



Monaghan Hedgerow Appraisal Survey, 2021.

A decade of change.



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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 were once dug to drain waterlogged soils and to increase the amount of arable land. 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 the 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 in the original Teagasc hedgerow maps made in 2005 (Teagasc, 2005). Hedgerows 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 practise 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 movement 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).

Ireland has made commitments to conserve biodiversity under a number of international agreements and policy frameworks. Recently it has signed up the High Ambition Coalition for Nature and People with a goal of “at least” 30 per cent of the planet being protected by the end of the decade and to promote nature-based solutions across the world. As a signatory to the Convention on Biological Diversity, Ireland is required to publish a National Biodiversity Action Plan which is updated every five years. Measures to conserve biodiversity need to be applied at several levels, from the international scale through to the local scale, in order to be effective. The County hedgerow surveys carried out to-date have addressed 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. It facilitated the collection of detailed data on the current extent, condition, species diversity and structural variation of our hedgerows. In the summer of 2010, a project to investigate hedgerow resources in County Monaghan was commissioned by Monaghan County Council and The Heritage Council. An area of approximately 1,295km² was surveyed, providing Monaghan County Council with information on the ecological and cultural value of hedgerows, aiding decision making and policies for the retention, management and conservation of this valuable resource. The Hedgerow Appraisal Survey methodology (HAS) 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.

The focus of this study was to determine the extent, composition, structure, condition and management of hedgerows in the county 11 years on. It assesses any significant deviations from the baseline survey, with the aim of understanding the current state and composition of our hedges and analyses environmental trends for these habitats. Hedgerow policies in local plans such as the County Development Plan and Climate Action Plan were examined and recommendations are made to guide future improvements in the protection of these biodiversity corridors and inform future iterations of hedgerow policies.

2. Executive summary

The 2021 Monaghan Hedgerow survey was carried out during the months of July and August on hedges previously surveyed in 2010. The aim and intent were to assess these hedges a decade on to review the state of hedgerow in the county. The methodology used during surveying has been set out by Foulkes *et al.* (2012) in the Hedgerow Appraisal Survey (HAS) methodology, which was first piloted in Monaghan's 2010 survey. The study was split into two phases in 2010; baseline hedges which were randomly chosen from twelve 1km² squares; and hedges which were perceived to be of High Ecological value, namely townland boundary hedges and those connected to native woodland. Both sets of hedges were re-surveyed and results outlined in this report.

This study identified 35 species of woody shrub (27 of which were native) and found an average of 3.5 species of shrubs per surveyed hedge strip in county Monaghan. A reduction of 0.12 species since 2010. An increase of 10% in mono shrub species hedges was noted. As species rich hedges are defined as hedges with 4 or more woody shrubs, there has been an approximately 14% decrease in species rich hedges since 2010 (See Section 6.6.: Species Rich Hedges).

On the other hand, tree species diversity has increased on average. A reduction in hedges containing only one tree species was noted (-8%). Hedges with more than 4 species of trees increased by 10%. This is most likely related to the reduction of Ash coverage in the canopy coinciding with an overall lack of management which results in the natural transition from hedgerow to treeline. This increase in tree species diversity is a significant factor in 16.8% of baseline hedges surveyed being designated as 'heritage hedges' based on their species diversity.

Ash dieback was noted as being of major concern. Hedgerow trees are present in 87.9% of hedges and 72.2% of those hedges containing trees have Ash species. Of hedges where Ash was noted, 90% displayed signs of dieback. A high percentage of ivy in the canopy is often linked to trees in a natural state of decline and hedges which contained over 25% ivy in the canopy have increased from 10.2% in 2010 to 36.4% in 2021.

73% of hedges were in Unfavourable Condition in 2010. This has increased by approximately 15% between the 2010 and 2021 survey. Around 55% of hedges scored Unfavourable in the category of gaps. There has been a 37% increase in hedges with gaps equalling more than 25% of their length (3% to 40%). 19% of hedges were deemed to be relict and a further 12% deemed to be remnant.

A doubling of nutrient rich hedges (these are hedges with >20% nutrient rich species) was noted, with 40% now classified in this category.

An increase in bank degradation is significant with 72% of hedges displaying some degree of damage to supporting infrastructure, an increase of 12% from 2010.

39% of baseline hedges in this survey are classified as heritage hedgerows under the HAS methodology (2012). For the phase two survey of townland boundary hedges and hedges connected to native woodland, 90.5% are classified as heritage hedgerows and their priority for

conservation will be outlined in this report. While shrub diversity in townland boundary hedges remains high in this study, as is in other County surveys, herb diversity was found to be lower for townland boundary hedges in Monaghan for the first time.

Finally, this study has estimated the net removal of between 0.5 and 0.88% of hedgerow in the county per annum, much higher than the estimated national average.

Based on the 2021 hedgerow survey results, several recommendations are made, applicable at a National and County level. These recommendations have been outlined in Section 10 of this report.

3. Background

In 2010 Monaghan County Council Heritage Office commissioned Neil Foulkes to conduct a hedgerow survey of the county, using a systematic approach and a standard methodology in 13 sample 1km squares, evenly distributed around the county. The focus was to record information on the extent, species composition, structure, condition and management of hedgerows.

In addition to this, in order to establish criteria to aid in the identification of hedgerows with significant or historical value, recordings of townland boundary hedges and some hedges linked to areas of native woodland were included.

The County Monaghan Biodiversity and Heritage Strategic Plan 2020-2025 “Hedgerows and Native Woodland” states:

“Aware of the important ecological and cultural value of hedgerows and native woodland, and their widespread inappropriate management and removal, we will create awareness and build capacity of landowners for their management and reinstatement and we will celebrate good practice.”

Estimates show that somewhere between five and seven per cent of the land area of the country is covered by hedgerows (sources include Teagasc’s use of aerial photography and EPA analysis using remote sensors). Additionally, many hedgerow and biodiversity specialists and environmental NGOs have raised concern about the level of hedge cutting across Ireland by private landowners or authorities, and the techniques used to do so.

3.1. The History of Hedgerows in Monaghan

Many hedgerows are not very old and most were planted from the mid-1700s up to the mid 1800s. Woven through this more modern landscape tapestry, however, 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 permanent 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, although 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.

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. Acts of Parliament passed made it obligatory for landowners to keep permanent boundaries between their properties. Agricultural improvement through land rotation programmes necessitated protection of crops by restricting the movement of livestock to particular fields. These boundaries were usually 5 feet deep ditches and 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 other tree species were planted in wet ground banks. This was the main period of land enclosure in Ireland and it was during this period that the familiar patchwork landscape of hedged fields largely came into being.

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, forming part of townland boundaries, or are remnants of ancient woodlands. The landscape value of hedges in the Monaghan drumlin 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.

Landscape

Patchworks of fields and hedgerows endow the Monaghan 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 sick animals coming into direct contact with healthy ones. Additionally, they act as wind barriers, protecting the soil from erosion and help to alleviate flooding.

Folklore

Many of our native shrubs are important in Irish folklore. Hawthorn (*Sceach Gheal*) is a common site in Monaghan 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.

Blackthorn is the second most common woody species found in Monaghan hedges. 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. 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 the country. 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. This Act provides the framework for Ireland to meet its International and EU climate commitments. A 2019 EPA report estimates that hedgerows, together with non-forest woodland and scrub, can remove up to 1.4 Mt CO₂ per year per hectare – 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 the county. 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, for roosting and their associated insects for food.. The National Roads Authority outlines the importance of hedgerows for bats in its 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 are 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, Hedgehogs and Foxes.

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 (Dondina *et al.*, 2018). This 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.

A Material Resource

In respect of native and naturalised species, a significant proportion of the country's broadleaf tree resource is contained within hedgerows. These provide the raw materials for a variety of crafts and are also a source of carbon-neutral fuel.

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 boundary 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.

4. Survey rationale

Hedgerows are living structures which change naturally 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 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 mechanical 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.

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. 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.

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 Monaghan Hedgerow Survey can complement data collated from other habitat related studies, e.g. the Countryside Bird Survey.
- The County Monaghan Hedgerow Survey can be placed in its national context when viewed alongside other surveys based on the same methodology.
- Provides valuable baseline data which will be essential in planning and implementing the County Monaghan Biodiversity and Heritage Strategic Plan 2020-2025.

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
- Monaghan County Council Environment Section
- Teagasc
- Local Authority Waters Programme (LAWPRO)
- Farmers, landowners 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

4.1. Need

Results from the County Monaghan Hedgerow Survey 2010 indicate that at the time there was an estimated hedgerow length of 12,845km in the country with an average density of 9.93km/km².

A total of 35 shrub and tree species, including 27 native species were recorded in the sample hedges in 2010. Hawthorn was the most frequently occurring shrub species found in 95% of hedges. Ash was the most common tree species, found in 68% of hedges in tree form. Given the current situation with regards to Ash Dieback, this aspect of hedgerows may present a concern.

37% of the hedges recorded in 2010 were classed as Highly Significant in terms of their history, species, composition, physical structure, habitat connectivity or landscape value under the Woodlands of Ireland hedgerow Assessment System. Only 27% met a series of Favourable Condition criteria. A recent EPA study using aerial photography estimated a net removal of hedgerows of between 0.16% and 0.3% per year between 1995 and 2015 (EPA, 2019). This suggest hundreds of kilometres of hedgerows may have been removed per year in Ireland.

An assessment of EIA (Agriculture) Regulations on Field Boundary Removal (2018) by Neil Foulkes, includes no data from County Monaghan. Monaghan is the only county to indicate zero applications for EIA screening for field boundary removal.

Recent investigations by the online news platform 'Noteworthy.ie' in relation to local authorities and hedgerow protections indicate that a systematic look at the framework 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

Objective

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

Aims

To carry out a detailed field survey of hedgerows in County Monaghan, 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 Monaghan, 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, 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.

International

The Paris Agreement (or Paris Accord COP 21) 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 would 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 would 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). 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 the upcoming CAP reform, it is likely that there will be more focus on hedgerow maintenance from 2023 onwards.

1257/1999 (Good Farming Practice)

Water Framework Directive (2000)

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.

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 (ACA's) 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).

Climate Action and Low Carbon Development (Amendment) Act 2021 This Act was introduced to provide for the approval of plans by the Government in relation to climate change, for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy, by no later than the end of the year 2050. It includes provisions for carbon budgets and a sectoral emissions ceiling to apply to different sectors of the economy and to provide for local authority climate action plans. As hedgerows are vitally important biodiversity corridors and contribute to carbon sequestration, they could be included under actions for this legislation.

National Biodiversity Plan (2017-2021) National Biodiversity Plans have been produced here since 2002, in response to the Convention on Biological Diversity (CBD, Rio de Janeiro, 1992). The current 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

Heritage Ireland 2030 The new national Heritage Plan is likely to include prominent sections on biodiversity conservation, including a specific section on hedgerows. 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.”

European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011

This 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 any stage.

Electricity Supply Act, (1927) Article 98 of the above Acts permit 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 Act permits 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.”

Local

Monaghan Biodiversity & Heritage Strategic Plan 2020 – 2025 this document was produced by the Heritage Office, Monaghan County Council, in conjunction with the Heritage Council. Two of its 13 Strategic Themes concern hedgerow management and protection:

Strategic Theme 1: ‘Hedgerows and Native Woodland’: “Aware of the important ecological and cultural heritage roles of hedgerows and native woodland, and their widespread inappropriate management and removal, we will create awareness and build capacity of landowners for their management and reinstatement, and we will celebrate good practice”. This includes related activities such as: “Re-survey 2010 Monaghan Hedgerow Survey sites”; “Hold native hedge planting and laying workshops”; “Produce Heritage at the Heart Hedgerow podcast or film” and “Identify Native Woodland Sites in county”

Strategic Theme 8: ‘High Nature Value Farmland’: “Recognising the important ecological contribution to biodiversity and climate change made by HNV farmland, we will encourage farming for nature practices at both small and large scales through awareness raising, stakeholder engagement and partnership”. This includes related activities that incorporate hedgerow maintenance such as: “Promote Pollination Plan activities on farms”; “Arrange specific talks or workshops for farmers on HNV farming practices” and “Support development of Results Based Agricultural Payment scheme in key areas”.

5.METHODOLOGY AND FIELD SURVEY

The County Monaghan Hedgerow Survey (2021) was carried out to the methodology of the Hedgerow Appraisal System (Foulkes *et al.*, 2010). 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: Phase 1

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” (Foulkes, 2010). 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 interchangeably 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 2010 data is being used this was not the case for one hedge in our survey which bordered a garden.

5.1.2. Selecting the sample

As the aim of the survey was to compare, the study area chosen in 2010 was resurveyed. The methods used in 2010 are outlined below:

The study area comprises land in Co. Monaghan contained within the Ordnance Survey 10km National Grid squares H52, H62, H63, H64, H65, H71, H72, H73, H74, H80, H81, H82, H91. The total approximate area of the sample area is 12.07km². The south-western (or “bottom left hand”) 1 km square of each of the Ordnance Survey squares of the study area was chosen as the sample area for the Hedgerow Survey, consistent with the sampling procedure used for the Badger and Habitats Survey of Ireland (Smal, 1995) and subsequently the Countryside Bird Survey (Crowe *et al.*, 2017). This sampling method gives the potential for some joint assessment of these data sets in the future. Samples are 1 km square. A total of 13 sample areas were selected in this way - eleven full squares and two-part squares on the county boundary. The total sample area is approximately 1% of the total study area.

- Foulkes, 2010.

Figure 5.1.2 shows the position of the sample squares in the study area. More details of the sample squares are included in Appendix 1.

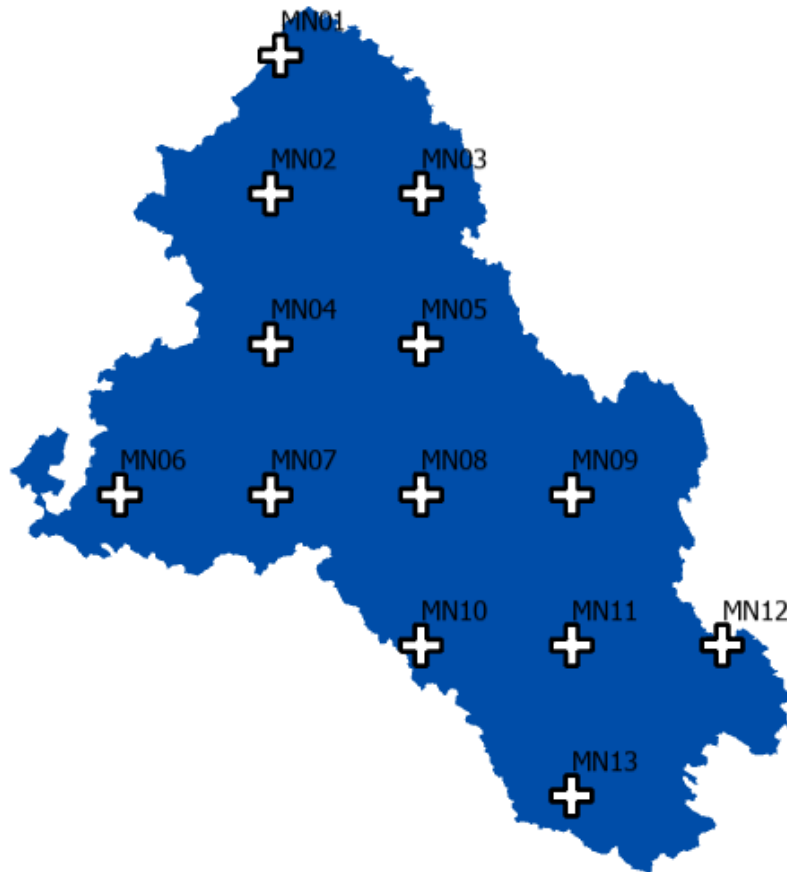


Figure 5.1.2. Map of County Monaghan showing the location of 1 km² samples

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

Floristic recordings study the 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 a 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 as in Table 5.1.4

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 (2021), First Edition Ordnance Survey (6" to 1 mile), Second Edition Ordnance Survey (6" to 1 mile), Townland Boundaries and Vector maps. GIS mapping for Native Woodlands was supplied by the National Parks and Wildlife Service in 2010 and this information was carried through to this report. 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 2010 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 1st of July 2021 and was concluded by 21st of August 2021.

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 iPod 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 Google MyMaps.

5.2. PHASE 2 – SAMPLE OF POTENTIAL HIGH ECOLOGICAL VALUE HEDGEROWS

In order to try and identify areas which may have hedgerows of high ecological value, recording of hedgerows connected to Townland Boundaries and Native Woodlands was made as an add-on study in 2010. These potentially high ecological value hedges were resurveyed in 2021.

5.2.1. SELECTING THE SAMPLE

Methods for the identification of Potentially high ecological value hedges are outlined below.

Townland Boundary Hedges

The aerial photographs of all of the sample squares were compared with details of townland boundaries in the area in 2010. A sample length of hedgerow was identified from any townland boundary that contained hedgerow and that was not already sampled by the Baseline survey. This resulted in the recording of an additional 22 hedgerows in 2021.

Hedgerows linking to native woodlands

Hedgerows linking to a number of woodland sites were recorded as part of the National Survey of Native Woodlands 2003-2008 (Perrin, 2008). These hedges were sampled in the 2010 survey and hence sampled again for comparison. The samples were previously selected by visual inspection of aerial photographs of all 40 Native Woodland Sites recorded during the survey. Those with no hedgerow links were eliminated. From the remainder, 13 sites were selected based on woodland type, period of origin (pre- or post-1st Edition Ordnance survey) and geographic spread. Of the sites selected there was a concentration in the Northwest and Southeast of the county, which reflects the distribution of appropriate sites rather than the exclusion of certain areas of the county from the study (See Figure 5.2.1). 31 additional hedgerows were recorded in 2010 and therefore also in the 2021 survey. Table 5.2.1 contains a list of the Native Woodland sites at which recordings were made.

Table 5.2.1.1: List of Native Woodland Sites

Native Woodland Number	Name	Woodland Type	Pre 1st Edition Ordnance survey
401	Lough Fea Demense	Mixed Broadleaf	Yes
410	Derrynashallog	Ash / Hazel	Yes
412	Hollywood Lake Wood	Birch / Alder	Yes
840	Hazel Wood	Ash / Hazel	Yes
849	Corrybrackan	Wet Woodland	No
954	Kilmore West	Bog Woodland	No
860	Reduff	Hazel / Ash / Birch	Yes
862	Annahaia	Hazel / Ash	No
864	Back Wood	Ash / Beech	Yes
1037	Comertagh	Wet woodland	No
1063	The Glen	Wet Woodland	Yes
1162	Mullaghmacateer	Hazel / Ash	No
1176	The Downs Wood	Ash / Birch	Yes



Figure 5.2.1.1: Map of county Monaghan showing Native Woodland Sites.

