

COUNTY MAYO HEDGEROW SURVEY REPORT

Neil Foulkes

October 2007



An
Chomhairle
Oidhreachta



The
Heritage
Council



County Mayo Landscape View

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1.0 SUMMARY

County Mayo, located in the west of Ireland, is the third largest county in the country with an area of 5,398 sq. km. (2,084 sq. miles). It extends from 53°28' to 54°21' north, latitude and from 8°25' to 10°5' west, longitude. It is a county with a very varied landscape

County Mayo's hedgerow network is an asset to the county, being valuable in terms of agriculture, landscape, wild flora and fauna, water quality, carbon sequestration and employment. The agricultural landscape contrasts with and compliments the large areas of upland and blanket bog.. Before this survey was carried out relatively little detailed information was known about the hedgerow resource.

In the summer of 2007 field recording of hedgerows was carried out using a standard methodology in 63 sample 1 km squares distributed evenly around the county, covering approximately 1% of its total area. The focus of the survey was to record information on the extent, species composition, structure, condition and management of hedgerows.

Results from the County Mayo survey were compared with those from similar hedgerow surveys conducted in County Cavan, East Galway, Longford, Kildare and Leitrim in 2006, County Laois and County Offaly in 2005, and Counties Roscommon and Westmeath during 2004.

Based on the results from the sample, the total length of hedgerow in County Mayo was estimated at 12173km, and the average figure for hedgerow density as 2.24 kilometres per square kilometre (km/km²).

Examination of Ordnance Survey maps indicates that the majority of hedgerows in the county originated between 1839 and 1913.

Hedgerows are concentrated in the south and east of the county and almost two thirds fall within one of the four *drumlin* Classifications identified in the Landscape Appraisal of the County Development Plan 2003-2009.

A wide range of shrub and tree species were found in County Mayo's hedges. A total of 41 shrub and tree species, including 21 native species, were recorded in the sampled hedges. Whitethorn is the most frequently occurring shrub species found in 89% of hedges; Rowan was more common in County Mayo hedges (17%) than other counties previously surveyed. Ash is the most common tree species, occurring in 31% of hedges in tree form.

73% of hedgerows sampled were comprised solely of native species. Fuchsia, which has become naturalised though not widespread, is locally common.

Approximately 13% of hedges recorded were classed as 'species rich', with the majority of these found in the south of the county. Hedges with large drains were found, on average, to contain greater species diversity than those with small or no drains.

Roadside hedges made up 21% of the sample, with Townland boundaries just 4.5%. 11% of hedges surveyed were classed as redundant in respect of their agricultural function as field boundaries.

The construction of hedges around the county would suggest that a significant portion of the resource is of a non-planted origin and developed from the colonisation of other linear boundaries such as banks and walls.

In relative terms, the hedges recorded during the County Mayo survey compare favourably with those from other counties in respect of their average height and width characteristics. However, County Mayo has a highest proportion of hedges with gaps of 10% or more.

Levels of management are relatively low with 46% of hedges having no evidence of management within the last five years or more, although almost a third of hedges had been managed within the last year.

22% of hedges met a series of ‘favourable condition’ criteria linked to structure and species composition. When species rich hedges alone were considered 42% met the criteria. Most of the assessed characteristics can be influenced by appropriate management. The level of gappiness and the basal structure are the two categories responsible for the majority of the hedges failing to meet the criteria.

In comparison with other counties previously surveyed, in terms of their construction and species diversity County Mayo’s hedges are most similar to those found in neighbouring East Galway.

Overall County Mayo has a very varied and interesting hedgerow resource, but appropriate efforts must be made by various bodies (and individuals) if the resource is to be improved and sustained into the future.

Recommendations have been made based on the Hedgerow Survey results, considered in the light of current best conservation practice. The relevance of the recommendations to each of the stakeholder groups, such as Mayo County Council, farmers and landowners, the various state bodies, research institutions and Teagasc, have been tabulated for easy reference.

Key Recommendations for Mayo County Council

Prioritisation of actions is important. The key recommendations (see section 9.0) most relevant to Mayo County Council have been listed below for easy reference.

No. Recommendation

- 1.13 As part of the County Mayo Biodiversity Action Plan, Mayo County Council should produce and adopt a ‘Hedgerow Conservation Policy’.
- 1.14 In the planning process, greater consideration should be paid to individual hedgerows in light of their particular qualities and characteristics. The concept of “Heritage Hedgerow” should be introduced for hedgerows which have notable historical, structural, or species composition characteristics.
- 1.15 Guidelines should be produced for planners and road engineers dealing with hedgerows in planning applications.
- 1.18 A study should be initiated to investigate the impact of development control in relation to hedgerows and to determine degrees of compliance with hedgerow related planning conditions by landowners.
- 1.20 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.

- 1.22 Special emphasis should be placed on the best practice maintenance of roadside hedgerows and verges.
- 1.23 All of the relevant Stakeholders listed in Table 9.1 should commit to eliminating the cutting of hedges during the period indicated in the Wildlife Amendment Act (2001) (1st March to 31st August) except where absolutely necessary for safety reasons. They should also commit to implement forward planning in order to minimise the necessity for cutting for safety reasons.
- 1.27 After consultation with relevant stakeholders, all Local Authorities jointly should set consistent standards for the interpretation and implementation of the section of the Air Pollution Act (and any other legislation) relevant to disposal of hedgerow waste. This interpretation should be communicated to farmers, landowners and contractors. Mayo County Council should take the lead in this process.
- 1.31 A repeat hedgerow survey for the county should be carried out no later than 2017.
- 2.01 As a base line, in order to achieve management objectives, stakeholders should commit to ensuring hedgerow management works carried out under their responsibility should conform to recognised, basic minimum standards.
- 3.01 A study should be conducted of nursery suppliers and garden centres to determine the availability of native planting stock (including provenance) for the range of hedgerow tree and shrub species recorded in the County Mayo Hedgerow Survey. This information should be disseminated to interested parties.
- 4.01 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.
- 4.04 A number of showcase sites of best practice covering different aspects of conservation and management should be developed around County Mayo.
- 4.05 Identify suitable hedgerows convenient to schools and colleges for use in environmental education.
- 4.06 General Awareness of the values of hedgerows should be encouraged among rural communities through circulation of educational materials, an increase in targeted education for schools, and with the introduction of initiatives such as the Golden Mile Competition.
- 4.07 A pictorial information leaflet should be produced to show all of the species native to County Mayo Hedgerows. This should be distributed to Teagasc offices, hedge-cutting contractors, marts, creameries, garden centres, etc.

This survey fulfils Action 2.11 of the County Mayo Heritage Plan 2005-2010.

2.0 INTRODUCTION

Hedgerows are a valuable multi- functional resource in our countryside, benefiting agriculture, wildlife, the environment, tourism and the general community. However there is only limited and localised data on the current extent, nature, variation and condition of Irish hedgerows.

For the purposes of this survey 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 or property boundary. They often have associated banks, walls, ditches (drains), or trees”.

This sample study examines the extent, species composition, structure, condition and management of hedgerows in County Mayo.

This information can then be used to further the objectives of the County Mayo Heritage Plan 2005-2010 which contains a number of actions, directly or indirectly, interrelated to hedgerow conservation.

Objective 1. Promotion of Awareness and Appreciation of our Heritage

- 16.1 Produce a series of heritage leaflets on various aspects of the built, natural and cultural heritage of the county.
- 1.10 Produce and distribute heritage education packs for primary and secondary schools.
- 1.11 Increase awareness of heritage issues in the Tidy Towns competition and promote best practice in the management of biodiversity and built heritage.

Objective 2. Collection and Dissemination of Heritage Information

- 2.5 Compile, in association with other organisations and bodies, datasets that exist into a natural heritage database accessible through web links and CD ROM.
- 2.7 Identify and highlight habitats and species of special significance in Mayo, with a view to publication.
- 2.11 Carry out a hedgerow survey of Co. Mayo.

Objective 3. Promotion of Best Practice in Heritage Management and Conservation

- 3.1 Prepare a County Biodiversity Plan.
- 3.3 Compile and make available appropriate training material on the proper care and management of natural heritage (existing resources in REPS training DVD, videos on water quality etc.).
- 3.7 Provide in-house training for local authority engineers and planners in all aspects of heritage conservation.
- 3.11 Provide training in hedgerow establishment and management for contractors, landowners, community groups and local authority staff.

- 3.12 Produce guidelines and provide advice to developers, planning authorities and the public on the integration of biodiversity conservation into the development process.
- 3.26 Prepare a checklist of heritage features for use on site by planners in assessment of development applications.

3.0 BACKGROUND

3.1 THE HISTORY OF HEDGEROWS IN COUNTY MAYO

The history of field boundaries, including hedgerows is closely linked with land use and ownership patterns.

Under the Gaelic system of joint land ownership there was little need for permanent enclosure or fencing. Instead, tillage plots were protected with fencing for one season before being moved. There is, however, some evidence to suggest that some ring forts were set (planted) with blackthorn and whitethorn. Permanent banks with or without hedges on them may also have existed.

The Norman Conquest meant the eclipse of many Gaelic lords and chieftains. It was the Normans who introduced the concept of private land ownership as they spread throughout Ireland during the thirteenth century. Mayo came under Norman control in 1235. They introduced the Feudal System, whereby tenants had to rent fixed plots of land from the landlord. The division of land and enclosure of commons was encouraged, even in some cases enforced by landlords. These changes were much resented by small stockowners.

By later medieval times (mid 14th to end of 15th centuries) townlands had become the fundamental unit of land tenure. Most would have been demarcated by natural boundaries such as rivers and streams, but some were bounded by constructed banks, walls or ditches. The banked boundaries in particular often had hedges too. The land within was largely unenclosed, though this was dependent on the landowner and their preferences. Townland boundary hedges thus tend to have larger banks and ditches than other hedges, and are often among the oldest hedges in the landscape. For these reasons they may also contain a more diverse flora than other, non townland boundary hedges.

The County of Mayo was formed during the reign of Elizabeth 1 (1558-1603) although the county borders were not very clearly set out.

The pattern of land ownership in Mayo underwent a continuous if slow change in succeeding generations as some clans evolved and grew stronger as others declined. The Cromwellian settlement which commenced in 1641 and ended a decade later resulted in major changes in land ownership. Commonwealth soldiers and adventurers were repaid for their services with grants of land in ten Irish counties. Displaced landowners were recompensed with lands, in proportion to their original estates, in four counties west of the Shannon - Mayo, Galway, Roscommon and Clare. The existing landowners west of the Shannon then had to be found estates elsewhere in the Province.

This origin of the estate system in the seventeenth century resulted in major agrarian landscape change and the associated establishment of fields, particularly in the more prosperous agricultural regions of Ireland (Aalen et al. 1997).

In 1721 the Irish Parliament passed an Act “*to oblige proprietors and tenants of neighbouring lands to make fences between their several lands and holdings ... at equal expense in making between such several lands and holdings good and sufficient ditches of six foot wide and five foot deep at least, where the same is practicable, well and sufficiently quicked in good husbandlike manner with white thorn, crab and other quicksets, where the same will grow, and, in ground where such quicksets will not grow, with furze*”.

The term ‘quick’ or ‘quickset’ refers to young hedging plants, usually whitethorn (hawthorn).

The main period of land enclosure in Ireland was during the period 1740-1830. Agricultural improvement through land rotation programmes necessitated protection of crops by restricting the movement of livestock to particular fields. It was during this period that the familiar patchwork landscape of hedged fields largely came into being.

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

In 1802 James McParlan produced his Statistical Survey of County Mayo. The report contains a Chapter on the "*Mode of hedgerows and keeping hedges*". Numerous references are made to the extent (or lack of it) around the Baronies of the County.

In the Barony of Tyrawley there are "*No hedgerows, except in ditches*". The "*mode of keeping them is to preserve them from cattle*". In the Barony of Burrishool "*there are no hedgerows*". A similar picture is painted in the "*Baronies of Murrisk, Carra, Clanmorris, etc, etc None, none, and so on*". The impression is one of a County with very little enclosure by hedgerows at this period. McParlan is of the view that this lack of hedgerows is not always down to the unsuitability of land –

"The very few hedges and trees about Newport are a living proof of the facility of growing trees here".

"The poor of the county, none indeed but the gentry have got into the practice of hedging ditches with thorn, or anything else; where they are put down they thrive prosperously, which is the case at all the gentleman's seats"

On the subject of the condition of existing hedges ("*Nature of Fences*") at the period this distinction between the rich and poor is continued. On a Barony by Barony basis the following comments were made.

Barony of Tyrawley

The "*better order of tenantry and gentlemen enclose with quicked ditches*"; others have "*bad ditches made of sods*"

Barony of Burrishool

"There are some, but very few quickset ditches and walls here."

Barony of Clanmorris

"Dry walls, from five to six feet high, where stones are convenient; and quickset ditches."

McParlan is generally uncomplimentary on the quality of fences

He also refers to the fact that there were three public tree nurseries two in Clanmorris (sic) and one large very good one at Castlebar: "*In Gallen some mountain ash is reared and sold.*"

The population increases of the 18th and 19th centuries necessitated the intensive reclamation of much previously un-cultivated land, due in no small part to the success of the potato and the desire of landlords to extract maximum rents from their lands. Initially settlement would have spread along new roads. However, as pressure on land increased, communal mountain pasture lands above

the 150m contour were exploited and small farms developed on mountain slopes. In areas where stone was plentiful walls would have been the most practical form of boundary. Earthen banks faced with stone would also be common in County Mayo.

The county was very badly affected by the Great Famine. The 'official' statistics for the county show that the population dropped from 388,887 in 1841 to 274,499 in 1851, but it is accepted that the actual figure in 1841 was far higher than the official census return. It can safely be said that over 100,000 died in Mayo from the famine epidemic. The population at the last census in 2006 stood at 123,839. In the aftermath of the famine, stronger farmers increased their holdings at the expense of weaker neighbours. The "Land League" was initiated in County Mayo during 1879 by Michael Davitt, James Daly, and others, which brought about great social change and led to long term reorganisation of the rural landscape. It is to this period that the majority of the current field systems, rural settlement patterns and hedgerows in County Mayo date. The Congested Districts Board (CDB) initiated infrastructure development, agricultural improvement and promoted changes in the countryside including encouraging the dispersion of farms and reorganising land-holdings. Clustered farm settlements and rundale holdings were replaced by owner occupied strip holdings. The second edition Ordnance Survey maps (1907-09) show enclosure patterns much more consistent with those of the current day indicating that the majority of the hedgerow network in the county would have been established between the famine and the end of the nineteenth century.

The Grand Juries, forerunners to the County Councils, were responsible for many road building programmes in the late eighteenth and early nineteenth centuries. A measure of funding was often provided for the provision of roadside hedges. Other hedgerows in the county may owe their origin to other transport routes. The building of Railways (1847-1860s), would also have involved the planting of many miles of hedgerow.

Intensification of farming and the development of larger machinery resulted in hedgerow removal on many farms particularly during the 1960s and '70s. The absence of any comparable survey data means that it is not possible to quantify the extent of the loss, but a comparison of the current status with field boundary patterns from the second edition Ordnance Survey maps from the early part of the twentieth century would suggest that hedgerow loss is a fraction of what occurred in Britain during a similar period. Much of the drumlin topography of County Mayo does not lend itself to this large scale mechanisation and hedgerow removal rates are likely to be much lower in the County in comparison with midland and eastern counties.

In the early 1990s increased emphasis on environmental conservation in connection with agriculture (largely driven by the EU) resulted in the Department of Agriculture and Food introducing the Rural Environmental Protection Scheme (REPS).

The objectives of the REPS are:

- To establish farming practices and production methods that reflect the increasing concern for conservation, landscape protection and wider environmental problems.
- To protect wildlife habitats and endangered species of flora and fauna.
- To produce quality food in an extensive and environmentally friendly manner.

Hedgerow conservation is an intrinsic component of the scheme. The design and operation of this scheme will set the tone for hedgerow conservation in Ireland for the foreseeable future. According to Department of Agriculture and Food statistics (website) Mayo is the County with the highest uptake of farmers in the REP Scheme.

3.2 THE VALUE OF HEDGEROWS FOR COUNTY MAYO

Based on the results of the Badger and Habitats Survey of Ireland (Smal, 1995) the hedgerow/tree row network in Ireland was estimated to be approximately 382,000 km. The estimated figure for County Mayo was 7,612km (2.0% of the national total). This is a huge asset to the county and the country.

Landscape

The patchwork of fields and hedgerows, along with stonewalls, endow the countryside, particularly in the east of the county, with a distinctive and attractive appearance. The flowering and fruiting of hedgerow shrubs give a colour and fragrance to the summer countryside that is unique. In particular, regional and local variations in hedgerows give character to a townland or area and lead to a sense of place. They frame the passage through much of the countryside by lining the roads and in certain areas give the impression of a wooded landscape.

Agriculture

Although the hedgerow network is largely a result of 18th and 19th century farming methods, hedges still have many benefits for the modern farmer. Apart from their basic function as cheap (Meyen, 1997) and environmentally friendly stock-proof boundaries, they provide vital shelter and protection of stock and crops across the county. By trapping airborne viruses they can prevent the spread of disease between farms and they can prevent animals from neighbouring farms coming in direct nose to nose contact. Good hedgerows reduce wind speeds and thus protect against soil erosion.

Flora and Fauna

Hedgerows are home to a range of wild flowers and flowering and fruiting trees and shrubs, all of which form the base of the food chain. They support invertebrates like butterflies, moths, ladybirds, beetles, bumblebees and hoverflies. In turn, two thirds of our bird species nest in hedgerows, finding essential food and shelter within. Birds of prey like kestrels, merlins, owls, and sparrowhawks use hedgerows for hunting along. Bats depend on hedgerows for shelter, roosting, and most importantly for their insect food. Hedges can also support other mammals like woodmice, hedgehogs, and badgers.

Hedges as habitat corridors

The network of hedges across the country provides links between surviving fragments of other wildlife habitats, thereby allowing the movement and dispersal of species through agricultural landscapes. This network is thus strategic to the conservation of much of our native flora and fauna, more especially in parts of the county where tillage and reseeded pasture are common. The quality of any particular hedge, in terms of its height, width, density, and general structure and condition (especially the amount and size of gaps), determines the extent to which it will act as a corridor for species movement and dispersal. However, even a relatively poor hedge may be important in an otherwise intensive agricultural landscape.

Water Quality

Hedges play a role in helping 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 river beds with fine grained particles like soil. It contributes much to the deterioration of aquatic habitats, preventing salmon and trout from spawning.

Carbon Sequestration

Estimating an average hedgerow width of two metres, hedgerows cover an approximate area of 764 square km of the country and play a role in meeting Ireland's obligations under the Kyoto Protocol (see section 4.3).

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.

4.0 SURVEY RATIONALE AND OBJECTIVES

4.1 THE NEED FOR A HEDGEROW SURVEY IN COUNTY MAYO

As will be seen from section 4.3, hedgerow conservation in Ireland is embraced through legislation, policy and incentive. Any attempts to promote hedgerow conservation need to be based on an accurate and meaningful assessment of the current resource. Until now there has been no systematic record made of the extent, species composition, structure, condition and management of the hedgerows of County Mayo.

The *Badger and Habitats Survey of Ireland* (Smal, 1985) produced statistics for hedgerow length based on the same sample as this survey (see section 5.2 for sampling details). However, the definition of what constitutes a hedge is different in both surveys. The estimated length of the hedgerow network in County Mayo based on Smal's survey was 7612km. Assuming an average hedgerow width of 2m; this would represent an area of over 15 km², which is approximately 0.3% of the area of the county. This is a lower percentage figure than for most counties but still represents a cultural, agricultural, and environmental resource which deserves to be better understood.

There probably has never been a more appropriate time for a survey of this nature given the growing emphasis on ensuring environmental welfare, especially as part of agricultural programmes, in addition to increasing development pressure from housing, transport infrastructure and industrial development.

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 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 conservation best practice.
- 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 Mayo Hedgerow Survey* can complement data collated from other habitat related studies, e.g. *The Badger and Habitats Survey of Ireland* (Smal 1985); *The Countryside Bird Survey* (Birdwatch Ireland, ongoing study).
- The *County Mayo 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 a future Biodiversity Action Plan for County Mayo.

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 and Food
- Teagasc
- Farmers, land owners and estate managers
- Foresters
- Schools, Colleges, and Universities
- State Bodies – National Parks and Wildlife Service, CIE, Waterways Ireland

4.2 THE AIMS AND OBJECTIVES OF THE COUNTY MAYO HEDGEROW SURVEY

1. To estimate the extent of hedgerows in County Mayo based on extrapolating data from a known sample area.
2. To establish the species composition of the county's hedges.
3. To examine the general environmental and historical context of hedgerows in County Mayo.
4. To record the general construction types of hedgerows in the county.
5. To record the structure and condition of hedgerows in the county based on a sample study.
6. To assess the data collected and produce recommendations that will promote the future conservation of the resource.

4.3 LEGISLATION AND POLICY

Various Legislative Acts, Directives, and Guidelines (International, European, and National) reflect the importance of the hedgerow resource and its management. These are listed below with a summary given for those having the most direct relevance.

International

- The Kyoto Protocol (1997)
This calls for the “*Protection and enhancement of sinks and reservoirs of greenhouse gases.*”

In the process of photosynthesis hedgerow trees and shrubs take in carbon dioxide and emit oxygen. Carbon Dioxide is a major greenhouse gas.

European Union

- (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.*”
- (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.
- (EC) Council Regulations
 - 2078/1992 (Agri-Environmental Schemes)
The Rural Environmental Protection Scheme (REPS) operates under this European Regulation. Specifications set down the conditions by which participant farmers in the Scheme must manage their hedgerows.
 - 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 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.
- 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 8kms in rural areas.
- Planning and Development Act, (2000)
There is scope within this legislation for Local Authorities to give some measure of protection to hedgerows in specific circumstances. They can designate Special Amenity Area Orders (SAAO's) within which certain activities can be controlled. Once SAAO's are

confirmed, Conservation Orders can be put in place. SAAO's are very seldom invoked, with only three designations (all in the Dublin region) as of April 2005 (Crangle, 2005). No Conservation Orders have been designated (Birdwatch Ireland, 2005).

Local Authorities can also make Tree Preservation Orders (TPO's), but currently there are no TPO's designated in respect of hedgerows (Hickie, 2004).

- National Biodiversity Plan (2002)

Produced in response to the Convention on Biological Diversity (CBD, Rio de Janeiro, 1992), the plan has a number of Actions that are relevant to Hedgerow Conservation. These include; Action 32: *"Review options on Regulation of Hedgerow Removal and Produce guidelines on Hedgerows and Biodiversity."*

This should be taken in the context of paragraph 2.27 of the plan which states:

"Field boundaries, mainly hedgerows, are a particularly prominent feature of the Irish countryside and provide important habitats for a variety of species. Hedgerows have suffered significant losses. Current legal controls for their protection are limited. For the future, the overall goal should be to have no net loss of the hedgerow resource."

Action 10 states, under *"Integrating Biodiversity into Sectors"*,

"Each Local Authority to prepare a Local Biodiversity Plan in consultation with relevant stakeholders."

Further actions will also have an impact of hedgerow conservation. Examples include:

Action 34. *"The Department of Arts, Heritage, Gaeltacht and the Islands will develop Guides to Best Practice with Local Authorities and other relevant bodies to safeguard biodiversity. These will, inter alia, normally require such bodies to use native species and seed stock in their tree planting programmes and to employ other environmentally beneficial management practices (e.g. cease using herbicides)."*

- National Heritage Plan (2002)

The National Heritage Plan recognises hedgerows as prominent and important features in terms of their ecological, archaeological and landscape values. Action 32 (Heritage in the Countryside) ensures the

"protection and enhancement of hedgerows as a natural and archaeological heritage resource through the use of regulatory, educational and financial measures, as appropriate."

- Electricity Supply Act, (1927)

Article 98 of the above Acts permits any *"authorised operator"* to *"lop or cut any tree, shrub or hedge which obstructs or interferes"* with electric wires.

- Communications Regulations Act, (2002)

Article 58 of the above Acts permit any *"authorised operator"* to *"lop or cut any tree, shrub or hedge which obstructs or interferes"* with the physical infrastructure of the network.

- The Forestry Act, (1946)

- Sustainable Rural Housing Guidelines (2005)

5.0 METHODOLOGY AND FIELD SURVEY

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

5.1 DEFINING HEDGES

For the purpose of this survey hedges are defined as

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

This definition is based on previous definitions made by Cooper & McCann (1997), Fossitt (2000), and Murray (2003).

The terms ‘*hedge*’ and ‘*hedgerow*’ are used inter-changeably throughout this report.

In accordance with the Methodology, garden hedges and those bordering curtilage (BL3 as fully defined by Fossitt, 2000) have not been recorded unless they also border agricultural land.

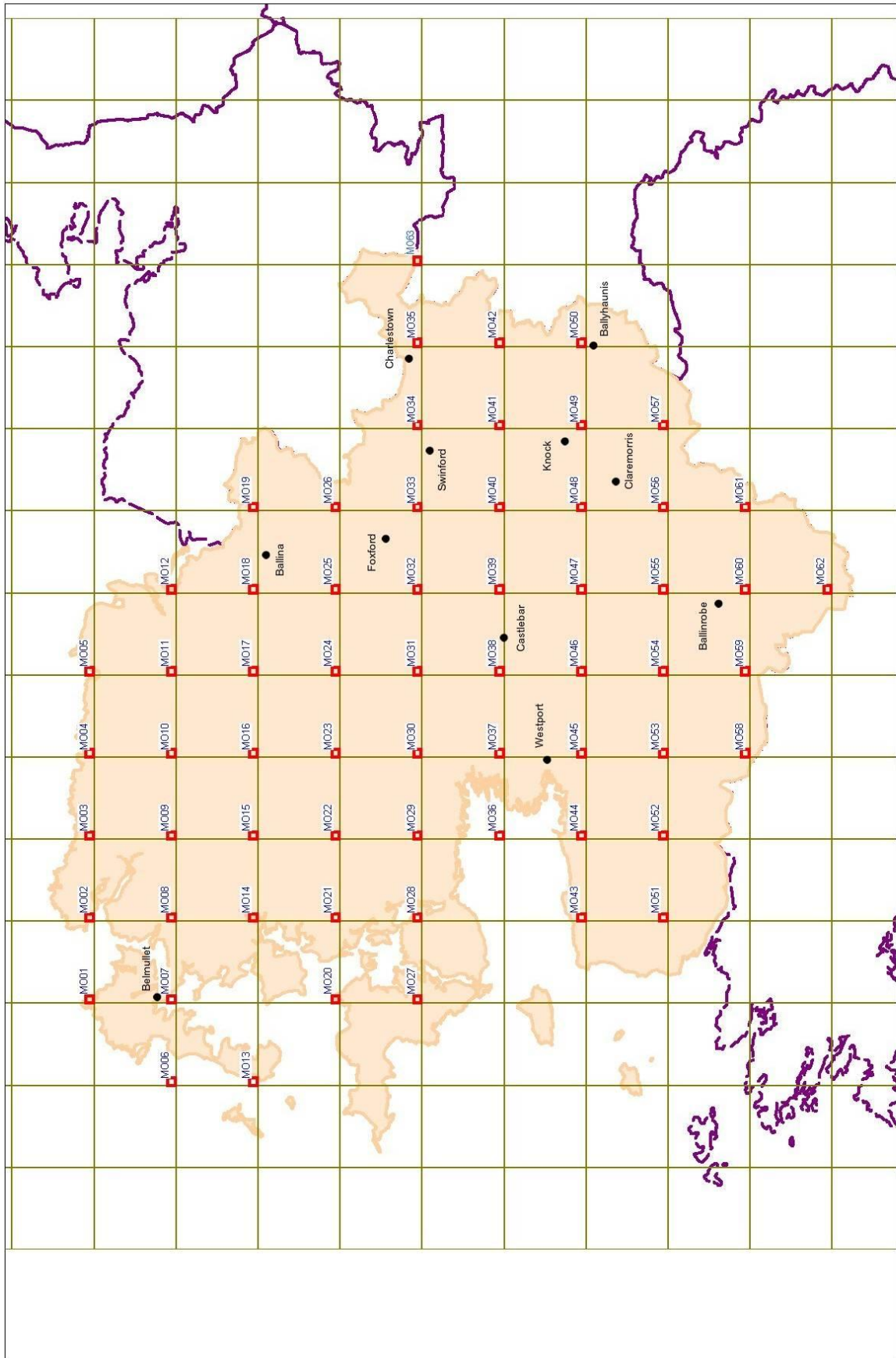
5.2 SELECTING THE SAMPLE

The south-western (or “bottom left hand”) 1 km square of each of the Ordnance Survey ten kilometre National Grid squares of the country was chosen for the Hedgerow Survey, in accordance with the sampling procedure used for the *Badger and Habitats Survey of Ireland* (Smal, 1995) and subsequently the *Countryside Bird Survey* (Birdwatch Ireland, ongoing study). This placement gives the potential for some joint assessment of these data sets in the future.

Samples areas are 1 km square, with the exception of one part square which falls on the county boundary (in which case only the area in County Mayo was surveyed). A total of 63 samples (62 full squares and one part square) were selected in this way. The sample area is approximately 1% of the total area of the County. Figure 5.2.1 shows the position of the sample squares in the County.

Within each sample square a maximum of 10 hedges were selected for detailed study using randomly generated points on a transparent overlay. The points on the overlay were selected at random using a random number generator and an appropriately scaled, numbered grid marked by subdividing the square, and then matching the randomly chosen numbers with points on this grid. The overlay was then placed on top of the relevant aerial photograph of each square, and the hedge nearest to each point on the overlay was chosen for detailed investigation. If there was no hedge within a fixed radius (equating to approximately 175m) of the randomly selected point, the number of sampled hedges was reduced by one. This was to ensure that the sample would not be skewed by a higher sampling density in certain areas. Where the ‘*hedge*’ chosen on the aerial photograph was discovered on the ground to be something other than a hedge (e.g. a tree line, a colonised drain, a vegetated bank, or a wall covered in vegetation), the next hedge nearest to the relevant point on the overlay sheet was recorded instead, provided that it fell within the specified radius of the random point.

Each hedge chosen for detailed investigation by the random selection process was clearly marked and labelled with a number on a copy of the relevant vector map (see Appendix 12.3), with beginning and end points also marked. A length of hedge was generally taken as one side of a field or enclosure. End points were identified as the junction between adjacent sides of a field, or where three or more hedge lengths meet. In a few instances end points were marked where the construction, management, or character of a hedge changed suddenly and conspicuously along its length, or where a clear and obvious difference in the origin of the hedge was apparent, but where no junction was evident. This was normally a result of boundary removal, where the two portions of a linear hedge once bounded separate fields.



