Salix aurita</i>	Eared willow		
<i>*Salix caprea</i>	Goat willow		
<i>*Salix cinerea subsp. oleifolia</i>	Rusty willow		
<i>*Salix pentandra</i>	Bay Willow		
<i>^Salix triandra</i>	Osier		
<i>*Sambucus nigra</i>	Elder		
<i>*Solanum dulcamara</i>	Bittersweet		
<i>*Sorbus aria, S. hibernica</i>	Whitebeam		
<i>*Sorbus aucuparia</i>	Rowan		
<i>*Taxus baccata</i>	Yew		
<i>*Ulex europaeus</i>	Gorse		
<i>*Ulmus glabra</i>	Wych Elm		
<i>^Ulmus procera</i>	English Elm		
<i>*Viburnum opulus</i>	Guelder rose		

Scientific Name	Common Name
<i>Ajuga reptans</i>	Bugle
<i>Alliaria petiolata</i>	Garlic Mustard
<i>Allium ursinum</i>	Ramsons
<i>Anemone nemorosa</i>	Wood Anemone
<i>Anthriscus sylvestris</i>	Cow Parsley
<i>Arum maculatum</i>	Lords-and-Ladies
<i>Chrysplenium oppositifolium</i>	Opposite Leaved Golden Saxifrage
<i>Conopodium majus</i>	Pignut
<i>Digitalis purpurea</i>	Foxglove
<i>Epipactus helleborine</i>	Broad-leaved Helleborine
<i>Fragaria vesca</i>	Wild Strawberry
<i>Galium odoratum</i>	Sweet Woodruff
<i>Geranium robertianum</i>	Herb Robert
<i>Geum urbanum</i>	Wood Avens
<i>Glechoma hederacea</i>	Ground Ivy
<i>Hyacinthoides non-scripta</i>	Bluebell
<i>Hypericum androsaemum</i>	Tutsan
<i>Lapsana communis</i>	Nipplewort
<i>Lathraea squamaria</i>	Toothwort
<i>Luzula sylvatica</i>	Great Woodrush
<i>Lysimachia nemorum</i>	Yellow Pimpernel
<i>Neottia nidus-avis</i>	Birds-nest Orchid
<i>Oxalis acetosella</i>	Wood Sorrel
<i>Potentilla sterilis</i>	Barren Strawberry
<i>Primula vulgaris</i>	Primrose
<i>Ranunculus ficaria</i>	Lesser Celandine
<i>Sanicula europaea</i>	Wood Sanicle
<i>Stachy sylvatica</i>	Hedge Woundwort
<i>Stellaria holostea</i>	Greater Stitchwort
<i>Veronica Montana</i>	Wood Speedwell
<i>Viola spp. (V. riviniana, V. reichenbachiana)</i>	Dog Violets

Ferns and Allies

Scientific Name	Common Name
<i>Athyrium filix-femina</i>	Lady Fern
<i>Blechnum spicant</i>	Hard Fern
<i>Dryopteris filix-mas</i>	Male Fern
<i>D. dilatata</i>	Broad Buckler Fern
<i>D. affinis</i>	Scaly Male Fern
<i>D. aemula</i>	Hay-scented Buckler Fern
<i>D. carthusiana</i>	Narrow Buckler Fern
<i>Phyllitis scolopendrium</i>	Hart's Tongue Fern
<i>Polystichum setiferum</i>	Soft Shield Fern
<i>Polypodium spp.</i>	Polypody Fern
<i>Equisetum telmateia</i>	Great Horsetail
<i>Equisetum sylvaticum</i>	Wood horsetail

Appendix 3a: Hedgerow Significance Criteria

From The Hedgerow Appraisal System (Foulkes *et al.*, 2012).

Table 1: Criteria for assessing Hedgerow Significance (historical, ecological and landscape)

	0	1	2	3	4
Historical Significance	Low Significance	Slightly Significant	Moderately Significant	Significant	Highly Significant
Period of Establishment (B,B1,B2,B3,B4,F,W)	Recently Established (0-25 years)	Internal Field Boundary	Roadside / Rail / Canal Boundary: Farm Boundary, March ditch*, Mearing* *old terms for farm boundaries	Boundary appears on 1 st Edition O.S.	Townland Parish / County Boundary: Area shown as, or connected to, woodland on 1 st Edition O.S. map: Connects to feature recorded on Sites and Monuments Record
				Non-linear (excluding roadside)	
		Past evidence of laying or coppicing			
	0	1	2	3	4
Species Diversity Significance	Low Significance	Slightly Significant	Moderately Significant	Significant	Highly Significant
Tree / Shrub / Climber Species Count (Floristic) (All species)	(1-3 species / 30m strip)	(4/5 species / 30m strip)	(6/7 species / 30m strip)	(8/9 species / 30m strip)	(10+ species / 30m strip)

Table 1 [continued]

	0	1	2	3	4
Ground Flora Significance	Low Significance	Slightly Significant	Moderately Significant	Significant	Highly Significant
Species type (Y)	Dominated by ruderal species* - nettles / docks / thistles / cleavers				
Species Count (from list) (Floristic)	(<2 species / 30m strip)	(2-3 species / 30m strip)	(4-5 species / 30m strip)	(6-7 species / 30m strip)	(>7 species / 30m strip)
Pteridophytes (Ferns) (from list) (Floristic)				3-5 species	>5 species

*Ruderal species - Weedy vegetation that shows a preference for growing on compacted, ploughed, or otherwise disturbed ground.