Structural and Floristic Recording of hedges was for the same as the Baseline survey, with the exception that for Native Woodland Hedges only one 30m strip (directly adjacent to the woodland) was recorded irrespective of the hedgerow length. Period of Fieldwork, target notes and data recording is as described in Sections 5.1.6-5.18.

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 7.0. 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.

PHASE 1 – BASELINE SAMPLE SURVEY

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

6.1 The extent of hedgerows in Monaghan

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 12.06 km² which is approximately 1% of the total of the study area (1,295km²). Sample squares contained 919 hedges. Hedgerow lengths from 2010 were estimated from maps.

Table 6.1.1: Phase 1- Baseline Sample Survey

OS Grid reference	Square reference	Location	Area km²	Length of Hedgerow 2010 (km)	Length of Hedgerow removed (km)	Total hedgerow length 2021 (km)	No. sample hedge recorded
H65	MN01	Clonkeen, Carrickroe	0.19	0.481	0.0	0.481	4
H64	MN02	Derrywassell, Scotstown	1.0	13.074	0.623	12.556	10
H74	MN03	Donagh, Glaslough	1.0	8.644	0.500	8.144	10
H63	MN04	Skervan, Three Mile House	1.0	12.565	1.862	11.212	10
H73	MN05	Greaghglass, Ardaghey	1.0	15.306	0.956	14.494	10
H52	MN06	Deerpark, Scotsthouse	1.0	2.038	0.464	1.852	6
H62	MN07	Annaghyduff, Newbliss	1.0	9.702	1.375	8.327	8
H72	MN08	Derryvalley, Ballybay	1.0	11,822	0.474	11.319	9
H82	MN09	Corrinshigo, Castleblaney	1.0	14.934	3.458	11.476	10
H71	MN10	Cortober, Bawn	1.0	10.306	1.124	9.182	9
H81	MN11	Dunaree, Laragh	1.0	8.125	0.093	8.032	7
H91	MN12	Keenogue, Inishkeen	0.87	3.341	0.0	3.341	5
H80	MN13	Knocknacran West, Maghercloone	1.0	11.433	0.349	10.602	10
			12.06	121.771	10.753	111.018	108

A total of 10.753 km of hedgerow has been removed from the sample squares since the 2010 survey (9.7%). This means around 0.88% of hedgerow may be removed annually in County Monaghan. A large number of hedges were removed in Corrinshigo, Castleblaney (MN09) due to the construction of the Castleblaney bypass (See figure 6.1.1.), but agriculture was still responsible for a significant amount of removed hedgerow in this grid square (2009 metres). The main reason for hedgerow removal in the county was linked to agriculture, and this contributed to the majority of hedge removal overall (See figure 6.1.2.). Residential properties and industry were also linked to removal. Some roadside hedges were also removed but do not appear to be linked to road creation or expansion.

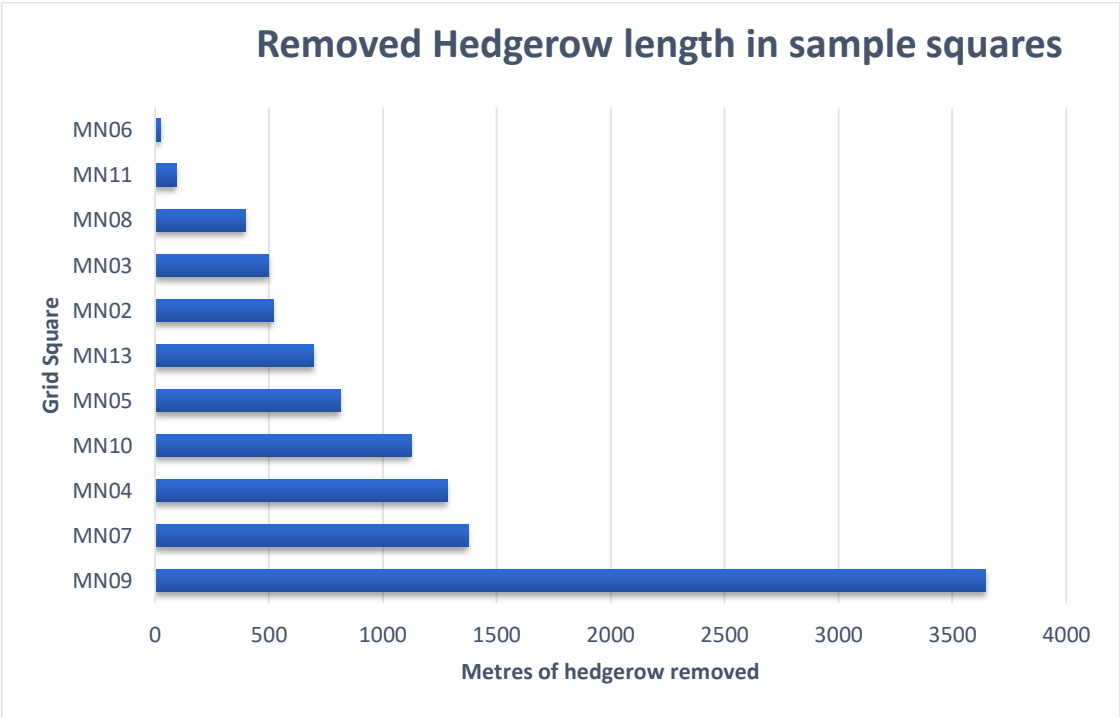


Figure 6.1.1.: Length of hedgerow removed in each grid square.

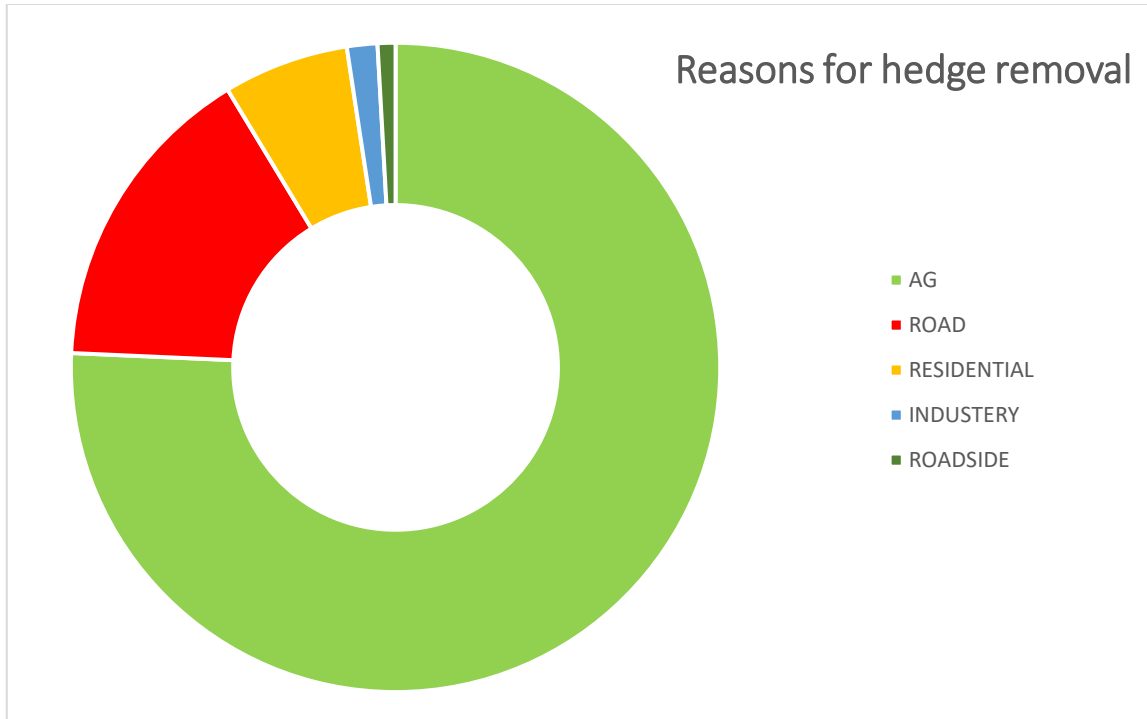


Figure 6.1.2.: Reasons for the removal of hedges in county Monaghan.

The total hedgerow length in 2010 was estimated to be around 12,845km, 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 11,921 km. Our estimates suggest around 1,154 km of hedgerow has been removed across County Monaghan in the last decade. Our total hedgerow extent has reduced by 9.7% and this is not including hedgerows which have been deemed remnant or relict. 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, 2012-2020). Based on this data, the net removal of hedges in Monaghan is closer to 0.9% per annum, worryingly larger than the estimated national average.

6.2 SPECIES COMPOSITION OF HEDGEROWS IN COUNTY MONAGHAN

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).

SHRUB LAYER

Thirty individual species were recorded in the shrub layer of the sampled hedges, which is 5 less than in 2010. 26 of these are species native to Ireland, including Wild Privet *Ligustrum vulgaris*. Hawthorn was the most frequently occurring hedge at 94.4%, similar to 2010. Of the times it was present, it was most likely to make up at least half of the hedge composition. The next most common shrub was Blackthorn at 65.4% followed by Holly at 41.1%. Other commonly found species were Gorse (30.8%), Elder (15.9%), Wild Privet (17.8%) and Ash (15.9%). Yew *Taxus baccata* was found in 2.8% of hedgerows and European Spindle *Euonymus europaeus* in 0.9% (1 hedges). Snowberry *Symphoricarpos albus* was identified in 5.6% of hedges. It is invasive, known to displace native species by forming dense thickets by suckering. The frequency and mean abundance of hedge shrubs is shown in table 6.2.1.



Figure 6.2.1: Hawthorn is found in most Monaghan hedges. It flowers mid-May, greatly benefiting pollinators.

Table 6.2.1. Frequency and abundance of woody shrub species occurrence in sampled hedges.

<i>Botanical name</i>	Common name	Frequency of occurrence (%)	Mean % abundance
<i>Crataegus monogyna</i>	Hawthorn	94.4	34-50
<i>Prunus spinosa</i>	Blackthorn	65.4	51-75
<i>Ilex aquifolium</i>	Holly	41.1	4-10
<i>Ulex europaeus</i>	Gorse	30.8	4-10
<i>Ligustrum vulgare</i>	Wild Privet	17.8	4-10
<i>Sambucus nigra</i>	Elder	15.9	4-10
<i>Fraxinus excelsior</i>	Ash	15.9	<4
<i>Acer pseudoplatanus</i> *	Sycamore	11.2	<4
<i>Corylus avellana</i>	Hazel	8.4	4-10
<i>Salix spp.</i>	Willow species	7.5	4-10

<i>Symphoricarpos albus*</i>	Snowberry	5.6	11-25
<i>Prunus domestica</i>	European plum	5.6	4-10
<i>Viburnum opulus</i>	Guelder Rose	5.6	<4
<i>Cytisus scoparius</i>	Broom	3.7	<4
<i>Vaccinium myrtillus</i>	Bilberry	3.7	<4
<i>Quercus spp.</i>	Oak species	2.8	<4
<i>Taxus baccata</i>	Yew	2.8	<4
<i>Alunus glutinosa</i>	Alder	2.8	4-10
<i>Sorbus aucuparia</i>	Rowan	1.9	4-10
<i>Fagus Sylvatica *</i>	Beech	1.9	<4
<i>Malus sylvestris</i>	Crab apple	0.9	4-10
<i>Betula spp.</i>	Birch species	0.9	<4
<i>Ulmus spp.</i>	Elm species	0.9	<4
<i>Ulmus glabra</i>	Wych Elm	0.9	4-10
<i>Betula spp.</i>	Birch	0.9	<4
<i>Euonymus europaeus</i>	European Spindle	0.9	<4
<i>Lonicera nitida</i>	Hedging box honeysuckle	0.9	<4



Figure 6.2.2. Hedges provide habitats for a range of biodiversity. Gossamer (spider silk) on gorse.

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 that 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 92.5% of the sample 30m strips in County Monaghan hedges surveyed. Wild Rose (*Rosa* species) was recorded in 58% and Honeysuckle *Lonicera periclymenum* recorded in 42.1% of the County Monaghan 30m sample strips. The abundance of the tree climbers mentioned is very similar to the 2010 data. Bittersweet Nightshade *Solanum dulcamara* increased in frequency by around 2.5%. Recordings of Climbers and Woody non-hedge-forming shrub species are presented in Table 6.2.2.

Table 6.2.2 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 agg</i>	Bramble	92.5	0.9	17.8	41.1	29.0	3.7
<i>Rosa spp</i>	Wild Rose	58	0	0.9	4.7	29.9	10.3
<i>Lonicera Periclymenum</i>	Honeysuckle	42.1	0	0.9	4.7	25.2	11.2
<i>Solanum dulcamara</i>	Bittersweet nightshade	3.7	0	0	1.9	0.0	1.9
<i>Calystegia</i>	Bindweed	2.8	0	0	0	2.8	0

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.

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 6.2.3.

Table 6.2.3: 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)
1	12.1	15.9
2	17.8	23.4
3	19.6	21.5
4	22.4	25.2
5	15.9	8.4
6	4.7	0.9
7	5.6	3.7
8	0.0	0.0

The average number of shrub species per 30m strip in 2021 was 3.5 (3.02 for native species only). This is slightly below that of 2010 in which an average of 3.62 species were recorded in sampled hedges (and 3.32 for native species only). 12.1% of hedges in 2021 contained only 1 species. This is a significant increase from the 2010 survey, in which only 3% of hedges contained one species alone, demonstrating a decline in shrub species diversity. These results point to less diverse hedges overall.

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 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, five 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. 23.3% of the sample hedges recorded had an average of four native shrub / tree species or more in the sample 30m strip/s.

This is less than 2010 when 37% of hedges were recorded as containing 4 or more species, demonstrating a downward trend in species rich hedges. This combined with the increase in single species hedges, from 3% to 13%, shows a significant decline in species richness across the county.



Figure 6.2.3: A species rich hedge in Ballybay. (MN0808)



Figure 6.2.4: A single species hedge.

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 87.9% of the recorded hedges in Monaghan (increasing by 5.9%). A total of 20 tree species were found in sampled hedges in this survey (3 more than 2010). Species recorded for the first time were Hawthorn, Lime and Horse Chestnut. Hawthorn was not included as a tree species in 2010 but due to its distinct growth away from the shrub layer and height, it was recorded as a tree in 28% of hedges. 14 of these tree species recorded were native species. The most commonly occurring hedgerow tree in County Monaghan is Ash *Fraxinus excelsior* which is found in 71% of hedges and in 80% of hedges which contain trees. Willow species were present in 23.3% of hedges and Sycamore *Acer pseudoplatanus* was present, in tree form, in 22.4% of hedges. Table 6.2.4 lists the tree species recorded and their frequency of occurrence. Willow species only occurred in 6.5% of hedgerows sampled in 2010 and has increased by 16.9% in the past 11 years.

Table 6.2.4 Frequency and abundance of woody non-shrub species occurrence in sampled hedges.

Botanical name (* denotes introduced species)	Common name	Frequency of occurrence (%)
<i>Fraxinus excelsior</i>	Ash	71.0
<i>Crataegus monogyna</i>	Hawthorn	28.0
<i>Salix spp.</i>	Willow	23.3
<i>Acer pseudoplatanus</i> *	Sycamore	22.4
<i>Corylus avellana</i>	Hazel	14.0
<i>Alnus glutinosa</i>	Alder	10.3
<i>Fagus sylvatica</i> *	Beech	8.4
<i>Ilex aquifolium</i>	Holly	5.6
<i>Sorbus aucuparia</i>	Rowan	5.6

<i>Betula spp.</i>	Birch spp.	4.5
<i>Prunus avium</i>	Wild Cherry	2.8
<i>Ulmus spp.</i>	Elm species	2.8
<i>Quercus spp.</i>	Oak species	2.8
<i>Pinus sylvestris</i> *	Scots Pine	0.9
<i>Malus sylvestris</i>	Crab Apple	0.8
<i>Aesculus hippocastanum</i> *	Horse Chestnut	0.9
<i>Picea spp.</i> *	Spruce spp.	0.9



Figure 6.2.5.: Crab apple is a native Irish tree often found in old hedgerows. (MN0801).

Tree Species Diversity

32% of the hedges where trees were recorded had just one tree species in 2010. This reduced to 24% in 2021, showing a decrease in hedges which contain only one tree species. This could be connected with Ash dieback, with the reduction in Ash canopy allowing other tree species to proliferate. This is showing a resilience in our tree canopy to adapt to the lack of Ash and an overall increase in tree species diversity.

A further 26% contained two tree species, 19% had three species and 15% had four species or more. This is an increase of 20% from 2010 when only 4% had 4 or more species.

Ash Dieback

Ash dieback 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 the ash trees over the next two decades. This will be significant in Monaghan hedgerows where Ash makes up over 70% of tree species.



Figure 6.2.6.: Trees with Ash dieback (MN02TB1).

Ground Flora

The ground flora of each 30m sample strip was investigated for the presence of 31 herbaceous ground flora species and twelve species (up from 8 species in 2010) 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 (4 less than 2010). The frequency of occurrence of each species recorded is detailed in Table 6.2.5, with the species counts per sample strip detailed in Table 6.2.6.

Table 6.2.5: Frequency and abundance of ground flora species occurrence in sampled hedges.

Botanical name (* denotes introduced species)	Common name	Frequency of occurrence (%)
<i>Geranium Roberta</i>	Herb Robert	62
<i>Viola spp.</i>	Violet species	21
<i>Digitalis purpurea</i>	Foxglove	20
<i>Veronica spp.</i>	Speedwell species	19
<i>Arum maculatum</i>	Cow parsley	18
<i>Stacy sylvatica</i>	Hedge woundwort	15
<i>Lapsana nomorum</i>	Nipplewort	14
<i>Geum urbanum</i>	Wood avens	11
<i>Glechoma hederacea</i>	Wildflower ground ivy	11
<i>Primula vulgaris</i>	Primrose	11
<i>Stellaria holostea</i>	Stitchwort	11
<i>Arum maculatum</i>	Lords and ladies	7
<i>Hypericum androsaemum</i>	Tutsan	7
<i>Fragaria vesca</i>	Wild strawberry	7
<i>Chrysplenium oppositifolium</i>	Opposite-leaved Golden-saxifrage	5
<i>Oxalis acetosella</i>	Wood sorrel	5
<i>Potentilla sterilis</i>	Barren Strawberry	5
<i>Hyacinthoides non-scripta</i>	Common bluebell	2
<i>Conopodium majus</i>	Pignut	3
<i>Anemone nemorosa</i>	Wood anemone	2
<i>Allium ursinum</i>	Wild garlic	2
<i>Alliaria petiolata</i>	Garlic mustard	1
<i>Lysimachia nemorum</i>	Yellow Pimpernel	3
<i>Ranunculus ficaria</i>	Lesser celandine	2

Other species such as Bird’s Foot Trefoil *Lotus corniculatus* (17%), Hogweed *Heracleum sphondylium* (18%) and Willowherb *Epilobium hirsutum* (41%) were also frequently found but are not included in the target species list.