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Figure 5.2.1 Map of County Mayo showing location of the 1 km² samples

5.3 MAPS AND AERIAL PHOTOGRAPHS

The Ordnance Survey Discovery Series maps (scale 1: 50,000) were used to physically locate the sample squares. Vector maps (regularly updated), aerial photographs (photographed in 2006), and second edition six inch Ordnance Survey maps from the early 1900s, all at a scale of 1:5000 with the 1km square outline overlaid were supplied by the GIS Technical Support staff in the Planning Department of Mayo County Council. The vector maps were used to identify features in the field and to record hedgerow extent. Aerial photographs enabled the square to be assessed in terms of its general character and the presence of hedges. This made the identification of the randomly selected hedge samples more efficient and aided orientation and navigation within and around the square. The second edition six inch Ordnance Survey maps were used primarily for the identification of townland boundaries. The first edition six inch Ordnance Survey maps were sourced through the Ordnance Survey web site.

5.4 PERIOD OF FIELDWORK

Fieldwork commenced on 7th June 2007 and was concluded by 2nd August 2007.

5.5 ACCESS AND PERMISSION

Due to difficulties in identifying ownership of all parcels of land within the sample squares and the fact that landowners may not be around during the day it was not considered practical to seek permission for access to all lands. Where access to land was through a farmyard, close to a dwelling, or in any other situation deemed relevant by the surveyor, efforts were made to secure permission for access from the landowner. The Mayo Heritage Office provided a covering letter explaining the purpose of the survey and requesting the co-operation of landowners. A sign indicating that the County Mayo Hedgerow Survey was taking place (with contact telephone number) was placed in the windscreen of the fieldworkers car so that people in the survey area would not be suspicious of an unattended vehicle.

The fact that the sample squares are the same as those used by Birdwatch Ireland for the Countryside Bird Survey meant that a number of landowners were well primed to see surveyors at work.

Where requested, permission was granted without exception. Two sample hedges were not recorded due to the fieldworkers being unable to make contact with landowners in order to gain permission to enter the appropriate lands in situations where permission to enter was considered imperative. In a number of cases landowners provided useful additional information. Their co-operation and assistance was much appreciated.

Full public liability insurance cover was in effect for the field work.

5.6 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) or gaps greater than 20m. Each selected hedge was subjected to a detailed investigation along its whole length.

A '*Field Survey Sheet*', developed in previous hedgerow surveys, was used to record the characteristics of each hedge and its associated features (see Appendix 12.5)

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 use and links with other habitats. The data recorded

is consistent with The Heritage Councils 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 or double 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.), including any degradation to the basic construction. Condition is gauged by an assessment of the vigour of the hedgerow shrubs, degree of fruiting and a record of the quantity and age profile of hedgerow trees.

Management

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

5.7 FLORISTIC RECORDINGS OF HEDGES

For each hedge examined, two 30m strips were paced out and marked from two randomly chosen points along the sample’s length. Based on hedgerow survey work in Britain (Bickmore, 2002), a 30m strip is generally accepted as an adequately representative sample size for recording woody species in a hedge. By recording woody species along a standardised length, statistical comparison of hedges of different lengths is made possible. Irish hedges tend to show high degrees of variation in species composition from one end of a hedge to the other. For this reason, two 30m strips were recorded for each sample hedge in this survey. The increased sampling intensity for each hedge gives a more accurate picture of the overall species composition of each hedge.

A ‘*Floristic Recording Sheet*’ was used to record these data. On this, each woody shrub species present within the length of each strip was allocated an appropriate Domin Scale value. The Domin Scale is used to record the percentage cover of each woody shrub species detected (see Appendix 12.6).

The presence of other species within the hedge but which did not fall within either sample strip was recorded separately.

The presence of Ivy (*Hedera helix*) at canopy level was recorded according to the Domin scale. The extent of cover (or absence) of the following species was also noted in accordance with the DAFOR scale (see Appendix 12.7). .

Common Name	Latin Name
Brambles	<i>Rubus fruticosus</i> agg.
Wild Rose	<i>Rosa</i> spp
Honeysuckle	<i>Lonicera periclymenum</i>
Clematis	<i>Clematis vitalba</i>
Bindweed	<i>Calystegia sepium</i> , <i>Convolvulus arvensis</i>
Blackcurrant	<i>Ribes nigrum</i>
Gooseberry	<i>Ribes uva-crispa</i>
Bilberry	<i>Vaccinium myrtillus</i>
Raspberry	<i>Rubus idaeus</i>
Heather	<i>Calluna vulgaris</i>

Tree species present along the whole length of the hedge were noted and the dominant tree species, where applicable, was noted.

5.8 RECORDING THE EXTENT OF HEDGEROWS IN SAMPLE SQUARES

For the purposes of this survey the extent of hedgerows within a sample square were recorded by visual inspection of all linear features apparent on the relevant aerial photograph or vector map. The presence of hedgerows was marked with a solid red line on a black and white photocopy of the vector map. Remnant hedgerows were recorded with a broken red line. Remnant hedges are those where the shrubs have reverted to their (often aged) tree form with extensive gaps. Any other linear feature that was apparent on the aerial photograph/vector map was investigated and non-hedgerows were noted with a solid green line to prevent duplication of investigation. These included *Vegetated Banks*, *Vegetated Drains*, *Walls* with or without shrubs, *Fence lines*, *Mini Woodland Strips*. Where clear and extensive gaps occurred within hedges a green line was used to mark the gap section. This was practiced to minimize the over estimation of hedgerow length due to the inclusion of significant gaps.

5.9 TARGET NOTES

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

5.10 PHOTOGRAPHY

A Nikon Coolpix 3700 digital camera was used to photograph all sample hedges plus other notable hedges, specific characteristics, wildlife, etc.

5.11 DATA RECORDING

All of the data recorded during the field survey was transferred into a Microsoft Excel spreadsheet for subsequent analysis. Target Notes were recorded on a separate worksheet within the Excel file and, where applicable, cross-referenced to the data in the spreadsheet.

Digital photographs were downloaded, referenced, and stored in electronic folders relating to each sample square.

6.0 DATA ANALYSIS

Data recorded during the field survey was transferred from the field recording sheets in to a Microsoft Excel spreadsheet for further analysis.

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. These results are presented in sections 7.1 to 7.8.

7.0 RESULTS OF THE COUNTY MAYO HEDGEROW SURVEY

The results from the sample survey are presented in this section with further analysis of the data and comments on its significance data discussed in section 8.0. Recommendations for future conservation of the County's hedgerow resource in the light of these results are presented in section 9.0.

7.1 THE EXTENT OF HEDGEROWS IN COUNTY MAYO

Table 7.1.1 shows the extent of hedgerows and remnant hedgerows in the individual sample squares of County Mayo. The total area surveyed was 62.39km² which is approximately 1% of the total area of the county.

Table 7.1.1 Measurement of Hedgerow Extent in Sample Squares in County Mayo

OS Grid Reference	Square Reference	Nearest Town/Village	Area km ²	Hedgerow Length (km)	Remnant Length (km)	Density (excluding remnant) (km/km ²)	No. of sample hedges recorded
F 70 40	MO01	Erris Head	1	0.00		0.00	0
F 80 40	MO02	Rinroe Point	1	0.00		0.00	0
F 90 40	MO03	Porturlin	1	0.00		0.00	0
G 00 40	MO04	Belderg	1	0.00		0.00	0
G 40 10	MO05	Downpatrick Head	1	0.00		0.00	0
F 60 30	MO06	Inishglora	1	0.00		0.00	0
F 70 30	MO07	Belmullet	1	0.00		0.00	0
F 80 30	MO08	Barnatra	1	1.49		1.49	3
G 90 30	MO09	Glenamoy	1	0.00		0.00	0
G 00 30	MO10	Sheskin	1	0.00		0.00	0
G 30 10	MO11	Kincon	1	1.28		1.28	3
G 20 30	MO12	Killala	1	1.39		2.32	4
F 60 20	MO13	Aghleam	1	0.00		0.00	0
F 80 20	MO14	Srahmore	1	0.00		0.00	0
F 90 20	MO15	Bangor Erris	1	0.00		0.00	0
G 00 20	MO16	Bellacorick	1	0.00		0.00	0
G 20 10	MO17	Crossmolina	1	7.82	0.18	7.82	10
G 20 20	MO18	Rathroeen	1	6.40		6.40	8
G 30 20	MO19	Crocks Town	1	5.47	0.05	5.47	8
F 70 10	MO20	Ridge Point	1	0.00		0.00	0
F 80 10	MO21	Ballycroy	1	0.65		0.65	3
F 90 10	MO22	Nepin	1	0.00		0.00	0
G 00 10	MO23	Keenagh	1	0.00		0.00	0
G 10 10	MO24	Lahardaun	1	2.91		2.91	6
G 20 10	MO25	Knockmore	1	13.15		13.15	10
G 30 10	MO26	Attymas	1	0.48		0.48	3
F 70 00	MO27	Achill Island	1	0.00		0.00	0
F 80 00	MO28	Corraun Peninsula	1	0.05		0.07	0
F 90 00	MO29	Cushcamcarrag	1	0.00		0.00	0

		Knockmoyle	1				0
G 00 00	MO30	Bridge		0.00		0.00	
G 10 00	MO31	Beltra	1	0.05		0.05	0
G 20 00	MO32	Pontoon	1	0.00		0.00	0
G 30 00	MO33	Kilmore	1	2.19		2.19	4
G 40 00	MO34	Swinford	1	3.05		3.05	5
G 50 00	MO35	Charlestown	1	1.73		1.73	3
G 90 90	MO36	(Islands)	1	0.00		0.00	0
M 00 90	MO37	Newport	1	6.73	0.12	6.73	8
M 10 90	MO38	Castlebar	1	6.23		6.23	8
M 20 90	MO39	Turlough	1	9.36		9.36	10
M 30 90	MO40	Kiltimagh	1	1.44	0.20	1.44	3
M 40 90	MO41	Kilkelly	1	2.25		2.25	5
M 50 90	MO42	Glentavraun	1	2.71		2.71	3
L 80 80	MO43	Louisburgh	1	1.66		1.66	5
G 90 80	MO44	Croagh Patrick	1	0.00		0.00	0
M 00 80	MO45	Knappagh	1	5.22		5.22	9
M 10 80	MO46	Killavally	1	4.97		4.97	6
M 20 80	MO47	Ballycarra	1	6.53		6.53	9
M 30 80	MO48	Ballynastangford	1	3.52	0.06	3.52	9
M 40 80	MO49	Knock	1	1.93		1.93	2
M 50 80	MO50	Ballyhaunis	1	4.59		4.59	8
L 80 70	MO51	Glencullin	1	0.00		0.00	0
L 90 70	MO52	Owenmore	1	0.00		0.00	0
M 00 70	MO53	Carrowkennedy	1	0.00		0.00	0
M 10 70	MO54	Tourmakeady	1	8.49		8.49	9
M 20 70	MO55	Ballygarries	1	6.90		6.90	9
M 30 70	MO56	Scardaun	1	8.81		8.81	8
M 40 70	MO57	Ballindine	1	3.79	0.14	3.79	6
M 00 60	MO58	Maumtrasna	1	0.62		0.62	2
M 10 60	MO59	Lough Mast	1	0.00		0.00	0
M 20 60	MO60	Neale	1	0.92		0.92	3
M 30 60	MO61	Kilmaine	1	3.10		3.10	6
M 20 50	MO62	Headford	1	2.49		2.49	4
G 60 00	MO63	Carracastle	0.39	0.38		0.95	2

It can be estimated that County Mayo has a hedgerow length of 12173km assuming that the squares surveyed are a representative sample of the county as a whole.

The estimated length of remnant hedgerows is just 65km. This equates to 0.05% of the total of hedgerow and remnant hedgerow length. None of the sample hedges selected for recording as part of the more detailed part of the survey were remnant hedges. Figures for remnant hedges are much

lower than those from counties of Roscommon and Westmeath where figures of 10% and 12% were recorded respectively.

Twenty six of the sample squares did not contain hedgerows. These were mostly upland and coastal areas although one square MO59 fell completely over the water body of Lough Mask. The highest recorded value was in square MO25 (Knockmore) with a length of 13.15km. The highest 'length of hedgerow' figure recorded in an individual 1km² in any of the specific Irish county based hedgerow surveys to date is 22.51km/km² in a square near to Drumsna, County Leitrim.

The average figure for hedgerow density in County Mayo is 2.24km per km². By excluding those squares which don't contain hedgerows the average hedgerow density increases to 3.82 km/km². The results from the other county hedgerow surveys are shown for comparison, along with the standard deviations in Table 7.1.2.

Table 7.1.2 Comparison of average hedgerow density

Year of Survey	County	Average Density (km/km ²)	Standard Deviation	% of remnant hedges
2007	Mayo	2.24	2.99	0.1
2006	Cavan	11.01	4.76	15.0
2006	East Galway	5.88	n/a	4.4
2006	Kildare	5.92	3.61	3.7
2006	Leitrim	7.31	6.98	4.1
2006	Longford	8.23	6.14	3.5
2005	Laois	7.28	3.15	1.7
2005	Offaly	5.81	4.32	2.1
2004	Roscommon	5.43	4.75	12.2
2004	Westmeath	5.82	3.28	9.7

Standard deviation of hedgerow density statistics gives an insight into the overall nature of the hedgerow landscape within a county. A high standard deviation figure is recorded, such as in County Longford, where there is a wide variation in hedgerow density across the county, from areas of bog and forestry, with little or no hedges to the areas with a much heavier concentration of hedges. In contrast, County Laois has a high hedgerow density, but relatively low standard deviation, which indicates a more consistent hedgerow landscape. Given the large proportion of the county which contains no hedgerows it is not unsurprising that County Mayo has the lowest hedgerow density so far recorded.

The pattern of hedgerow distribution with the main concentration of hedgerows to the south and east of the county is reflected by the location of the sample hedges. This is illustrated graphically in Figure 7.1.1

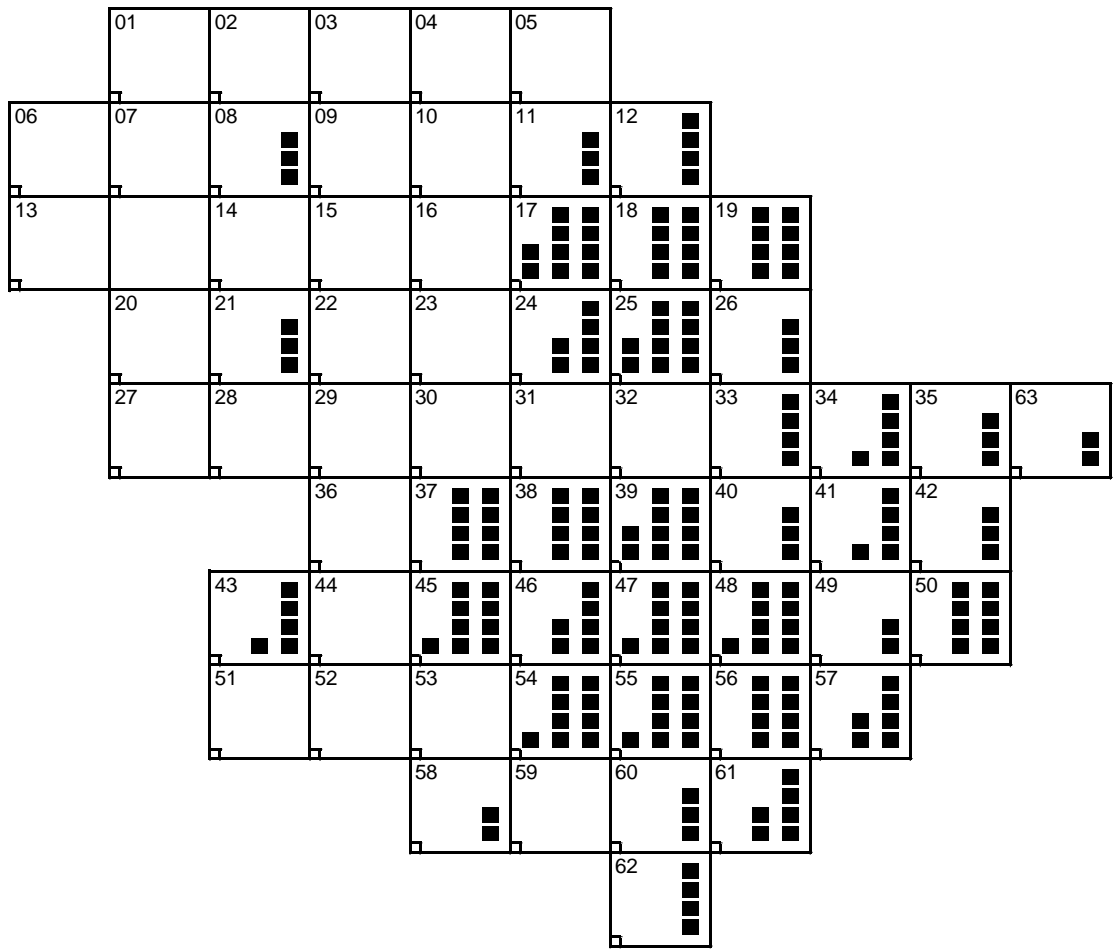


Figure 7.1.1 Distribution of sampled hedges in County Mayo



Hedge-less landscape near Beltra (MO31)

Potential Error in Extent Values

Recording non hedgerows as hedgerows

Close inspection of every hedge within each 1km square for the purpose of recording extent was outside the scope of the survey within the working timeframe. Even on close inspection it was difficult, in many cases, to determine whether a particular linear feature was or was not a hedgerow based on the survey definition. When it came to recording extent this distinction was often determined from a distance. It is possible that some features that were recorded for extent purposes as hedgerows may have been considered not to be hedgerows on closer examination. This potential error would be almost non-existent in most landscapes but in areas on the fringes of bog-land the difference between a hedgerow and a colonized drain, or similar feature is more blurred. Of particular relevance to this survey were distinguishing between walls and banks colonised with a few shrubs (but with high levels of brambles) and hedgerows, and also assessing whether linear features were greater than 4m in width, in which case they would be classed as linear scrub and not hedgerow.

Recording of remnant hedgerows as hedgerows

Similar comments to the above apply, but in reverse. Some hedgerows that were recorded for extent purposes may on close inspection have been classified as remnant hedges. Any potential errors from the two above points would tend to cancel each other out. Overall any potential error would be deemed to be insignificant.

Non detection of new hedges

Young hedges that would not be included on early Ordnance Survey Maps and that would have been too small to register as distinct linear features on aerial photographs or vector maps could only be recorded if detected during the field survey. The incidence of this was very low and it is not considered that new hedges would significantly contribute to the overall hedgerow extent.



Odd thorn bush with brambles – not a hedgerow (MO25 - Knockmore)

7.2 SPECIES COMPOSITION OF HEDGEROWS IN COUNTY MAYO

The 'species composition' of hedgerows is individually examined in respect of i) the shrub layer and ii) the tree layer. The average length of recorded hedgerows was 142m.

SHRUB LAYER

Shrub species occurring in the hedge layer

40 species were recorded in the shrub layer of the sampled hedges. 21 of these are species native to Ireland, excluding wild privet (*ligustrum vulgaris*). Although native to southern Britain, the Wild Privet is not considered to be a native species in Ireland. Webb (1977) states that it is found '*frequently in hedges as an introduction*'.

In common with all previous studies Hawthorn (Whitethorn) is the most commonly occurring hedgerow shrub found in 89% of sampled hedges. It also has, of the most commonly occurring species, the highest percentage cover in hedges. Five other species occur at frequencies of 20% or greater, these are Gorse (40%), Willow species (36%), Blackthorn (35%), Ash (27%) and Elder (22%). Rowan Holly and Sycamore occur at frequencies between 10 and 20%. All other species were recorded at levels of 10% or less.

The frequency and abundance of each species is presented below, in Table 7.2.1 with the frequency of the major species represented graphically in Figure 7.2.1.

The '*frequency of occurrence*' is the frequency with which each species is found in one or other of the two sampled 30m strips of each hedge.

The "*mean Domin abundance level*" is a representation of the degree of cover of each species within the 30m sample strips. To arrive at the figure the average is taken of the relevant mid-point Domin percentage figure from each hedge in which the species occurs.



Typical gorse hedgerow (MO17 – Crossmolina)

Table 7.2.1 Frequency of woody species occurrence and mean abundance in sampled County Mayo hedges

Latin Name (*denotes non-native species)	Common Name	Frequency of occurrence (%)	Mean Dominance level	abundance cover
<i>Crataegus monogyna</i>	Hawthorn	89.1	7	34–50% cover
<i>Ulex europaeus</i>	Gorse	39.6	7	34–50% cover
<i>Salix spp</i>	Willow species	35.6	5	11–25% cover
<i>Prunus spinosa</i>	Blackthorn	34.7	6	26–33% cover
<i>Fraxinus excelsior</i>	Ash	26.7	4	4–10% cover
<i>Sambucus nigra</i>	Elder	22.3	4	4–10% cover
<i>Sorbus aucuparia</i>	Rowan	17.3	4	4–10% cover
<i>Ilex aquifolium</i>	Holly	15.3	5	11–25% cover
* <i>Acer pseudoplatanus</i>	Sycamore	12.4	4	4–10% cover
<i>Corylus avellana</i>	Hazel	8.4	5	11–25% cover
<i>Alnus glutinosa</i>	Alder	7.4	5	11–25% cover
* <i>Fuchsia magellanica</i>	Fuchsia	3.5	5	11–25% cover
* <i>Fagus sylvatica</i>	Beech	2.5	6	26–33% cover
<i>Betula spp.</i>	Birch species	2.5	5	11–25% cover
* <i>x Cupressocyparis leylandii</i>	Leylandii	2.0	8	51–75% cover
* <i>Picea spp</i>	Spruce	2.0	5	11–25% cover
<i>Prunus avium</i>	Wild Cherry	2.0	4	4–10% cover
<i>Malus sylvestris</i>	Crab apple	1.5	5	11–25% cover
<i>Ulmus spp</i>	Elm species	1.5	3	< 4% cover
* <i>Ligustrum ovalifolium</i>	Japanese Privet	1.5	3	< 4% cover
<i>Sorbus aria</i>	Whitebeam	1.5	3	< 4% cover
* <i>Prunus domestica</i>	Wild Plum	1.5	5	11–25% cover
* <i>Ligustrum vulgare</i>	Wild Privet	1.5	4	4–10% cover
<i>Populus tremula</i>	Aspen	1.0	5	11–25% cover
* <i>Populus nigra</i>	Black Poplar	1.0	7	34–50% cover
<i>Cytisus scoparius</i>	Broom	1.0	4	4–10% cover
* <i>Symphoricarpos albus</i>	Snowberry	1.0	4	4–10% cover
<i>Euonymus europaeus</i>	Spindle	1.0	3	< 4% cover
<i>Myrica gale</i>	Bog Myrtle	0.5	4	4–10% cover
* <i>Ribes sanguineum</i>	Flowering Currant	0.5	3	< 4% cover
<i>Viburnum opulus</i>	Guelder Rose	0.5	3	< 4% cover
* <i>Laburnum anagyroides</i>	Laburnum	0.5	7	34–50% cover
* <i>Larix spp</i>	Larch	0.5	3	< 4% cover
* <i>Pinus contorta</i>	Lodge Pole Pine	0.5	3	< 4% cover
* <i>Populus nigra Ivar. italica</i>	Lombardy Poplar	0.5	3	< 4% cover
* <i>Lonicera nitida</i>	Dwarf Box	0.5	9	76–90% cover
<i>Quercus spp</i>	Oak species	0.5	3	< 4% cover
* <i>Rhododendron ponticum</i>	Rhododendron	0.5	7	34–50% cover

The following species were noted in the sample hedges but not within the two 30m strips

* <i>Aesculus hippocastanum</i>	Horse Chestnut
?	Garden Escape

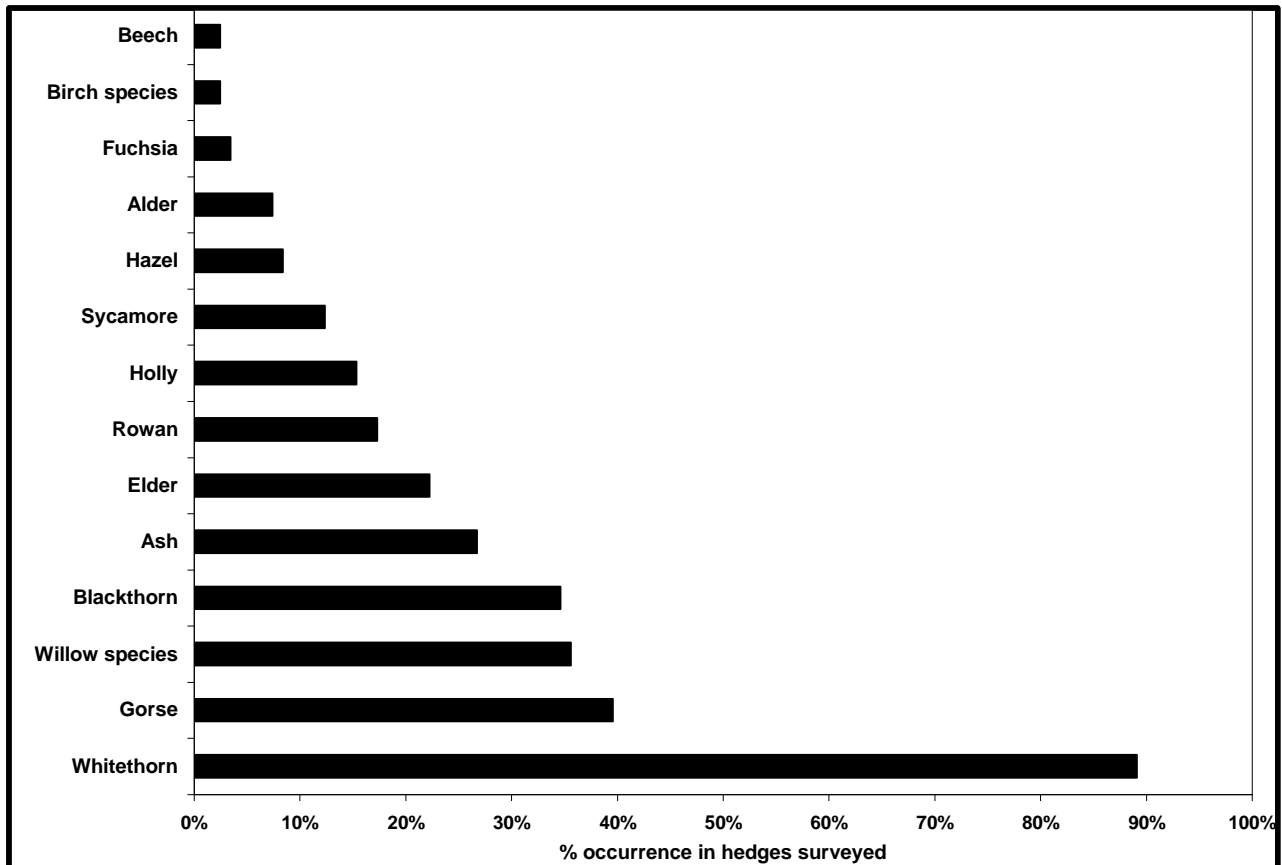


Figure 7.2.1 Frequency of occurrence of main shrub species in sampled hedges in County Mayo

Rare Species

Whitebeam (*Sorbus aria*) is an uncommon hedgerow species, but was found in three sample hedges in two squares MO47 (Ballycarra) and MO48 (Ballynastangford). In nine County Hedgerow Survey's prior to this Broom (*Cytisus scoparius*) had only been recorded in hedges in two Counties (Cavan and Longford). In this survey it was recorded in two sample hedges in two separate squares MO54 (Tourmakeady) and MO58 (Maumtrasna). Bog myrtle was found in one hedge adjacent to bog land in square MO24 (Lahardaun). Laburnum is a species native to the mountains of central Europe that was formerly used in hedging in Western Britain. It was found in reasonable quantity in one sample hedge in square MO48 (Ballynastrangford).



Whitebeam (and Holly)



Broom

Woody Climbers

Bramble (*Rubus fruticosus*) was recorded as being present in a total of 95% of County Mayo hedges surveyed which is consistent with results from counties Kildare, Longford, Laois and Offaly (no comparative data from other surveys). Wild Roses (*Rosa* species) were recorded in 8% and Honeysuckle (*Lonicera periclymenum*) recorded in 13% of the County Mayo sample.

Recordings of woody climbers are presented in Table 7.2.2 below, with a graphical representation of their level of abundance using the DAFOR scale in Figure 7.2.2.

Table 7.2.2 Frequency of woody non-shrub species occurrence in sampled hedges

Latin Name	Common Name	Frequency of occurrence (%)
<i>Rubus fruticosus</i> agg	Bramble	94.5
<i>Lonicera periclymenum</i>	Honeysuckle	13.2
<i>Rosa</i> spp	Wild Rose	8.2
<i>Calystegia sepium</i> , <i>Convolvulus arvensis</i>	Bindweed	4.2
<i>Calluna vulgaris</i>	Heather	2.5
<i>Vaccinium myrtillus</i>	Bilberry	0.8
<i>Ribes uva-crispa</i>	Gooseberry	0.3

Raspberry (*Rubus idaeus*) was present in one sample hedge but not in either of the two 30m strips.