	0	1	2	3	4
Structure, Construction & Associated Features	Low Significance	Slightly Significant	Moderately Significant	Significant	Highly Significant
Wall / Bank (G1,G2,G3,H)	None	Wall / Bank < 0.5m (height / depth)	Wall / Bank 0.5 - 1m	Wall / Bank > 1m	Double Ditch
Drain / Ditch (B,I,I1)			Dry Ditch	Wet Ditch / Drain	Stream / River
Other (Target Notes)			Badger Set		
Other (G3)			Green Lane		

Table 1 [continued]

	0	1	2	3	4
Habitat Connectivity Significance	Low Significance	Slightly Significant	Moderately Significant	Significant	Highly Significant
(C1,C2,D1,D2,D3)	No connection with other semi-natural habitat	Single link with semi-natural habitat including hedgerow	Multiple links with semi-natural habitats, including other hedgerows	Link with woodland / forest habitat	Link with designated area, particularly woodland
	0	1	2	3	4
Landscape Significance	Low Significance	Slightly Significant	Moderately Significant	Significant	Highly Significant
(J, P,Q, Desk study)		Wind shaped	Mature Hedgerow Trees		Area covered by Landscape designation (Landscape Conservation Order, TPO, Amenity Area Order)
Other Factor/s of Significance	Record any other factors of significance which are not included above, e.g. upland hedgerow with landscape significance.				

Appendix 3b: Hedgerow Condition Assessment

From The Hedgerow Appraisal System (Foulkes *et al.*, 2012).

Table 2: Criteria for assessing condition assessment of hedgerows.

Structural Variables	0	1	2	3
	Unfavourable	Adequate	Favourable	Highly favourable
Dimensions				
Height (K)	<1.5m	1.5 – 2.5m	2.5 – 4m	>4m
Width (L)	<1m	1 – 2m	2- 3m	>3m
Profile (J,J1)	Remnant; Derelict;	Wind shaped; Losing Base Structure	Boxed / A-shaped; Straight sided	Overgrown; Top heavy/ undercut; Outgrowths at base
Basal density / porosity to light of woody shrubs? (N)	Open	Semi-translucent	Semi-opaque	Opaque / Dense

Continuity	0	1	2	3
	Unfavourable	Adequate	Favourable	Highly favourable
% gaps (M)	>10%	5-10%	<5%	Continuous
Specific gaps (M1)	Individual Gap > 5m	Individual gap <5m	No gaps	No gaps

Table 2 [continued]

Negative Indicators/ Degradation / Issues affecting long-term viability	0	1	2	3
	Unfavourable	Adequate	Favourable	Highly favourable
Bank / Wall (O,O1)	>20% of the length of the hedge degraded	<20% of the length of the hedge degraded	Minor degradation	No degradation
% of canopy dominated by Ivy (Floristic)	>25%			
Unfavourable species composition (from list) (Floristic)	>10% of woody growth volume comprised of unfavourable species			
Ground Flora / Hedge Base (Y)	> 20% of ground layer showing evidence of Herbicide Use			
Ground Flora / Hedge Base (Y)	Contain Noxious weeds [•] / > 20% Dominated by Nutrient Rich Species			
Ground Flora / Hedge Base (Y)	Presence of alien invasive species [®]			
Degraded Margin (R2,R4)	Ploughing up to base of hedge shrubs or Poaching/erosion		(grassy) margin (2 m or greater on one side of the hedge)	(grassy) margins (2 m or greater on both sides of the hedge)

• *Noxious Weeds* - Native plants of disturbed ground that impact adversely on agriculture. They may compete for space with tillage or forage crops, harbour pests or diseases, or be injurious to livestock or human beings. These are: Common ragwort (*Senecio jacobea*), Spear thistle (*Cirsium vulgare*), Creeping or field thistle (*C. arvense*) and two species of dock, i.e. the curled dock (*Rumex crispus*) and the broad-leaved dock (*Rumex obtusifolius*).

^a*Alien invasive species* – see Table 1: ‘[Problematic Plant Species: Top 39](http://invasives.biodiversityireland.ie/)’ at <http://invasives.biodiversityireland.ie/> Those listed as occurring in woodland, hedgerows, demenses and on roadsides often occur in hedgerows. Cherry laurel (*Prunus laurocerasus*) can be added to this list.