The accurate recording of herbaceous ground flora species can be influenced by the ability to access the base of the hedge. Also, seasonal factors can result in under recording of certain species as they die back. For example, Primrose flowers in March-May, making it more easily identifiable during these periods. The 2010 survey took place between May and July whereas the 2021 survey took place from June-August. Primrose recordings were approximately 8% less in 2021 but this could be influenced by temporal factors. For these reasons, the above results should be considered as minimum standalone figures.



Figure 6.3.7: Herb-Robert was the most common target species identified. It is a foodplant and nectarsource for many invertebrates including bees, hoverflies and the barred carpet moth.



Figure 6.2.8: St. John's Wort is found in 8% of hedges, however it is not included in the target species list.

11.2% of sampled hedges contained no species from the target list, double that of 2010. 29% of hedges contained only one target species, showing an increase in mono-herb hedges as this figure was around 17% in 2010. In 2010, 28.9% of hedges contained 4 or more species. In our

survey this figure stood at 25% which shows a slight reduction in species diversity. The average number of ferns per 30m strip was 1.11. The average number of target herb species in Baseline hedges was 2.42 species.

Table 6.2.6: 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	11.2	33.6
1	29.0	35.5
2	17.8	17.8
3	17.8	12.1
4	13.1	0.9
5	5.6	0.0
6	3.7	0.0
7	1.9	0.0
8	0.0	0.0
9	0.0	0.0
10	0.9	0.9

Nutrient rich species

Nettle *Urtica spp.* was recorded in 84% of hedges, Docks *Rumex spp.* in 41% and Cleaver *aparine spp.* in 51%. These are considered as nutrient rich species, most troublesome when phosphate levels are high. Overuse of fertilisers near hedgerows can have extremely negative effects on plant variety as nutrient rich species will outcompete other species, leading to less diversity. 40.19% of hedges were judged to be nutrient rich based on the presence of >20% nutrient rich species. A large density of nutrient rich species is a sign of a surplus of nutrient run-off from fertilised fields. The average number of target species in nutrient rich hedges was 2.2 while the average number of target species in baseline hedges was 2.42.

The Rural Environment Protection Scheme (R.E.P.S) advises not to apply pesticides and fertilisers within 1.5 metres of the boundary. Thick coverings of slurry within a 1 metre margin of the hedge and spreading across the bottom of hedges was noted on a number of occasions during surveying. Figure 6.3.8. shows slurry spread across the lower boundaries of a hedgerow. Thick coverings of slurry block plants from photosynthesising and no herbs were found in the herb layer of this hedge, even outside of the target species list.



Figure 6.2.9: Slurry spread on hedgerows in MN840NW.



Figure 6.2.10: Nutrient rich hedge.

Ivy

In the light of the fact that Ivy *Hedera helix* is a native food plant for a number of bird and invertebrate species, including the summer generation larvae of the Holly Blue butterfly, control of Ivy should be kept to an absolute minimum. The specifications for the and CAP agri-environment schemes permit the control of Ivy where it poses a threat to the stability or long-term viability of hedgerows. This is set in the context of the importance of Ivy for wildlife and where possible should be retained and allowed to develop.

The presence of Ivy at canopy level was recorded according to the DOMIN scale. Ivy is not parasitic and does not directly affect the health of the trees. Its supplies itself with water and nutrients and only uses the tree as a means of support to reach the light. Ivy was present but not in the canopy in 45.8% of hedges. However, a heavy infestation of ivy throughout the crown of a tree is usually, but not always, an indication that the tree is in a state of natural decline. In these circumstances Ivy can smother a tree and hasten its decline. The dense adult growth, throughout the crown, will tend to make the tree top heavy and therefore more likely to fail during adverse weather conditions. Ivy was present in the canopy of 45.8% of the sampled hedges, and was found at 'greater than 25%' in 31.8% of these hedges. This is a significant increase from 2010 when Ivy was present in just over 10% of hedges. Ivy was often noted in the canopy of trees suffering from Ash dieback (57% of trees with Ash dieback also had >25% ivy in canopy). Given the high percentage of Ash in Monaghan Hedgerows, and the high percentage of these Ash trees suffering die back, this increase in Ivy in the canopy is not unexpected.

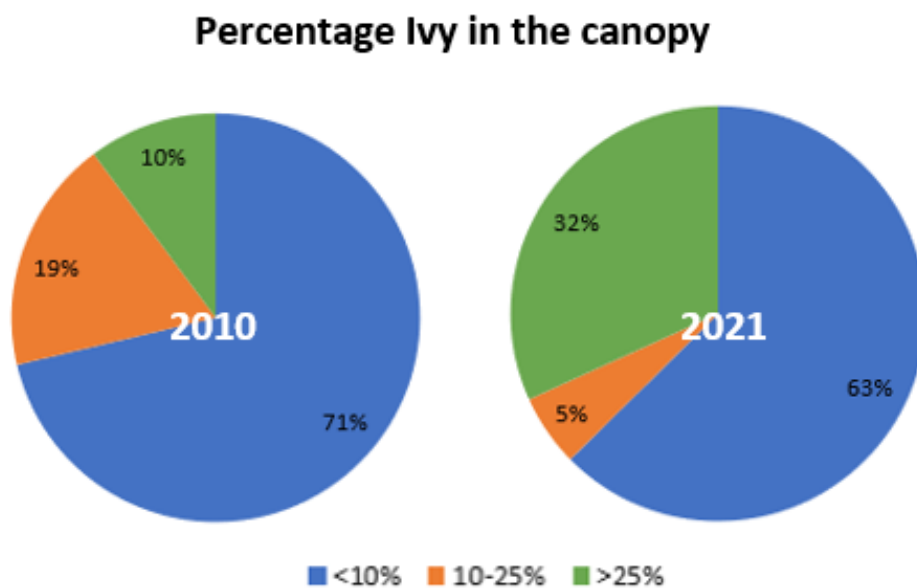


Figure 6.2.11: Percentage Ivy in the canopy.



Figure 6.2.12: Ash tree with dieback and a high percentage of Ivy in the canopy in Emyvale. (MN410)

6.3. 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 Monaghan’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).

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 6.3.1. illustrates the results.

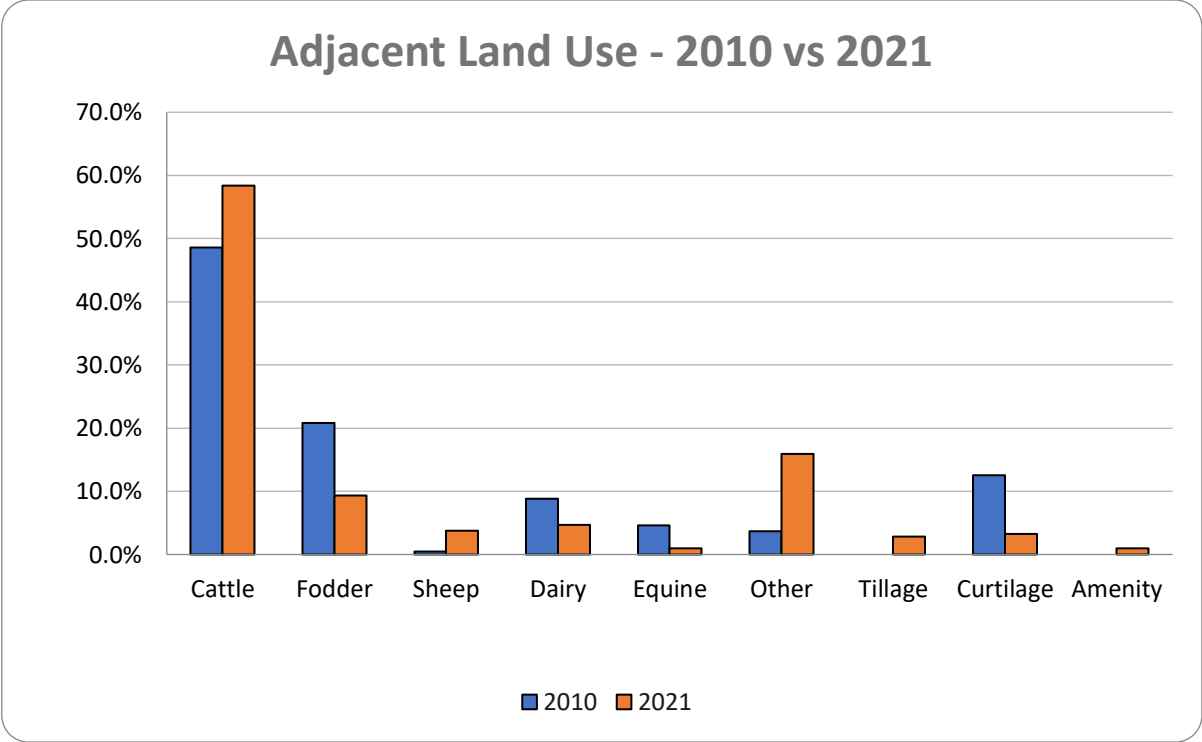


Figure 6.3.1: Adjacent land use

Around 58.4% of adjacent land is used for cattle, approximately a 10% increase from 2010. Tillage, which was absent in the 2010 survey, was noted for the first time as the adjacent land use, in 2.3% of the sampled hedges. Tillage was the only farming land use not related to livestock. Nearly all sampled hedges were connected to livestock farming, whether directly through stock or for the harvesting of fodder (exclusively silage).



Figure 6.3.2: A field of wheat at MN0502. This was the first time tillage was noted as the adjacent land-use in a Monaghan hedgerow survey.

Adjacent Land Classification

Figure 6.3.3. shows the breakdown of the habitat classification of the land each side of the sampled hedgerows. Over 64% of land adjacent to hedgerows in Monaghan is classed as improved grassland (an increase of 10% from 2010). Just one fifth of land adjacent to hedgerows sampled is of a natural or semi-natural habitat type, with 14% of this figure attributed to semi-natural grassland (a reduction from 28% in 2010) and 2.8% to semi-natural woodland/scrub.

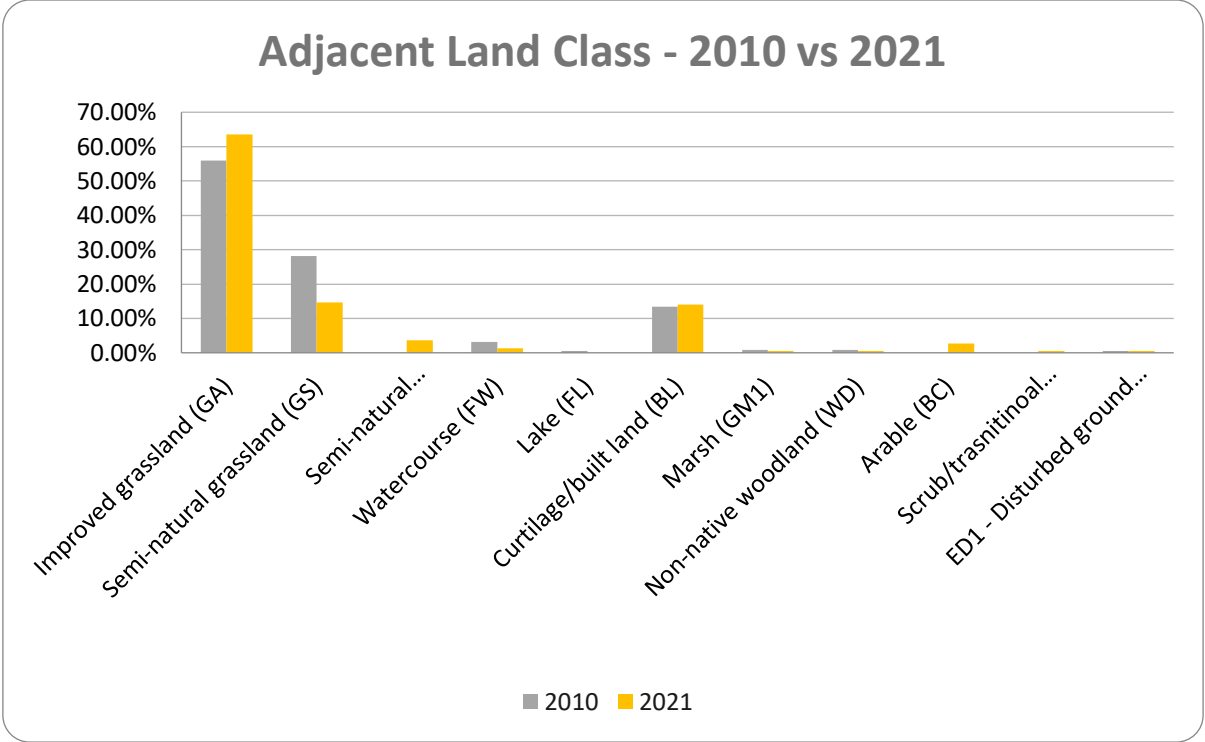


Figure 6.3.3.: Adjacent land habitat class.

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. Figure 6.3.4. shows the breakdown of how the end points of the sampled hedges connected with other hedgerows and other habitat types. Hedgerows sampled in County Monaghan linked to eight different basic natural or semi-natural habitat types, principally other hedgerows or scrub. Although 50.9% of end links were with other hedgerows, 27.3% linked with treelines and 9.3% linked with woodland or scrub. It appears hedgerows and treelines were included in the same category in 2010 and so no comparison of recordings will be made here.

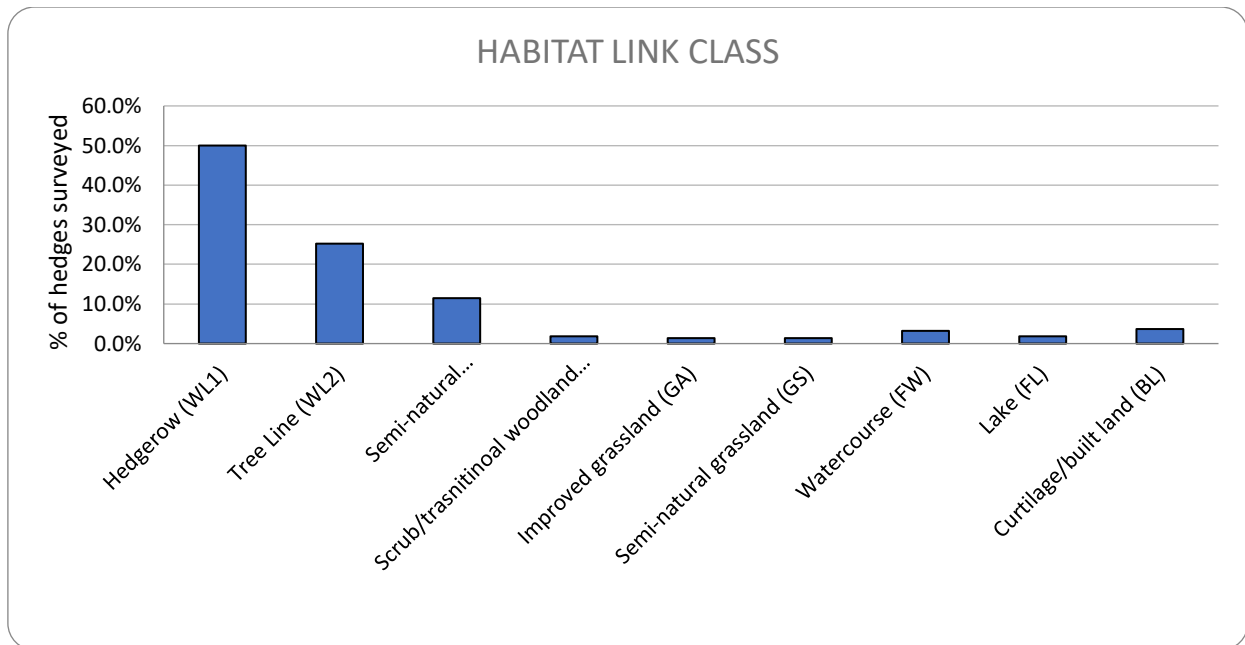


Figure 6.3.4. Habitat links to sampled hedges.

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. Since 46% of the sample hedges were not present on the first edition maps from 1834-35 it can safely be assumed that a significant proportion of the hedgerow network in County Monaghan is less than 200 years old (Foulkes, 2010). The second edition O.S. maps (1909-10) show that less than 1% of the sample hedges were, most likely, not present. Four hedges were linked to features on the Records of Monuments and Places (RMP), established under the National Monuments Amendment Act 1994.

Townland Boundary and Roadside hedges

Since there has been a small degree of realignment of townland boundaries between the first and second editions of the Ordnance Survey, townland boundary hedges were identified using the second edition maps in 2010; in County Monaghan they accounted for 12% of the sample. Roadside hedges are at the forefront of the public’s perception of hedgerows. In County Monaghan, 24% of hedges surveyed were roadside hedges; this was evenly split between classified roads and unclassified roads and farm tracks. One hedgerow bounded the old Dundalk – Enniskillen railway line outside of Castleblayney, MN0909 (See figure 6.3.5.)

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 Monaghan, the first edition of maps was produced in 1834-35, followed by the second edition in 1909-10. 46 % of hedge boundaries were present on first edition OS maps, while only 1% were not present on second edition maps. The 2010 survey estimated approximately 5,900 km of hedgerow was established in the 75-year period between 1835 and 1910, compared with just 128 km in the 100 years between 1910 and 2010 (Foulkes, 2010). Only four hedges in our baseline survey were connected to a feature on the Records of Monuments and Places (RMP), established under the National Monuments Amendment Act 1994. One surveyed hedge bounded the old Dundalk – Enniskillen railway line outside of Castleblayney. An old pillar can be found at the end of the hedge, however it has not been recorded on the Records of Monuments and Places. The majority of sampled hedges formed part of internal boundaries on farms. The boundary context of sampled hedges is shown in Figure 6.3.5.



Figure 6.3.5.: Old stone pillar at MN0909 on the old Dundalk-Enniskillen railway tracks.

Boundary Function

To assess the relevance of hedgerow boundaries to modern agriculture, a record was made as to whether the hedgerow formed part of an active farm boundary. A 'redundant boundary' is one where stock would have uncontrolled simultaneous access to the land either side of the hedge. The boundary function is irrespective of the functionality of the hedge which may or may not be reinforced with other forms of fencing. Hedges along redundant boundaries may not be redundant for shelter or other roles. 69% of hedgerows in County Monaghan are considered still to be part of active divisions or subdivisions of farms (91% in 2010), with 31% adjudged to be redundant boundaries.



Figure 6.3.6: Relict and redundant hedge boundary at MN0901

6.4 CONSTRUCTION OF HEDGEROWS IN COUNTY MONAGHAN

'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. In County Monaghan 80% of the hedges surveyed were considered to be linear in outline.