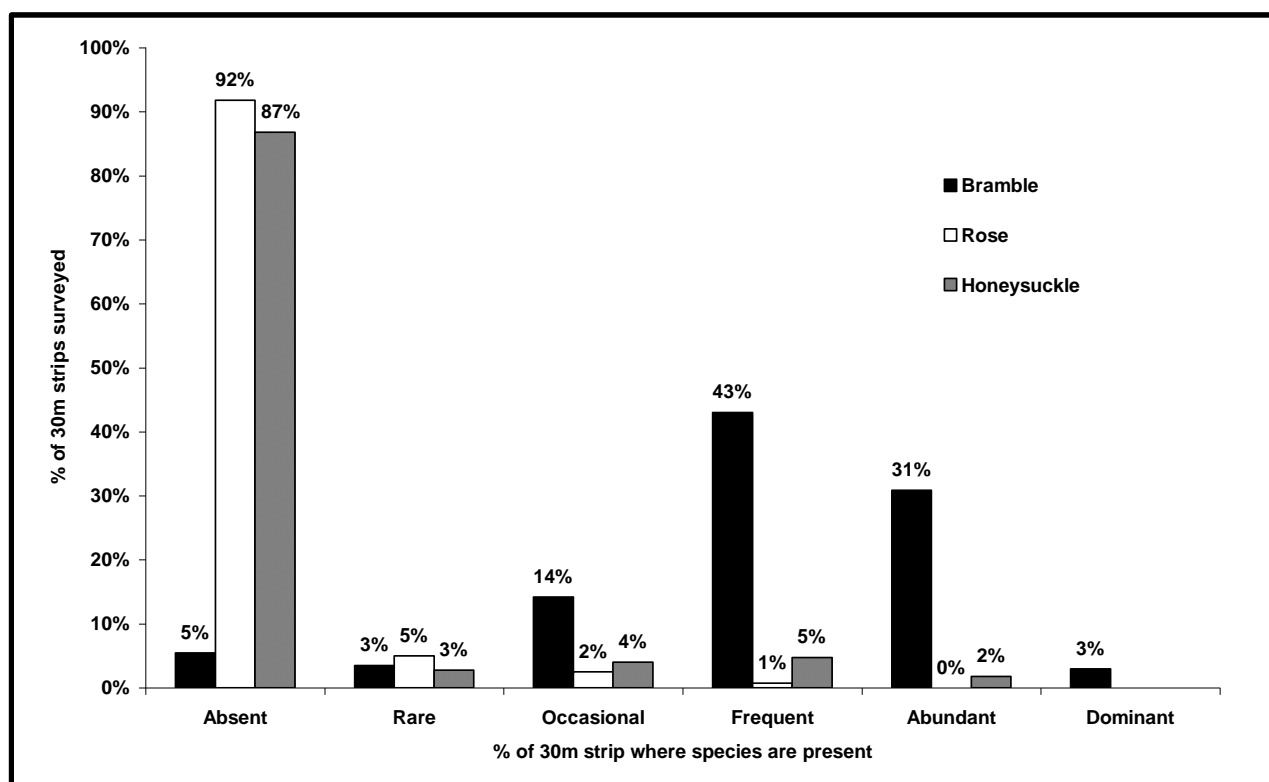


Figure 7.2.2 Level of abundance of woody non-shrub species in sample strips in County Mayo

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. As two 30m sample strips were recorded for each hedge in this survey, the average number of species from the two strips is the most representative figure of species diversity for each sampled hedge.

Species Rich Hedges

There are no defined criteria for what is considered to be a species rich hedge in Ireland. In the absence of a standard, I have based my assessment on British measures, where 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, website). In northern England, upland Wales, or Scotland the presence of four or more native species qualifies as being species rich. As Ireland's native flora overall is less diverse than that of England, Wales and Scotland, four species per 30m length could be considered as species rich here. Only native species, based on Webb (1977) are included for the calculation of native species diversity.

Species Diversity Figures

The average number of species in the two 30m strips was calculated. The breakdown of percentages for the different levels of species diversity found in the sample hedges is shown in Figures 7.2.2 and 7.2.3. Figure 7.2.2 shows diversity of all species, both native and non-native while Figure 7.2.3 shows just those species considered to be native to Ireland.

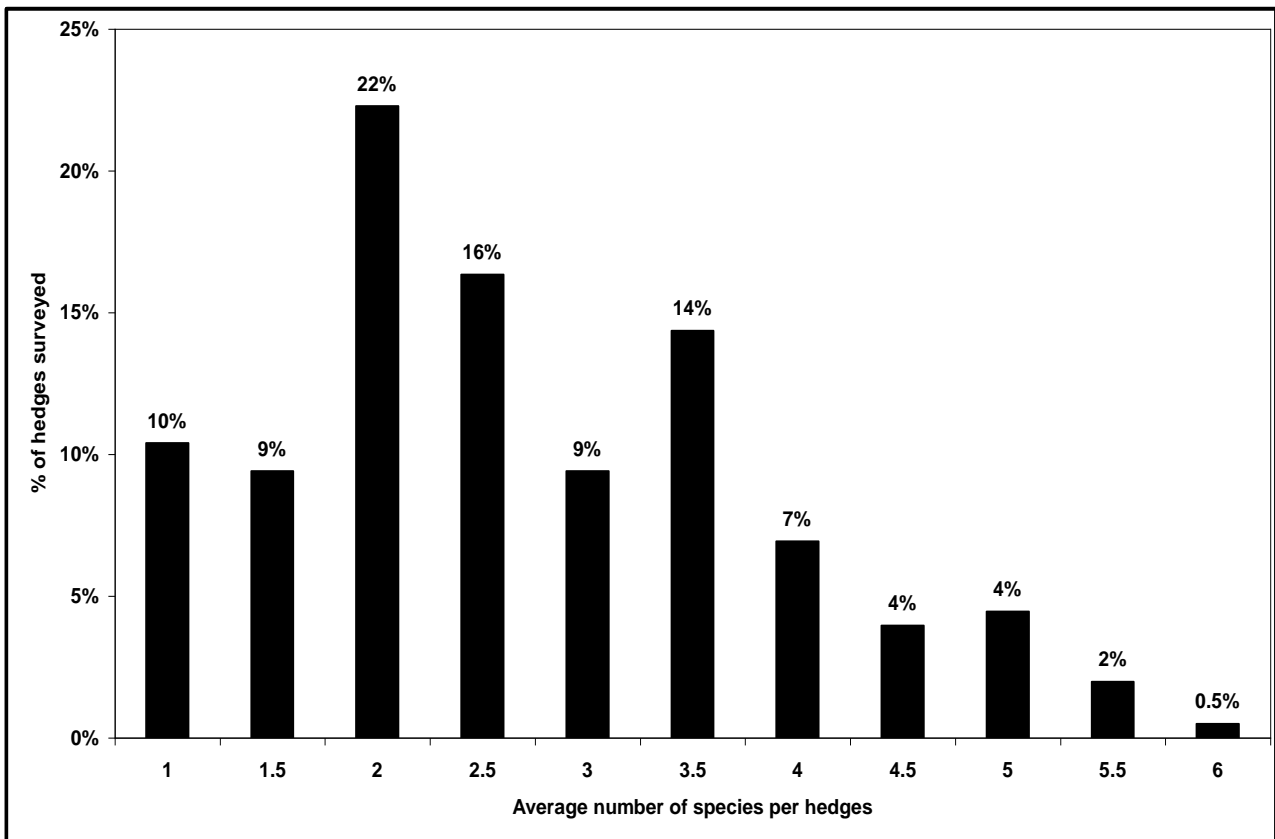


Figure 7.2.3 Percentage breakdown of (average) species numbers in sample hedges (all species)

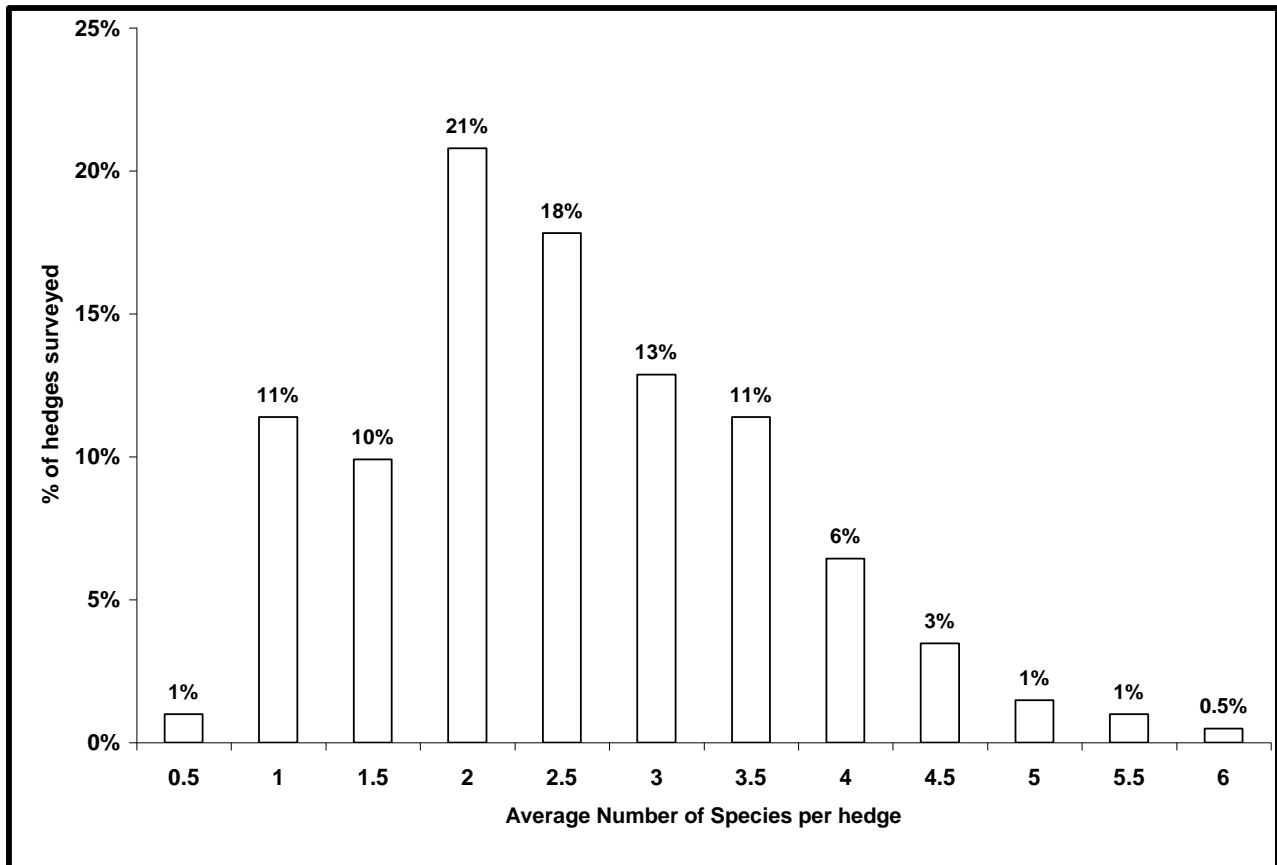


Figure 7.2.4 Percentage breakdown of (average) native species numbers in hedges

It is interesting to look at species diversity results from different perspectives. Table 7.2.3 shows an analysis of the species diversity figures for the sampled 30m strips in County Mayo. These can be compared with the results from counties Kildare, Leitrim, Longford, Laois, Offaly and East Galway which are also shown.

Table 7.2.3 Comparison of species diversity figures in 30m sample strips in Counties Kildare, Leitrim, Longford, Laois, Mayo and Offaly

Species Diversity criteria in 30m sample strips					
% of sample in County	an average of 4 or more native species	4 or more native species in at least 1 strip	a combined total of 4 or more native species in the two 30m strips	an average of 4 or more (all) species	4 or more (all) species in at least 1 strip
East Galway	14.7	21.6	36.0	18.3	26.1
Kildare	18.8	29.9	60.7	40.2	44.0
Leitrim	46.9	55.2	77.1	56.3	81.3
Longford	15.4	26.6	48.7	26.9	34.6
Laois	44.7	59.1	66.0	52.2	69.2
Mayo	12.9	20.3	38.1	18.3	25.7
Offaly	31.5	56.9	66.9	49.2	69.2

These results indicate the variability in the species composition of individual hedgerows. Although only 13% of hedges sampled in County Mayo contained four or more native species, over a fifth of hedges contained four or more native species in at least one of the 30m strips.

The fact that over 38% of sampled hedges in the County had a combined total of four or more native species in the two 30m strips indicates that in many hedges the species are not necessarily the same species in the two strips which suggests that the hedges are even more diverse than the general species diversity figures might portray. Results in County Mayo are very similar to those found in the neighbouring area of East Galway.

107 separate recordings were made in 71 hedges of species that were present in sample hedges but were not present within the two 30m strips.

In terms of native species only this amounted to 91 recordings in 66 hedges.

The average species diversity for all hedges recorded in nine County hedgerow surveys is shown in Table 7.2.4.

Table 7.2.4 Comparison of species diversity statistics

County	Mean Species Diversity (All)	Standard Deviation	Mean Species Diversity (Native)	Mean Total number of species in 2 x 30m strips (All)	Mean Total number of species in 2 x 30m strips (Native)
Cavan	4.6	2.6	n/a	n/a	n/a
East Galway	2.8	n/a	2.6	3.5	3.2
Laois	4.00	1.5	3.56	5.10	4.45
Leitrim	3.93	1.2	3.65	5.04	4.58
Mayo	2.70	1.3	2.49	3.43	3.11
Offaly	3.81	1.4	3.25	4.92	4.09
Kildare	3.48	1.5	2.88	4.46	3.80
Longford	3.26	1.2	2.80	4.20	3.57
Westmeath	2.80	1.1	n/a	n/a	n/a
Roscommon	2.50	1.0	n/a	n/a	n/a

Relationship of individual species to overall species diversity

The relationship between the presence of certain individual native species and the overall species diversity of the hedge was examined. The ‘*overall average*’ is the average species diversity (all species) of all the hedges recorded. The ‘*mean species number*’ is the average species diversity of those hedges where the listed species recorded a Domin value in one or other of the two 30m strips for that hedge. The results are shown in Table 7.2.5.

Table 7.2.5 Relationship between species occurrence and species diversity (all species) in County Mayo

Hedges Containing	Mean Species Number
<i>Overall average</i>	2.70
Holly	4.08
Alder	3.73
Sycamore	3.66
Hazel	3.62
Rowan	3.56
Ash	3.41
Willow	3.35
Blackthorn	3.11
Elder	3.08
Gorse	2.95
Hawthorn	2.83

These figures would suggest that, of the native species, the presence of Holly, Alder, Hazel or Rowan is a good potential indicator of species diversity in a hedge. Relating these findings with those from other studies would suggest that Hazel is the best indicator of species rich hedges.

It would be expected that individual species would be more likely to occur in species rich hedges than the norm. Figure 7.2.5 shows the relationship between the occurrence of each of the major species in species rich hedges and their overall occurrence rate in county.

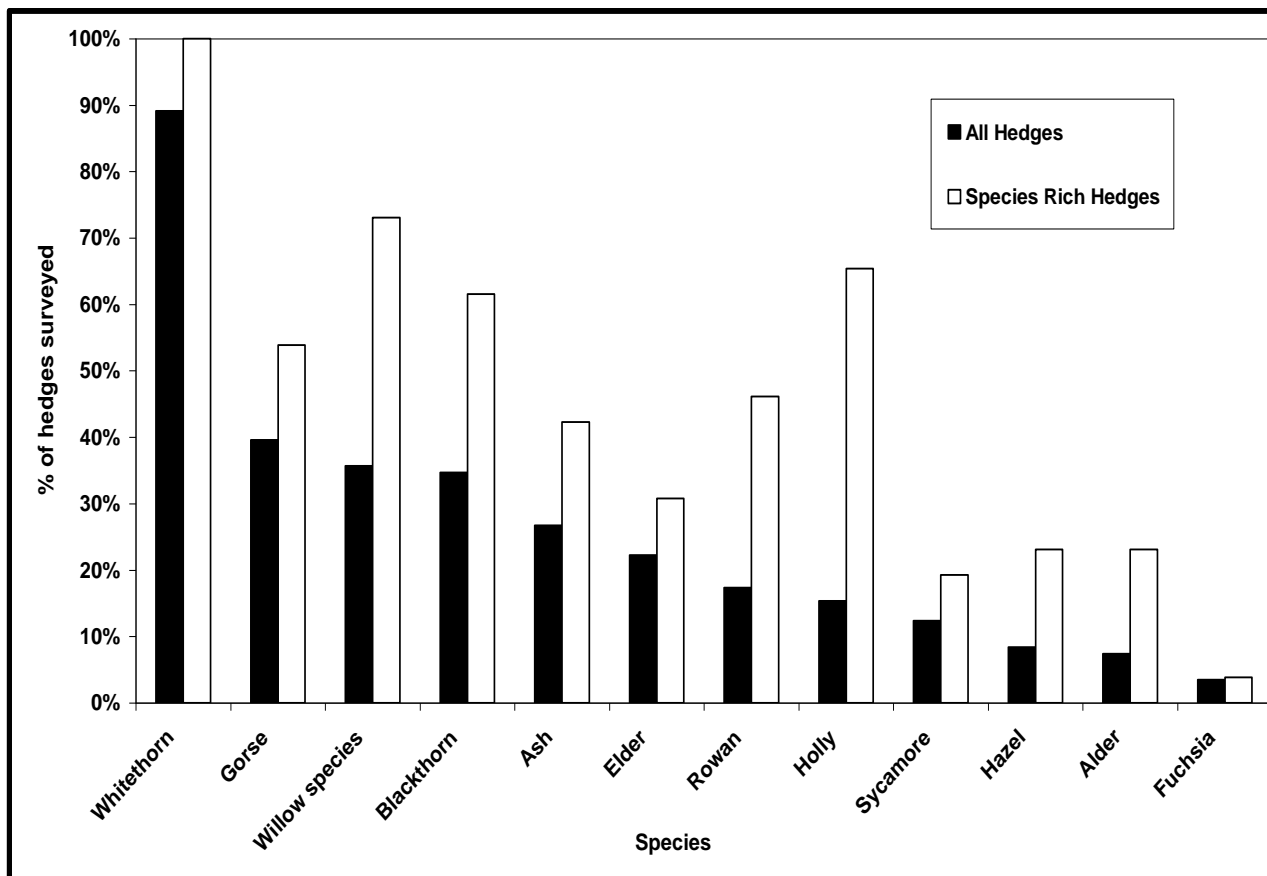


Figure 7.2.5 Relationship of individual species to overall species diversity

Willow, Rowan, Hazel, Holly, and Alder all occur substantially more frequently in species rich hedges than non-species rich hedges. In County Mayo Holly, in particular, is interesting. While it occurs in 15% of all hedges, it is found in 65% of the species rich hedges.

Townland Boundary and Roadside hedges

Just 4.5% of all of the randomly chosen hedges surveyed in County Mayo were townland boundary hedges. 21% of hedges sampled were adjacent to public roads. Table 7.2.6 shows a comparison of the species diversity of townland boundary hedges and roadside hedges with average species diversity figures.

Table 7.2.6 Comparison of average species diversity figures for townland boundary and roadside hedges

	Average Species Diversity (All species)	Average Species Diversity (Native species)
All hedges	2.70	2.49
Townland boundary hedges	2.61	2.56

Roadside hedges	2.92	2.61
Non townland boundary and roadside hedges	2.65	2.45



Townland boundary hedge (MO25 – Knockmore)



Roadside hedge (MO19 – Bunnyconnellan)

In terms of native species composition both townland boundary hedges and roadside hedges are marginally more diverse than hedges that do not fall in to either of these categories.

Species Distribution

Figure 7.2.6 shows the distribution of the main hedgerow species in the County by means of identifying each sample square where the particular species was recorded in at least one sample 30m strip.

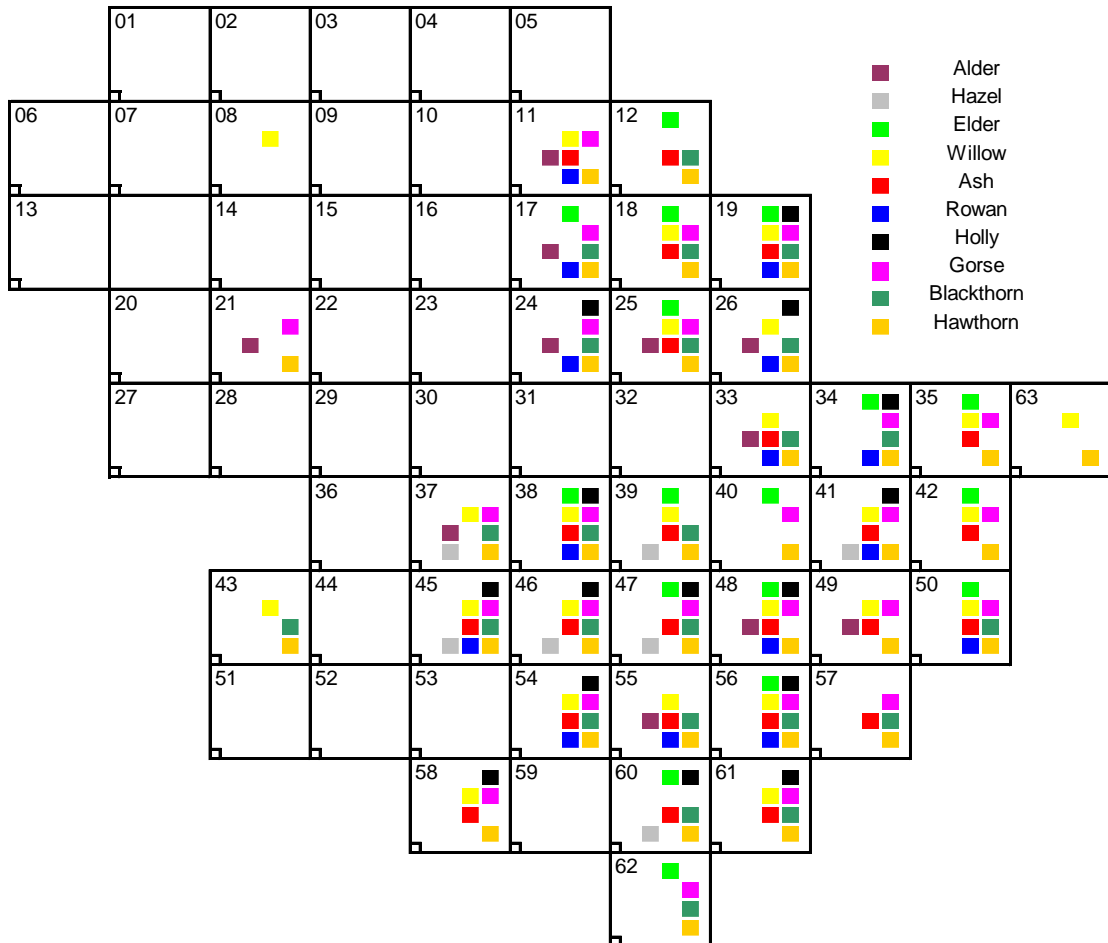
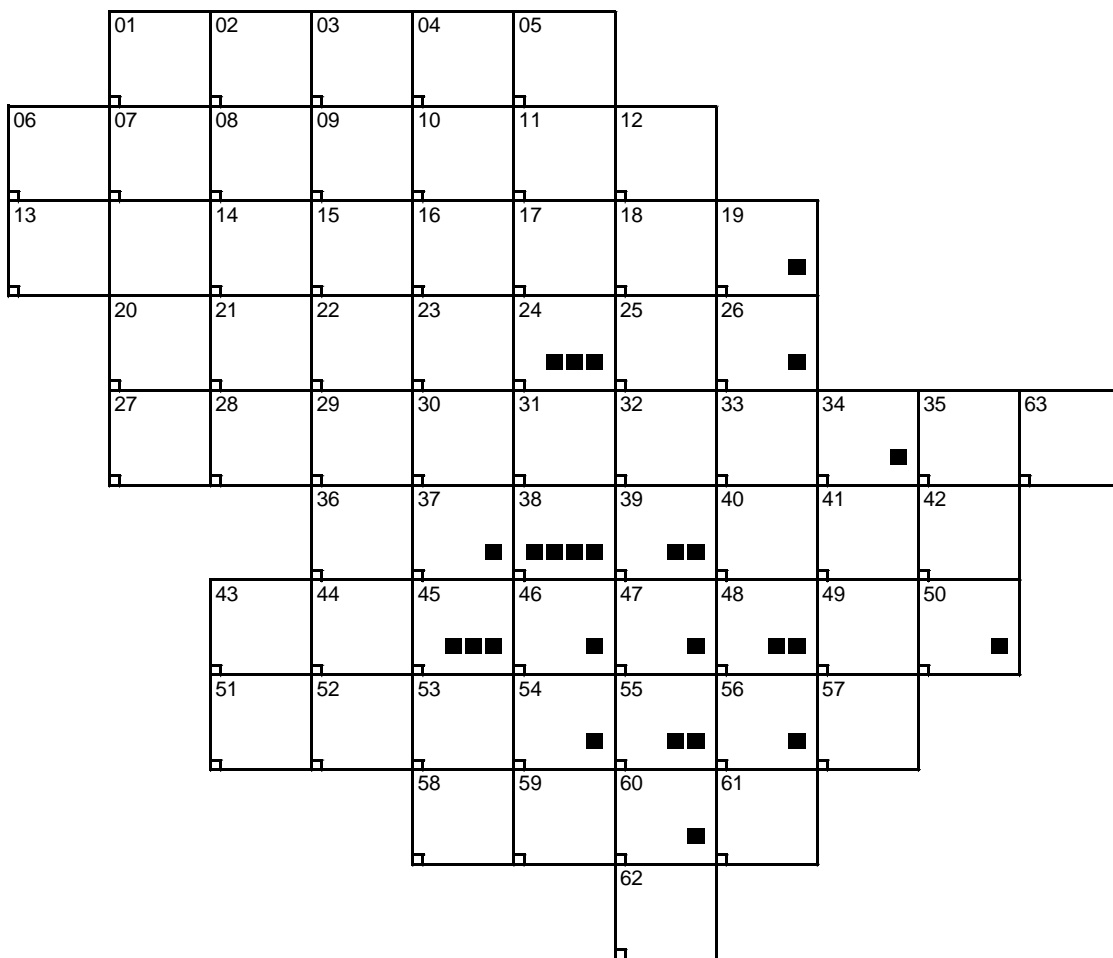


Figure 7.2.6 Distribution of main hedgerow species in sample squares

These results may reflect the individual conditions in the sample squares but certain trends do seem to emerge. Hawthorn, Gorse and Willow are widespread. Blackthorn, though fairly widespread was less concentrated in the eastern squares. Both alder and rowan were absent from the extreme southern squares. Ash was absent from the west and its incidence was much more concentrated in the southern half of the county. Elder was also absent from the west, but was less frequently found in the southern squares compared to the northern half of the sample. The incidence of Holly and Hazel was more concentrated in the centre of the county, with Hazel completely absent from the samples in the northern half of the county. None of the sample squares contained all 10 of the main hedgerow species with squares MO19 (Crocketts Town), MO38 (Castlebar), MO45 (Knappagh), MO48 (Ballynastrangford), and MO56 (Scardaun) all containing eight of the 10 species.

Distribution of species rich hedges

An examination of the distribution of species rich hedges around County Mayo shows that they are mainly concentrated in two blocks. In the area around Castlebar and Westport over 50% of the species rich hedges recorded were found in just seven sample squares. To a lesser extent almost a fifth of species rich hedges were recorded in the area around Ballina and Crossmolina. There were no species rich hedges in the north west of the county and only one species rich hedge (from 30 samples) recorded in the five most southerly squares within the county. These results reflect more the distribution of hedges around the county rather than a geographic bias in the distribution of species rich hedges. This can be seen from Figure 7.2.7 which shows the distribution of species rich hedges around the county.



(One square equals one species rich hedge)

Figure 7.2.7 Distribution of Species Rich Hedges in the sample squares

TREE LAYER

'Hedgerow trees' 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 58% of the recorded hedges in County Mayo. A total of 23 tree species were found in sampled hedges in this survey. 12 of the tree species recorded were native species. The most commonly occurring hedgerow tree in County Mayo is by far the Ash (*Fraxinus excelsior*) which is found in 31% of hedges (53% of hedges that contain trees). Hawthorn (Whitethorn) had reached tree proportions in 22% of hedgerows. No other species was found in more than 10% of hedges sampled although Rowan, found as tree in 7.4% of the sample, is of note. Table 7.2.7 lists the tree species recorded

and their frequency of occurrence. Figure 7.2.8 shows the frequency of occurrence of the main species in the tree layer.

Table 7.2.7 Frequency of tree species occurrence in sampled County Mayo hedges

Latin Name (*denotes non-native species)	Common Name	Frequency of occurrence (%)
<i>Fraxinus excelsior</i>	Ash	30.7%
<i>Crataegus monogyna</i>	Hawthorn	21.8%
<i>Salix spp</i>	Willow species	9.9%
* <i>Acer pseudoplatanus</i>	Sycamore	7.9%
<i>Sorbus aucuparia</i>	Rowan	7.4%
<i>Alnus glutinosa</i>	Alder	5.9%
<i>Ilex aquifolium</i>	Holly	2.5%
<i>Betula spp.</i>	Birch species	2.5%
* <i>Picea sitchensis</i>	Sitka Spruce	2.5%
* <i>Fagus sylvatica</i>	Beech	1.5%
<i>Ulmus spp</i>	Elm	1.5%
<i>Sambucus nigra</i>	Elder	1.0%
<i>Quercus spp</i>	Oak species	1.0%
* <i>Prunus domestica</i>	Wild Plum	1.0%
* <i>Larix spp</i>	Larch	1.0%
* <i>x Cupressocyparis leylandii</i>	Leylandii	1.0%
* <i>Aesculus hippocastanum</i>	Horse Chestnut	0.5%
<i>Malus sylvestris</i>	Crab Apple	0.5%
* <i>Populus nigra</i>	Black Poplar	0.5%
<i>Prunus Avium</i>	Wild Cherry	0.5%
<i>Populus tremula</i>	Aspen	0.5%
* <i>Pinus contorta</i>	Lodge Pole Pine	0.5%
* <i>Thuja plicata</i>	Red Cedar	0.5%



Fine Rowan tree in Tourmakeady hedge (MO54)

Tree Species Diversity

52% of the hedges where trees were recorded had just one tree species. A further 31% contained two tree species, 10% had three species, 5% had four species and 2% had five or more species.

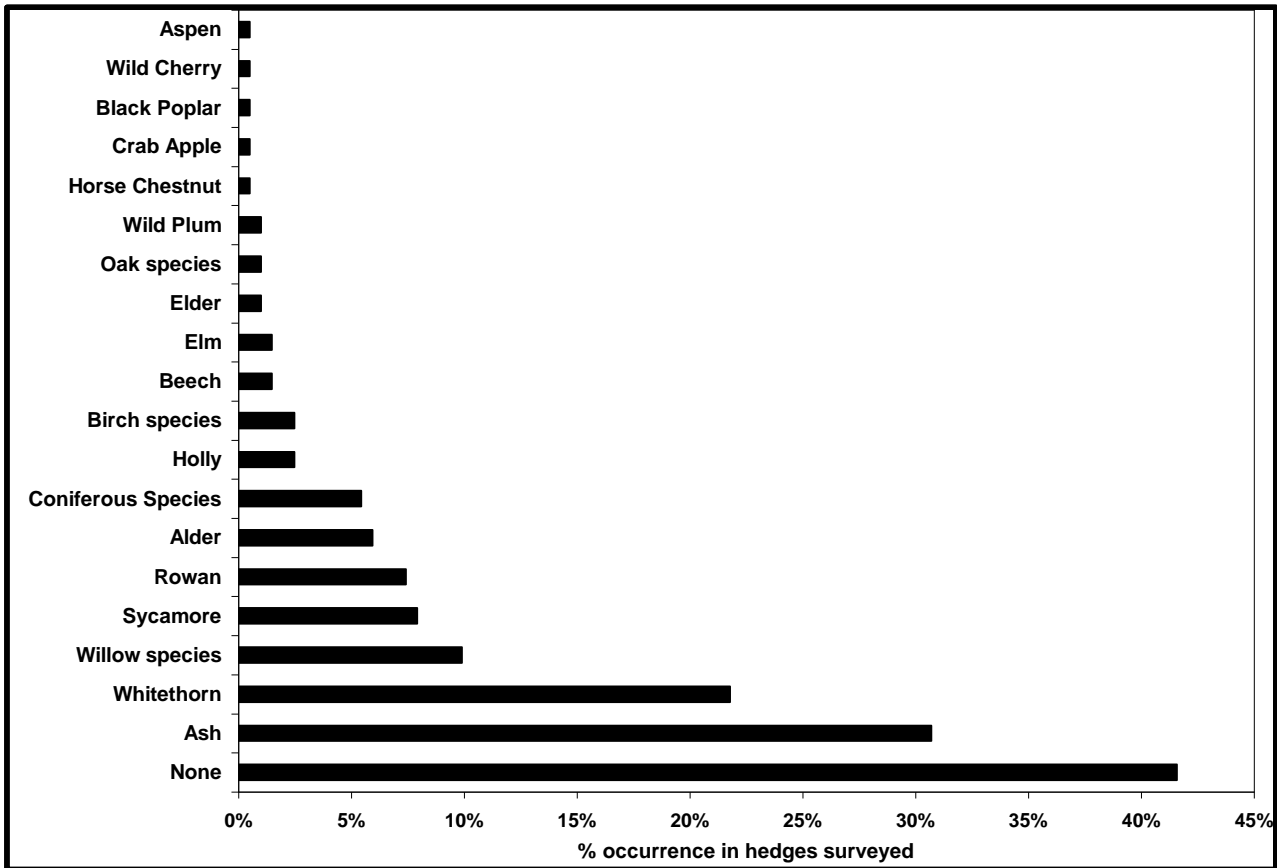


Figure 7.2.8 Frequency of main tree species occurrence in sampled hedges in County Mayo

LANDSCAPE CHARACTER AREAS

Appendix X of the County Mayo County Development Plan 2003-2009 gives a Landscape Appraisal of the County which divides the county into ‘Landscape Character Areas’. Sampled hedgerows were related to the Landscape Character Areas in which they occurred. Figure 7.2.9 shows a breakdown of how the samples were distributed within the different landscape classifications, including the distribution of species rich hedges.



Clew Bay Glacial Drumlins (foreground)

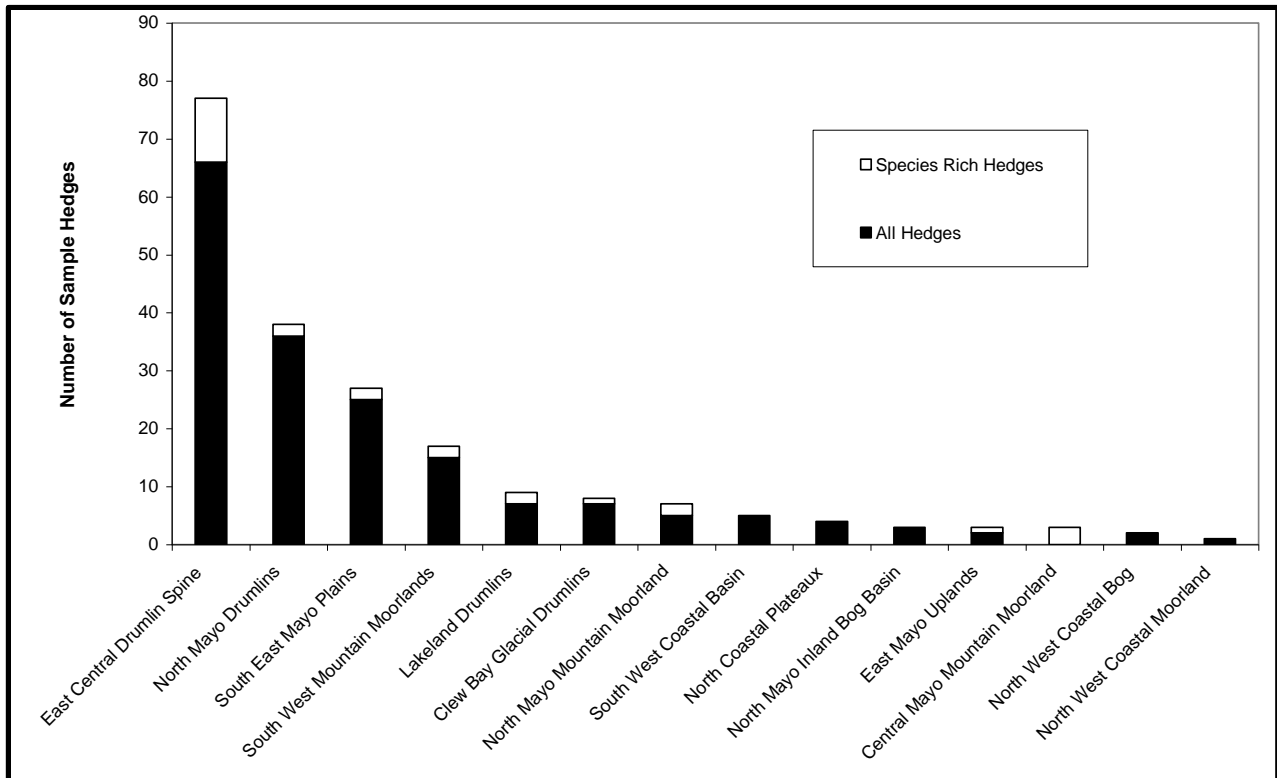


Figure 7.2.9 Sample hedges related to landscape character areas

The majority of hedges recorded fall within one or other of the “Drumlin” landscape classifications.

IVY

The specifications for the REP Scheme permit the control of ivy (*Hedera helix*) 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 the statement that ‘*Wherever possible ivy should be retained and allowed to develop*’ (Specifications for REPS Planners, 2004).

Figure 7.2.10 shows the Domin level of ivy at canopy level in the sampled hedges.



Ivy dominating the canopy of Kilmaine hedge (MO61)

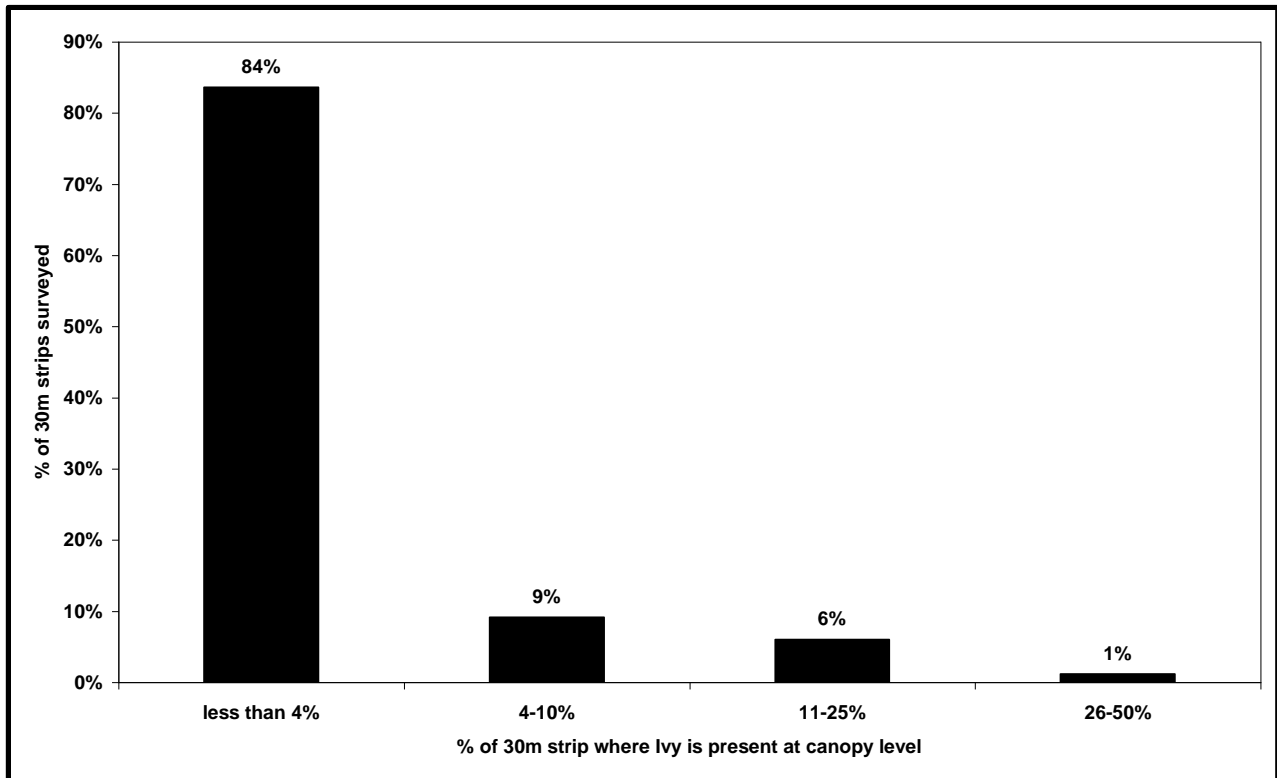


Figure 7.2.10 Percentage breakdown of domination of ivy at canopy level

Levels of ivy at less than 10% would be unlikely to be a threat to the long term viability of the hedge. There is more cause for alarm when the level of canopy cover exceeds 25%. This is the case in just 1% of the hedges surveyed. This is lower than the levels witnessed in all other counties previously surveyed. In particular it is significantly below the 20% figure recorded in County Westmeath. 6% of hedges sampled in County Mayo are in the 11-25% coverage category where a watching brief is advised.

7.3 GENERAL ECOLOGICAL, HISTORICAL, AND AGRICULTURAL CONTEXT OF HEDGEROWS IN COUNTY MAYO.

The biodiversity value of individual hedges is related to the general ecology of the area in which they occur and how they interconnect with other natural and semi-natural landscape features. In order to examine the overall ecological context of County Mayo's hedgerow resource a record is made of both the type of land adjacent to the sampled hedges and any link the hedge makes with other habitat types. The classifications are based on Fossitt (2000).

Adjacent Land Use

Figure 7.3.1 shows the breakdown of the adjacent land use of the sampled hedgerows. County Mayo's hedgerows show strong links with other natural and semi-natural habitats. Although half the hedgerows border improved grassland in almost a half of these samples the grassland was noted as reverting to a more semi-natural type. In the majority of cases the *Semi-natural grassland* type is *Wet Grassland* (GS4). Links with *Scrub / transitional woodland* are fairly low as a result of the fact that in most situations where a hedge-like feature is adjoining an area of scrub the whole area would be classed as scrub. It is only in situations where the hedge is a clear and distinct linear feature that the *Scrub / transitional woodland* category would be recorded. Similar comments apply to *Semi-natural woodland*.

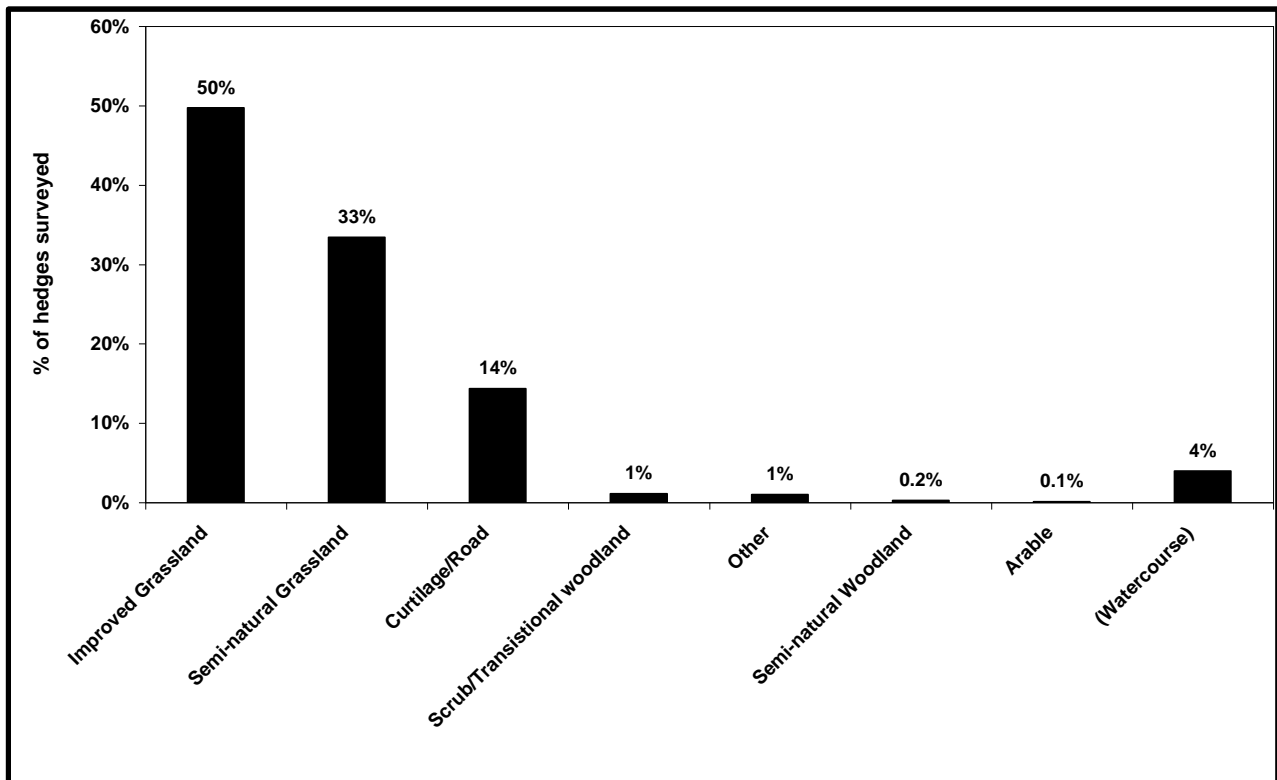


Figure 7.3.1 Habitat category of land adjacent to sampled hedgerows.



Contrasting adjacent land use in Breaghwy square (MO39)

Links with Other Habitats

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 7.3.2 shows the breakdown of how the sampled hedges connected with other hedgerows and other habitat types. Two thirds of hedgerows sampled had at least one link with another hedgerow and 63% of the samples linked with another natural or semi-natural habitat type. Hedges that have no link at one or more end can be attributed in a number of cases to roadside hedges ending at road junctions. County Mayo has a higher proportion of roadside hedges recorded than other counties previously surveyed.

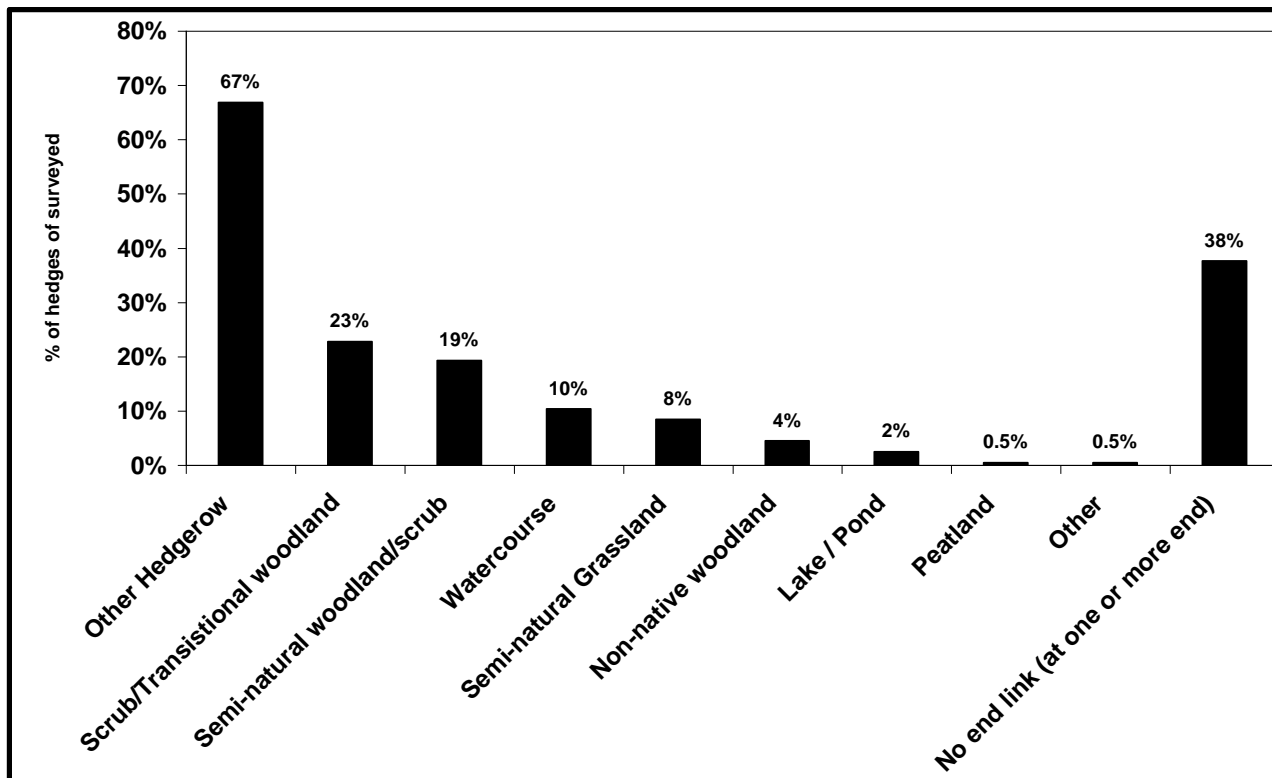


Figure 7.3.2 Links of sampled hedgerows with natural or semi-natural habitats in County Mayo

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 dating from 1837-39 and 1913-17 respectively. It cannot be known for certain if the boundaries marked on these maps were hedgerows, but the absence of any boundary marking would clearly indicate the absence of a hedgerow at that period. 63% of the sample hedges were not present on the first edition maps from 1837-39. The second edition O.S. maps (1913-17) show that less than 4% of the sample hedges were, without doubt, not present.

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 County Mayo they accounted for just 4% of the sample; the range from other county hedgerow surveys is from 10% to 14%. 'Infill' hedges are all those that don't fall into any of the other categories (railway side, canal side). Roadside hedges are at the forefront of the public's perception of hedgerows. In County Mayo 21% of hedges surveyed were road side; this is above the average figure for all surveys. In sample squares with significant proportion of scrub roadside hedges are more likely to be sampled by virtue of the necessity for management which

restricts their dimensions, particularly in regard to width, allowing them to be classed as hedgerows and not scrub. Overall, roadside hedges form a significant proportion of the whole resource. Consistent with other county surveys streams are more likely to be associated with townland boundary hedges than non-townland boundary hedges. Figure 7.3.3 compares the historical origins of sampled hedgerows.

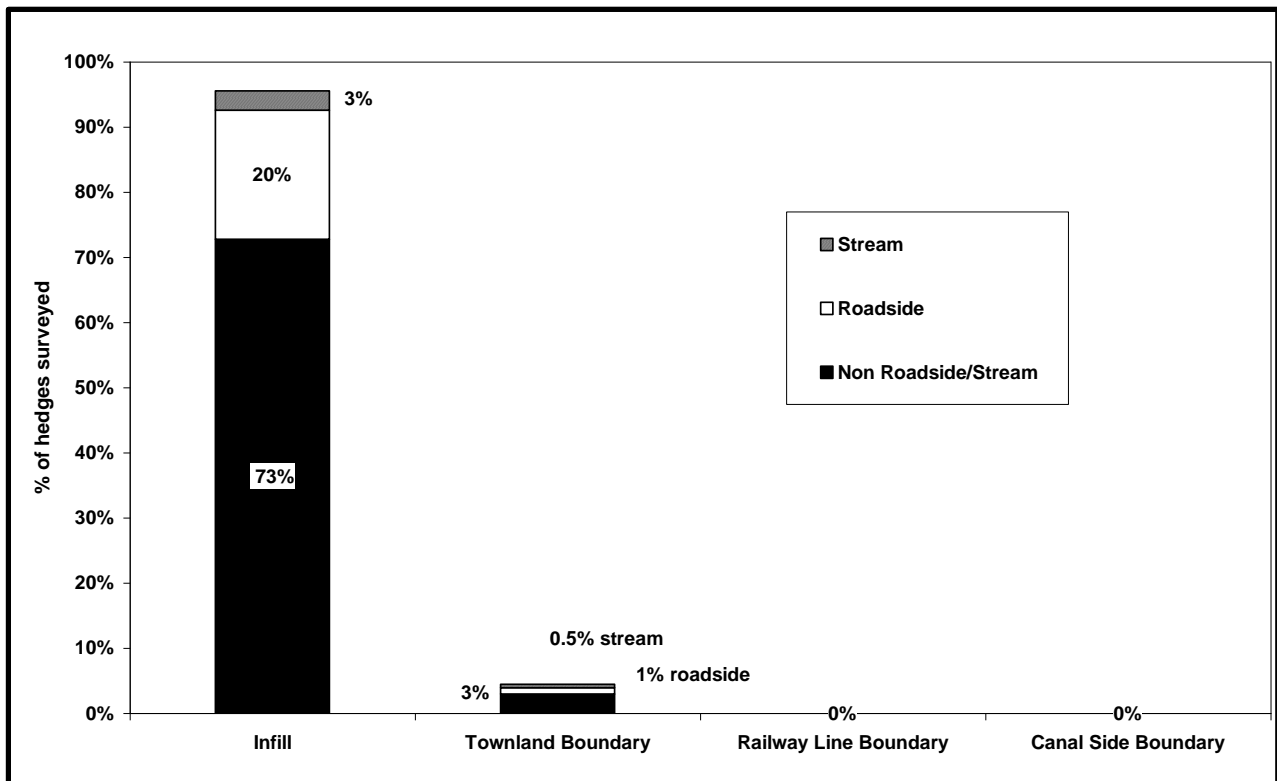


Figure 7.3.3 Historical context of sampled hedgerows

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.

89% of hedgerows in County Mayo are considered still to be part of active divisions or subdivisions of farms, with 11% adjudged to be redundant.



Redundant boundary Glentavraun (MO42)

7.4 CONSTRUCTION OF HEDGES IN COUNTY MAYO

'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 Mayo 85% of the hedges surveyed were considered to be linear and regular in outline. Of the 15% having a more irregular outline 39% were associated with a road or farm track and a further 23% were part of townland boundaries or bordered streams. From a small sample 33% of townland boundaries were non-linear which is significantly lower than in County Longford where the figure was 75%. This is partially accounted for by the fact that more townland boundaries in County Longford follow the course of streams or rivers than in County Mayo.

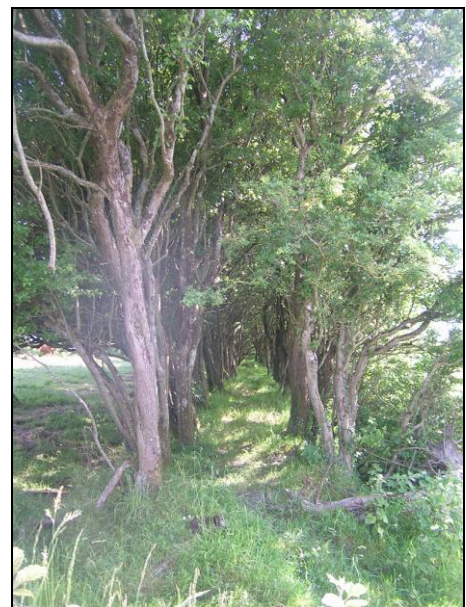


Non-linear hedge in Ballygarries square (MO56)

A single or double line of shrubs is generally an indicator of a planted origin for hedgerows. In total 43% of the sample fell in to these two categories with a greater proportion (57%) being of a random line construction which would suggest a non-planted or more "spontaneous" origin.



Single Row hedge – Kilkelly (MO41)



Double Row hedge – Glentavraun (MO42)

A notable feature of County Mayo is the low percentage of hedges which have an associated drain. Less than a third of hedges sampled have either an internal or external drain which compares with County Leitrim where 87% of hedges have drains.

Figure 7.4.1 shows a breakdown of the construction type of the County Mayo hedges surveyed. The dominant form of hedgerow construction is a random line of shrubs with an associated hedgebank.

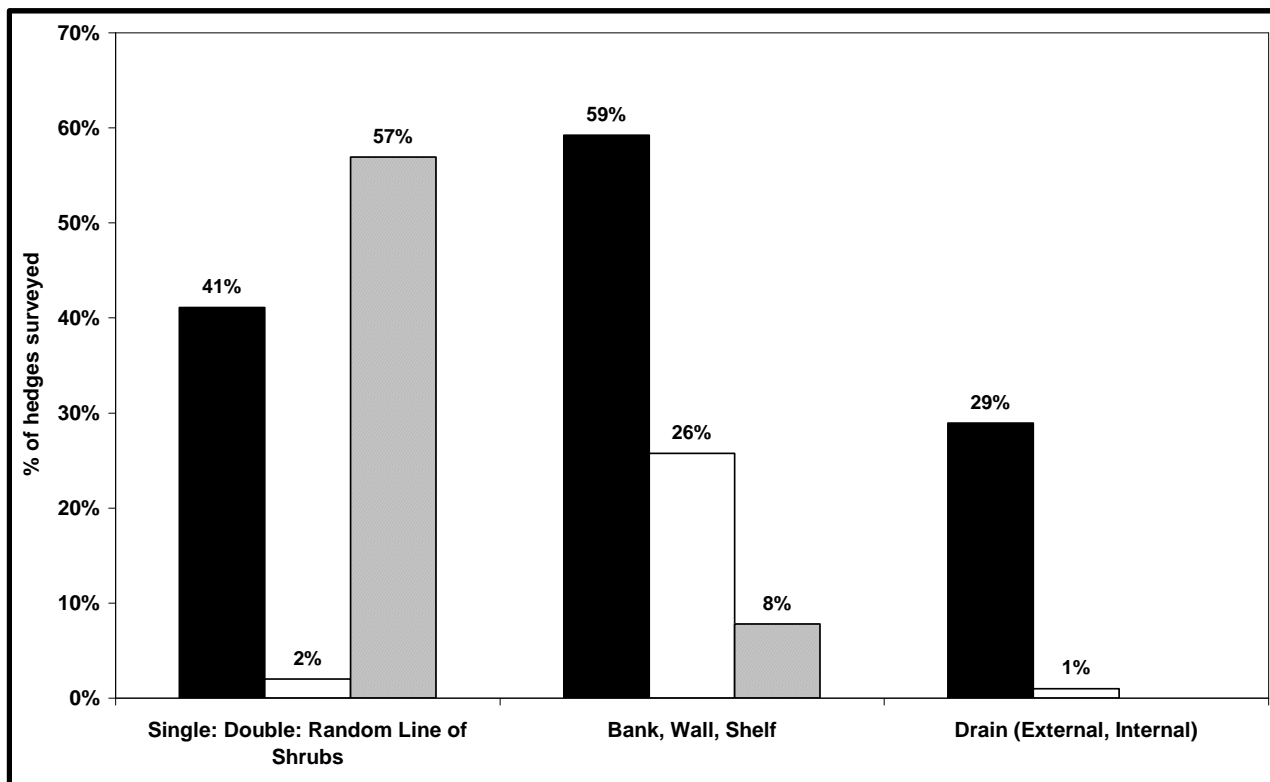


Figure 7.4.1 Boundary construction of samples hedgerows

Figure 7.4.2 shows how the sampled hedges fared in the various size categories for banks, walls or shelves. Over 93% of hedges have some form of bank, wall or shelf as part of their construction. In 44% of hedges the bank / wall or shelf is of the largest size category of greater than 1m in height. This would be consistent with a non-planted origin, the bank or wall being constructed as a boundary but then becoming colonised with shrubs over time.