The dominant form of hedgerow construction is a single line of shrubs with an associated hedge bank, frequently associated with an external drain. A single or double line of shrubs is generally an indicator of a planted origin for hedgerows. Almost two-thirds of sampled hedges fell into

these two categories, with a much greater proportion (91%) being of a single line construction. Around 77% of sampled hedges have an associated hedge bank. 4% of sampled hedges were classified as stone wall hedges and 15% were shelves. Just over half of the hedges sampled have an associated drain.

42% of hedgerows surveyed would now be categorised as treelines (Fossitt 2000).

STRUCTURE AND CONDITION OF HEDGES IN COUNTY MONAGHAN

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.

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 4% of sampled hedges in County Monaghan were recorded in the lowest height category. Around 80% had an average height greater than 2.5m. 40% of those hedges were over 5m in height.

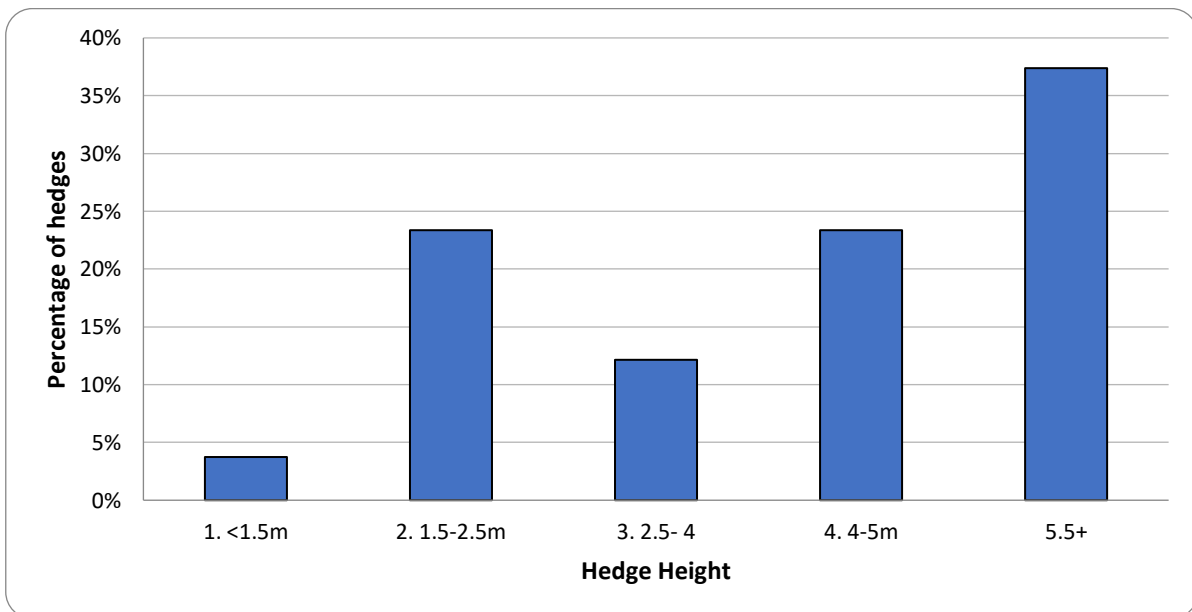


Figure 6.4.1.: Hedge Height

Hedge Width

Increasing width generally correlates with improved biodiversity in hedgerows. As can be seen from Figure 6.4.2., the results of the survey show that 96% of hedges surveyed in County Monaghan are over 1m wide, and this figure is the same as in 2010. 24% of hedges were in the largest width category of 3m+ (+9% from 2010).

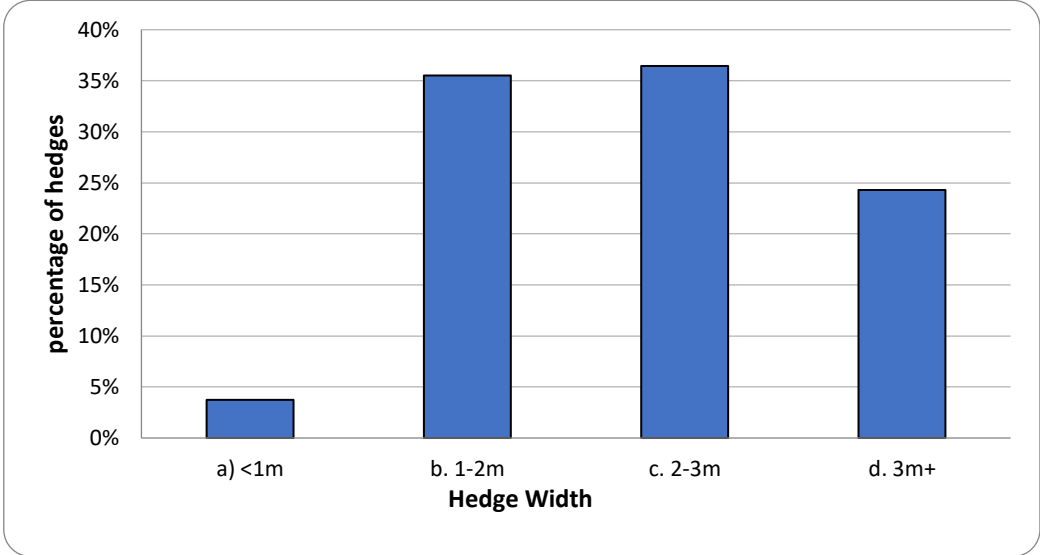


Figure 6.4.2: Hedge width

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. Some hedges have very well-defined individual ‘specific’ gaps; others have a low stocking density of shrubs and trees that result in a lateral weakness in the structure, referred to as ‘general gaps’. A specific gap is defined as one that is at least 3m in length. Figure 6.4.3. shows the breakdown of the sample in terms of percentage gaps over the length of the hedge.

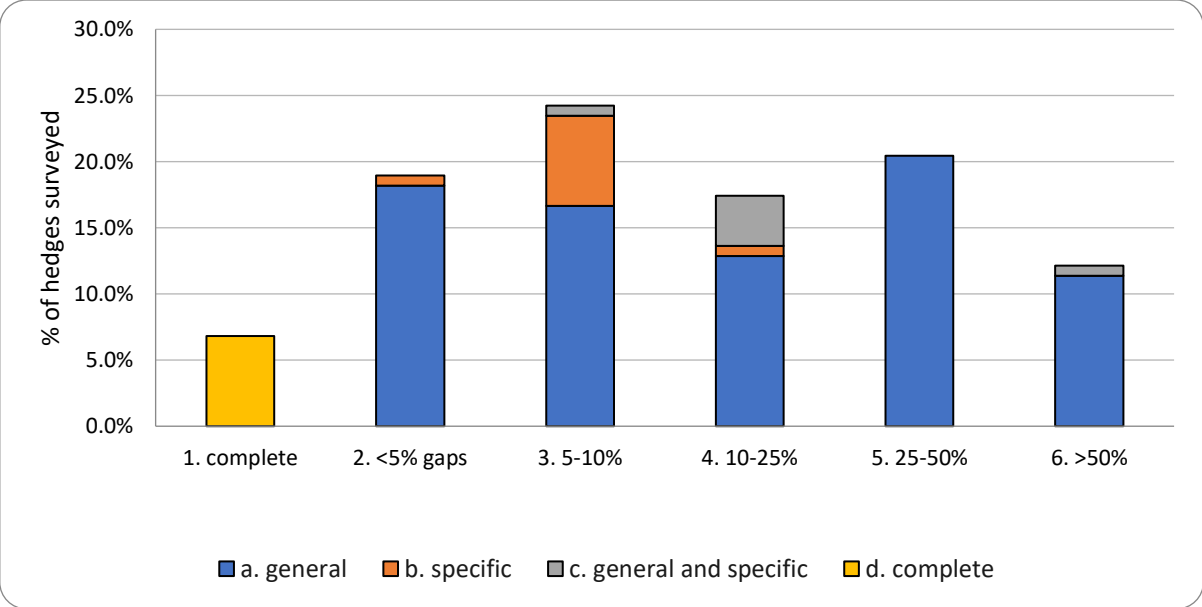


Figure 6.4.3: Percentage of gaps.

39.3% of sampled hedges had less than 10% gaps, with 17.8% of hedges having less than 5% gaps. Approximately 40% of hedges have over 25% gaps and 15% of sampled hedges had gaps totalling greater than 50% of their length.

In 2010 37% of hedges had less than 5% gaps, but this figure is almost halved in 2021. Stock proof hedges have declined since 2010 when just 3% of sampled hedges had gaps totalling greater than 25% of their length (See figure 6.4.4.). This can happen through lack of management, leading to conversion to lines of trees/shrubs and relict hedges.

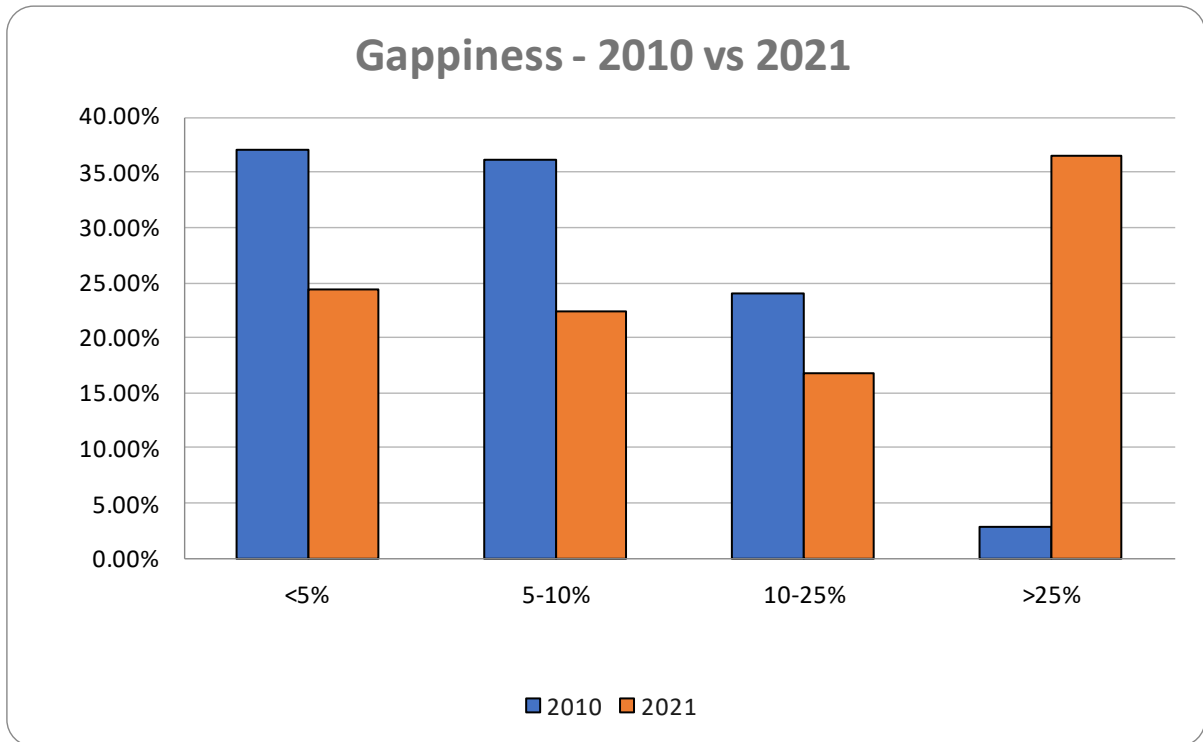


Figure 6.4.4.: Comparison of percentage gaps in 2010 vs 2021.

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 6.4.5. 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. 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 (73%) of sampled hedges showed some degree of translucence in the lowest 1m of growth. 21% were classed as being open / translucent. 22% of hedges were classed as having a dense base, which is 12% higher than 2010, however the subjectivity of the surveyor must be taken into account for this category. This density is disregarding gaps outlined above and thus shows that with correct management of gaps, healthy hedgerows can form.

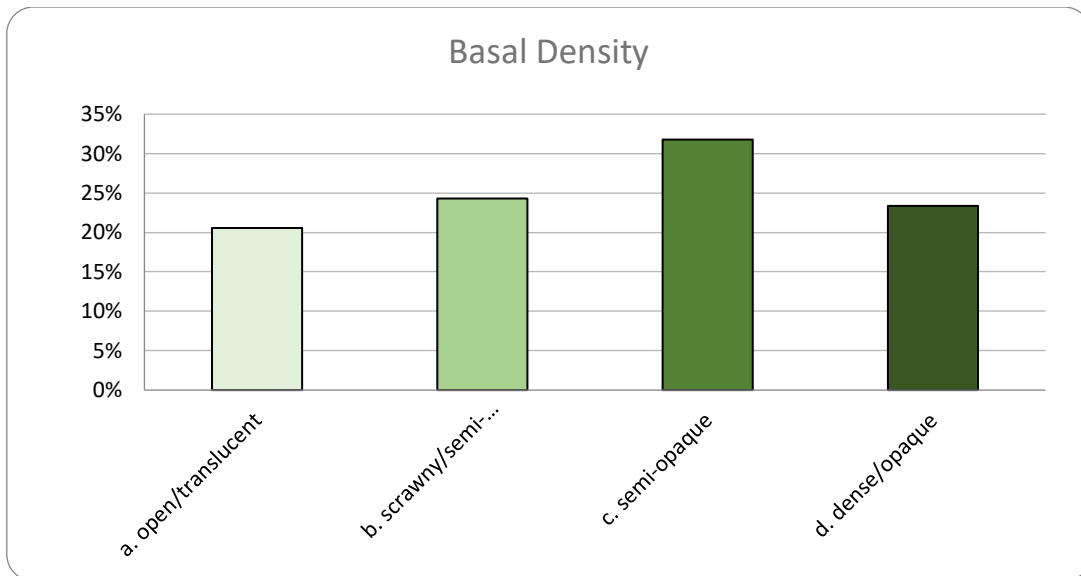


Figure 6.4.5: Basal density

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. The survey noted where the profile of the hedge included a significant element of outgrowths to the side of the main hedge line. An assessment of the findings in the sample hedges is shown in Figure 6.4.6.

Hedges with an overgrown or irregular profile in County Monaghan decreased from 2010 from 61% to 43%. Overgrown profile is indicative of lack of management, however, this figure does not show an increase in the management of hedgerows as both remanent and relict hedge categories have been included in the new methodology and many hedges which would have been included in the overgrown/irregular category were now assigned to these new categories.

12% of hedges were recorded as remnant hedges which is defined as the remains of what used to be a hedge, having no consistent profile. 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 a boundary, it is no longer classed as remnant and instead can be classed as relict.

Relict hedges were recorded where shrubs and thorns of the hedge component have mostly grown up into trees, no longer displaying shrubby, dense growth form in the bottom 1-2 metres of the hedge. 19% of sampled hedges were classified as relict.

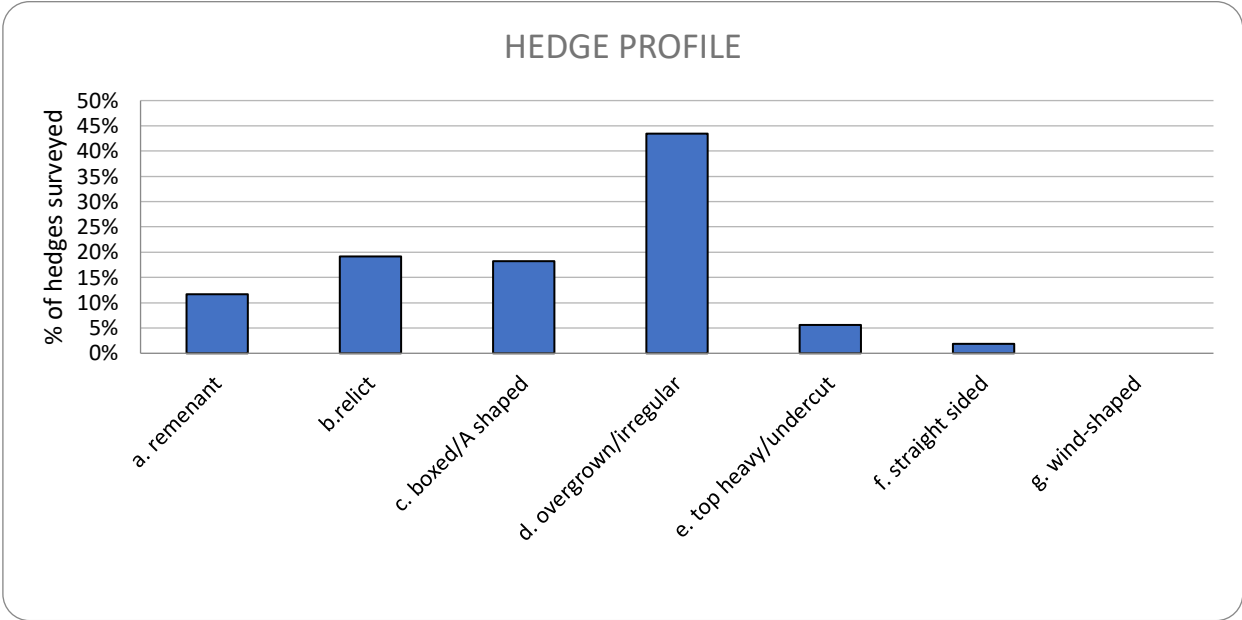


Figure 6.4.6: Hedge profile categories in 2021.



Figure 6.4.7: A relict hedge (MN02TB3).

Hedgerow Trees

This survey looked at both the abundance of trees in hedges (Figure 6.3.14) 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. 11.4% of the sample hedges had no hedgerow trees (-6% from 2010), with a further 24% of hedges having Few Trees (up to 15% canopy cover). At the other end of the spectrum, 26% 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 17% from 2010. Showing an overall increase in tree species in hedges in the county and a general increase in treelines over hedgerows.