Hedge with stone wall – Tourmakeady (MO54)

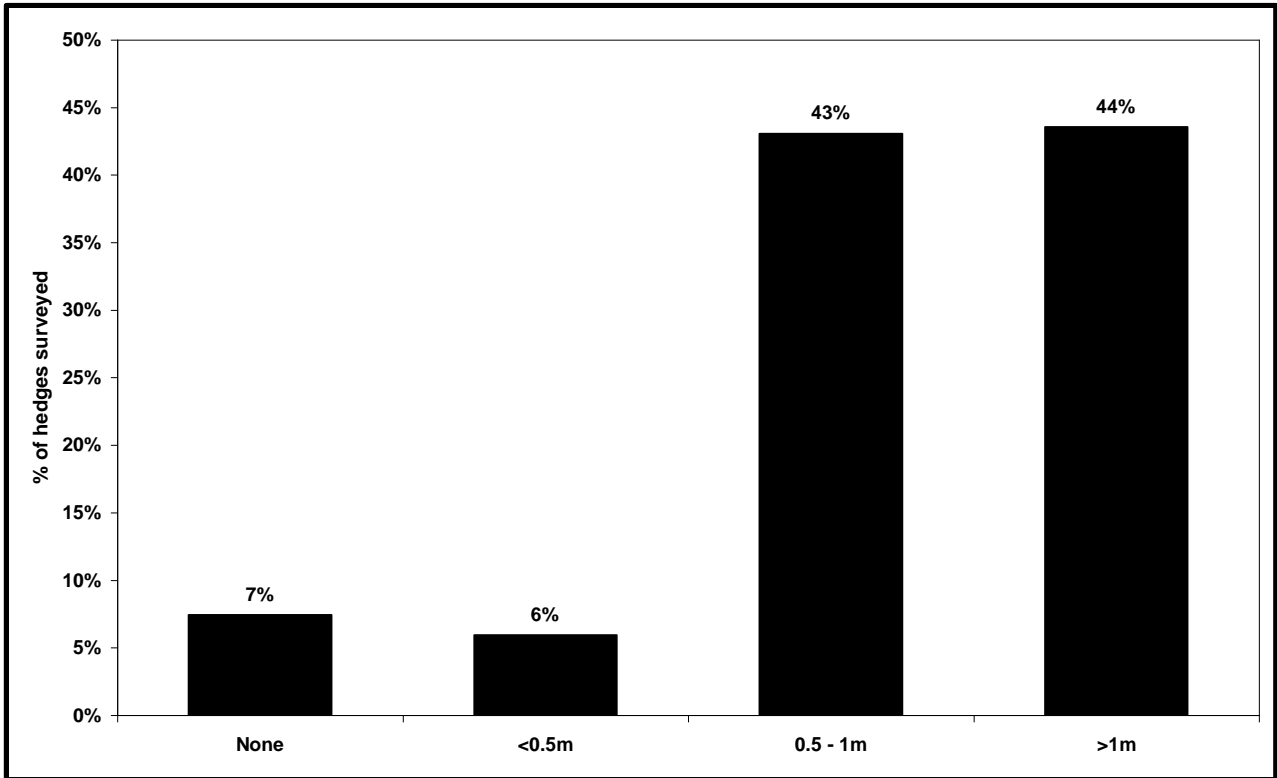


Figure 7.4.2 Proportion of hedges in bank/wall/shelf size categories

Hedgerows often have an associated function of being part of the drainage scheme of land. This is particularly the case in areas of higher rainfall or poor soil porosity



Large drain adjacent to Ballina hedgerow (MO18)

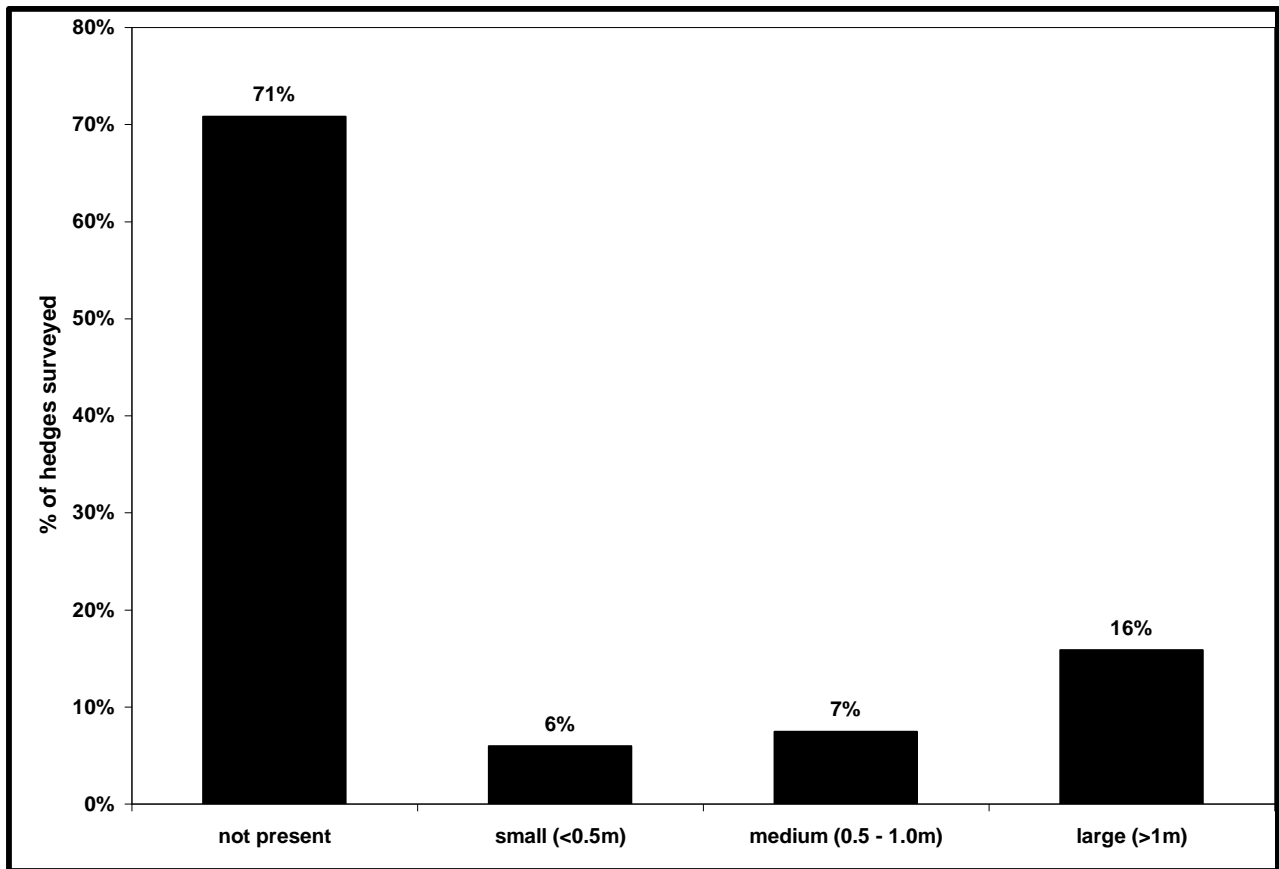


Figure 7.4.3 Proportion of hedges in drain size categories

7.5 STRUCTURE AND CONDITION OF HEDGES IN COUNTY MAYO

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 erosion, tree age composition, and overall vigour. These factors can be indicators of the long-term viability or sustainability of the hedge.

Hedge Height

Figure 7.5.1 shows a breakdown of the sample in terms of the hedge height categories.

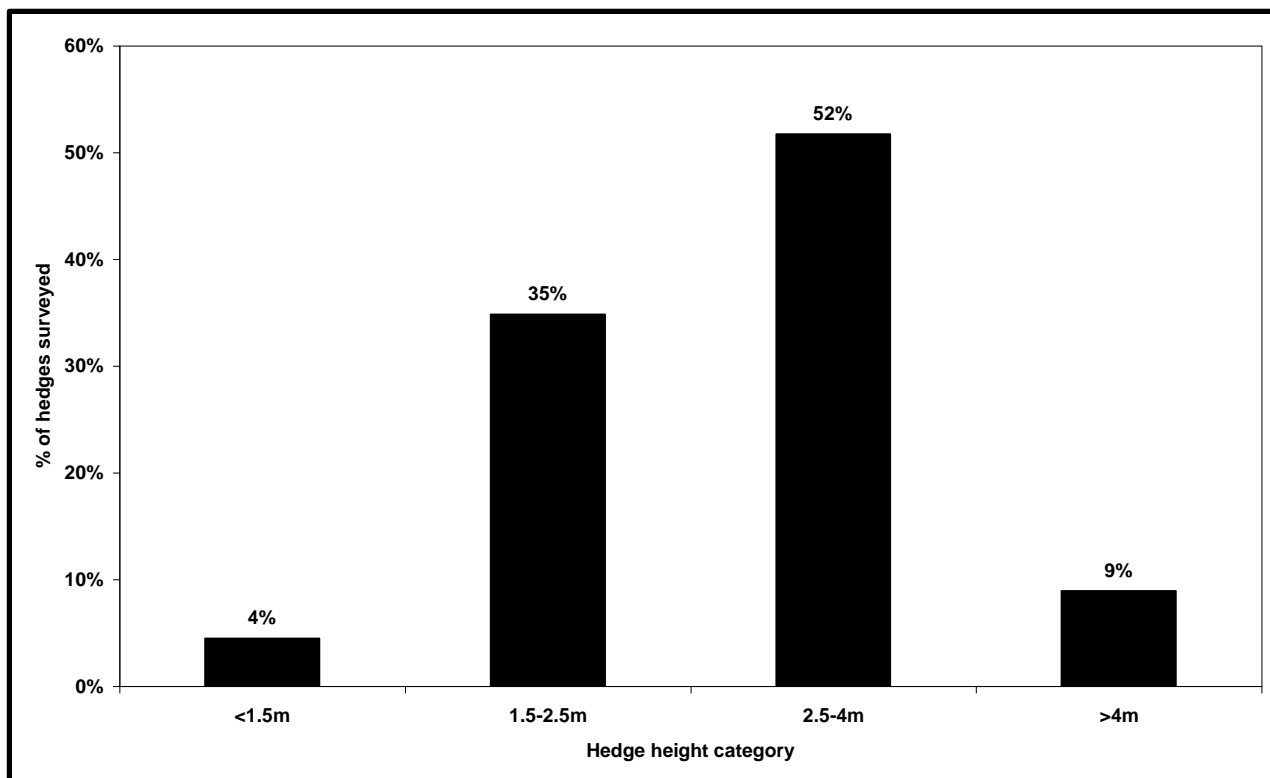


Figure 7.5.1 Proportion of hedges in hedge height categories

Research indicates that taller hedges are generally better from a wildlife perspective. Just 4% of hedges in County Mayo were recorded in the lowest height category (<1.5m) with the majority of hedges having an average height between 2.5m and 4m. Only 9% of hedges were recorded in the tallest category but this is likely to be related to shallow soils restricting the growth potential of hedgerow shrubs.

Hedge Width

Increasing width generally correlates with improved biodiversity in hedgerows. As can be seen from Figure 7.5.2, the results of the survey show that over 80% of hedges surveyed in County Mayo are over 2m wide, with just 1% being less than 1m in width.

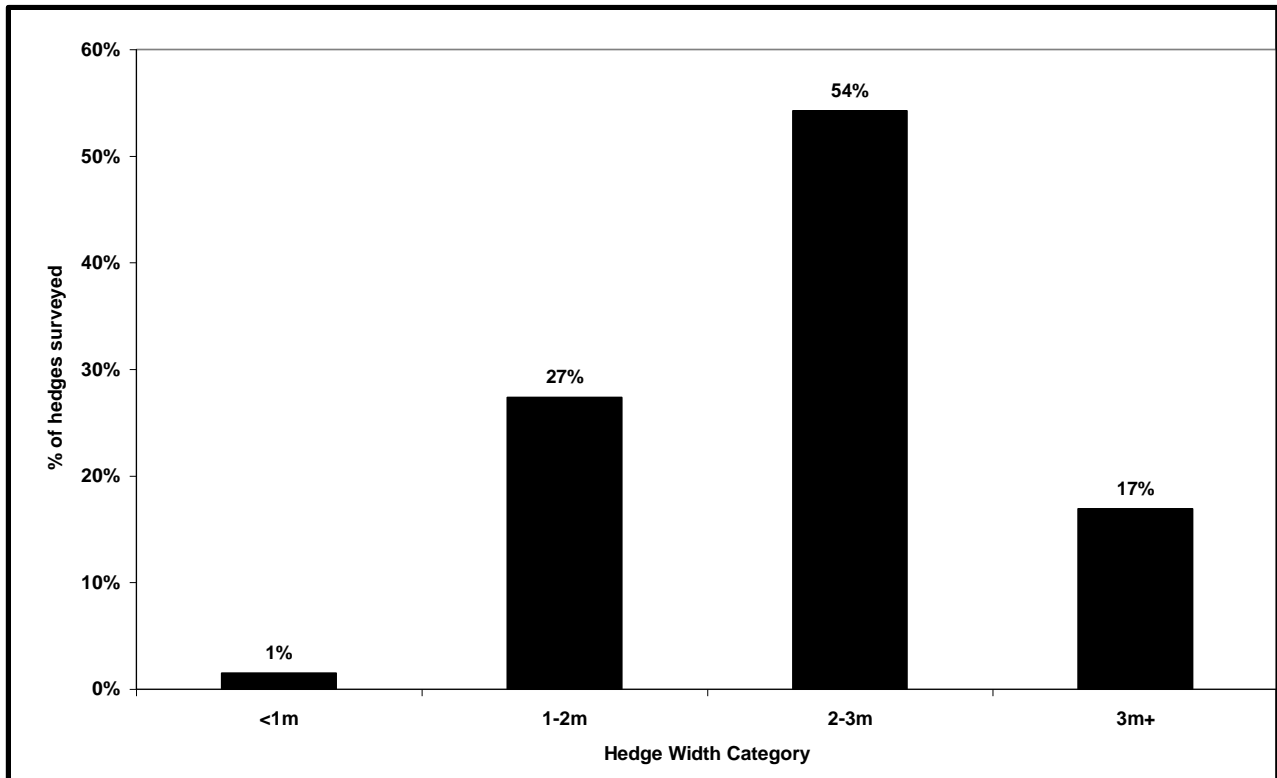


Figure 7.5.2 Proportion of hedges in hedge width categories



Attymas (MO26) hedgerow over 3m in width

Percentage of Gaps

'Gappiness' is an assessment of the percentage of the 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 gaps, other have a low stocking density of shrubs and trees that result in a lateral weakness in the structure. Figure 7.5.3 shows the breakdown of the sample in terms of percentage gaps over the length of the hedge.

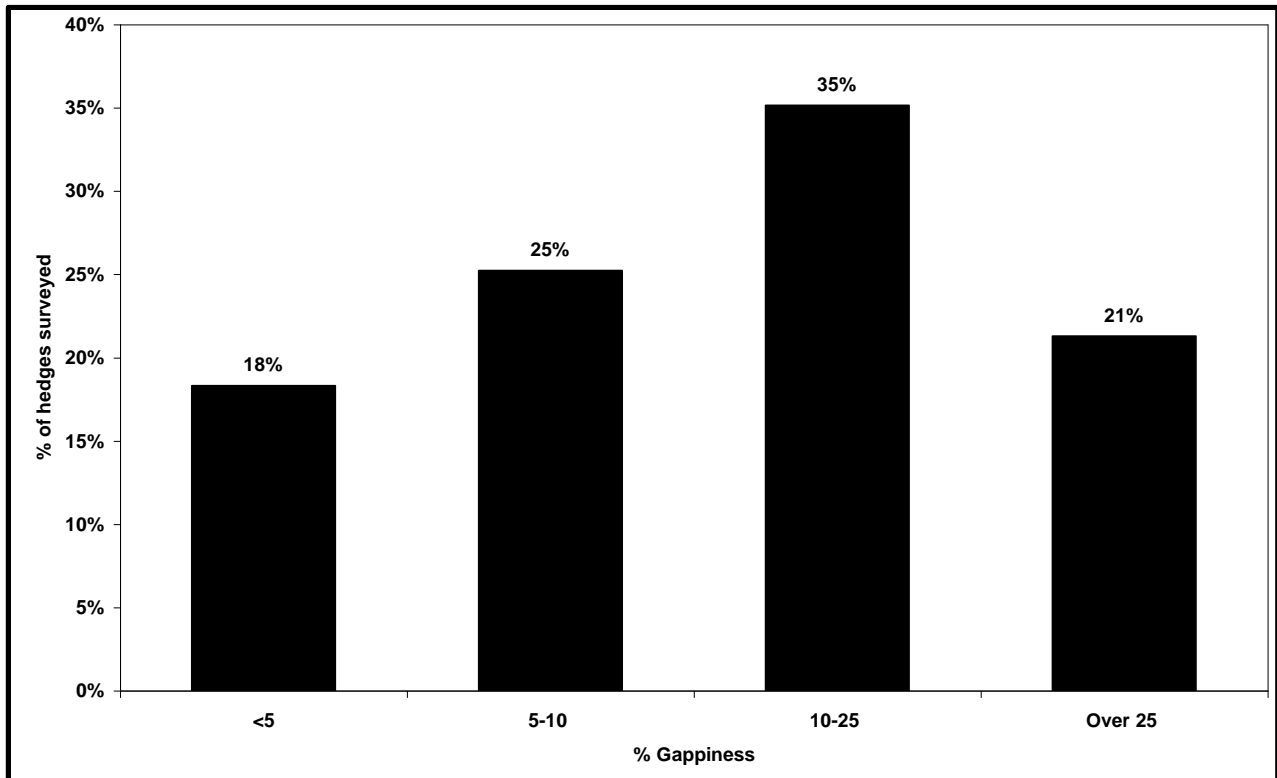


Figure 7.5.3 Proportion of hedges in ‘percentage gaps’ categories

County Mayo recorded a greater proportion (56%) of hedges with gaps of 10% or greater than any of the counties previously recorded. Over a fifth of hedges had gaps totalling 25% or more. In fact 4% of the sampled hedges had gaps greater than 50% pushing them close to not being classed as hedges at all. In absolute terms there is clearly potential for reducing the level of gappiness in County Mayo’s hedges, however the figures may be misleading. Given the random construction of a significant proportion of the sampled hedges a case could be made for stating that many of the samples are more *incompletely colonised banks and walls* that they are *gappy hedges*. 18% of the sampled hedges had less than 5% gaps.

Basal Density

Recording how dense the growth of 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 hedges ability to support wildlife. Figure 7.5.4 shows the breakdown of how the samples fared in terms of the hedge base categories.

In respect of basal density results from County Mayo there is an even split between hedges with a dense base and those with a weaker base structure generally termed *scrawny*. These results are comparable with those from other counties previously surveyed with the exception of Counties Roscommon and Westmeath which both recorded higher percentages (both at 26%) of hedges in the *open* category at the expense of the *dense* category.

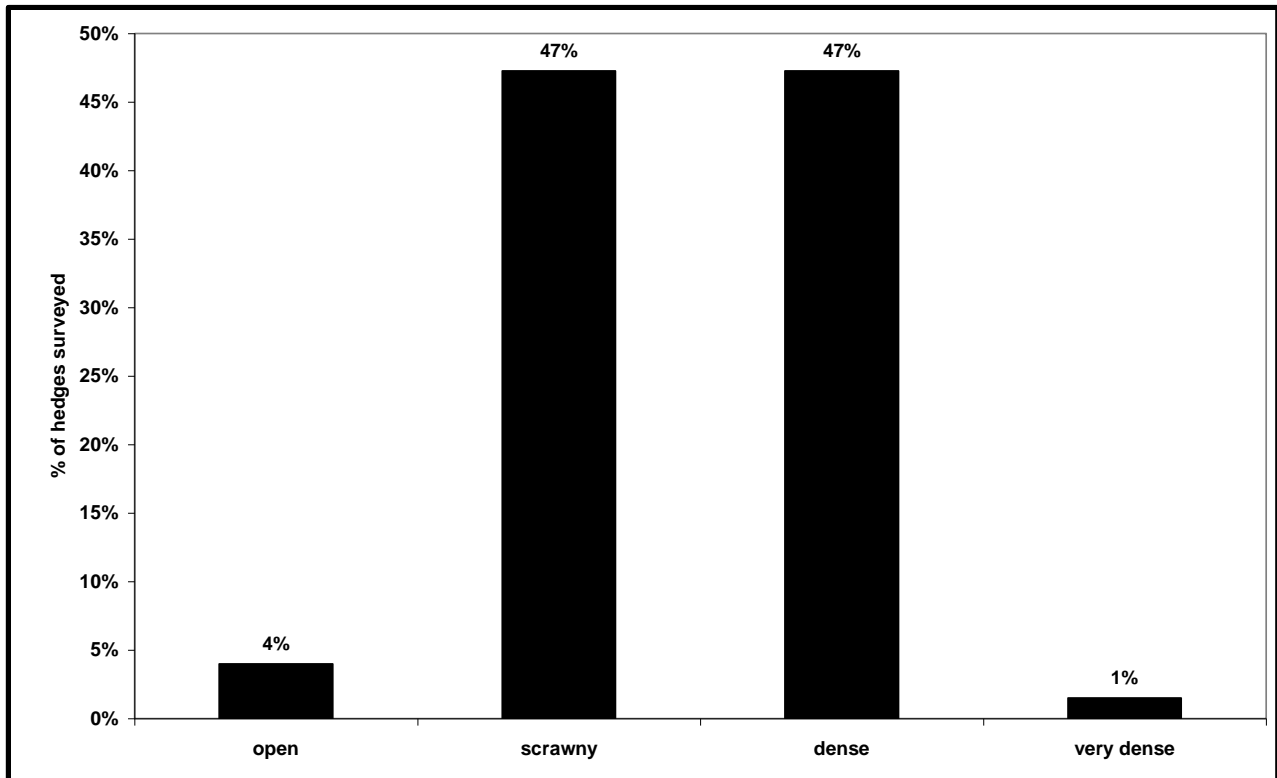


Figure 7.5.4 Proportion of hedges in basal density categories

Hedge Profile (cross section)

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 hedges 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 7.5.5.



Overgrown Killavally (MO46) hedge

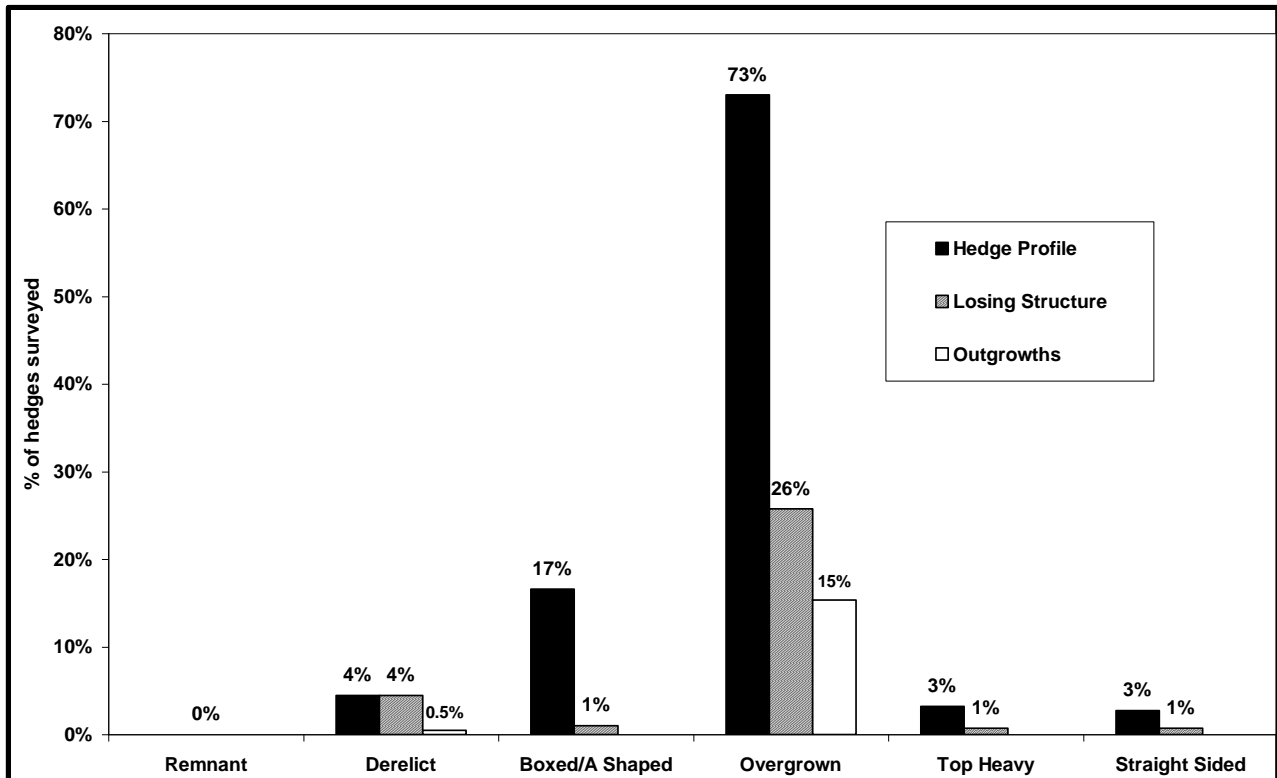


Figure 7.5.5 Proportion of hedges in profile categories

The majority of hedges in the County Mayo sample have the *overgrown* profile indicative of lack of management in the recent past. Over a third of these *overgrown* hedges were considered to be losing their base structure (26% of the total sample) and reverting to tree form which can be considered a sign of deteriorating quality. 17% of sampled hedges in County Mayo had the *boxed / A-shaped* profile indicative of recent management. This proportion is consistent with results from the north midland and western counties previously surveyed, but below the figures for the south midland and eastern counties of Kildare, Laois and Offaly. At just 4% the proportion of derelict and remnant hedges is relatively low in County Mayo.

Hedgerow Trees

This survey looked at both the abundance of trees in hedges (Figure 7.5.6) and also the age composition of the trees.

Hedgerow trees are generally the result of self sown plants within the hedge. As these saplings grow either leaving them uncut during management operations or the absence of management entirely allows them to develop into trees.

Hedgerow trees can be the result of intent where young 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. Colonising species such as ash and sycamore become established in hedges and grow unchecked by management activities. County Mayo has the highest proportion of hedges (41%) containing no hedgerow trees. This is significantly higher than the 11% recorded in County Leitrim, but closer to the 36% in County Laois where the proportion of managed and unmanaged hedges is similar.

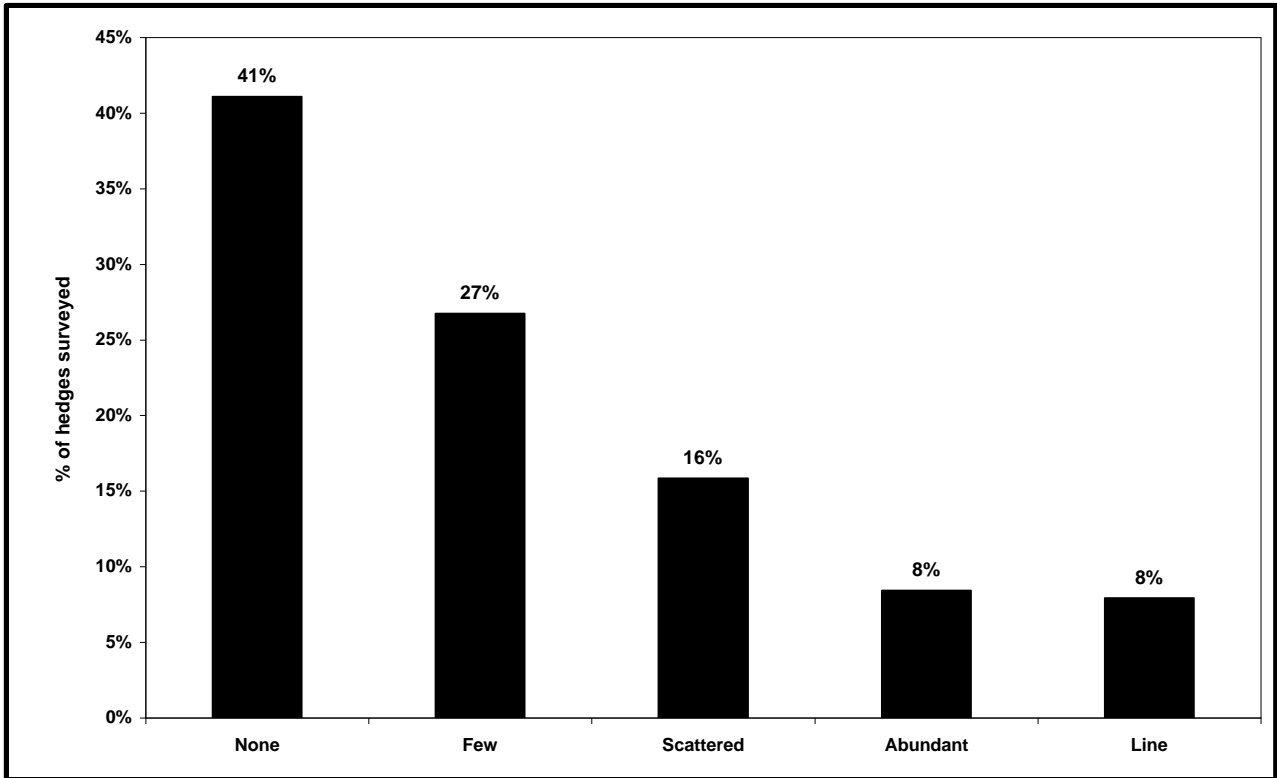


Figure 7.5.6 Proportion of hedges in abundance level of hedgerow trees categories



Line of trees – Ballina (MO18)

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. 60% of the County Mayo hedges which had hedgerow trees recorded young trees as being present.

Bank/Wall 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 is also compromised. Sampled hedges were examined for damage to the supporting structure and the results are shown in Figure 7.5.8.

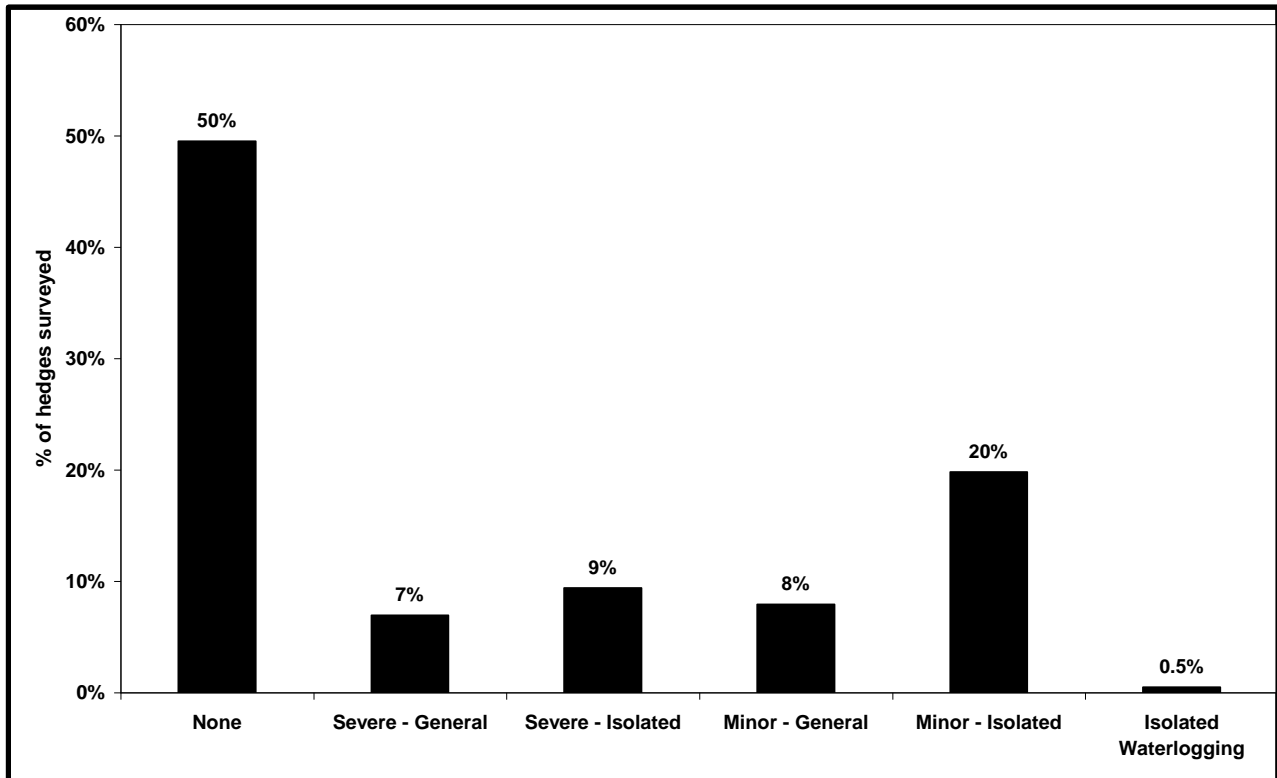


Figure 7.5.7 Proportion of hedges having degraded banks or walls

Degradation of hedge banks has been a common feature in all of the county hedgerow surveys conducted to date. 45% of hedges sampled during the County Mayo survey exhibited some degree of damage to the supporting infrastructure of bank, wall or drain. In 16% of hedges this damage was considered to be serious in nature.

Vigour

With a view to long term viability an assessment was made of the overall vigour of the sampled hedges. Only 8% of the sample was deemed to be lacking vigour which is below the average figure recorded in any of the county hedgerow surveys, and significantly below the 31% recorded in County Roscommon.

7.6 MANAGEMENT OF HEDGES IN COUNTY MAYO

The management of hedges affects the hedge structure, condition and sustainability which in turn impacts on functional, biodiversity and aesthetic values. For these reasons an in-depth assessment of hedge management forms an important part of this survey. The implications of management variables recorded are presented in section 8.0.

Figure 7.6.1 gives a breakdown of the hedgerows sampled by their type of management.

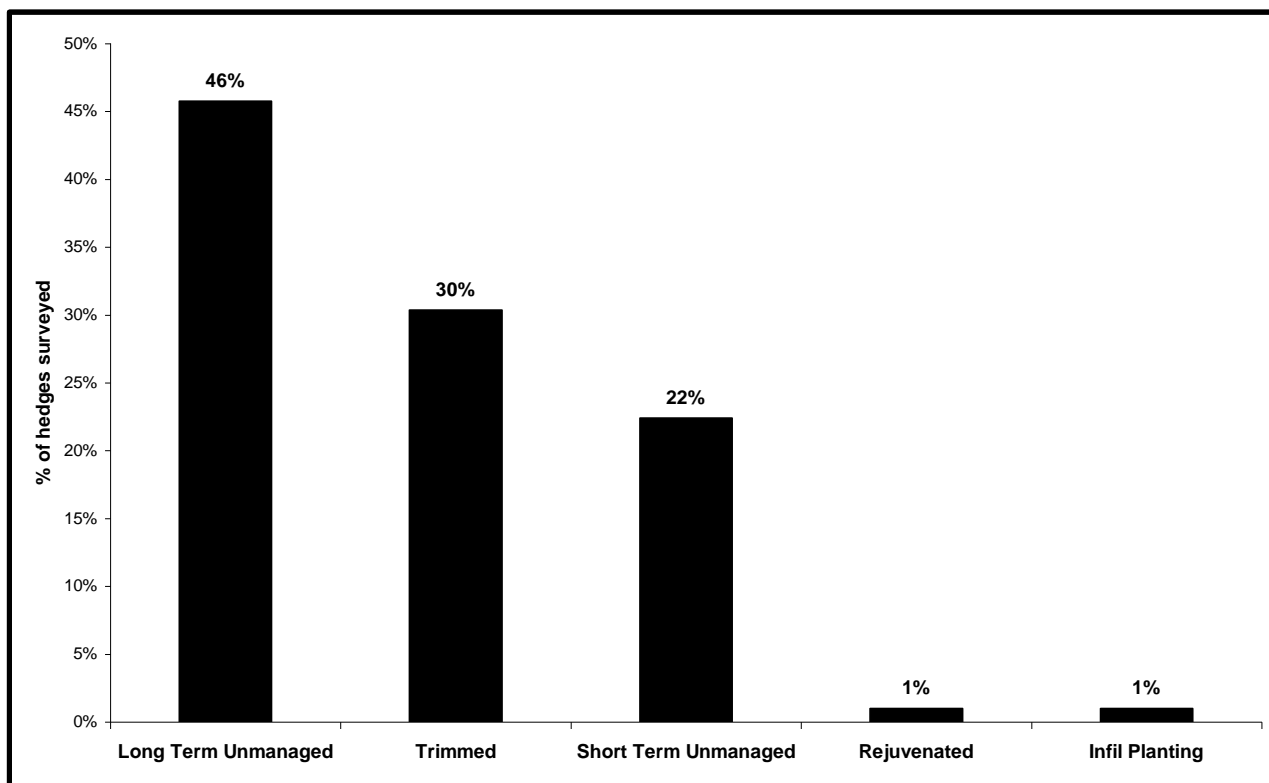


Figure 7.6.1 Breakdown of the management type of the sample

Almost half of the hedges recorded during the survey showed no evidence of management in the recent past (five years). Many of these have probably not received any attention for a much longer period, if at all. Nearly a third of hedges had been managed within the last 12 months. There was some evidence of the rejuvenation and infill planting promoted by the REPS, but levels were low (1% each).



**Long term unmanaged hedge
Hollymount (MO56)**



**Managed hedge
Ballindine (MO58)**

The method by which hedges were managed was also investigated. Where hedges have been managed in the short-term past, but not during the current season, detecting the precise means by which the management was carried out can be difficult to establish, Figure 7.6.2 shows the breakdown.

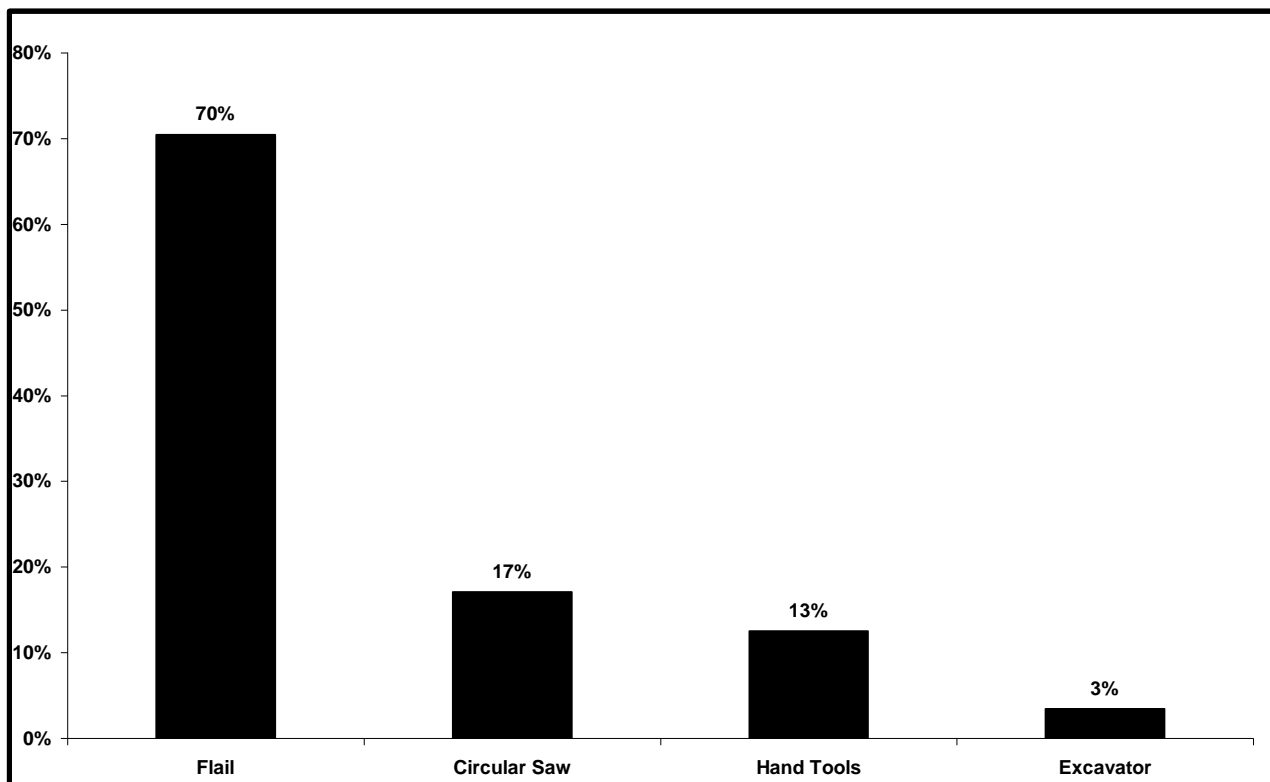


Figure 7.6.2 Proportion of managed hedges in management method categories.

The flail is the management tool responsible for 70% of the managed hedges recorded during this survey. This is the average figure for flail use in the previous surveys conducted by the author. 13% of sample hedges showed evidence of being managed with hand tools. This is equivalent to the figure recorded in County Longford and well above that found in other counties where the average is 5%.

The principal original function of hedges was to act as stock-proof barriers. The current survey looked at to what extent the hedgerow network is being reinforced with additional fencing to maintain its stock retaining capacity. The results are shown in Figure 7.6.3.

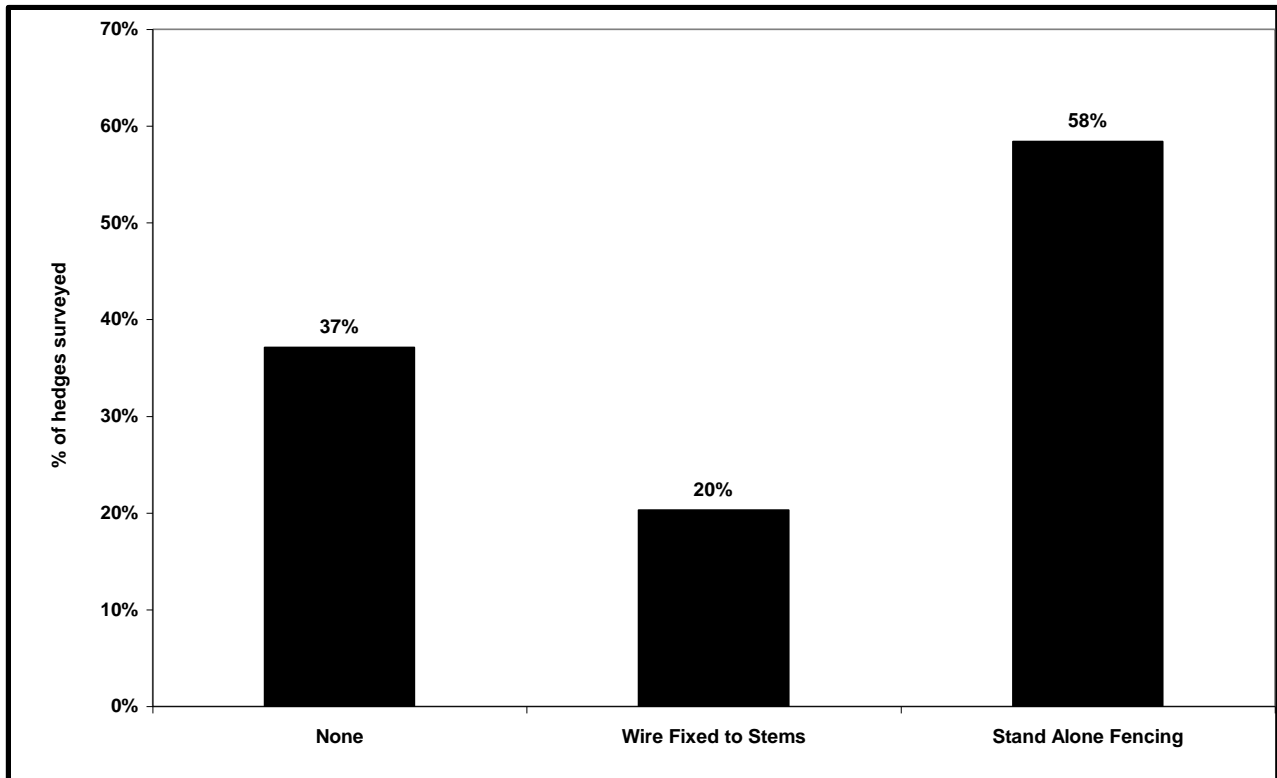


Figure 7.6.3 Additional fencing of hedgerows

Most hedges (63%) in County Mayo are reinforced with some other type of fencing, with 16% of hedges having more than one layer of additional fencing. Levels of wire being fixed to hedgerow stems, at 20%, whilst being higher than desirable, are below those in other counties with the exception of County Roscommon.

Hedge laying is not a widespread traditional management technique in County Mayo with no evidence of it in 95% of hedgerows. Anecdotal evidence from talking to landowners would indicate that there was a tradition of laying in certain areas where the technique was known as “stretching”. Two thirds of the samples recorded were in the north of the county between Knockmore village and Crossmolina. 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. Counties Westmeath and Offaly have both recorded figures of over 25% in this category. The tradition of laying hedges tends to reduce further west, with counties Roscommon, Longford and Leitrim at 12%, 6%, and 1% respectively.

Despite the promotion of hedge laying as a means of rejuvenating hedgerows in the REPS, only two recent examples of hedge laying were recorded during the survey (1% of all hedges recorded).

7.7 QUALITY OF HEDGES IN COUNTY MAYO

Condition of Species Rich Hedges

The Steering Group for the UK Biodiversity Action Plan (UK Biodiversity Action Plan Website) have produced a list of nine criteria as to what constitutes ‘favourable condition’ for species rich hedges. Of these only five were sufficiently consistent with data recorded in the County Mayo Hedgerow Survey to allow comparison. These were

1. Average height at least 2m
2. Average width at least 1.50m
3. Less than 10% gaps, with no individual gap wider than 5m
4. Base of woody component closer than 50cm to the ground
5. Less than 10% introduced non native species.

There are no defined criteria for what is considered to be a species rich hedge or what is considered to be favourable condition for Irish hedgerows. In the absence of such criteria I have based my assessment on the British measures (see Recommendation 6.5).

All sample hedges were assessed against the above criteria.

22% of hedges sampled in County Mayo passed all of the above standards for favourable condition which compares favourably with results from other counties.

Of the sampled hedges in County Mayo, 12.9% were classed as species rich and of these 42% passed the above criteria for favourable condition which is 5.4% of the total hedges sampled. All of the available comparative figures from the other County surveys are shown in Table 7.8.1.

Table 7.7.1 Comparison of the ‘favourable condition’ status of hedges County by County

County	% of hedges in favourable condition	% of Species Rich Hedges	% of species rich hedges in favourable condition	% of total sample that are species rich hedges in favourable condition
Cavan	n/a	40.7	39	15.7
East Galway	n/a	14.7	13	n/a
Kildare	23.0	18.8	41.0	7.7
Leitrim	25.0	46.9	40.0	18.8
Mayo	22.3	12.9	42.3	5.4
Longford	6.4	15.4	16.7	2.6
Laois	20.0	44.7	32.4	14.5
Offaly	4.8	31.5	24.4	7.7
Roscommon	n/a	4.8	55.6	2.6
Westmeath	n/a	4.6	14.3	0.7

Figure 7.7.1 shows a breakdown of how the sample compared against each of the favourable condition criteria.

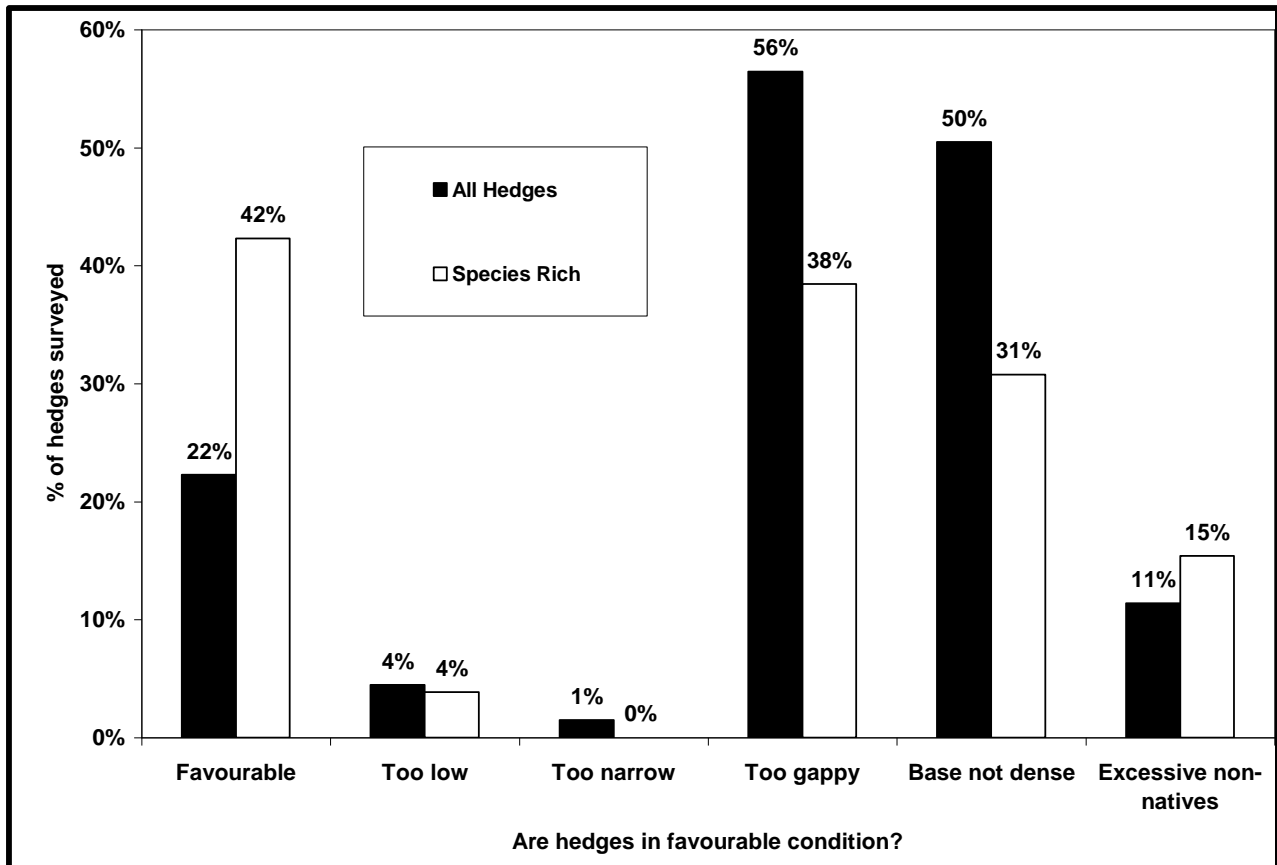


Figure 7.7.1 Favourable condition status of hedges

An examination of how the hedges fared in each of the favourable condition criteria categories reflects a similar pattern to that found in other counties. Lack of height and width are an issue in a relatively small number of hedges and are relatively easy to rectify by modifying management techniques, but of much more significance are the level of gaps and the base structure of the hedge. Excessive gaps and lack of base structure are factors generally associated with lack of management intervention, however in the case of County Mayo the gappiness may be more a result of incomplete colonisation. Whatever the reason these hedges will almost certainly require greater levels of appropriate management involvement to achieve favourable status.

Eleven different non-native species were present to levels considered excessive in terms of favourable condition status. These were, in descending order of prevalence, Sycamore, Fuschia, Beech, Leylandii, Wild Plum, Spruce spp., Wild Privet, Rhododendron, Black Poplar, Dwarf Box and Laburnum. Wild Privet is considered native to certain parts of Ireland, but, according to Webb (1977), not County Mayo. Beech and Sycamore are other species that impact on the statistics in this category. The former is frequently planted particularly near to dwellings, whereas the latter is a ready natural coloniser of hedgerows.

7.8 OTHER OBSERVATIONS

A number of observations were made during the period of fieldwork which could not be recorded as part of the survey methodology but are considered to be worthy of note.

New Hedges

New and young hedges which would not be included on old O.S. maps and which would be too small to register as distinct linear features on aerial photographs could only be recorded if detected during the field survey. There was some encouraging evidence of new planting, including the planting of saplings in to existing hedgerows. One of the sample hedges recorded was a newly planted beech hedge. With the development of the REPS the extent of new hedgerows would be expected to grow over the next number of years.

There were opportunities for planting of sections of new hedgerow where road improvement works had taken place. Chain link fencing, as pictured below in square MO19 (Bunnyconnellan) appears to be the preferred boundary option at present.



Summer Cutting

Accurate assessment of ‘out of season’ cutting cannot form a part of the overall survey methodology because it can take place any time from 1st March to 31st August whereas fieldwork may well be completed, as in this case, earlier in the season. Also, it can be almost impossible to ascertain later in the season whether a hedge was cut in February or a few weeks later.

Six sample hedges (3% of total) were noted as having been cut after 1st March. All of these were adjacent to either a public or farm road. Five of the six examples occurred in just two of the sample squares. Hedgerow survey reports in counties Laois and Longford have flagged out of season cutting as a management issue.

Cutting hedgerows during the growing season is potentially damaging to the health of hedgerow shrubs and to much wildlife dependent on the hedge. It is also contrary to the conditions of REPS agreements. However, some out of season cutting may be necessary in respect of public health and safety as in the case photographed below in the Tourmakeady square (MO54) where the cutting maintained sight lines at a junction.



Coastal Areas

Exposure and salt winds can restrict the potential for many native tree and shrub species to grow in coastal areas. Non-native species, such as New Zealand Flax, that are tolerant of such conditions are frequently planted. Numerous cases were observed travelling around the county of healthy native shrubs and trees growing in hostile conditions. It is quite probable that certain provenances of individual species are much more tolerant of extreme conditions and plants from these provenances should be produced for establishment in relevant areas.



Healthy trees at Killala Bay (MO12)

Ground Flora and Fauna

The survey methodology does not have the scope to make any meaningful recordings of the wild flora and fauna associated with hedgerows. The ground flora of Irish hedgerows is a subject worthy of more detailed study.



Hypericum (St. John's Wort) in Louisburgh (MO43) hedgerow

8.0 ANALYSIS AND DISCUSSION

In this section the results of the survey are analysed in more detail and discussed in absolute and in relative terms.

In 'absolute' terms the hedgerow resource can be assessed in light of current thinking on best conservation practice and data can be compared against a set of agreed criteria for favourable attributes. The 'relative' assessment compares the resource with that from comparative studies in Counties Cavan, East Galway, Kildare, Laois, Leitrim, Longford, Offaly, Roscommon and Westmeath. Ideally all counties should commission County Hedgerow Surveys to allow for wider comparison and an assessment of the resource at a National level.

In the future, a relative assessment could involve a follow up survey to compare the future resource with its current condition.

Hedgerow Extent

County Mayo has a significant network of hedgerows particularly in the east and south of the county, with an estimated total length of 12173km.

Hedgerow Distribution

The landscape of County Mayo varies from the relatively flat terrain in East Mayo, through large lakes, like Lough Conn, Lough Carra and Lough Mask, to the quartzite peaks along the indented Atlantic coast. Extensive tracts of blanket bog in North Mayo contrast with the mountains of South Mayo. The main concentration of hedgerows is to the south and east of the county. Hedgerows are scarcer in the west and largely absent from upland areas and blanket bog. In terms of Landscape Character Classification the distribution of hedgerows is strongly biased towards the drumlin areas with 65% of the sample falling into one of the four *drumlin* classifications.

Over 27% of the land area of County Mayo is designated for nature conservation. The bias of the designated areas (NHA's, SAC's, SPC's) covers upland areas and large parts of the west of the county. Hedgerow distribution and concentration is largely a mirror image of this pattern.

County Mayo has the lowest hedgerow density so far recorded with an average of 2.24 km/km².

Hedgerow Loss

It is anticipated, on the basis of observations made during the current study that there will be a small measure of hedgerow loss as a result of development in the coming decade unless controls are put in place to enforce mitigation measures. There is also likely to be a measure of 'loss' through habitat change (see below) as some hedges spread to become areas of scrub as a result of less intensive agricultural management. The further development of the REP Scheme will create a quantity of new hedgerow stock which will counteract losses in other areas. The extent data recorded during this survey sets a benchmark for future surveys. Repeat surveys in the future will enable quantification of the degree of gain/loss of hedgerows.

Hedgerow 'loss' can be a misleading term. It can reflect, as most people would expect it to, the direct loss or removal of hedgerows for agricultural, development or other purposes. Hedgerow loss figures would also include situations where hedgerows are re-classified as other habitats or features. For example, if a hedgerow deteriorates in quality to such an extent, particularly in respect of an increasing percentage of gaps, it can be re-classified as remnant hedgerow. Also of relevance to the current study is the situation where unmanaged hedgerows comprised of a high percentage of spreading or suckering species develop into small thickets or areas of scrub. Once a hedge line is greater than 4m in width it becomes re-classified as a new habitat type (scrub). Both of the above cases technically would be included in the figures for hedgerow loss. A similar circumstance can occur where areas of afforestation adjacent to hedgerows become sufficiently developed so that there is no distinction in the canopy between the forest and the hedge. The hedge is no longer a linear feature within the definition of the survey and the hedges are technically 'lost', despite not having been removed.

Direct loss through removal for development purposes is likely to be an ongoing reason for a small measure of hedgerow loss during the next number of years. Often, this involves short lengths to facilitate access and sight lines for new one-off houses, or for road improvements. Loss rates are relatively small but habitat fragmentation may become an issue. A report by the Department of Environment: "Urban and Rural Roles" (2001), estimates that 420 km of hedgerow were removed in Ireland to facilitate sight-line requirements to new rural dwellings in 1999 alone. This rate of removal is inconsistent with the recommendation of the National Heritage Plan, which states that "*For the future, the overall goal should be to have no net loss of the hedgerow resource*" (paragraph 2.27).

Direct removal of hedges for agricultural purposes is not likely to be a significant factor due to the measure of protection afforded through REPS (REPS farmers are not permitted to remove hedgerows, and participation rates in REPS are expected to increase), but loss through deterioration in quality and ageing is likely to be a factor on farms if rates of rejuvenation are not increased. It will be an important component of any future survey that the nature of any future hedgerow loss be classified. Loss through change of habitat type may be considered a positive feature from a biodiversity perspective. This would depend on the new habitat type created; semi-natural woodland or scrub generally would be preferable to non-native woodland.

New, one-off, housing developments are potential cause of hedgerow loss and degradation. Care is needed at the Local Authority planning level. There is evidence that hedgerow conservation measures included in planning consents are not being adhered to on the ground (McDonnell, 2005) and that greater enforcement of planning conditions is necessary.

Some research is ongoing in County Roscommon to investigate the practicalities of physically moving mature hedgerows. If this can be carried out in a cost-effective way without diminishing substantially the qualities of the hedgerow then this could become a recommendation within planning consents where existing hedgerows are interfering with new sight-line requirements.

The hedgerow network is largely a feature of land ownership patterns and agricultural practices of the nineteenth century. Changes in farming methods and practices have an influence on the relevance of the network to modern farming. Rationalisation of field sizes particularly in light of modern agricultural methods and machinery size has taken place on many farms particularly during the 1960's and '70's. Extensification can also result in hedgerows becoming redundant for stock control purposes as stock are allowed to range over a wider area rather than grazed in rotation on smaller blocks of land. Results from the hedgerow surveys undertaken indicate that these changes have happened to different degrees in different areas. In the south midland counties of Laois and Offaly just 8% of hedges were considered to be redundant, this figure rises to an average of almost 20% in Counties Leitrim, Longford and Roscommon. County Mayo had just 11% of boundaries recorded as redundant. This was a similar figure to East Galway and it is quite likely that the higher percentage of hedges with stone walls in these two counties results in fewer boundaries being classed as redundant.

Species composition

A total of 40 shrub species, including 21 native species, were found in the hedge layer of this sample of the county's hedges. Hawthorn is the most frequently occurring shrub species found in 89% of sample hedges. It's frequency of occurrence is lower than in other counties where it has been recorded in well over 90% of the samples. Other species that occur less frequently in County Mayo hedges are Blackthorn, Hazel, Spindle and Wild Privet. Gorse is more common in County Mayo and only County Cavan has recorded an equivalent proportion of hedges (40%) containing this species. Rowan (Mountain Ash) occurs more frequently in County Mayo hedges (17%) than in

any of the other Counties previously surveyed. Whitebeam is a relatively rare hedgerow species that was recorded in 2% of the hedges sampled.

The average number of species found in the representative sample of the selected hedges was 2.7 (2.49 for native species only). Species diversity figures for County Mayo are very similar to those recorded in the neighbouring area of East Galway but overall diversity figures are below those in eastern and midland counties – the average species diversity of hedges in County Laois was found to be 4.

12.9% of sampled hedges in County Mayo were classed as being species rich. Over 38% of hedges contained four or more native species in total along the length of the hedge with 73% of hedgerows sampled comprised solely of native species.

In most parts of the country the majority of hedges would have been initially established by planting using just one (usually whitethorn) or possibly two species, however this is not necessarily the case in County Mayo as a significant proportion of hedgerows sampled appeared to have a more spontaneous or unplanned origin. A number of factors contribute to the development of the species composition of hedgerows through colonisation. Soil type and elevation can restrict the suitability for colonisation by certain species, as can the availability of a local source for the seed. Age can also be a factor in the colonisation process. Older hedges have more time to be colonised so are more likely to be more diverse than relatively younger hedges.

There does appear to be a geographic bias to the distribution of species rich hedges around the county with just 8% of sampled hedges above latitude of 53° 58'N being classed as species rich compared with over 15% south of that latitude. The reasons for this distribution pattern are not clear. With the exception of the *Central Mayo Mountain Moorland* classification where all three hedges recorded were species rich there did not appear to be any noticeable trend to the distribution of species rich hedges within the different landscape classifications compared with the general pattern of hedgerow distribution.

Consistent with findings in counties Kildare, Longford, Laois and Offaly, Hazel is much more likely to be found in species rich hedges than non-species rich hedges (23.1% compared to 6.3%). The difference is much less marked with Elder (30.8% and 21%) and Gorse (53.9% and 37.5%). These observations are unsurprising. Elder is a good initial coloniser of whitethorn hedgerows but is often quite short lived so is more likely to be found in relatively recently established hedges. Gorse, as a spreading shrub, tends to be a major component of hedges where it is present. Its dense cover will tend to inhibit other species from seeding into the hedge. It is often found on thinner, poorer soils which have less capacity to support a wide variety of species. Based on this and previous surveys, Hazel is consistently much more likely to be found in species rich than non species rich hedges, and can be considered good identifier species for species richness.

Townland boundary hedges made up just 4.5% of the sample, with hedges adjacent to public roads accounting for 21%. These percentages differ from those in the other county hedgerow surveys where the average for townland boundary hedges is 11% and that for roadside hedges is 15%. The size of townlands is generally governed by the quality and agricultural productivity of the lands; larger townlands are generally comprised of poorer lands. Townlands are generally of larger area in County Mayo than in midland and eastern counties. Therefore they are less likely to be sampled in Counties, like Mayo, with larger townland areas since they form a lower proportion of the total hedgerow network.

In previous hedgerow surveys, specific studies in County Mayo (Condon and Jarvis, 1989), County Kildare (Murray, 2001), and in Northern Ireland (Hegarty and Cooper, 1994) these two classes of hedge have been found to contain higher mean species diversity than non townland boundary or non roadside hedges. This is assumed to be due to townland boundary and roadside hedges being

generally of more ancient origins than non-townland boundary/roadside hedges. In the current study the difference exists but is less marked and there is no mathematical significance in the variation. On the evidence from all of the surveys so far conducted the higher species diversity found for townland boundary and roadside hedges makes them candidates for particular care and attention in their management, and measures should be taken to avoid their degradation and removal wherever possible. There is currently little or no distinction, in terms of planning and development, or REPS between the different types of hedgerow recorded as part of this survey and their relative agricultural, ecological and aesthetic importance. The concept of ‘*Heritage Hedgerow*’ should be considered to raise the status of certain hedgerows that have notable historical, structural, ecological or landscape qualities. Stakeholders will need to agree the criteria for what constitutes a Heritage Hedgerow. Hedgerows meeting these criteria could be noted on REPS plans; be identified in planning applications; be identified when land is re-zoned, etc. This should enable them to be monitored and might eventually enable their appropriate conservation to qualify for incentives for the landowner.