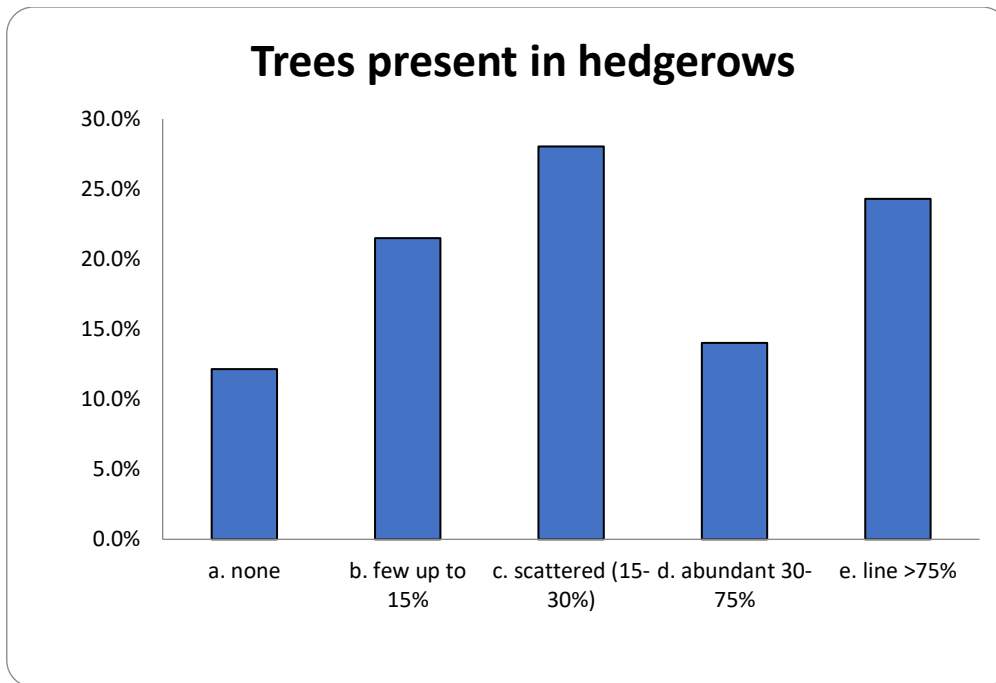


Figure 6.4.8: Hedgerow trees

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 64.5% of sampled hedgerows trees were either exclusively or predominantly mature, an increase of around 7% since 2010.

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 6.3.15. 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.

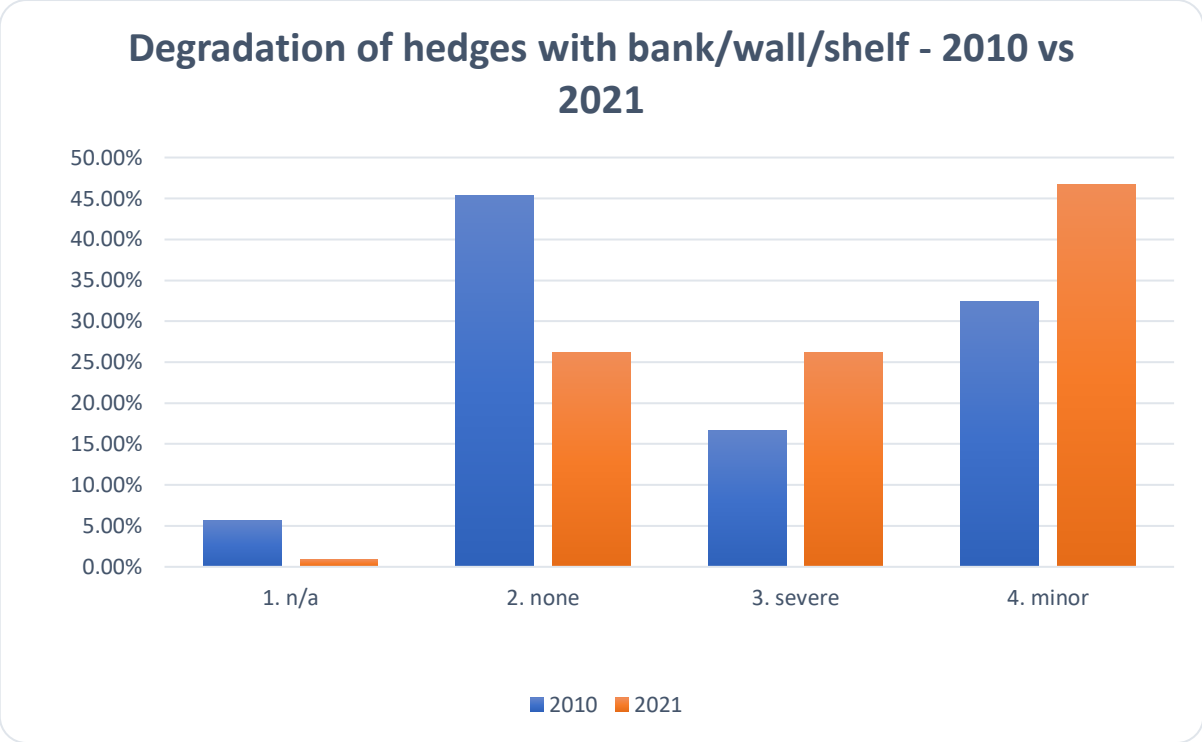


Figure 6.4.9.: Hedges showing degradation of the bank, wall or shelf.

Degradation of hedge banks has been a common feature in all of the county hedgerow surveys conducted to date. 72% of hedges sampled during the County Monaghan survey exhibited some degree of damage to the supporting infrastructure of bank, wall or drain compared to 50% in 2010. In 26% of hedges this damage was considered to be severe in nature, an increase of 10%.



Figure 6.4.10: Degraded bank. MN0707.



Figure 6.4.12: South facing banks provide important insect habitats.

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 as 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, 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 Monaghan most hedges in the sample had a margin.

47% of verge margins were less than 1 metre. Around one quarter of hedge margins were 2 metres or greater. A large number of hedges showed some degree of poaching within 2 metres (39%).



Figure 6.4.13: Hedge poached within 1m (MN0708).

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 10% of hedges were noted as having poor vigour in part. 37% of sampled hedges displayed good vigour showing most hedges are in healthy condition and are suitable for revival.

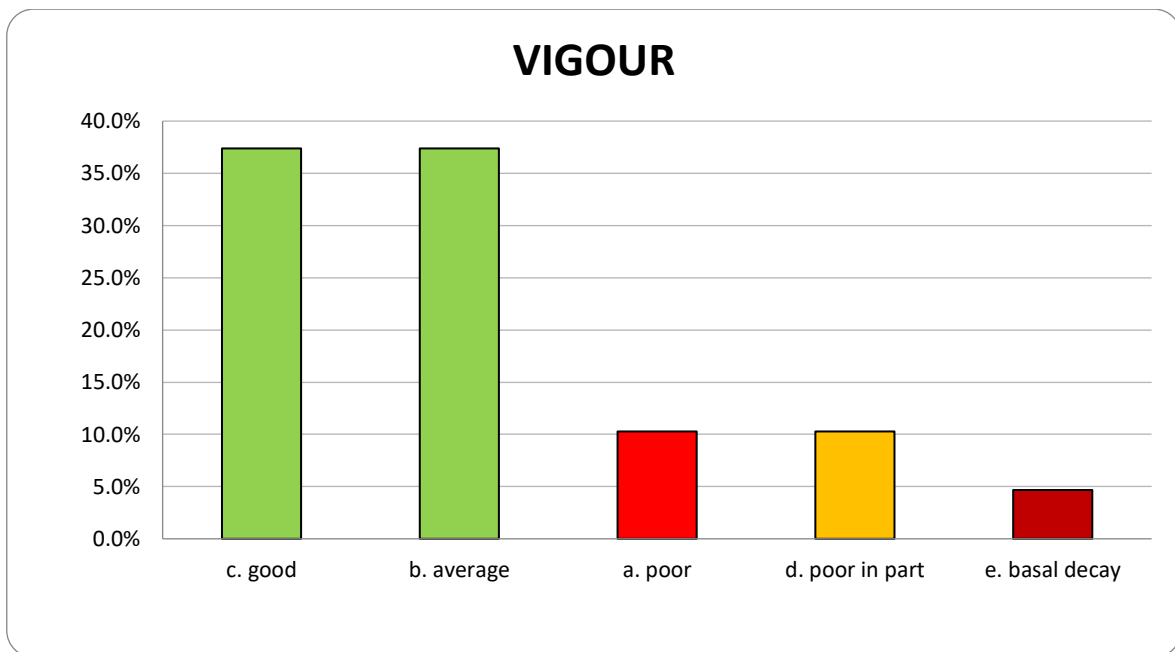


Figure 6.4.14: Vigour of assessed hedges.

6.5. MANAGEMENT OF HEDGES IN COUNTY MONAGHAN

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 Section 6.3.

40% of hedges in County Monaghan have received some degree of management intervention in the last 10 years. This varies from mechanical trimming to the pruning of individual hedges. None of the hedges sampled showed evidence of infill planting of gaps and only 1% showed evidence of rejuvenation through laying, however this was in a historical context. A further 2% showed evidence of coppicing. Laying and coppicing have been promoted by the agri-environmental schemes to date. 60% of hedges were noted as long term unmanaged.

5% of sampled hedgerows were noted as having been managed during the prohibited period of the Wildlife Amendment Act (2000). However, this category can be hard to distinguish as surveying takes part in the summer while restrictions on cutting are in place from March. A number of roadside hedges were noted as cut outside of season during surveys, however these were not inside the study area. This illegal practice was most severe in the Scotstown area where multiple roadside hedges showed evidence of extreme cutting, with consequences for biodiversity. These hedges also displayed poor cutting practices, putting hedgerows at risk of disease. Cutting hedgerows during the growing season is potentially damaging to the health of hedgerow shrubs and to much of the wildlife dependent on the hedge. However, some out of season cutting may be necessary in respect of public health and safety.



Figure 6.5.1: Hedge at MN0509 shows evidence of being cut out of season. The hedge is quite far from the road boundaries and seems unlikely to have been affecting road-users' visibility.

The mechanical flail is the management tool responsible for the majority of cut hedges in this survey. However, a circular saw is a less damaging alternative which results in a cleaner cut and encourages better regrowth. This is normally reserved for cutting larger growth to reshape overgrown hedges or where hedges are cut on longer rotations (as prescribed by the REPS).

Tractor-mounted flail cutters should only be used on the soft growth of thorny species, and never on heavy woody growth as the resulting ends are unsightly and invite disease. The machine must be kept in good condition. Sharp blades and regularly maintained equipment are extremely important and the proper training of the operator cannot be overstated.



Figure 6.5.2.: Recently flailed Blackthorn hedge (Barker, 2016)

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 6.4.3.

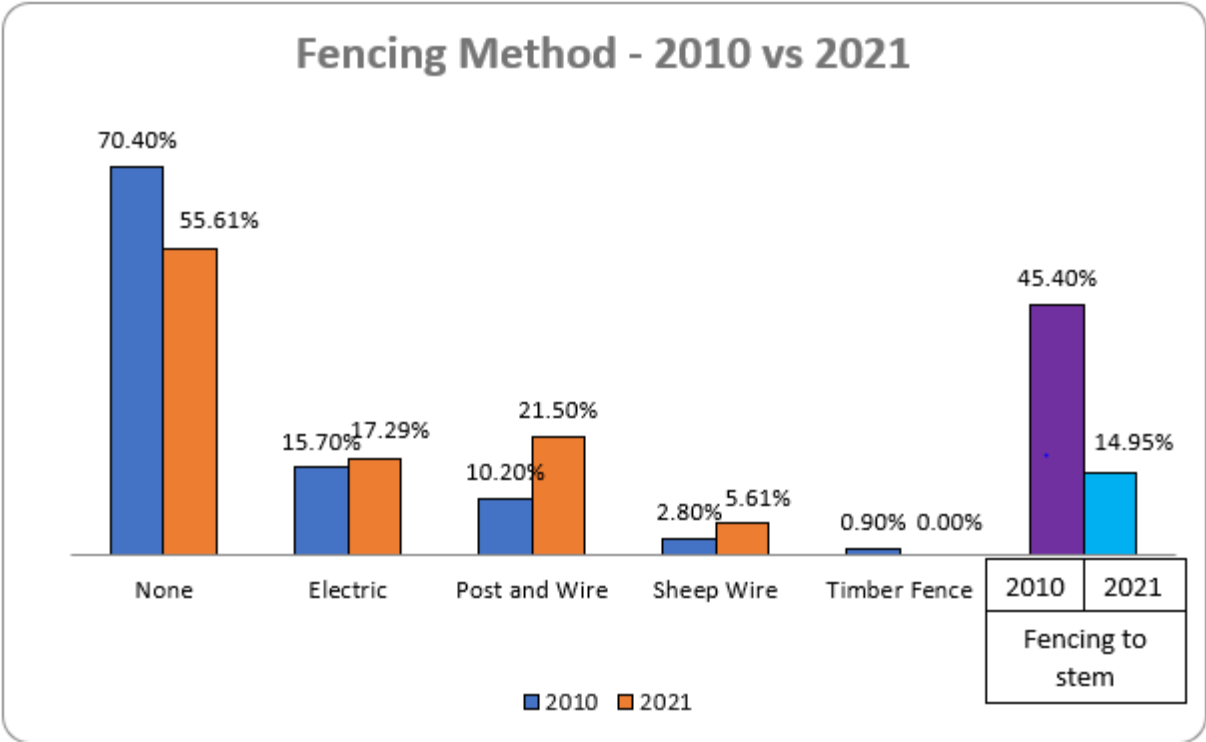


Figure 6.5.3.: Comparison of fencing methods.

In 2010, taking into account both sides of the hedge, 70.4% of sampled hedges in County Monaghan had no additional fencing. This is reduced to 55% of hedges in the 2021 survey. This number is still very high and demonstrates there is still a need for stock-proof hedges. A reduction in fencing to stem was also welcomed with the figure dropping to 14.2%, a 30% reduction. This practice was very common in Monaghan in the past but evidence points to a large reduction in the practice, bringing many benefits for tree health. The principal means of supplementary fencing is through the use of post and wire, at 21.5%. Electric fence wire accounted for 17.29% of the sample, increasing by 7%. Temporary fencing methods, which are extremely beneficial to protect hedge flora during the summer months, are still not common practice in the county.



Figure 6.5.4.: wire fixed to stems at MN0804

Hedge Laying

There is little evidence for a tradition of laying hedgerows in County Monaghan, with just 2% of the sampled hedges showing some evidence of having been laid in the past. Evidence of old hedge laying can be difficult to detect in dense hedges or those with dense ground vegetation, so it is possible that these results may be on the conservative side. Two sampled hedges had signs of having been laid in the past (See figure 6.4.5.).



Figure 6.5.5.: Evidence of laying at MN0305

Removed hedges

Six hedges were removed since the 2010 survey. There are national regulations in place since 2011 to ensure that farmers apply to the Department of Agriculture for screening to determine if permission and an environmental impact assessment (EIA) is needed to remove a hedge. According to the Department's guidance, if the proposed newly created field will be over five hectares after hedge removal, or if a farmer wants to remove more than 500 metres of hedgerow, they must apply for screening. These Regulations were introduced following a 2008 European Court of Justice (ECJ) ruling against Ireland for using uniform, unqualified size thresholds to assess the effects of projects on the environment.

An assessment of EIA (Agriculture) regulations on Field Boundary Removal (2018) by Neil Foulkes includes no data from County Monaghan. Monaghan is the only county in Ireland to indicate a zero number of applications for EIA screening for field boundary removal.

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



Figure 6.5.6: Old townland boundary hedge removed for poultry farm (MN05TB4).



Figure 6.5.7: Hedge removed (MN0401).



Figure 6.5.8: Roadside hedge removed and replaced with fencing. (MN1008)

6.6. Appraisal of hedges in County Monaghan.

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 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.

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 2010 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 39% of hedges in the baseline survey can be classed as highly significant or Heritage Hedgerows. Around 16% of hedges scored as highly significant due to their historical context. While 16.8% were found to be significant due to their species diversity, there has been a decline in shrub and flora diversity but an increase in tree species diversity in the County. 6.5% of hedges scored highly significant based on structure, construction and associated features. No hedges scored as significant hedges based on their habitat connectivity value or landscape significance. This is due to the fact that there are only a small number of designated sites in County Monaghan and high significance for the category of habitat connectivity in the HAS is based on connectivity to a designated site.

Table 6.6.1. Percentage of baseline hedgerows scoring as Highly significant hedgerows.

% Baseline Hedgerows achieving Highly Significant Status	
Scoring category	Percentage (%)
Historical Significance	15.9
Species Diversity	16.8
Structure, Construction and Associated Features	6.5
Habitat Connectivity Significance	0
Landscape Significance	0

See appendix 3 for significance scoring criteria.

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 6.6.2. Condition Assessments.

Conditions Assessment	Unfavourable %	Adequate %	Favourable %	Highly Favourable %
Structural Variable				
Height	3.7	23.4	12.1	60.7
Width	3.7	35.5	36.4	24.3
Profile	27.1	8.4	16.8	36.4
Basal density	20.6	24.3	28.0	29.0
Continuity				
% gaps	53.3	22.4	17.8	6.5
Negative Indicators				
Bank/Wall/Shelf Degradation	26.2		46.7	27.1
% ivy in canopy	31.8			
Ground Flora (nutrient rich)	40.2			
Verge margin poached within 2 metres	38.8			
>20% evidence of herbicide use	0.5			
Grassy margin (>2m 1 side)			27.1	
Grassy margin (>2m both sides)				3.7
Unfavourable species (>10%)	10.3			

87.9% of hedges fell into the category of unfavourable based on criteria which assessed structure, continuity and a number of other unfavourable indicators, meaning only 12.1% of hedges were found to be in adequate or favourable condition. Figure 6.5.3. shows the main categories which resulted in a hedge scoring as unfavourable. Only 1 hedge scored highly favourable in all categories. A high percentage of gaps is the prevailing cause of hedges in Monaghan scoring unfavourable, with over half of hedges failing in this regard. This is followed by the percentage of nutrient rich species. Improved grassland was the most common type of land use adjacent to unfavourable hedges, at 85%. Poaching of the hedges within 2m was also an issue, followed by Ivy in the canopy and unfavourable hedge profiles (such as remnant or relict hedges). Around 10% of hedges scored unfavourable due to the fact that >10% of woody growth volume comprised of unfavourable species e.g., Sycamore, Beech and Snowberry.

See appendix 4 for condition scoring criteria.

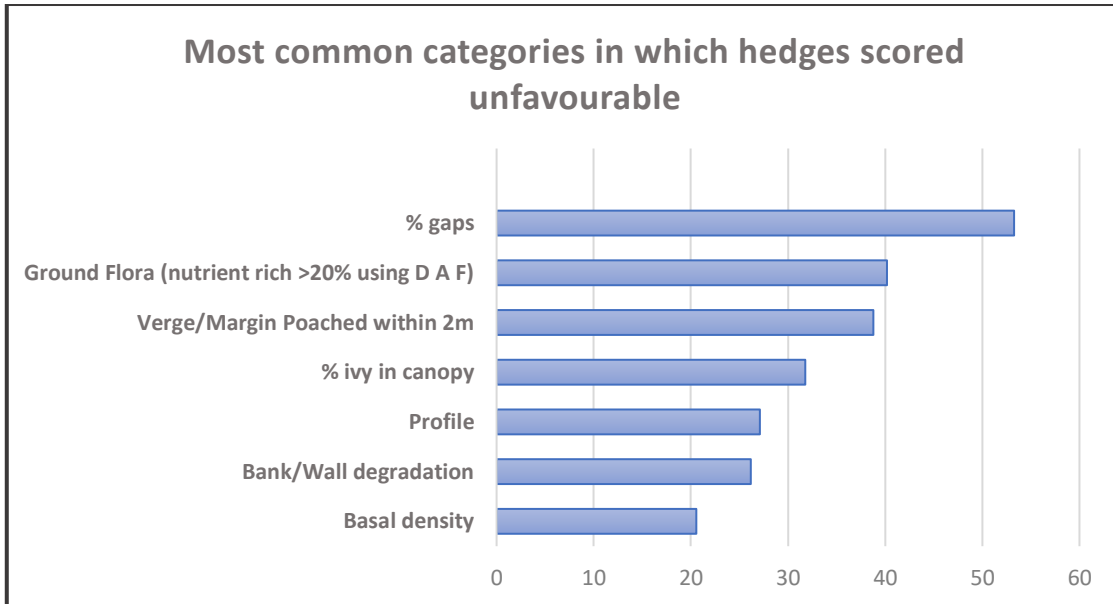


Figure 6.6.3.: Most common categories where hedges scored unfavourable.

6.7. PHASE 2 - SAMPLE OF POTENTIAL HIGH ECOLOGICAL VALUE HEDGEROWS

Townland Boundary Hedges and Hedges linking to Native Woodland

In 2010, in the baseline survey 12% of all of the randomly chosen hedges surveyed formed part of townland boundaries and 8% linked at one end to semi-natural woodland or scrub. In order to look in more detail at hedges of this type of hedgerow, additional recordings were made. These hedges were re-surveyed in this study in order to understand their conservation status 11 years on.

Frequency of Occurrence

A number of shrub species were recorded more frequently in townland boundary and native woodland linked hedges than in the baseline survey. Some of the main tree and shrub species, Ash, Hawthorn, Blackthorn and Holly were recorded more or less in similar incidences in both native woodland/townland boundary and baseline hedgerows. In 2010 however, Ash, Hawthorn, Blackthorn and Holly occurred less frequently in townland boundary/native woodland linked hedgerows than baseline hedgerows.

Several shrub species saw a significant increase between Baseline and Native Woodland/Town Boundary in the 2021 survey. These were: Wild Privet (+15%) and Elder (+13%). Less significant, but still notable, were Sycamore (+5.5%), Rowan (+5%) and Hazel

(+4%). Hazel and Wild Privet also occurred marginally more in 2010 townland boundary/native woodland linked hedges than baseline hedges.



Figure 6.7.1.: Flowering Wild Privet in a townland boundary hedge (MN04TB2).

Wild Cherry was not recorded in baseline hedges but had a 2.4% incidence in the native woodland/town boundary hedgerows. Also, low in incidence overall was Spindle (2.4%), however it did have a higher prevalence in this category than in baseline hedges. There was also a higher incidence of Spindle in townland boundary/native woodland linked hedges in the 2010 survey, with none at all detected in the baseline samples. Spindle was noted once in the baseline survey in MN03TB5, which was also a townland boundary hedge. This shows a connection between this species and townland boundary hedges. No Yew was recorded for any native woodland/townland boundary hedge in 2021, but a small percentage was present in baseline hedgerows surveyed.

The majority of the herbaceous ground flora species occur slightly more frequently in townland boundary and native woodland linked hedges than in the baseline survey. This is true for both the 2010 and 2021 surveys. However, in 2021 there was not a significant difference in abundance between several species, including Cow Parsley, Foxglove and Wood Avens. In terms of species-rich flora, the key species that show a greater abundance in the native woodland/townland boundary hedgerows are Thistle (+17%), Ground Ivy (+10%), Hogweed (+8%) and Lords & Ladies (+7%). Other notable differences are Opposite-leaved Golden Saxifrage (+5%) and Nipplewort (+5%). For the 2010 surveys, while there was greater abundance for Wood Sorrel and Hedge Woundwort in native woodland linked/townland boundaries, this was not the case for the 2021 surveys as both hedgerow types were quite similar in number.

Species Diversity

In terms of the category All Woody Shrubs, townland boundary hedgerows show the greatest diversity in species followed by townland boundary (TB) hedges linked to native woodland and then hedge linked to native woodland (NW) (See table 6.7.1.). For example, townland boundary hedges average around 4 woody species per 30m sample strip (3.94 for TB hedges linked to NW), while baseline hedges had 3.5. Townland boundary hedges were less diverse when it came to herbs, with both TB categories scoring the lowest in this category. This is the reverse of 2010 when TB hedges scored the highest in this category. Hedge linked to native woodland had the highest number of target herbs (3.0).

Although diversity has dropped for most categories since 2010, TB hedges linked to NW have on average 0.54 less species than 2010, for herbs a reduction of 1.42 species on average and 0.5 less species of ferns.

Hedges linked to native woodland are less diverse than 2010 (0.4 species woody shrubs species less). However, they are still more diverse than the baseline hedges studied in this survey.

Table 6.7.1.: Comparison of average number of species per 30metre strip in different hedge types.

	All woody shrubs	Native shrubs only	Target Herbs	Fern (and Allies)
Baseline hedges 2021	3.5	3.02	2.56	1.12
Baseline hedges 2010	3.62	3.32	2.88	0.83
Townland boundary hedges 2021	4	3.31	2.25	0.94
Townland boundary hedges 2010	3.87	3.63	3.07	0.93
Hedge linked to native woodland 2021	3.8	3.28	3.0	1.48
Hedge linked to native woodland 2010	4.20	4.04	3.40	0.84
Townland boundary hedges linked to native woodland 2021	3.94	3.59	2.41	1.0
Townland boundary hedges linked to native woodland 2010	4.48	4.26	3.83	1.50

Hedgerow Appraisal System

Hedgerow Significance

90.5% of townland boundary and native woodland linked hedgerows are classed as *Highly Significant* or *Heritage Hedgerows*. This is 51.3% more than in the baseline survey. 66.7% scored highly significant due to their historical significance. Approximately 12% scored highly significant due to species diversity. This figure was the same for the category structure, construction and associate features. No hedges scored significant for habitat connectivity or landscape significance. Only 11.9% of hedges in this category scored highly significant due to their species diversity, which is actually less than this category in the baseline survey (16.8%). No hedges scored highly significant in terms of habitat connectivity. This is due to the fact that there are only a small number of designated sites in County Monaghan and high significance for the category of habitat connectivity in the HAS is based on connectivity to a designated site (Special Area of Conservation, Special Area of Protection and National Heritage Area).

Table 6.5.1. Percentage of townland boundary and native woodland linked hedgerows achieving Highly Significant status

% Baseline Hedgerows achieving Highly Significant Status	
<i>Scoring category</i>	<i>Percentage (%)</i>
Historical Significance	66.7
Species Diversity	11.9
Structure, Construction and Associated Features	11.9
Habitat Connectivity Significance	0.0
Landscape Significance	0.0
	90.5%

Condition Status

Just 14.3% of townland boundary and native woodland linked hedgerows achieved either *Adequate, Favourable or Highly Favourable Condition* status, which is only slightly better than the baseline hedges at 12.1%. This is concerning, as the 2010 survey showed 17.8% in the category *Favourable Condition* alone. The degree and nature of gaps is the most significant reason for failing the criteria. The details are presented in Table 6.5.2.

The most obvious negative outcome was that the category ‘Canopy dominated by Ivy’ increased which is most likely down to the takeover of Ash Dieback disease in the last decade. Species rich ground flora and degradation of the verge margin due to poaching were highly problematic.

Table 6.5.2. Percentage of townland boundary and native woodland linked hedgerows in Unfavourable Condition

Condition Category	Condition Criteria	Unfavourable 2010 %	Unfavourable 2021 %
<i>Overall</i>		82.2	85.7
<i>Height</i>	<1.5m	6.5	2.4
<i>Width</i>	<1m	1.6	2.4
<i>Basal density</i>	Open	24.2	7.1
<i>% Gappiness</i>	>10%	46.8	47.6
<i>Bank/Wall</i>	>20% of the length of the hedge degraded	9.7	21.4
<i>Proportion of introduced species</i>	>10% of woody growth volume comprised of unfavourable species	6.5	9.5
<i>Ground flora/hedge base</i>	Contains Noxious weeds or > 20% Dominated by Nutrient Rich Species	24.2	42.9
<i>Degraded margin</i>	Ploughing up to base of hedge and shrubs Poaching/erosion	22.6	35.7
<i>Proportion of canopy dominated by Ivy</i>	>25%	3.2	47.6

7.0. Discussion

This section will discuss some key and significant points from the results section. Remarks will be made on certain categories which have resulted in Monaghan hedges failing to be deemed in favourable condition. 73% of hedges were in Unfavourable Condition in 2010. This has increased by approximately 15% in the 2021 survey.

Around 55% of hedges scored unfavourable in the category of gaps. The percentage of gaps in hedges is increasing and will be discussed in Section 7.4. The implication for wildlife is severe and actions should be taken to prevent the decline of these vital wildlife corridors.

The second most prevalent issue addressed in the 2021 survey, is the doubling of nutrient rich hedges (these are hedges with >20% nutrient rich species). 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 poaching of verges and margins was also apparent which correlated with Monaghan's high instances of cattle or dairy farming, field margins will be discussed in Section 7.5.

Ivy in the canopy has become an issue and 31.8% of hedges failed to meet favourable condition in this category. This may be related to the prevalence of Ash dieback, and other issues associated with the disease are outline in Section 7.2.

Hedge profile was deemed unfavourable in 27% 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.

7.1. Species Composition

Shrubs

Hawthorn, Whitethorn, or 'Sceach gheal' in Irish, is a common feature of hedgerows throughout the country but this is certainly true of Monaghan. Hawthorn was found in 94.4% of hedges sampled. *Crataegus monogyna* 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 is often found growing in conjunction with Hawthorn (found in 65% of our 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 mid-green 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.

Along with this, Holly provides dense cover and good nesting opportunities for birds, while its deep, dry leaf litter may be used by hedgehogs and small mammals for hibernation. Holly was identified in 41% of hedges in Monaghan. It is one of our few native evergreen shrubs. It is shade-tolerant and grows naturally in the murky under-story of native broadleaf trees. Wild privet (17.8%), Gorse (30.8%) and Elder (15.9%) also commonly make an appearance. 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. Invasive Snowberry was found in only 5.6% of sampled hedgerows but was noted on many occasions in roadside hedges. It often displaces native species by forming dense thickets by suckering. Its berries are poisonous to humans and provide little nutrition to birds.

As previously mentioned, species rich hedges are defined as those which contain four or more woody species on average per 30m strip. Only 23% of our hedges were deemed to be species rich for shrubs, a reduction of approximately 14%. At the same time, there was an overall increase in mono shrub hedges (+10%).

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 (See figure 6.3.8. in previous sections). Hedges which may have been species rich are being removed for farming, such as the townland boundary hedges removed for a poultry farm at MN05TB4 (See figure 6.4.6. in previous sections).

Ivy and other woody climbers

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 a more rapid decline. Neale Foulkes, in Monaghan's 2010 survey, noted that high proportions of Ivy in hedges is usually symptomatic of over or under management. In 2010 ivy had dominated over 25% of the canopy in one tenth of trees surveyed. This has increased to one quarter of trees in 2021, possibly correlating with the prevalence of Ash Dieback. These trees 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 pose a major health and safety risk.

Bramble (92.5%) was recorded in a high number of hedges, and it was found to be abundant in 16.7% of hedges and frequent in 42.9%. Bramble provides many benefits for wildlife but can impact ground flora when abundant. For this reason, bodies such as Farming for Nature encourage the use of temporary fencing of hedges during certain months, but removal of that fencing during certain periods to allow livestock graze at hedge margins and stop bramble from dominating. Wild Rose species (58%) are also widespread climbers in Monaghan hedges. Honeysuckle was noted in 42% of hedges which contained climbers providing nectar for insects, prey for bats, nest sites for birds and food for small mammals. Bittersweet Nightshade (3.7%) and Bindweed were also noted.



Figure 7.1.1.: Bittersweet (a nightshade) was recorded in 3.7% of hedges.



Figure 7.1.2.: Bramble provides a nectar source to pollinators.

Trees

Tree species diversity has actually increased since the 2010 survey, which seems logical due to an overall decrease in hedge management, leading to an increase in percentage of tree over shrubs. At the same time, hedges which are dominated by Ash which is suffering from dieback have a reduced canopy cover, allowing other tree species to take hold. Hedges containing 4 or more species of tree increased by 20%. Willow species only occurred in 6.5% of hedgerows sampled in 2010 and has increased by 16.9% in 2021. Sycamore frequency remained relatively similar to 2010, showing it may be more likely that the native Willow rather than the non-native Sycamore will take the place of Ash across the county. The occurrence of Hazel was similar while Alder increased by 5%. Hawthorn was not recorded in its tree form in 2010 but was the second most common tree species in 2021, found in 28% of hedges.

7.2. Ash Dieback

Ash dieback becomes apparent in trees if leaves turn brown, wilt and hang from their branches. It can spread to the entire branch and cause major damage to the tree if it spreads to the trunk. October 2022 will mark a decade since Ash Dieback was first recognised in Ireland.

Dying Ash woodlands pose risks to landowners for both public safety and deterioration of woodland cover and the ecological, social and economic benefits these woodlands provide. The initial response was a grant aided removal of imported Ash but as the disease swept through the country it was clear eradication was impossible and the scheme was abandoned. The Reconstitution and Underplanting Scheme (RUS) aimed to address this issue for foresters with promises to make available financial support for Site clearance or partial clearance, reconstitution (replacement of Ash trees with alternative species), and under-planting of trees. However, the scheme has been heavily criticised due to a lack of successful applications and inadequate compensation. IFA Farm Forestry Chairman Vincent Nally suggests where dieback is severe, the best approach is to harvest remaining commercial timber before value depreciation and replant the area with other tree species.

At the same time, many farmers may suffer the effects as the Roads Act 1993 states landowners must ensure that a tree, shrub, hedge or other vegetation on the land is not a hazard or potential hazard to persons using a public road. Dying Ash with a heavy infestation of ivy in the canopy is 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.

On the other hand, dead and decaying trees are vital components 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 habitat or as a food source. In instances where dying trees do not pose a health and safety risk, preservation of this standing wood may be the best course of action.



Figure 7.2.1: Roadside tree with Ash Dieback, (MN1307).

7.3. Nutrient rich hedges

Wildflowers prefer to grow in low fertility soil. When soil is rich in nutrients, the flowering plants find it difficult to compete with grasses and other nutrient rich plants such as Nettle, Thistle and Cleaver. On poorer soils, grasses and ruderal weeds lying in the seedbed can't take a hold as much as they would in nutrient rich soils, allowing the wildflowers to germinate and grow to the best of their ability. Nitrogen is relatively easy to deplete from soil, if no fertiliser is added. It is very 'mobile' and easily taken up by plants and grasses. It is 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. If a large amount of fertiliser has historically been applied to the area, it may take a long time to deplete.

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 – wildflowers will not thrive in nutrient-rich soil and wasting fertiliser in this area is costly to the farmer.

Teagasc has launched a study to examine the long-term trends in fertilizer use on Irish farms. The study is based on 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 is also evident in the study as fertilizer application rates on grassland were on average 36% lower for farms participating in an agri-environment schemes. This highlights the importance of these schemes in shaping farming practice. A remnant hedge is the remains of what used to be a hedge, having no consistent profile. A remnant hedge is generally indicated by a (broken) line of mature or senescent plants in tree, rather than in shrub form. These hedges have potential for rejuvenation. 12% of hedges surveyed were classe as remnant hedges.

7.4. Hedge structure and construction

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 where relatively favourable in Monaghan hedges. 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.

Gaps

A large percentage of hedges in Monaghan had over 25% gaps, with the figure coming out at 40%. In 2010, three-quarters of sample hedges had <10% gaps. 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.

Profile

In the 2021 study, 78% of hedges were noted as having some degree of translucency. This figure is similar to 2010. 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, an increase of 17% from 2010. 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 19% of sampled hedges were classified as relict. 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 is a fantastic landscape feature, and is 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 as the hedge may not survive (Teagasc, 2020). Remnant hedges have no consistent profile and are indicated by a broken line of mature or senescent trees. 12% of hedges were designated in this category and have the potential for rejuvenation.



Figure 7.4.1.: A relict hedge. (MN0901).

7.5. 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. Nettles, for example, are the food plant for caterpillars of the butterflies such as the Peacock, 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 other herbs. 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. 38.7% of hedges were found to be unfavourable in the category of poaching of the verge/margin, and 26.2% were unfavourable due to bank/wall

degradation. Selective grazing of livestock on these margins has huge benefits to hedgerow health but should be limited to certain times of the year.

Nearly half of hedge margins surveyed were less than 1metre. The tendency to maximise land use has led to many field margins becoming non-existent. Only 27% of hedges scored favourable for their field margins. The density of field boundaries per hectare will be rewarded in the Results Based Environment Agri Pilot Programme (REAP), including hedgerows in good condition, recognising the benefits of heterogenous landscapes. For example, a field of 2.5 ha should have a margin of 2 metres (DAFM, 2021).



Figure 7.5.1.: Hedge with favourable margin (MN07TB3).

7.6. Disappearance of semi-natural grasslands and an increase in nutrient rich species

The term ‘semi-natural’, when applied to grassland, implies that it has 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, reseeded or drainage. Just 14% of adjacent land during the 2021 study was judged to be semi-natural grassland, half the figure of 2010. Plant diversity thrives in low soil fertility. 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. A wide range of flowering plants attract a wider range of invertebrates and a wider range of animals which prey upon them. Semi-natural grasslands across Ireland are in danger due to conversion to arable farmland by the addition of nutrients to soil and the reseeded of these areas with grass mix. These grasslands have the potential to be species-rich meadows but instead usually house just a few grass species. Yellow Rattle is one of the tools in the fight against the disappearance of semi-natural grasslands. It is a parasitic plant which weakens grasses by siphoning away water and nutrient for its own use, slowing the expansion of grasses and giving space for other species to grow.

Healthy grasslands can store carbon, maintain good soil structure and well-managed grasslands, reduce waterlogging and the impacts of droughts, at the same time supplying a food source for livestock and wildlife (Farming for Nature, 2010). Results-based agri-environment 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 is 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.



Figure 7.6.1.: Semi-natural grassland in Clones, Co. Monaghan.

7.7. Impacts of hedge removal and hedgerow loss

Hedges were once important features on farms across Ireland but farming has changed dramatically since then. Since hedges are less important now than fences, they are often overlooked or over-trimmed, reducing their vigour and attractiveness for wildlife. Out of the 108 hedges surveyed on the ground, 6 had been removed. This would correlate to a removal of 0.5% per annum since 2010. Results from a visual analysis of 13 1km² sample grids show a drastic rate of hedge removal across the country. If this sample population (about 1% of the total county area) is an accurate representation, then we can estimate that around 0.88% of hedges are removed annually in county Monaghan. With agriculture accounting for 75% of this removal, this is somewhat surprising given the low amount of land used for arable purposes, as hedge removal is often connected to the use of heavy machinery for crops. This 75% includes hedge removal for poultry farming and piggeries. 15% of hedge removal was attributed to the creation of roads (namely associated with the Castleblaney bypass). Industry accounted for just 1.5% of removal and only 6.2% was accredited to residential purposes.