One interesting feature of species diversity observed in County Mayo is that hedges with an associated drain are, in general, more diverse than those without a drain. Species rich hedges accounted for 12.9% of the sample. However 22% of hedges with drains were species rich. This figure rose to 25% if only hedges with drains in the largest size category were considered. Examination of the results from other County Hedgerow Surveys in the light of this observation showed a similar trend in the results though not as dramatic as those from County Mayo. Research conducted in Northern Ireland has revealed similar findings (Moles (1975) and Watson and Orr (1983)).

23 tree species, of which 12 are native species, were found in the hedges of this survey with the majority of hedges (58%) having trees along their length. The most commonly occurring hedgerow tree in County Mayo (in common with all other counties) is Ash (*Fraxinus excelsior*) although its frequency of occurrence (31%) is much lower in County Mayo than in other counties, particularly Longford and Leitrim where it is found in 75% and 67% of hedges respectively.

Species Distribution

There appears to be a pattern to the distribution of some of the most common hedgerow shrub species in County Mayo, in particular incidence of holly and hazel were confined to the central areas of the county. Rowan and alder were absent from the extreme south. These results may reflect the individual conditions in the particular sample squares but the results would suggest that species selection advice for new planting (REPS, mitigation planting, etc.) should be specific rather than general and should reflect local conditions.

Certain non-native species have become naturalised and almost traditional in certain areas. One such species in County Mayo is Fuchsia. Overall it was recorded in 3.5% of the sample, but its distribution was quite localised and it was recorded in 60% of the samples in two squares – MO43 (Louisburgh) and MO54 (Tourmakeady). The biodiversity value of Fuchsia should be evaluated.

The New Atlas of the British and Irish Flora (Preston et al, 2002) documents the distribution of native and non-native species around Britain and Ireland based on their presence within 10km grid squares. A number of recordings made during this survey would indicate that certain species have a wider distribution than is indicated in the Atlas. Detailed results of the survey should be available to the local Botanical Society of Britain and Ireland (BSBI) Recorder to allow updating of datasets.

Ivy, Woody Climbers

Ivy was recorded as present in 56% of the 30m strips recorded in County Mayo. It is a plant that provokes polarised views from different quarters. Its value for wildlife as a food source, and as

nesting or roosting site is unquestionable. However, it is the destructive potential of ivy that provokes controversy. It is generally acknowledged that ivy is not directly parasitic on its host, but the fact that ivy is frequently associated with trees that are in poor condition gives rise to two schools of thought.

One view suggests that ivy can dominate its host and cause it to lose vigour and even eventually kill it. The other view suggests that ivy only dominates trees and shrubs that are already in poor condition and that ivy itself is not destructive. The truth probably lies somewhere between the two. Just 1% of 30m strips recorded had ivy dominant at the canopy level for over 25% of their length, with a further 6% in the 11-25% cover category. In comparison with other Counties so far surveyed ivy is less prevalent and less invasive in County Mayo.

Honeysuckle and particularly the Wild Rose species occur less frequently in County Mayo hedges compared with other counties previously surveyed. Roses were only recorded in 8% of sample strips compared with 85% of samples in County Offaly. Bindweed was recorded in 4.2% of samples in County Mayo. This plant can have a detrimental impact on the growth of hedgerow shrubs and can also be difficult to control due to the persistence of its rhizome root system.

History and Landscape Context

The majority of the current hedgerow landscape in County Mayo was established during the period from the mid 18th century up to the early part of the 20th century, although a portion is likely to be older. Townland boundary hedges tend to be of more ancient origins than non-townland boundary hedges. Older boundaries frequently are non-linear and are often demarcated by natural features such as watercourses.

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.

In County Mayo, the first edition of maps was produced in 1837-39, followed by the second edition in 1913-17.

Where a boundary is present on the second edition Ordnance Survey maps, but is absent from the first edition it is possible roughly to date the origin the hedge to the period 1837 to 1909. 63% of the sample hedges were not present on the first edition maps from 1837-39. The second edition O.S. maps (1913-17) show less than 4% of the sample hedges were not present.

Boundary lines shown on the original edition maps were not necessarily hedgerows. However, some boundaries shown include small tree symbols to indicate the presence of timber trees. This could indicate an avenue or tree line but could also represent a hedgerow containing mature trees. More recently established hedges (that are not present on the second edition O.S. maps), are most likely associated with Land Commission property divisions. These hedges are invariably species poor. The average native species diversity of those hedges not present in 1837 was 2.4 species per hedge compared with an overall average of 2.49 native species per hedge. The second edition O.S. maps in general show the greatest degree of field division, indicating that although land enclosure was well established before the famine, further sub division of lands was ongoing up to the end of the nineteenth century. There is also some evidence of field realignment in the period between the two surveys.



Strip field pattern in Crossmolina (MO17) square

85% of hedges surveyed in County Mayo were linear in outline. This is generally an indication that the boundary was laid out by a surveyor and the hedges are relatively recent in origin. A high proportion (61%) of the non-linear hedges recorded form part of either a townland boundary, a roadside or stream boundary. This would tend to support other findings that non-linear hedges are normally associated with hedges of antiquity (Murray, 2001).

The period of origin of other hedges may be established by other means. Road-side, canal-side and railway-side hedges are likely to have their origins at the period of the development of the particular route. Documentary evidence should enable quite precise dating of certain hedges adjacent to such features, but was beyond the scope of this survey.

Hedgerows exist in the wider framework of the landscape. How hedges interface with the wider environment can have a significant bearing on their relative value in the landscape and their ability to support biodiversity. Where hedgerows sub divide improved grassland or arable land their absolute value for supporting a diverse ecology is reduced, but their relative importance for biodiversity in that area is increased. Extensive farming practices and general land use in much of County Mayo mean that hedgerows form a part of a largely semi-natural landscape resulting in an environment that is generally conducive to the maintenance of biodiversity. In the context of REPS it would be very useful if a full habitat survey of each farm were conducted (in line with Fossitt, (2000)). This should enable greater prioritisation of management actions in order to maintain and enhance biodiversity. Areas where extensive farming is practiced with a large percentage of transitional/ semi-natural grassland and scrub land should be treated as whole ecological units rather than dividing field boundaries and fields.

11% of hedges surveyed were classed as redundant in respect of their agricultural function as field boundaries. This is half of the figure recorded in County Leitrim where field sizes are still relatively small, but it is above the 8% recorded in Counties Laois and Offaly. Just fewer than 9% of redundant hedges were still being actively managed.

Hedge Construction

Hedgerows vary in their construction based upon numerous factors including origin, soil type, topography, farming practice, tradition and legislation. In wetter areas or where soils are poorly drained, a bank would need to be constructed to prevent shrub roots from becoming water-logged. A drain to carry away surplus water would also be common. Where stony soils are frequent, hedge banks often contain quantities of field stone cleared from adjacent farmland when under tillage. Sometimes there is sufficient stone to construct a wall in association with the hedge. Older hedges may follow natural landscape features, such as streams; whereas other hedges were marked out by surveyors and follow straight lines. Certain Acts of Parliament prescribed specifications for hedgerow construction including dimensions for banks and drains, and methods of planting (Feehan 1983). Many landowners included such details as clauses in tenants' leases. Whitethorn was the preferred choice of hedgerow shrub, but crab was also recommended (Hayes 2003).

A single or double line of shrubs is generally an indicator of a planted origin for hedgerows. Almost 60% of sampled hedges in County Mayo were recorded as being composed of a random line of shrubs. This is generally indicative of a spontaneous as opposed to a planted origin for the hedge. Only the study in East Galway has recorded a similar proportion of hedges in this category. The other County Hedgerow Surveys have shown over two thirds (and up to 93% in County Cavan) of hedges as being comprised of a single line of shrubs.

Hedge banks, walls, and drains create niche environments for many wildlife species adding much to the habitat value of a hedge. They also improve the stock retaining capacity of hedges, particularly against sheep, and have a shelter value. In County Mayo over 90% of hedges were associated with a bank, wall or shelf. In the East Galway survey over a third of recorded hedges had an associated stone wall. The figure is lower in County Mayo at 26% but figures from these two areas are much higher than from any of the other counties previously surveyed. The third highest is County Offaly with just 8% of hedges having an associated wall. The results in East Galway and Mayo are further support to the premise of the non-planted origin of a significant proportion of the hedgerow stock in these two areas. The proportion of hedges with associated drains at 30% is relatively low in County Mayo (and similarly so in East Galway). This again ties in with an unplanned origin for hedges as drains are often constructed to improve drainage sufficiently for the satisfactory establishment of hedgerow trees and shrubs. This obviously applies more in areas with higher rainfall and more impervious soils. Although County Mayo has a relatively high annual rainfall many soils, though thin and stony, are quite porous. Construction of drains in such soils would be very difficult given that only hand tools would have been available when the vast majority of hedges were constructed. Given these factors it is not surprising that County Mayo has the lowest proportion of hedges with drains so far recorded in any of the County Hedgerow Surveys.

Hedgerows and their associated banks and drains act as buffers to nutrient loss from agricultural land, but there has been little or no research carried out in Ireland to evaluate to what extent. Given that the EU Nitrates Directive (1991) has been adopted on a national basis in Ireland research is needed to quantify the buffer role of different types of hedgerows in various agricultural situations.

Hedge Structure and Condition

Many studies have found that taller, wider, denser, and structurally more intact hedgerows are also preferred by most wildlife, including small woodland plants (Hegarty and Cooper, 1994, Corbit and Marks, 1999, and Murray 2001); invertebrates (Burel, 1989), and hedgerow birds (Chamberlain et al, 2001, Arnold, 1983, and Lysaght, 1990).

In relative terms, the hedges recorded during the County Mayo survey compare favourably with those from other counties in respect of their average height and width characteristics. 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. Research indicates that

increasing hedgerow height correlates positively with increasing diversity of bird species in a hedge (Arnold, 1983; Lack, 1987). Taller hedges also provide better shelter for farm animals. In terms of farming, landscape and wildlife perspectives the fewer hedges recorded in this category, the better. In this regard County Mayo, at just 4%, has fewer hedges in the smallest height category than any of the other counties previously surveyed. In counties Longford, Laois and Westmeath these excessively low hedges account for between 17% and 21% of the sample. All except two of the sample hedges in this lowest category in County Mayo were adjacent to either public or private roadways. Just 9% of hedges recorded fell in to the largest height class (>4m). The most common hedgerow shrubs will only grow over 4m in height on good quality, deep soils which are infrequent around the county. Two thirds of the hedges recorded in this category were noted as lines of trees and were comprised mainly of tree species – predominantly ash and alder of the native species, or coniferous species.



Contrasting hedges types Ballina (MO18) left, and Lahardaun (MO24)

As with hedge height, it is generally accepted that the wider the hedge, the better it is for wildlife, although agriculturally, allowing hedgerows to occupy too much land is less likely to be acceptable. A reasonable compromise would be not to reduce hedges below one metre in width. 99% of County Mayo hedges surveyed were greater than one metre wide. This is very much in line with findings in other studies. Although County Mayo does have a greater proportion of hedges in the widest category (3m+) than any of the counties previously surveyed. 65% of the hedges in County Mayo in the widest category were recorded as being “*long-term unmanaged*”, and 29% were noted as having “*outgrowths at base*” indicating that they are spreading further. This is consistent with the non-planted origin of many hedges and low levels of management.

It is generally acknowledged that lack of hedge management can lead to a weakening of the hedge base and lead to a gappier structure. Increasing levels of gaps in the hedge structure correlates with lower species diversity (Murray, 2001), as do smaller and lower hedges. Just 18% of the sampled hedges had less than 5% gaps. This is a similar proportion to that found in Counties Roscommon and Westmeath (both 20%), but well below the 41% recorded in County Kildare. Of all of the counties so far surveyed County Mayo has the highest proportion of hedges with gaps of 10% or more, with over half of the hedges recorded being so classified. Given the probable spontaneous origin of many hedges these figures for gappiness can be slightly misleading. Many of these “hedges” are likely to be incompletely colonised walls and banks rather than hedges that have developed gaps. A more detailed analysis of gappiness showed that 54% of hedges with greater than 10% gaps were in the long term unmanaged category whereas only 35% of hedges with gaps of less than 10% were recorded as long term unmanaged. Gaps can be both specific and general. The current survey methodology does not distinguish between the two types. Given the nature of County Mayo hedgerows it would be a useful distinction to make. It is quite probable that some of the “colonised” hedges recorded during the survey are not considered to be hedges by the landowners

concerned and are therefore not considered for management activities including infill planting. The REPS Specifications (Dept of Agriculture, 2004) state that all hedgerows should be identified on the farm plan. However there is no formal definition to guide planners as to what constitutes a hedgerow in the Specifications. Other field boundary types should be recognised and guidelines should be developed for their appropriate management given the objectives of the Scheme. It would also be useful to investigate the comparative biodiversity value of non-hedgerow field boundaries and features (e.g. compare stone wall with stone wall plus brambles and isolated shrubs/trees).



General Gaps Hollymount (MO56) and Specific Gaps Tourmakeady (MO54)

The density of shrub growth in the bottom metre of the hedge is also an important indicator of the hedge structure. Continuous hedges with a good basal structure are more agriculturally valuable as they may not need additional fencing, and good growth from the bottom of the hedge also improves the shelter value. Several studies have shown that density of growth in the hedge base also influences the hedges capacity for supporting wildlife (Arnold, 1983; Osborne, 1984). In relative terms County Mayo hedges compare favourably in this category with those in other counties, particularly in respect of having the lowest proportion of hedges in the *open base* category. In absolute terms there is plenty of room for improvement with almost half of the hedges recorded failing to meet the favourable condition criteria in respect of the woody growth in the hedge base. This has been a consistent feature in County Hedgerow Surveys with only Counties Cavan and Kildare recording more than half of the sample with a dense hedge base.



Very dense roadside hedge – Ballyhaunis (MO50)

The most commonly occurring hedge profile in County Mayo is the ‘overgrown’ category (73%) an indication of the fact that the hedges have not been subject to intensive recent management. This can be beneficial for wildlife. There are negative implications if hedges are left unmanaged for longer periods. Significantly, 35% of the overgrown hedges were considered to be losing their base structure, which is often a result of lack of appropriate management and would be considered an undesirable feature.

17% of hedges have either the ‘boxed’ or ‘A-shaped’ profile characteristic of recent routine management.

Remnant and derelict hedges account for just 4% of the sample in County Mayo. Remnant hedges are those where the shrubs have reverted to their (often aged) tree form with extensive gaps. They have declined to the extent that they can no longer be called hedges and are deemed to be beyond rejuvenation. They can be considered as being unsustainable. Without intervention derelict hedges will become remnant over time, and hedges that are classed as losing structure (where many of the shrubs and thorns of the hedge no longer display low dense growth, and most of the stems are visible) can, similarly, become derelict. These problems are not as evident in County Mayo as they are in other counties, particularly Counties Westmeath and Roscommon where over a quarter of hedges were classed in these two categories. Again this could be due the different origin of much of the hedgerow stock between the counties. The *Remnant* and *Derelict* classifications are primarily related to reversions in the growth form of shrubs in planted hedges due to absence of management. These conditions do not apply to a proportion of the County Mayo hedgerow network.

In common with the results from the other county hedgerow surveys, damage to banks and walls is a frequent occurrence in County Mayo. The proportion of hedges with banks or walls classified as *severely eroded* was above the average figure for all counties. Livestock are generally the main agents of the damage. Reparation of this basic component of hedgerow composition needs to figure more in management plans for hedgerows, particularly in the REPS.

Only 8% of the hedges recorded were classed as being of *poor vigour*. A further 3% of hedges were target noted as having poor vigour in part. 20% of the hedges recorded classed as showing *poor vigour* were at altitudes above 130m. Poor soil drainage was a likely contributory factor in one case.



Severe degradation to Crossmolina (MO17) hedge bank



Poor vigour in high altitude Kiltimagh (MO40) hedgerow

Hedgerow Management

In most areas hedgerows are predominantly man-made features and most require a degree of management intervention to fulfil agricultural and biodiversity functions and remain sustainable.

There has been a considerable contrast in the degree to which hedges are managed across the country. Based on the county surveys conducted to date they range from County Laois where 77% of hedges have received some degree of management intervention in the recent past (last five years) down to County Roscommon where the figure is just 38%. County Mayo falls around the middle of the spectrum, with 54% of the hedges sampled showing some evidence of recent management, with 30% being managed in the last year.

The Department of Agriculture & Food, through the Rural Environment Protection Scheme (REPS) sets guidelines for appropriate hedgerow management as part of its contract with participating farmers. Although REPS 4 has recently been officially launched the full details of the scheme are not currently published so the critique in this Report is based on REPS 3.

Measure 5 of the scheme concerns the Maintenance of Farm and Field Boundaries. The objective of the measure is to conserve, maintain and enhance hedgerows in the interest of stock control, bio-security, wildlife and scenic appearance of the area. Some of the guidelines for REPS Planners most relevant to the recordings of this survey are outlined below;

- Where ivy infestation is a risk to the stability or long-term viability of a hedgerow it should be controlled.
- If possible, one side of a hedge should be trimmed in a season.
- Careful consideration should be given when prescribing the lowering of the height of a hedgerow.
- The quest for neatness should not take precedence over ecological and landscape considerations.
- Hedgerow maintenance must be avoided during the bird nesting season (March 1st - August 31st).
- Where hedgerows are cut, they must be cut to an A-shaped profile.
- The crushing of hedgerows by heavy machinery is not permitted.
- Fencing wire should not be attached to hedgerow trees and shrubs.

Participants in REPS 3 must also chose from a number of biodiversity options to qualify for additional payments. In respect of hedgerows, this can involve planting a minimum of three metres of new hedgerow per hectare annually, or rejuvenating a minimum of two metres of hedgerow per hectare annually through either coppicing or laying on a maximum of 20 hectares of their holding.

The latest statistics from the Department of Agriculture indicate that, in County Mayo, there were 6682 active participants in REPS on 30/04/07. County Mayo is at the top end of the scale in terms of farmer uptake accounting for over 11% of participants in the national Scheme. €250 million has been paid out to farmers in the county since the scheme launched in 1994. The original costings for the Scheme suggested that 20% of spending by participant farmers would be on Measure 5 which would equate to an input of over €50 million from the Department of Agriculture and Food towards farm and field boundary maintenance in the County since 1994.

The REPS encourages the managing of hedges on a three to five year rotation rather than a more intensive annual cutting program. The results from the County Hedgerow Surveys have reflected the influence of the Scheme on management levels in different parts of the country. The ratio of annually managed hedges to those classed as *short term unmanaged* (last 2-5 years) is 1.36 in County Mayo compared with 7.67 in County Laois where uptake of the REP Scheme is much lower.

The Department of Agriculture and Food (REPS), and Teagasc recommend that when hedges are trimmed this should be done so that the hedge is wider at the base, tapering to a narrow top (A-shape). This reduces self shading and helps maintain a dense base to the hedge that is essential for stock control and also beneficial to the nature conservation value of a hedge. The county wide hedgerow surveys have shown that the message of the A-shape profile is slow to filter through to hedge cutting contractors with the vast majority of hedges still being cut to a box shape. A breakdown of the trimming profiles for routinely managed hedges showed that proportion of hedges being trimmed to the A-shaped profile to those being trimmed to a more conventional box profile was 3:19. In absolute terms this is a disappointing result, but is superior to results from other counties (with the exception of County Kildare) where there are few examples of hedges trimmed in the recommended manner.

Previous results from hedgerow surveys and other research from Britain (Sparkes et al., 2000) have shown that a high proportion of routinely managed hedges have little or no flowers or fruit. For best practice it is necessary to achieve a balance between maintaining hedge structure and density, and allowing hedges to flower and fruit. For the future this might best be achieved by annually or biennially trimming the hedge sides to taper in to an 'A-shape' whilst still allowing a portion of the top of the hedge to grow freely in order to flower and fruit. 3% of the sample was considered to have this (top-heavy) profile in County Mayo, compared with 7% in County Offaly and 16% in County Laois.

Some trimming of hedgerows may be necessary for health and safety reasons during the prohibited period outlined in the Wildlife Act (1976, Amendment (2002)) for the protection of nesting birds. 3% of hedges recorded during the survey were noted as having been cut during the nesting season. These were all related to roadside / trackside hedges. If hedges are maintained at the appropriate time it should only ever be necessary to cut this year's light, new growth when cutting for health and safety purpose during the nesting season. Other examples were observed within the County but outside of the sample areas of hedges that had been cut out of season most probably for safety purposes; cutting which could have been avoided had the hedges been managed during the appropriate period. Since some cutting during this period will always be necessary for health and safety reasons the impact of the use of different types of hedge cutting machinery should be investigated to determine whether certain types of cutter are less damaging to nesting birds.

Although one of the principle functions of hedgerows to agriculture is that they can act as barriers to the movement of stock, evidence from previous and current hedgerow surveys indicate that a significant proportion of hedges are either reinforced with wire or displaced as the principle barrier by stand alone fences. Over a third of hedges in this survey had no additional fencing with 58% having some independent form of fence to supplement the hedge. A fifth of hedges surveyed had wire attached to the hedgerow stems. This is an indication that the hedge is no longer totally fulfilling its function as stock barrier. Attaching wire to live wood has implications for safety, the well-being of the hedge, and the cost of restoration. Wire in the hedge is capable of damaging hedge cutting machinery and makes the activity potentially unsafe (at least 35% of hedges containing wire had been trimmed by mechanical means and it is probable that the figure is as high as 50%). Where wire is attached to hedgerow stems it can lead to bacterial and fungal infections which weaken the structure of the plant. In the worst case it can even threaten the viability of hedgerow stems. The cost of restoring degraded hedges is increased by the presence of wire which needs to be removed before work can be carried out safely. Removal of wire from hedgerows should be considered for inclusion in the management activities for the REPS.



New fencing wire fixed to hedgerow stems – Ballyhaunis (MO50)

Only 4% of hedges recorded showed evidence of having been laid in the past. This is much lower than the 24% and 26% recorded in counties Offaly and Westmeath respectively where the technique is widespread. In County Mayo the distribution is more localised with the majority of the examples noted were around the Crossmolina, Ballina, Knockmore area. In the Knockmore square (MO25) I was told of one farmer now in his mid seventies who still lays or “stretches” hedges. Despite not being a common form of management it was generally acknowledged to be a very good method.



Old laid stem in Breaghwy (MO39) hedge

Abandonment of management is regarded by most experts as the principle cause of dereliction and eventually the demise of planted hedgerows. Rejuvenative hedge management refers to hedge laying, coppicing and the planting of new hedgerow stock to replace losses. It is generally considered that laying or coppicing need to be carried out on most hedges at least every 30 years in order to maintain sustainability. This means that overall 3.3% of hedges would need to be rejuvenated on an annual basis. Despite the increasing awareness of the value of rejuvenating hedgerows and its necessity for the sustainability of the hedgerow resource, this category of (recent) management was only recorded in 1% of the sample indicating that current rates of rejuvenation are not sufficient to maintain a sustainable resource.

Hedgerow rejuvenation through coppicing and laying can result in large volumes of woody brash which landowners need to dispose of. Traditionally this would have been achieved by burning. Inconsistent interpretation of the Air Pollution Act and Waste Management Act by Local Authorities (Irish Farmers Journal, 2005) has resulted in uncertainty amongst farmers as to their legitimate options in this regard. The REPS specifications indicate that farmers are permitted to burn this type of material *“If hedge trimmings are to be removed or burned; this should be done as soon as possible after cutting.”* The issue of disposal of woody brash from hedge management activities needs to be resolved at a national level.

Management of hedgerow trees

Hedgerow trees are not as significant a landscape feature in County Mayo as they are in most other counties. 41% of sampled hedges had no hedgerow trees compared with Counties Longford,

Leitrim and Westmeath which all had less than 20% of hedges without trees. Despite this, hedgerow trees are, especially when mature, beneficial to the overall ecology of the hedgerow landscape of the county.

In County Mayo a higher proportion of the sample were roadside hedges than in other counties. This includes hedges with overhead telecommunication and electricity supply cables (9.5% of sampled hedges). For network maintenance purposes restricting the growth of potential hedgerow trees in such situations is practical which partially accounts for the lower proportion of hedges containing trees.

Almost 60% of the hedges with trees have young trees as well as mature trees which is a positive feature from a sustainability perspective.

Roadside Trees

The view has been expressed to the author by more than one road engineer that there should be no trees growing within falling distance of a public road. This is an extreme view but is difficult to dismiss purely from a health and safety perspective, but must be weighed against the enormous aesthetic and wildlife value of roadside trees. County Mayo recorded the lowest percentage of roadside hedges containing trees (36%) In other parts of the country (including County Laois and County Westmeath) over 70% of roadside hedges have trees. It is outside the scope of the survey to determine the condition of trees, but it can be stated as an undeniable fact of life that all of those trees will have to come down at some point.

Healthy trees are of little danger to road users, and can in some circumstances be of benefit. (e.g. – trees can alleviate the blinding effect of low angled sunlight; the microclimate under mature trees can keep road surfaces drier and also reduce the amount of frost on the road). Roadside trees can be subject to (often unintentional) damage by machinery during the course of ordinary hedgerow management work. This can often impact on their health and ultimately their stability.

Responsibility, and hence liability, for the safety of roadside trees rests with the landowner. The costs of dealing with unsafe trees can be considerable. Anecdotal reports from around the country suggest that there is a measure of pre-emptive felling of roadside trees by landowners concerned that they may be considered negligent if the trees were to fall and cause injury or damage. This is an issue that requires some attention at the strategic rather than the “fire-brigade” level.

New Hedges

REPS 3 has an optional measure for participant farmers to plant 3m/hectare/year of new hedgerow during the course of their 5 year plan. Based on figures given at the National REPS Conference (Tullamore November 2003) this could result in over 2,000 km of new hedgerows being planted annually under the scheme. Given the level of gappiness in the current hedgerow network it would seem prudent to concentrate planting efforts at improving the condition of the existing resource before adding to it.

In Britain approximately 3500 km's of new hedgerows were planted annually during the 1990's. A sample study by Bickmore (2005) for DEFRA reviewed the establishment success of these hedgerows and concluded that ground preparation, quality of planting stock, soil type, and aftercare were all factors in successful establishment. Teagasc are promoting all of these aspects in their support of new planting to farmers in the REPS. Unlike in Britain and Northern Ireland there are no mandatory standards to which new hedges planted under EU agri-environmental schemes must comply. In eight county wide hedgerow surveys the best examples of new hedge establishment that I have seen have been around new one off housing developments, and the worst in agricultural situations. One of the key problems is that protective fencing is invariably placed too close to the new hedge leading to browsing by stock. Within the next two years, Teagasc should carry out a similar specific study (on REPS farms) to that undertaken in Britain to assess the effectiveness of any new planting under the scheme. Hedge construction should reflect that of the general area – i.e. single / double row; bank and drain. There were generally sound practical reasons for the particular types of construction of hedges and it would be sensible to observe and replicate where appropriate.



Young whitethorn quicks in Kilmaine (MO61) hedge

An issue in relation to the potential surge in hedge planting is the availability of planting stock from Irish seed sources. Current research carried out by Jones et al (2001) indicates greater establishment success where hawthorn (whitethorn) provenance is closely matched to the planting site and that locally provenanced plants can be superior to commercially available material. The same report concludes that in Britain the current state of the commercial nursery sector is not sufficiently well regulated to ensure the necessary controls over provenance of material for hedgerow plantings. There is no information to suggest that the situation in Ireland is better and anecdotal evidence would indicate that the vast majority of the planting stock for Irish hedgerows is sourced from other parts of Europe. The REPS3 Specifications for New Hedgerow Establishment state “*Choose native plants raised from native seed sources*”. In the absence of any certification programme for the supply of hedgerow trees and shrubs of native provenance it is impossible to see how this can be enforced. In the summary of his paper on Habitat Creation Sackville Hamilton (2001) states that “*Use of locally provenanced seed should be standard practice, except where the introduction of non-local genotypes is specifically justified in terms of conservation genetics.*” Local provenance is likely to be particularly important in coastal, upland and exposed areas. More information is needed on the status and production capacity of the hedgerow nursery sector in Ireland.

Hedgerow Quality

A report by Robinson (2002) which assessed post war changes in farming and biodiversity in Britain concluded that whilst reduction in habitat diversity was important in the 1950s and 1960s, reduction in habitat quality is now probably more important. Biodiversity Action Plans need to reflect the importance of quality in relation to the value of habitats.

22% of all hedges sampled in County Mayo met all of those ‘favourable condition’ criteria of the UK Biodiversity Action Plan (BAP) which were consistent with the recording details of this survey. 42% of the species rich hedges recorded were classed as being in favourable condition, compared with 24% and 32% in County Offaly and County Laois respectively and just 13% in East Galway.

All of these criteria can be influenced by management, leaving the potential, with appropriate management, for all hedges to be in favourable condition.

The level of gappiness and the basal structure are the two categories responsible for the majority of the hedges failing to meet the criteria.

It would be beneficial if criteria were agreed by relevant stakeholders as to what constitutes 'favourable condition' for Irish hedgerows. Management plans in REPS could then be designed to achieve favourable status for hedges on REPS farms. One possible addition to the UK BAP criteria could be to include reference to the status of hedgebanks, walls and drains. Positive features of sound structure of the woody component of a hedge can be compromised in the longer term where the hedge bank is badly damaged. 11% of hedges which achieved *favourable condition* status during this study had evidence of severe damage to the associated bank or wall. Renovation of the damage accompanied by protective fencing may be required to rectify the problem.

Comparison with Badger and Habitat Survey Data

The *Badger and Habitat Survey of Ireland* (Smal, 1995) produced figures for hedgerow and treeline lengths using the same sample squares as the current hedgerow survey. However, definitions between the two surveys are not entirely consistent.

The estimated hedgerow length in County Mayo was 7612 km, based on the definitions and results of the *Badger and Habitats Survey of Ireland*.

By comparing the results of the two surveys an approximation of 'hedgerow change' during the period between the two surveys should be possible. This varies between 14 and 18 years as the *Badger and Habitats Survey* was conducted during the period 1989-1993.

The results from this survey would suggest that there has been a gain of 4561km of hedgerows throughout County Mayo in the period between the two surveys. This would equate to an increase of 60% in the hedgerow network which is unquestionably an anomaly. Serious discrepancies occurred in County Roscommon (Foulkes and Murray, 2005b), and County Longford (Foulkes, 2006b), where increases of approximately 40% were indicated.

Young hedgerows (less than 20 years old) were observed during this survey but total lengths were relatively small and an explanation of this variation must be sought elsewhere. In fact, observation of recent hedgerow removal for development purposes most probably exceeded that of any new planting.

There has been some suggestion that not all of the sample squares were recorded during the Badger and Habitats study and this could have an impact on the overall result. More probable is that certain areas in transition landscapes were classified as scrub in the *Badger and Habitats survey* but the current study would have identified individual lengths of hedgerow within these areas resulting in a higher figure for total hedgerow length.