Hedgerows are protected under the Habitats Directive. There are also EU farm subsidy-linked standards that give hedgerows protection as landscape features that, in general, cannot be interfered with or removed. Where removal is necessary, an equivalent length of new hedgerow must be planted in advance (Council Directive 92/43/EEC). In addition, national regulations have been in place since 2011 to ensure that farmers apply to the Department of Agriculture for screening to determine if permission and an environmental impact assessment (EIA) is needed to remove hedges. A study by Neil Foulkes in (2018) show Monaghan is the only county in Ireland to have made no applications for screening. Yet, our study shows that Monaghan may have an estimated net removal of between 0.5% and 0.88% per annum. 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 in Ireland (EPA, 2012-2020). Based on our study, net removal in Monaghan is much higher, and at the same time an EIA screening has never been applied for.

In 2020, An Taisce made an official complaint to the Department in relation to the removal of several kilometres of hedgerow on farms in Cavan, Monaghan and Tipperary, in which no permission had been sought. The complaint was redirected to the NPWS who have not been able to follow up on this due to 'operational reasons' (Noteworthy, 2021). The NPWS has been drastically under-funded and Monaghan is currently without an NPWS ranger, a position which has been vacant for over two years. Only recently has funding and restaffing for the NPWS been restored to pre-financial crisis levels.

An Taisce ecologist Elaine McGoff has stated 'Ireland has one of the lowest levels of habitat connectivity in Europe' (Noteworthy, 2021). Our hedgerows are the most important links to natural and semi-natural habitat in the country. Our biodiversity is in severe decline with around 1,050 species of vertebrates, invertebrates and plants either Critically Endangered (CR),

Endangered (EN), Vulnerable (VU), Regionally Extinct (RE) and Near Threatened (NT) (NPWS, 2019), including mammals such as the Eurasian Otter *Lutra Lutra* and the Western Barbastelle *Barbastella barbastellus*. Species like these are at significant risk if this rate of removal is to continue.



Figure 7.7.1: Hedge removed for agriculture (MN0701).

7.8. Out of season cutting

Accurate assessment of 'out of season' cutting cannot form part of the overall survey methodology because it can take place any time from 1st March to 31st August. The majority of the 2021 hedgerow surveys took place between June to September. In many cases it is almost impossible to ascertain when exactly a hedge has been cut. However, in July and August 2021, while carrying out surveys, it was evident in a few cases that hedge-cutting had recently occurred and recent cutting was recorded in 5% of sampled hedges. Severe cutting was observed on a number of occasions in roadside hedges. On these occasions, hedges had usually been cut back to below 1.5 meters. This was especially evident on Bog Road, Scotstown.

Cutting hedgerows during the growing season is potentially damaging to the health of hedgerow shrubs and to much of the wildlife dependent on the hedge. It is also contrary to the conditions of most agri-environment schemes to date, as well as rules and regulations such as the EIA (Agriculture) Regulations 2011, CAP Cross Compliance and Nitrates Derogations. However, the associated rules and regulations are often not currently monitored or enforced, meaning

inappropriate and sometimes illegal hedgerow cutting and removal on farmland continues to be a regular occurrence.

In terms of roadside hedgerows, some out of season hedge-cutting may be necessary in respect of public health and safety. Exemptions during this period exist in the interest of road safety, and local authorities have power under the Roads Act to issue notices to the owner or occupier of land to cut a hedge to ensure that it is no longer a road safety concern at any time during the year.

The National Parks and Wildlife Service brought only 88 successful prosecutions between 2007 and 2020 for illegal hedge cutting or removal, but this trend may increase as more NPWS rangers and the impending Wildlife Crime Unit (under the Department of Housing, Local Government & Heritage) becomes established. From an ecology point of view, hedge-cutting would ideally be delayed until October to allow late-flowering herbs, berries, pollinators and nesting birds to complete their yearly life cycle, however the current ongoing legislation states the period is set at March to August inclusive.

7.9. Potential High Ecological Value Hedgerows

90.5% of townland boundary hedges and hedges linking into areas of native woodland were classed as Highly Significant compared with 32.7% in the baseline survey. This was primarily due to the fact that townland boundary hedges, by definition, are Historically Significant. Both hedgerow types have reduced in this category since 2010, showing that they have deteriorated in quality.

Only 14.3% of townland boundary and native woodland linked hedgerows were classed as being in Adequate, Favourable or Highly Favourable Condition compared with 12% of the sampled hedges in the Baseline survey. In general, for the 2021 surveys, the height and width characteristics of townland boundary and native woodland linked hedgerows were less likely to be a cause of failing to meet criteria, but the level and nature of gappiness were significantly more of a problem. This finding correlates with the 2010 hedgerow surveys. The reason for substantial height and significant gappiness is likely to be that over half of the townland boundary/native woodland linked hedgerows are long-term unmanaged, followed by 'short-term unmanaged' and 'cut box' shape.

Higher Proportion of Species Richness but only for shrub species

Overall, there is greater species diversity in the woody shrubs category for high ecological value hedges. This includes greater incidences of Willows, Wild Privet, Elder, Rowan, Elm, Hazel, Wild Cherry and Spindle. In terms of Ground Flora, several species were present in greater numbers in high ecological value hedges, such as Thistle, Ground Ivy, Hogweed, Lords & Ladies, Opposite-Leaved Golden Saxifrage and Nipplewort. However, townland boundary hedges had less ground ground flora species than baseline hedges, the opposite of what was found in the 2010 survey.

As with the baseline hedgerows, there is a substantial incidence of nutrient rich species (e.g. Nettles, Docks, Cleavers) in Potential High Ecological Value Hedgerows that was not as prevalent in the 2010 surveys (it is now almost 19% greater). This could be partly due to the intensification of agriculture in the last decade, which includes increased use of herbicides, pesticides and chemical/organic fertilisers.

High Historical and Ecological Value Hedge

While all hedgerows are of great importance in terms of historical and ecological significance, townland boundary hedgerows and those linked to native woodland tend to display more vegetative species diversity. Greater links to native woodland also makes for greater ecological corridor links. In general, the greater the plant diversity and habitat corridor linkage, the greater the insect, bird and mammal populations these hedgerow types will likely support.

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 not for ground flora in our study.

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 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. Woody shrubs are still more diverse in these hedges, but the diversity of the herb layer has declined. In terms of herbs, baseline hedges were found to be more diverse in this study.

Priority for Conservation

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. No hedgerows in Monaghan were found to be heritage hedges based on their landscape significance. This makes a strong case for prioritising these hedgerows for a more focused conservation programme involving targeted protection, maintenance and enhancement methods. This approach has also been suggested in other Hedgerow Survey reports in the past, such as those of counties Louth, Galway and Mayo.

7.10. Hedgerow management

Lack of hedge management can decrease the effectiveness of hedgerows as a stock proof barrier, lead to decreased basal density and increased gappiness. This survey recorded a decrease in hedgerows with an overgrown or irregular profile from 2010 by 18%. This may in part be due to the increased number of contractors cutting hedges but is also partly due to the method of categorisation of remnant and relict hedges in the methodology.

Mechanical flail cutting is the most popular hedgerow management technique recorded. Circular saw cutting was also noted, which is a less damaging alternative, but was generally reserved for cutting larger growth, to reshape overgrown hedges or where hedges are cut on longer rotations. Both methods when done with consideration can produce results that will benefit the function and structure of hedgerows. However, in most instances where management of long-term unmanaged hedgerow was recorded this had been 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 or post and wire fence is used, the need for a stock proof hedge is removed. Top heavy hedgerows are more similar to treelines or linear woodlands and are likely to allow more opportunities for plants to flower and fruit. Greater light into the ground layer can also encourage spring flowers. 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 has been seen with the large amount of poaching noted in this study.

Management of hedgerow shrubs

Hawthorn is our most common hedgerow scrub along with blackthorn. These species give hedgerows their density and functionality for stock proofing and shelter. Bramble, Holly, Gorse and Ivy are also important components of hedgerow shrub layers. Traditionally hedgerows were managed through hedge laying. This involves cutting through hedgerow trees and shrubs to create a living stockproof fence. Laid hedgerows have significant long-term benefits for biodiversity, shelter quality and are part of our countryside heritage. This method of

management is no longer popular as it is labour intensive, and the skills required to do it are now in short supply.

Cutting with a mechanical flail is now generally the most popular method of mechanical hedgerow management. Done sympathetically, this method can provide good long-term benefits for hedgerow structure and function and for biodiversity. Sadly, however flail cutting is done without consideration for the variable benefits of hedgerows and often with only a (conceived) notion of agricultural benefits. When using a flail, hedgerows should not be topped but only breasted. Instances where hedgerows are too high are limited and they only occur if a dense hedge of over 5 meters high is block light from a building, house or garden. Stock or crops will in general benefit from a tall thick hedge to a greater extent than any lost production from reduced sunlight in the hedge's shadow.

On a large number of farms today, hedgerows are fronted with an electric fence or post and wire fence. To achieve the greatest benefits from biodiversity, and for the farm enterprise, these fences should be kept at least 2 meters from the base of the hedgerow. 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 and keeping the hedgerow back from the fence. 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.

Management of hedgerow trees

Hedgerow trees are not as significant a landscape feature in County Monaghan as they are in most other counties, both in terms of quantity or diversity. 32% of sampled hedges had no hedgerow trees compared with Counties Longford, Leitrim and Westmeath, which all had less than 20% of hedges without trees. However, this figure has increased from 2010. Despite this, hedgerow trees, especially when mature, are beneficial to the overall ecology of the hedgerow landscape of the county. On a positive note for the longer term, of the hedges with hedgerow trees, almost 70% had young trees present. A greater diversity of species of hedgerow trees was seen in 2021. This should continue to be encouraged by the planting of cultivated fruit trees to act as hedgerow standards. The high percentage of hedges containing Ash would also give rise to potential to produce wood as a carbon neutral fuel source

7.11. 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 hedgerows 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 biodiversity benefits. If being planted for biodiversity benefits, 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 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 verge at establishment.

Maintenance and Fencing

As discussed above in stock-based systems, hedgerows should be fenced off with a wire at least 2 metres from the base of the hedge to create a grassy verge. Animals should be totally excluded

from this area for around 5 years until trees and shrubs are strong enough to withstand browsing.

Grass needs to be managed within the first two or three years after establishment. This can be achieved through cutting, stamping or very careful strimming around the base of the trees. In general, if the growing tip of the tree is not covered by grass, the tree's growth is not being impeded. In year 2 some of the shrub species like hawthorn and holly could be cut back to 10cm from the ground to encourage bushy growth. This will help create a thicker hedge in time. Larger species like Oak and Crab Apple should not be cut back.

7.13. Agri-Environment Schemes

There have been numerous Agri-environment schemes in place in Ireland since it was made compulsory for each EU Member State to establish them since 1994. Irish Agri-environment schemes have evolved over the years from the initial Rural Environment Protection Scheme (REPS 1, 2, 3 and 4); to the Agri-Environment Options Scheme (AEOS) introduced in 2010 with AEOS 1, 2 and 3; then the Green Low Carbon Agri-Environment (GLAS) scheme; and currently the Results-Based Environment-Agri Pilot Project (REAP). REAP is a pilot scheme acting as a bridge between the current Common Agricultural Policy (CAP) and the new reformed CAP, which is due to be launched in 2023. Proper, eco-sensitive management of hedgerows, along with grassland management, have been key features of these Agri-environment schemes so far. The new CAP promises to include more emphasis on biodiversity and a focus on 'results-based' Agri-environment schemes that will ultimately provide real and tangible benefits to nature.

To date, Agri-environment schemes have been limited in terms of applicant numbers, meaning only a small proportion of farmers can take part each time. The new CAP aims to work towards achieving a green and sustainable system of agriculture in the EU and continues to link in with the Birds and Habitats Directives. It will include:

- a simplified, flexible, and targeted approach;
- strengthened environmental conditions and standards to be met by farmers;
- plus, an expanded set of voluntary environmental actions available to farmers, through eco-schemes and rural development policy.

Along with grasslands, hedgerows are likely to be an important feature of the new CAP schemes as they are seen as vital "wildlife corridors" and "landscape features".

While implementation of Agri-environment schemes is mandatory for each Member State, farmers are still not obliged to take part and applicant numbers may continue to be limited. However, it is hoped that a simplified process under the new CAP Reform will encourage more farmers to sign up and work towards achieving effective results. Increased take-up of such schemes would greatly contribute to the better management, maintenance and protection of hedgerows across Ireland, including in County Monaghan. This, combined with greater public

awareness, monitoring and enforcement measures for those damaging and removing hedgerows, would be even more effective in protecting these precious landscape features.

8. Conclusion

The loss of traditional management practises, such as hedge laying, has resulted in an increase in gaps, loss of profile, and the degradation of supporting structures such as banks and stone walls. Remnant and relict hedges are common, either unsuitable for rejuvenation or not of enough concern to landowners to consider revival.

Hedges classed as 'Unfavourable' have increased by 17% in County Monaghan in the last decade, with 87.9% designated to this category. This raises the possibility that no hedges in the county will be in favourable condition a decade from now. Loss of favourable hedgerows coincides with a loss of shelter for livestock, a loss of buffers protecting rivers from agricultural run-off, a loss of wildlife corridors, a loss of habitat, and a loss of an array of other benefits.

After percentage gaps, a high percentage of nutrient-rich species is the next most common reason for hedges scoring Unfavourable. This can be connected to an intensification of farming practises, an overall loss of semi-natural grasslands, and an increase in improved grassland habitats. Despite the multiple benefits of semi-natural grasslands such as providing vitamins, minerals and nutrients to grazers, providing resilience against drought, supporting healthy soils and storing carbon (Farming for Nature, 2021).

This study has estimated a removal of between 0.5% and 0.88% of hedgerow length per annum in County Monaghan in the last decade, at least 0.2% more than the predicted Nationwide loss (EPA, 2012-2020). Yet, no screening applications for an EIA have been made in Monaghan to date. Management of hedgerows out of seasons set down by the Wildlife Act is still seen throughout the county. A lack of enforcement of wildlife legislation is apparent.

Our Ash trees are suffering the consequences of imported disease, with concerns for the longevity of the hedgerows and treelines they colonise, given the high percentage of Ash in County Monaghan. At the same time, the resilience of nature can be seen in the findings of this study which show an increase in tree species diversity since 2010. These top-heavy hedgerows or treelines also have significant benefits to biodiversity and thus undermanagement, which has led to the conversion of hedges to treelines. This may not always be of concern where these hedges are reinforced with fencing for livestock.

Unfortunately, the same cannot be said for ground flora and woody shrub diversity which has declined since 2010, with an increased number of hedges having only one target shrub or ground flora species.

Considering the results of this survey, a worrying trend has emerged. Intervention is needed if we hope to preserve Ireland's patchwork of 'linear woodlands' for future generations. A list of recommendations has been set out in Section 10.

9. Recommendations

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

- 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.
- Further consideration must be given to the extension of this ‘no cutting’ season to include October.
- 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.
- Monaghan 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 recognised for hedgerows which have notable historical, structural, or species composition characteristics. This should be considered when planning infrastructure and should be incorporated into new developments and landscaping plans.
- 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 Monaghan, including:
 1. Wildlife (Amendment) Act 2000 and Heritage Act 2018, which stipulate that hedgerows 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.

- 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 to 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 when hedge cutting is advised.
- An NPWS officer should be appointed to the Monaghan area as soon as possible.
- 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 Monaghan. 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 2030.

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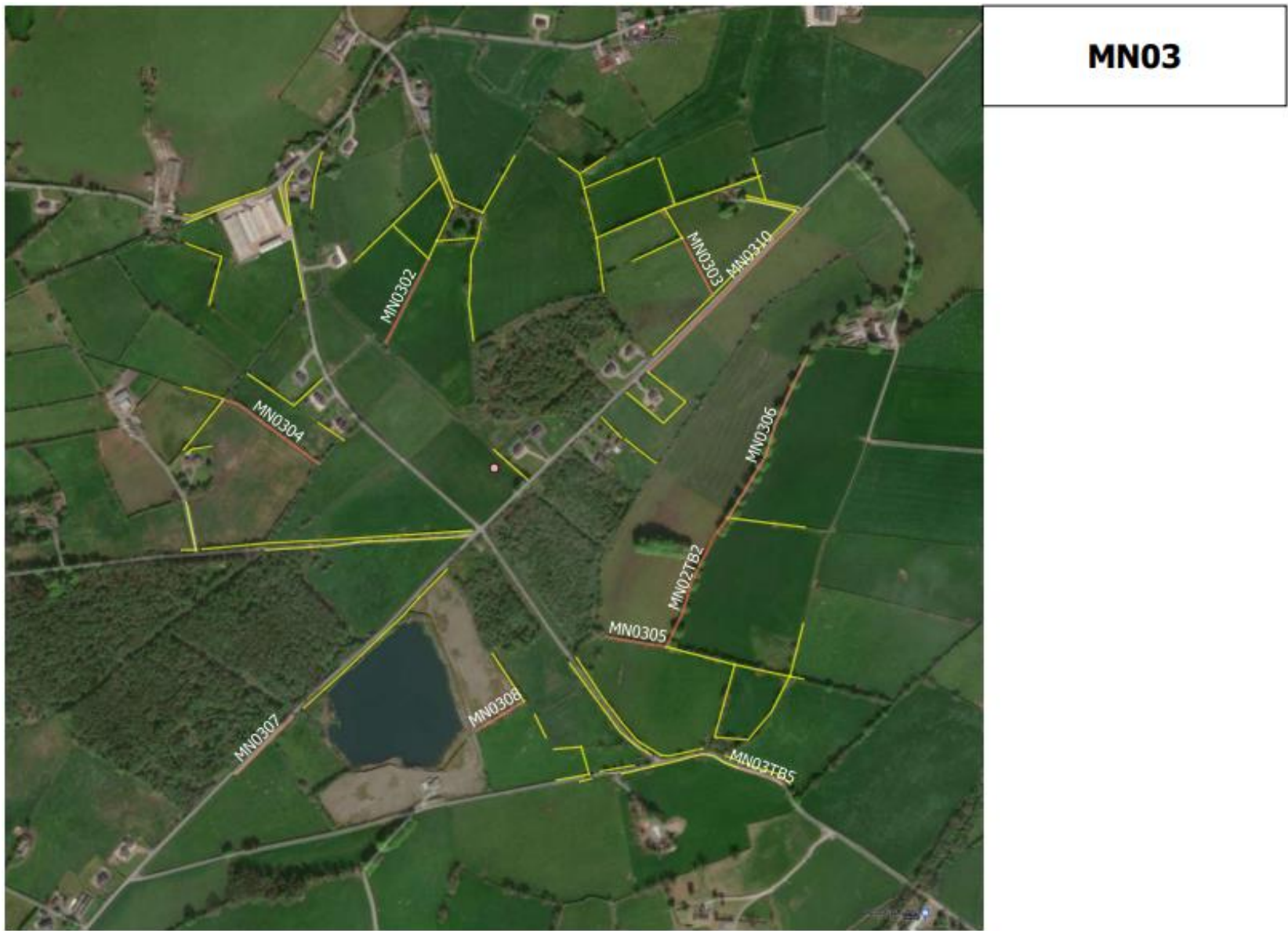
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11. Appendix1: Maps.





MN02





MN04



MN05



MN06



MN07



MN08



MN09



MN10



MN11



MN12



MN13



MN410



MN412



MN840/MN864



MN849





MN862



MN1037



MN1063



MN1162



MN1176

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 pseudoplatanus</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 3: 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 4: 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 ^B			
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*).

^BAlien invasive species – see Table 1: ‘*Problematic Plant Species: Top 39*’ 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.

Appendix 5: Survey recording sheets

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

Surveyor(s)	Name(s), address & contact details
Date of Recording	Date of field survey (day: month: year)
*D ID	Unique identifier: 3 character OS hectad reference; 2 digit hedge number identifier; 1 alpha character <i>a</i> or <i>b</i> to indicate 30m strip, e.g. H13.01a
*D OS_Square	3 character OS hectad reference
*D Length	Total length (m) of polyline
*D Start_node_to_start_of_1st_30m_strip_	Distance in metres
*D End_of_1st_30m_to_start_of_2nd_30m_	Distance in metres
*D End_of_2nd_30m_to_End_Node_	Distance in metres
Context	
*D Corine	CORINE Land Cover Classification
*D Soil Type	This can be assessed using the appropriate layer on the NBDC website www.biodiversityireland.ie
GPS_Start_Point	
GPS_End_Point	
*D a1. Elevation_max.(m)	Record maximum elevation of the hedge using GPS or Discovery Series contours.
*D a2. Elevation_min.(m)	Record minimum elevation of the hedge using GPS or Discovery Series contours.
*D b1. Aspect_Side_1	Using 16 major compass points deduce the aspect of each side based on a straight line drawn from one end of the hedge to the other.
*D b2. Aspect_Side_2	See above.
A. Adjacent Land Use (1)	
a tillage	
b dairy	
c cattle	
d sheep	
e mixed stock	
g equine	
h other	
i fodder	Meadow cut or left for making silage or hay

j	curtilage	Fossitt BL3 and BC4
k	amenity / golf course / playing field	
l	parkland / demesne	
*D	B. History (1)	With reference to the 6 inch to one-mile OS Maps note if the hedge is a Townland, County or other boundary of historical significance.
	1 internal farm boundary	
*D	2 townland / parish, etc. boundary	
*D	3 canal side boundary	
*D	4 railway line boundary	
	5 farm boundary	Townland boundaries, etc. should be assumed to be property boundaries.
	B1. History Road / Stream (0,3)	
*D	1 road	
	2 stream	Only record if it meets Fossitt watercourse definitions
	3 recently established	Hedgerow up to c.25 years old
*D	B1a. Road Class (0,1)	For roadside hedges only
	NP – National Primary	
	NS – National Secondary	
	R – Regional	
	L – Local	
	U – Unclassified	
	F – Farm Road or Track	
	B2. History Ordnance Survey (0,2)	
*D	1. Boundary present on 1st Edition OS Map	6 inch to one-mile
*D	2. Boundary present on 2nd Edition OS Map	6 inch to one-mile
	B3. Sites and Monuments Record (0,1)	
*D	3. Boundary connects to feature on SMR	Sites and Monuments Record can be found at www.archaeology.ie
	B4. Old Woodland Link (0,2)	

*D a	Boundary connects to woodland on 1 st edition OS	
b	Boundary shown as treeline on 1 st edition OS	
C. Adjacent Land Classification (1+) &		Record the Fossitt (2000) habitat (to the greatest level of detail possible) for land on both sides of the hedge
D. Habitat Link Classification (1+)		This category is primarily applicable to the ends of the hedge. If the hedgerow links at any other point with any other listed habitat that is not recorded in C this should also be recorded. A 'link' is applicable only where the hedge physically borders or runs in to another habitat type. Where a break of 5 metres or less, such as a gateway, occurs between the hedge and the other habitat, treat this as being linked. Where the canopies of trees in the hedge and the other habitat meet (often over distances of 10m +), include as a link. Likewise, if a ditch continues past the hedge to link up with, for example, a watercourse, record as a link.
a	arable (BC)	
b	improved grassland (GA)	
b1	neglected pasture (GA)	
c	semi-natural grassland (GS)	
d	non-native woodland (WD)	
e	semi-natural woodland / scrub (WN)	
f	scrub/transitional woodland (WS)	
g	curtilage/built land (BL)	
g3	curtilage/built land (BL3)	BL3 Buildings and artificial surfaces
h	peatlands (P)	
i	lake/pond (FL)	
j	watercourse (FW)	
k	other (target note)	
m	hedgerow (WL1 or WL2)	
n	earthbank (BL2)	
o	re-colonising bare ground (ED3)	
*D D3. Designated Site (0,1)		Record if hedgerow is within or immediately adjacent to any designated site.
1	Annex 1 habitat	
2	designated site	NHA, SAC, SPA layers can be found at http://www.npws.ie/protectedsites/ and at http://maps.biodiversityireland.ie/Maps.aspx

	3 designated woodland	
	E._Boundary Function (1)	This refers specifically to the functionality of the hedge line as a farm / field boundary. Does the same stock have simultaneous access to land on both sides of the hedge? An active boundary must be stockproof, irrespective of the condition of the hedge. A redundant boundary may not necessarily be redundant for shelter or other functions.
	1 hedge redundant	
	2 active boundary	
	<u>Construction</u>	
	*D F._Outline (1)	Assess whether the hedge runs in a straight line or has a more curved or irregular plan. This may best be noted from the map.
	a linear	
	b non-linear	
	G1._Linearity_of_Shrubs_ (1)	
	1 Single Line Hedge	where the linearity of the hedgerow stems is principally defined by a single line
	2 Double Line Hedge	where the linearity of the hedgerow stems is principally defined by a two separate and distinct lines
	3 Random Line	Where the hedgerow stems do not appear to follow any distinct linear pattern record
	G2._Bank,_Wall,_Shelf (1)	
	1 Bank	
	2 Wall	
	3 Shelf	
	0 none of the above features	
	G3._Drain (1,2)	
	a External Drain	Double Ditch should be recorded as a_a
	b Internal Drain	
	c Internal Path, Track-way, etc.	Where this category is recorded structural, management and floristic recording should be made on the hedge on the side of the lane nearest to the randomly selected point that identified the hedge
	0 none of the above features	

G4. Boundary Classification (1)	Fossitt classification of recorded feature
1 WL1	Hedgerow
2 WL2	Treeline
H. Bank,Wall,Shelf_size__ (1)	The height of these features should be estimated as the average along the length of the hedge. Record the height above the general ground level of the top of the earth or stone bank (also called ditch!). Take care not to record the bank height from the level of bottom of shallow drains. A stone-breasted bank, containing earth / clay, should not be confused with a stone wall. A shelf is where the ground level is different between the two sides of the hedge (often in roadside situations). The height of a shelf is the difference between the two levels.
a < 0.5m	
b 0.5 – 1 m	
c > 1m	
d not applicable	
I Drain Size (1)	Drains tend to be approximately square in cross section. The measurements denote width and depth of the drain. An assessment based on volume should be made for very wide, shallow drains or very deep, narrow drains.
1 not present	
2 small (<0.5m)	
3 medium (0.5 – 1m)	
4 large (>1m)	
I1. Drain_Wet/Dry (0,1)	
a dry ditch / drain	
b wet ditch / drain	
<u>Structure/Condition</u>	For structural attributes the recording should be taken as an average for the hedge length as a whole. With the exception of Category <i>M</i> this average should not include the gaps in the hedge.
J Profile (1)	The cross-sectional profile of the hedge

a remnant	The remains of what used to be a hedge, has no consistent profile. A remnant hedge is generally indicated by a (broken) line of mature or senescent plants in tree, rather than shrub form. Almost invariably has a high percentage of gaps, although may have bits of shrubby growth (including brambles) along its length. Once the remains of a hedge covers <25% of a boundary, it is no longer classed as remnant and is not recorded (including for extent). <i>For a remnant hedge only record categories A-J, M,O, R, and U-Y.</i>
b relict (derelict)	Where shrubs and thorns of the hedge component have mostly grown up into trees, no longer displaying shrubby, dense growth form in the bottom 1-2 metres of the hedge. Plants have potential for rejuvenation.
c boxed / A shape	Has been cut into some form of a box- or A -shape, even if the last one or two years growth since cutting does not give the impression of a straight, neat, clipped hedge. 'Boxed' does not necessarily mean cut down low, hedges can be cut quite high (up to around 2 metres or more).
d overgrown/irregular	This type will have more of a base structure than type b.
e. top heavy / undercut	Hedges that have been managed in the lower section and allowed to grow up and out on top.
f straight sided	A hedge that has been completely breasted (side cut) but not topped
g wind-shaped	Shaped by the effects of strong prevailing winds.
J1._Profile_base_suffix (0,2)	
a losing basal structure	Where many of the shrubs of the hedge component do not display a horizontal mesh of branches in the lowest 1m; most of the lower portion of stems are visible (unless obscured by herbage/ground flora).
b outgrowths at base	Where shrubs / scrub are spreading laterally in to the verge alongside the base over the majority of the length. This is most commonly seen where blackthorn, gorse or damson plants are suckering out from the base of the hedge.
K Height (1)	
	This is estimated as an average over the whole length of the hedge to best fit classes. Where there is a distinct tree layer the measurement is taken as the height of the woody shrub layer. For managed hedges – 'height' should be the height at the last trimming/cutting point; otherwise the recorded height category could vary dependent on the time of year the hedge is surveyed.
1 <1.5m	
2 1.5 – 2.5m	
3 2.5 – 4m	
4 4 - 5m	
5 5m+	
K1._Height_overhead_cables (0,1)	
a overhead wires/cables	

L Width (1)	This is estimated as an average over the whole length of the hedge to best fit classes.
a < 1m	
b 1- 2m	
c 2 - 3m	
d 3 m+	
M. __%_of_Gaps_ (1)	This is an assessment of the percentage of the length of the hedge that no longer has a cover of hedgerow shrubs. Gaps that are filled with brambles and /or non woody vegetation are still recorded as gaps
1 complete	
2 < 5 % gaps	
3 5 - 10 % gaps	
4 10 - 25 %	
5 25 - 50 %	
6 > 50 %	
M1. Gaps_Specific_or_general (0,1)	
a general	Individual gaps < 5m
b specific	Any individual gap >5m
N Base Structure (1)	Rampant growth of brambles and cleavers or other climbers in the base of the hedge can be deceptive regarding the density at the base of the hedge. Picture the density in winter when foliage is absent for a more accurate assessment of base structure.
a open / translucent	Little or no horizontal mesh of branches of woody shrubs in the bottom metre.
b scrawny, semi-translucent	More light/ vegetation than hedge growth. The horizontal mesh of branches or bushy growth of hedging shrubs at base of the hedge is unlikely to prevent movement of stock through the hedgerow.
c semi-opaque	More hedge growth than light/ vegetation.
d dense / opaque	Shrub growth and horizontal meshing of branches in the bottom metre, sufficiently dense to contain livestock.
N1. Base_-_Vegetation (0,1)	
a vegetation	Record where the space in the lower 1m of the hedge is filled with growth of brambles or other herbage/ vegetation, etc.

O. Bank Degradation Degree (1,2)	
1 not applicable	No bank, wall or shelf.
2 none	
3 severe	Degree of erosion or degradation - bare soil may be showing, root systems may be exposed.
4 minor	
5 drain blocked/waterlogged	
O1. Bank Degradation Extent (1)	
a general >10%	Damage occurs over >10% of the length of the hedge
b isolated	Damage occurs at up to 10% of the length of the hedge.
P. Trees Quantity (1)	Should reflect where species have reached tree proportions (particularly for hawthorn) diameter at breast height (DBH >8cm).
a none	
b few up to 15%	
c scattered 15 – 30%	
d abundant 31-75%	
e line >75%	
Q. Tree Age Composition (1)	For the purpose of this survey, immature trees are defined as having a diameter at breast height (DBH) of no more than 8 cm. Planted saplings, whips, etc. that are clearly intended to be trees should be recorded as such. Some discretion is required on the part of the surveyor as long as the basis of discretion is explained for the benefit of those using the data.
1 all mature	
2 predominantly mature	
3 predominantly immature	
4 mixed age range	
5 none	
Q1. Tree Height (max) (1) &	Record the maximum and minimum height for trees within the hedge.

a <3m	
b 3-5m	
c 5-10m	
d 10-20m	
e >20m	
R._Verge_/_Margin__Width (1)	This refers to an uncultivated strip or undisturbed grassy margin alongside the hedge. In the case of tillage or arable land, this will be an unploughed/ unplanted strip (a sterile strip is not counted as a verge). In grassland situations a verge is where the edge of the field is clearly not seeded, managed, or utilised as the rest of the field, such as where grazers are excluded by a fence. A fenced off area in from a hedge should be counted, but a strip left after mowing for hay/silage should not. This should be clearly indicated by the surveyor. Record for both sides of the hedge.
a < 1m	
b 1 - 2m	
c 2 - 4m	
d 4m +	
e none	
R2._Verge_/_Margin_Degradation (0,2)	Record for both sides of the hedge.
0 none	
1 poached within 2m	
2 ploughed within 2m	
3 herbicide use >20%	Herbicide use over >20% of the length of the side of the hedge.
S._Vigour_(1,2)	An assessment of the average amount of new growth (annual increment), in terms of protruding shoots, along the length of the hedge.
a poor	This recording is appropriate where there are few new shoots, little annual increment, and /or shoots are weak or unhealthy looking.
b average	
c good	
d poor in part	
e basal decay	Evidence of dead wood in the base of hedgerow trees and shrubs.
f. evidence of disease	This includes fungal disease, mildew, etc.

U._Management_ (1+)		
a	cut box profile	
b	cut 'A' shape	
c	cut on one side	
d	cut on both sides	
e	topped	
f	excavator	This applies where land excavator type machinery has been used for hedge management purposes. Usually this involves knocking over mature stems along the hedge line and compressing them. Occasionally just the side growth is 'folded' or 'tucked' back into the hedge. Both cases are identified by partially broken rather than cut wounds.
g	fully laid	
h	laid in part	This category applies where gaps have been dealt with by laying
i	coppiced	Cut no higher than 10cm from the ground
j	short term unmanaged	Applies where options a-i and m have not been implemented in the last 3-5 years.
k	long term unmanaged	Where there is no evidence of management activity in the last 5+ years.
l	infill planting	Evidence that young plants have been introduced into the hedge to fill gaps.
m	pruned	Selective cutting of individual hedgerow plants.
n	other (target note)	
o	cropped	Cut between 10cm and 1m from ground (high coppicing.)
U1._Management_ - _out_of_season (0,1)		
a.	out of season	Cut between 1 st March and 31 st August.
U2._Management_ Stage		This is based on work done by Hedgelink in the UK, detailed in www.ptes.org/files/1353_hedgemanagementcycle.pdf
1		Heavily over-trimmed with many gaps and sparse stems, their bases gnarled or rotting.
2		Over-trimmed, infrequent stems too far apart to be 'let up' for laying. Hard knuckle at trim line, shrubs developing mushroom shaped growth form.
3		Over-trimmed, frequent stems. Stems still healthy but require more height. Hard knuckle may be starting to form at trim line.
4		Recently layed, coppiced, or planted hedgerow.

5	Healthy, dense, hedgerow with frequent stems and more than 2m in height.
6	Either a) Hedgerow more than 3m high and trimmed on rotation, or b) May also be non-intervention hedge, having intentionally been left un-trimmed for several years.
7	Hedgerow with frequent healthy stems more than 4m high.
8	Mature tall hedgerow with spreading tops. Stems still healthy (although they may be infrequent) but too large (more than 18cm in diameter) for laying.
9	Over-mature hedgerow with tops dying back, collapse possible. Perhaps becoming dominated by tree species.
10	Hedge developed into line of trees.
V. Management Method_ (1+)	This must be determined by examining the cuts at the hedge front over which machinery has passed. If a hedge clearly has been managed but the surveyor is unsure as to the means employed, record as 7, 'unsure'.
1 flail	
2 circular saw	
3 bar cutter	
4 hand tools	
5 excavator	
6 other	
7 unsure	
8 not applicable	
W. Evidence of Rejuvenation - Past (1,2)	Laying is detected by looking in at the hedge stems to see if any are growing horizontally, or at an upward angle with lesser shoots / stems growing vertically from these. Often it can be seen where the hedge was laid as long as several decades ago. Sometimes branches can have a horizontal growth form as a result of a reaction to trimming, this should not be confused with laid stems. Closer inspection should reveal the source of the action. The scar tissue around the clean wounds from hedge laying is significantly different from those caused by the action of machinery. Past coppicing is generally detected by multiple stems originating from the same point at or close to ground level of species where this would not be the typical habit.
a no evidence	
b past evidence of laying	
d past evidence of coppicing	
W1. Evidence of Rejuvenation - Recent	

c recent evidence of laying	Within the last 5 years.
d recent evidence of coppicing	
X Fencing (1)	Record for both sides of the hedge.
1 none	
3 electric	
4 post & wire	
5 sheep wire	
6 timber fence	
7 concrete post and rail	
X3. Fencing__wire_to_stems	
2 fixed to stems	Record if wire is fixed to hedgerow stems irrespective of other fencing.
Y Ground Flora (1,5)	
d noxious weeds	Record the following on the DAFOR scale <ul style="list-style-type: none"> ▪ Common ragwort (<i>Senecio jacobea</i>) ▪ Spear thistle (<i>Cirsium vulgare</i>) ▪ Creeping or field thistle (<i>C. arvense</i>) Two species of dock: the curled dock (<i>Rumex crispus</i>) and the broad-leaved dock (<i>Rumex obtusifolius</i>).
e nutrient rich >20%	>20% of ground layer dominated by nutrient rich species – nettles, docks, cleavers (<i>Galium aparine</i>).
f use of herbicide	>10% of ground layer affected.
h. alien invasive species	Record presence of alien invasive species, primarily Japanese Knotweed, Giant Rhubarb, Spanish Bluebell and Himalayan Balsam. See also; http://invasivespeciesireland.com/most-unwanted-species/established/terrestrial/?pg=1