Comparing recent hedgerow survey data with the Badger and Habitat survey results from Westmeath, Offaly and Laois indicated hedgerow loss at rates of 1.1% and 3.8%, and 6% respectively in a similar period

The discrepancy between the figures produced between the recent hedgerow surveys in Counties Longford, Mayo and Roscommon and those of the Badger and Habitats Survey would suggest that any direct comparison between the current hedgerow surveys and the Badger and Habitats study is irrelevant unless the sources for the above discrepancies can be deduced.

9.0 RECOMMENDATIONS

The recommendations included in this section are based on the results of this survey considered in the light of current best conservation practice. Hedgerow conservation is within the remit of numerous stakeholders who have differing degrees of influence over the resource. In order to better target the recommendations, their relevance to each of the stakeholder groups is tabled at the end of the section with lead partners identified where appropriate. A copy of this report should be circulated to a representative of each of the stakeholder groups.

9.1 CONTEXT

In relation to hedgerows, the term ‘conservation’ does not simply relate to their retention but to their retention in a condition that is conducive to their multifunctional benefits.

Change has been a constant feature of the Irish landscape. It is an insufficient reason to try to conserve hedges just because they are there. Instead, their continuing role needs to be assessed in the context of the changing needs of agriculture, biodiversity, the environment, and the landscape. For example, whilst wire fencing has reduced the need for hedges as stock enclosures, and shifts in fuel consumption have reduced their value as fuel sources, the importance of hedges for wildlife conservation is more highly regarded. The role played by hedges in maintaining water quality is insufficiently understood but in light of current research in Europe (Viaud et al., 2001), may be very significant.

In recent years the conservation of our natural and cultural heritage has gained importance, as reflected in current environmental and conservation policy (see section 4.3 Legislation & Policy) most especially through the REP Scheme. Within the context of these changes, the heritage and aesthetic aspects of hedgerows must be regarded.

The movement to the Single Farm Payment (SFP) is expected to reduce livestock numbers in Ireland considerably. It is yet to be seen fully how this will affect land utilisation. Will farmers maintain stocking density and put surplus land into forestry or other alternative enterprises, or will the same land be farmed more extensively? Either option has consequences for hedgerows.

The level of native woodland is another dynamic factor. Hedgerows are considered to be sub-optimal woodland edge habitats for wildlife. Most of the species that utilize hedgerows would be more at home in native woodlands. If, in any region, the area under native woodland were to increase significantly, the need for hedgerows as habitats in that area may diminish yet their importance as habitat corridors in order to maintain viable populations of woodland wildlife might increase.

The key to successful hedgerow conservation policy is that it is formulated in an appropriate and relevant context. This applies from management requirements for a single hedge up to policy decisions at a National (or even European) Level.

The value of a hedgerow or a network of hedgerows in any given environment is relative to its wider environmental context. A species rich hedgerow, in good structural condition, in an area well populated with similar hedges, in an area dominated by semi-natural vegetation, may be of lower relative importance in its setting than a less diverse hedge, in poorer condition, in an intensively farmed area with few hedges or other semi-natural features. The former may be a sub-optimum habitat for many species in its area; the latter might be the *only* habitat.

If hedgerow conservation is to be more than just aspirational then a series of practical, cost effective conservation measures need to be put in place. There are a number of issues which complicate the design of such measures:

- Some of the desirable qualities of hedgerows are subject to value judgements.
- Hedgerows are a multi-functional resource. In the absence of a full cost/benefit analysis it is not possible to determine what constitutes a cost effective measure.
- Fencing-off and leaving alone is not an option for most hedgerows. Hedgerows are man-made features of the landscape and the majority need a degree of appropriate active management to ensure their long term viability. Leaving them alone can be appropriate in the short term but is generally not a sustainable long-term option.
- Most hedgerows are private property. Ownership of hedgerows lies in the hands of thousands of farmers and land owners.
- The variable type, condition and regional differences make uncomplicated management guidelines difficult to frame.
- A significant percentage of the current network has fallen in to disrepair over a period of decades. Reparation of degraded hedgerows involves substantially higher costs than the routine maintenance of hedges in good condition.
- Lack of knowledge/skill base.
 - Intensification of agriculture has tended to diminish the agricultural value of hedgerows. Prior to the introduction of the REPS in 1994 there were no external incentives for farmers to retain hedgerows whereas grants have been available for land reclamation and drainage which have involved hedgerow removal. Declining agricultural functional value led to a fall off in the practical knowledge and skills needed to manage hedges appropriately.
- Relevance of the resource to the modern landscape.
 - The value of the hedgerow resource to the modern environment is fairly well documented. However, the relevance of a land division system that dates back 200 years is questionable.
 In 2002, the number of agricultural holdings in Ireland totalled 136,500, compared with 419,500 in 1855, less than a third the number (CSO, 2002).
 Agricultural methods have changed significantly, especially in relation to mechanisation. In addition, the decline in the number of people engaged in agriculture is of consequence.

The recommendations included in this section are based on the results of the survey, considered in the light of current conservation best practice. Hedgerow conservation is within the remit of numerous stakeholders who have differing degrees of influence over the resource. In order to better target the recommendations, their relevance to each of the stakeholder groups is tabled at the end of the section, with lead partners identified, where appropriate.

9.2 POLICY RECOMMENDATIONS

NATIONAL POLICY LEVEL

No.

	Any hedgerow conservation policy or actions need to be cost effective. Cost effectiveness can only be assessed when the full costs and benefits have been quantified.
1.00	A full cost / benefit analysis of the national hedgerow resource should be carried out.

REPS

1.01	In order to place hedgerows in their wider ecological context a full habitat survey of each REPS farm should be conducted consistent with A Habitat Classification for Ireland (Fossitt, (2000)).
1.02	REPS plans should show a distinction between active and redundant farm boundaries. Unless there are specific conservation or management objectives, resources should not be directed into hedgerows that form part of redundant field boundaries. Conversely, ancient, species rich, and other notable hedges should be given particular and carefully targeted management attention, where appropriate.
1.03	REPS 4 needs to prioritize the filling of gaps in existing hedgerows over the planting of new hedgerows.
1.04	Species Selection advice for new hedge and infill planting should be area specific rather than general and should reflect local conditions.
1.05	Greater commitment is needed to the use of native (even local) provenance in new hedgerow planting and infill planting within the Scheme.
1.06	The restoration and protection of degraded hedge banks and walls should be fully costed and included in the options for hedgerow management under REPS 4.
1.07	The REPS Specifications should define field boundary types including a clear and precise definition of “hedgerow”.
1.08	The appropriate aftercare of newly planted hedgerows needs to be stressed by advisory bodies. Fencing from livestock must be an adequate distance away from the hedge to prevent browsing and also to allow maintenance. Recommended figures should be stated for the spacing of protective fencing from newly planted hedges in the REPS specifications and considered best practice for non REPS situations.
1.09	Ivy is a valuable wildlife plant but can, when over-dominant, be potentially detrimental to the long term viability of hedgerows. Its control may be deemed to be a necessary part of a hedgerow management programme (as in REPS). Guidelines should be given to REPS participants as to the timing of cutting ivy so as to minimize the wildlife disruption. This will need to be based on research evidence and then should be considered best practice for non-REPS situations.
1.10	Planners and Inspectors and Contractors operating the REP Scheme need to become familiar with recognised Standards in hedgerow management.

	Protection and enhancement of hedgerows that connect to other wildlife habitats such as woodlands and scrub will have a positive impact on the connectivity of wildlife habitats throughout the landscape and the stability of wildlife populations.
1.11	Hedges that provide direct connections to other natural or semi-natural habitats should be prioritised for protection and enhancement, and where new planting is to take place, further wildlife corridor establishment be promoted.

Afforestation

	Afforestation with non-native forestry species, e.g. sycamore, has the potential to impact on the species composition of hedgerows in the longer term.
1.12	Forest Biodiversity Guidelines should include consideration of the potential impact of the new forestry on the wider ecology in the locality.

LOCAL POLICY LEVEL

Local Planning and Development

	There is a need for Mayo County Council to deal systematically with the relevant issues of this report and to give status to the recommendations. A policy document could set policy, standards and targets; and assign areas of responsibility.
1.13	As part of the County Mayo Biodiversity Action Plan, Mayo County Council should produce and adopt a ‘Hedgerow Conservation Policy’.
	There is currently little or no distinction, in terms of planning and development, between the different types of hedgerow recorded as part of this survey and their relative agricultural, ecological and aesthetic importance. For example townland boundary hedges, hedges with good species diversity or those containing rare species, should be safeguarded more stringently in roads, construction, and other development operations.
1.14	In the planning process, greater consideration should be paid to individual hedgerows in light of their particular qualities and characteristics. The concept of “Heritage Hedgerow” should be introduced for hedgerows which have notable historical, structural, or species composition characteristics.
	Simple and systematic methods should be developed for dealing with hedgerows within the planning process.
1.15	Guidelines should be produced for planners and road engineers dealing with hedgerows in planning applications.
1.16	Hedges on agricultural land that has been re-zoned for development should be surveyed and hedges with significant biodiversity, historical value, or containing rare species should be identified and incorporated into the GIS database.
	Paragraph 2.27 of The National Biodiversity Plan states that “For the future, the overall goal should be to have no net loss of the hedgerow resource”.
1.17	Hedgerow removal to facilitate development should be kept to an absolute minimum and, where unavoidable, a requirement for mitigation planting should be incorporated into the planning consent. This should consist of a hedge of similar length and species composition to the original, established as close as is practical to

the original and where possible linking in to existing adjacent hedges. Native plants of a local provenance should be used for any such planting.

There is evidence from around the country that although measures to protect hedgerows are included in planning consents, lack of enforcement is resulting in less than optimum performance on the ground.

1.18 A study should be initiated to investigate the impact of development control in relation to hedgerows and to determine degrees of compliance with hedgerow related planning conditions by landowners.

Greater enforcement of hedgerow conditions in planning consents is required.

1.19 Enforcement of hedgerow conditions in planning consents could be achieved by making the retention, re-location, or re-establishment of hedgerows in planning consents the subject of a bond sought by the Local Authority from those seeking the planning permission. The bond to be returned on the successful retention, re-location or re-establishment of the hedgerow/s concerned within a given period.

New Planting

1.20 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.

1.21 Nurseries and garden centres in the County should be encouraged to carry sufficient stock of the above.

Roadside Hedgerows

Roadside hedges make up approximately 21% of the overall hedgerow extent, the fact that they are at the front line of public perception of hedgerows, and that they tend to be relatively species rich due to historic factors, makes their appropriate maintenance particularly important.

1.22 Special emphasis should be placed on the best practice maintenance of roadside hedgerows and verges.

Cutting hedgerows during the growing season is potentially damaging to the health of hedgerow shrubs and to much wildlife dependent on the hedge.

1.23 All of the relevant Stakeholders listed in Table 9.1 should commit to eliminating the cutting of hedges during the period indicated in the Wildlife Amendment Act (2001) (1st March to 31st August) except where absolutely necessary for safety reasons. They should also commit to implement forward planning in order to minimise the necessity for cutting for safety reasons.

1.24 A log should be kept by the local authority (or other body) detailing all hedge cutting carried out during the bird nesting season as stated in the Wildlife Amendment Act (1st March – 31st August). Details to include are the date of cutting; machine operator; location; landowner; details of any Section 70 Notification; length of hedge cut; and precise justification for management. This will provide a useful record for the council (or other body) in the case of any complaints or actions taken. Recording photographic evidence prior and subsequent to the action would also be recommended.

1.25 A pilot programme for the assessment of the condition and potential hazard of

roadside hedgerow trees should be undertaken.

If the relevant stakeholders (local authority, farmers and landowners, arboriculturalists) were to come together and devise a project that allows for an assessment of the condition and potential hazard of trees, removal of potentially dangerous specimens, and mitigation through alternative planting (in safer areas?), this issue could be tackled in a constructive, proactive and much more cost effective way than if it is tackled piecemeal. Such a programme would not only protect the interests of the landowner and road users but would also recognize the enormous aesthetic and nature conservation value of roadside trees. Appropriate management implemented in advance of crisis situations would result in a greater retention of roadside trees. Some level of European funding may be available for such a programme.

Incentives

Not all of the species rich hedges within the County fall within the protection and support of the REPS. Given their role as ecological corridors it is important that the appropriate management of these hedgerows on non-REPS farms be incentivised in order to prevent a fragmented countryside. This could be done through Local Authorities, NPWS, or Heritage Council.

- 1.26 Incentives for the conservation of, or renovation to, favourable condition of all ‘species rich’ (or ‘Heritage’) hedges should be available to landowners not participating in the REPS.**

Disposal of hedge cuttings

Many land owners have expressed uncertainty over the legitimacy of disposing of woody residue from hedge cutting by burning. A clarification of the interpretation of the relevant section of the Air Pollution Act is needed, along with consistency of implementation. Coppicing and hedge laying can generate significant amounts of this type of material. If the burning of hedgerow waste is to be prohibited the infrastructure for acceptable alternative methods of disposal needs to be developed.

- 1.27 After consultation with relevant stakeholders, all Local Authorities jointly should set consistent standards for the interpretation and implementation of the section of the Air Pollution Act (and any other legislation) relevant to disposal of hedgerow waste. This interpretation should be communicated to farmers, landowners and contractors. Mayo County Council should take the lead in this process.**

As they dry out and decay piled hedgerow cuttings begin to form a habitat for wildlife. Burning once they have reached this stage is damaging for that wildlife.

- 1.28 The practice of piling hedgerow cuttings (or in the case of hedgerow removal whole hedgerows) and leaving to dry out for a number of weeks or months before burning should be strongly discouraged on environmental grounds. Cuttings should either be disposed of promptly or allowed to bio-degrade.**

Fuel Wood Production

Producing a greater proportion of its fuel demands from hedgerows would be consistent with Ireland’s commitments under the Kyoto Protocol.

- 1.29 Farmers and landowners should be encouraged to utilise hedgerows for fuel wood production in a sustainable manner.**

1.30 Technical advice should be provided to farmers and landowners wishing to produce wood fuel on cyclical basis from hedgerows.

Re-survey

The results of this survey should act as a benchmark for the assessment of trends in the status of the Counties hedgerow resource.

1.31 A repeat hedgerow survey for the county should be carried out no later than 2017.

9.3 RECOMMENDATIONS IN RELATION TO HEDGEROW MANAGEMENT IN COUNTY MAYO

Standards of management activities

Results from the survey indicate that there is room for improvement in the structural quality of hedgerows, which can be achieved by appropriate maintenance.

2.01 As a base line, in order to achieve management objectives, stakeholders should commit to ensuring hedgerow management works carried out under their responsibility should conform to recognised, basic minimum standards.

- **Routine trimming should be carried out by operators qualified to Teagasc Unit MT 1302 – Mechanical Hedge Trimming.**
(This module should be reviewed on an ongoing basis to ensure that it is fully compliant with current best practice and remains consistent with standards in operation in other member states of the EU.)
- **Hedge laying should be to National Proficiency Test Council (NPTC) (UK) Standard (AO2098) or equivalent.**
- **Coppicing of hedgerows should be carried out to standards currently being developed by the Coppice Association of Ireland in conjunction with Standards bodies in the UK.**
- **Planting of new hedgerows should be to NPTC standard or equivalent.**

In order to achieve these standards, more opportunities for training need to be made available to farmers and landowners who wish to undertake hedgerow management activities, especially in connection with the REPS.

2.02 Opportunities for training to recognised Standards in hedgerow management should be made more widely available.

Hedge trimming

Breasting hedges but allowing the top to grow freeform is as a management technique that potentially satisfies both ecological and agricultural functions. It is also well suited for the management of many roadside hedges.

2.03 Breasting hedges but allowing the top to grow freeform should be encouraged as a management option for routinely managed hedges.

2.04 Farmers and landowners in County Mayo should be encouraged to not reduce hedge

height below 1.5m during routine maintenance.

Hedge rejuvenation

Sustainable hedgerow networks will only be achieved if appropriate management regimes based on long term needs are implemented. Levels of hedgerow rejuvenation need to increase significantly from those detected in the survey.

2.05 Reducing the level of gaps in hedgerows through appropriate infill planting should be encouraged

2.06 Greater levels of rejuvenation of old and degraded hedgerows should be encouraged.

Hedgerow Trees

2.07 Control of invasive non-native species (especially sycamore) should be encouraged, particularly in species rich hedges.

Safety

2.08 Farmers and Landowners should be strongly discouraged from attaching fencing to hedgerow stems and trees.

2.09 Removal of old wire/ netting/ staples from hedgerow stems should be encouraged for safety reasons.

9.4 INFRASTRUCTURAL RECOMMENDATIONS

Registration/ certification of local provenance planting stock

The ability to source planting material of a known genetic provenance is important. The origin of plants or seeds determines their adaptability, quality, and wildlife value. More information is needed on the status and production capacity of the hedgerow nursery sector in Ireland.

3.01 A study should be conducted of nursery suppliers and garden centres to determine the availability of native planting stock (including provenance) for the range of hedgerow tree and shrub species recorded in the County Mayo Hedgerow Survey. This information should be disseminated to interested parties.

3.02 A programme should be developed for the identification, registration, and certification of local provenance seed sites for woody hedgerow shrubs in County Mayo.

Nurseries and Nursery Stock

Plans need to be made to ensure that the planting requirements predicted as a result of the introduction of REPS 3 and 4 can be met from indigenous stock. This will require a degree of forward planning.

3.03 The production capacity of nurseries producing Irish hedgerow stock from Irish seed sources should be determined.

Individuals wishing to establish, develop or expand tree nurseries with a view to supplying hedgerow plants of a local provenance should be actively encouraged through the Development Agencies. The Department of Agriculture and Food could look at providing funding through its direct provision of support services. The Forest Service, which is now under the wing of the Department, could facilitate this.

- 3.04 Financial and technical support should be given to individuals and groups wishing to develop nurseries to supply woody hedgerow shrubs from local seed sources.**

Machinery Contractors

The vast majority of hedgerow management is carried out by operators using tractor mounted machinery. Some anecdotal evidence has suggested that, given the restricted legitimate season of cutting, business viability may be threatened. At a technical level the message promoted by Teagasc, and the Department of Agriculture through the REP Scheme, to cut hedges to an A-shape profile does not appear to be getting through at ground level. The reasons why the recommendation is not being heeded should be investigated.

- 3.05 A survey should be undertaken of hedge-cutting machinery operators, to assess the operation and requirements of the sector.**

9.5 EDUCATION AND AWARENESS RECOMMENDATIONS

A chain is only as strong as its weakest link. All individuals in the process from decision making to implementation need to be sufficiently well informed so as to be able to direct, implement and evaluate best practice actions.

- 4.01 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.**

- 4.02 Stakeholders should provide appropriate training for staff in aspects of hedgerow conservation relevant to their position.**

- 4.03 Highlight the value of hedgerows in environmental education.**

Education in terms of best practice management is best implemented with reference to good examples.

- 4.04 A number of showcase sites of best practice covering different aspects of conservation and management should be developed around County Mayo.**

- 4.05 Identify suitable hedgerows convenient to schools and colleges for use in environmental education.**

- 4.06 General Awareness of the values of hedgerows should be encouraged among rural communities through circulation of educational materials, an increase in targeted education for schools, and with the introduction of initiatives such as the Golden Mile Competition.**

Managing species rich hedges depends on the ability to identify species.

- 4.07 A pictorial information leaflet should be produced to show all of the species native to County Mayo Hedgerows. This should be distributed to Teagasc offices, hedge-cutting contractors, marts, creameries, garden centres, etc.**

9.6 RECOMMENDATIONS FOR FUTURE RESEARCH

Ecology

5.01	Studies should be undertaken to determine the extent to which adjacent land type and use influences biodiversity in hedgerows, particularly species rich hedges.
	Since a certain amount of hedge cutting is always necessary during the summer months for health and safety reasons it would be beneficial to try and minimise the impact of the work from a wildlife conservation point.
5.02	The impact of different types of hedge cutting techniques and machinery should be investigated to determine whether certain techniques or types of cutter are less damaging to birds during the bird nesting season (1st March – 31st August).
5.03	The biodiversity value of locally traditional, but non-native species (e.g. Fuchsia) should be investigated.
5.04	Investigate the comparative biodiversity value of non-hedgerow field boundaries and features.

Ivy

5.05	Research needs to be initiated to examine the causes of the development of ivy in hedgerow trees and shrubs and the impact that different levels of ivy growth have on the host plant.
5.06	Research needs to be carried out to determine the optimum time for the cutting of ivy (where necessary) to minimize the disturbance to dependent wildlife.

Water Quality

5.07	Research is needed to quantify the nutrient buffer effect of hedgerows in different agricultural situations.
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Investigating Data Sets from other surveys

	This survey uses the same sample areas as the Badger and Habitats Survey of Ireland, the Countryside Bird Survey and other surveys carried out by NPWS (e.g. hare survey). This should allow some comparison of data sets. Even more concentrated recording of habitat data and how these habitats change over time should allow for a greater understanding of the factors that govern the fluctuations in wildlife populations.
5.08	Data from this Hedgerow Survey could be related to previous surveys which have used the same sample area to enable more specific analysis.
5.09	A full habitat survey should be conducted consistent with A Habitat Classification for Ireland (Fossitt, (2000)) in each of the sample squares of this survey on an ongoing basis.
5.10	Species distribution data from this survey should be compared with current BSBI data to see if updating of the BSBI data is required.

9.7 RECOMMENDATIONS IN RELATION TO THE SURVEYING OF HEDGEROWS

National Survey

A National Hedgerow Survey is needed to fully record the national hedgerow resource and to place the findings of this survey in their national context. This can be achieved on a county by county basis. A full and meaningful floristic classification of Irish hedges can only be carried out when consistent data is available for the whole country.

- 6.01 It is recommended that comparable hedgerow surveys be carried out in other counties across the country.**

Survey Methodology

Consistency is required in the recording of hedgerow data at a national level.

- 6.02 The methodology used for this survey, after suitable review, should be adopted as the standard methodology for carrying out national, countywide or regional hedgerow surveys in Ireland.**

- 6.03 Any future surveys carried out using the same methodology as this one should include an appraisal of the methodology as part of any report.**

- 6.04 An appropriate method of assessing the representative species composition for hedgerows in Ireland should be determined.**

- 6.05 Criteria for what constitute 'species rich', 'favourable condition' and 'rare' will need to be developed in relation to hedgerows in Ireland, and should be decided upon by the relevant stakeholders.**

Standardising data input into Geographic Information Systems

- 6.06 A standard format for the presentation of hedgerow survey data in GIS should be agreed.**

Table 9.1 Relevance of Policy Recommendations to Stakeholders

Stakeholder Group	Recommendation reference number																													
	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25	1.26	1.27	1.28	
Agri/Environmental Consultants			*	*	*	*	*		*		*	*	*								*								*	*
Community Groups																					*	*	*	*	*			*		
Department of Agriculture	L	L	L	L	L	L	L	L	L	L	L	L									*						*		*	
Developers																			*	*		*						*		
Environmental NGO's																												*		
Farmers/Landowners			*	*	*	*	*	*												*	*	*	*	*			*	*	*	
Forest Service/Foresters	*												L								*						L		L	
The Heritage Council	*																								*	L				
Mayo County Council														L	L	L	L	L	L	L	*	*	*	*	*	*	L		L	
Management Professionals			*	*	*	*				*												*	*	*			*			
National Parks & Wildlife Service	*	*																				*	*	*	*					
Nurseries, Garden Centres																												L		
Research Institutions	*									*								*												
Semi-State Bodies																				*	*	*	*							
Teagasc	*	*	*	*	*	*	*	*	*	*	*	*							*	*		*	*	*				L	*	*

* denotes relevant recommendation

L indicates Lead Partner/s

Table 9.2 Relevance of Management; Infrastructural; and Education and Awareness Recommendations to Stakeholders

Stakeholder Group	Recommendation reference number																				
	2.01	2.02	2.03	2.04	2.05	2.06	2.07	2.08	2.09	3.01	3.02	3.03	3.04	3.05	4.01	4.02	4.03	4.04	4.05	4.06	4.07
Agri/Environmental Consultants	*		*	*	*	*	*	*	*						*	*					
Community Groups	*		*												*				*		
Department of Agriculture Developers	*	*	*		*	*							*		*	*					
Environmental NGO's																	*	*	*	*	
Development Agencies													*								
Farmers/Landowners	*		*	*	*		*	*	*						*	*					
Forest Service/Foresters	*										L	L	L		*	*	*				
The Heritage Council													*				*			*	*
Mayo County Council	*		*	*											*	*	*	L	L	L	L
Management Professionals			*											*	*						
National Parks & Wildlife Service	*		*												*	*	*				
Nurseries, Garden Centres										*	*	*			*	*					
Research Institutions										*				*							
Schools/ Educational Bodies																	L		*		
Semi-State Bodies	*														*	*					
Teagasc		L	L	L	L	L	L	L	L	L	*	*		L	*	*		*	*	*	*
Tourist Sector																					*

* denotes relevant recommendation
L indicates Lead Partner/s

Table 9.3 Relevance of Future Research; and Future Survey Recommendations to Stakeholders

Stakeholder Group	Recommendation reference number															
	5.01	5.02	5.03	5.04	5.05	5.06	5.07	5.08	5.09	5.10	6.01	6.02	6.03	6.04	6.05	6.06
Agri/Environmental Consultants												*	*	*	*	*
Community Groups																
Department of Agriculture	*	*	*	*	*		*		*						*	
Developers																
Environmental NGO's						*										
Farmers/Landowners									*							
Forest Service/Foresters						*										
The Heritage Council											L	L			L	L
Mayo County Council											*					*
Management Professionals		*														
National Parks & Wildlife Service	*	*	*	*	*	*				L					*	
Nurseries, Garden Centres																
Research Institutions	L	L	L	L	L	L	*	L	*	L		*	*	L	*	*
Semi-State Bodies																
Teagasc	*	*	*	*	*	*	L								*	
Tourist Sector																

* denotes relevant recommendation

L indicates Lead Partner/s

10.0 CONCLUSIONS

The information gathered from this survey adds to the existing limited, but growing, knowledge of hedges in Ireland, and should be of value to a wide range of interests and stakeholders in County Mayo and the rest of the country. Recording and analysis of the various hedgerow characteristics should also foster a greater appreciation of the unique nature of these hedges, and enable a strategic approach to their conservation.

Hedgerows link archaeological, geological, social and natural heritage. They have utility in the present but mark the past. Their values are multi-functional in both practical and spiritual terms. They enrich our understanding of history, ecology, rural society and farming practices. They give character to an area giving aesthetic appeal and creating a sense of place

Although over a quarter of the area of County Mayo has specific conservation status, hedgerow landscapes do not generally qualify for designation and protection. It is therefore important that appropriate conservation measures are adopted in order to safeguard the resource. These need to be based on accurate and up-to-date knowledge of extent, nature and status.

In absolute terms, there is plenty of scope for improvement in the resource to maximise its full multi-functional potential, but in relative terms, in many respects County Mayo compares fairly well in most categories with other counties previously surveyed.

The recommendations presented, if implemented, should contribute towards conserving and enhancing this extensive and interesting resource into the future.

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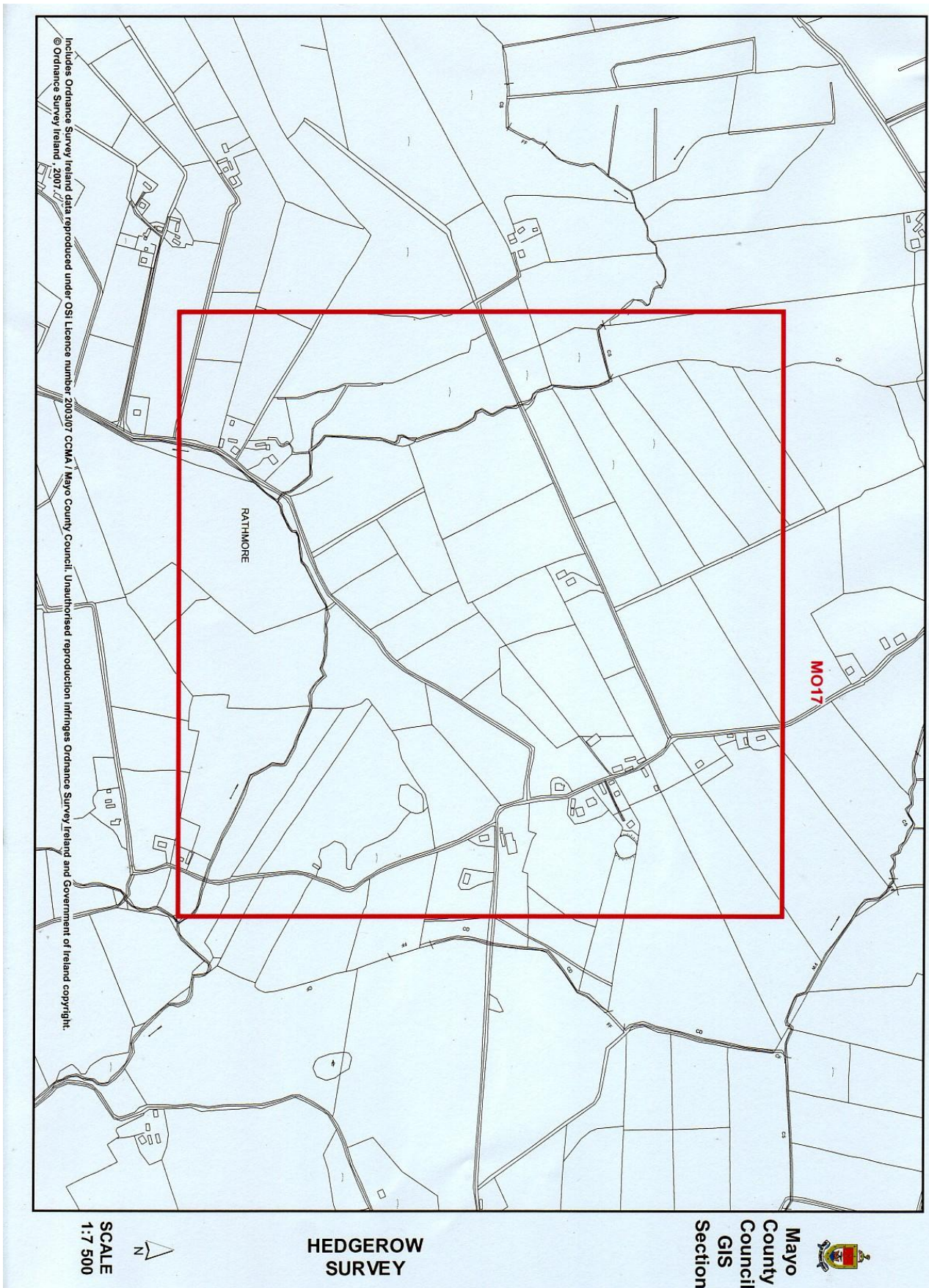
12.0 APPENDICES

12.1 EXAMPLE OF AERIAL PHOTOGRAPH



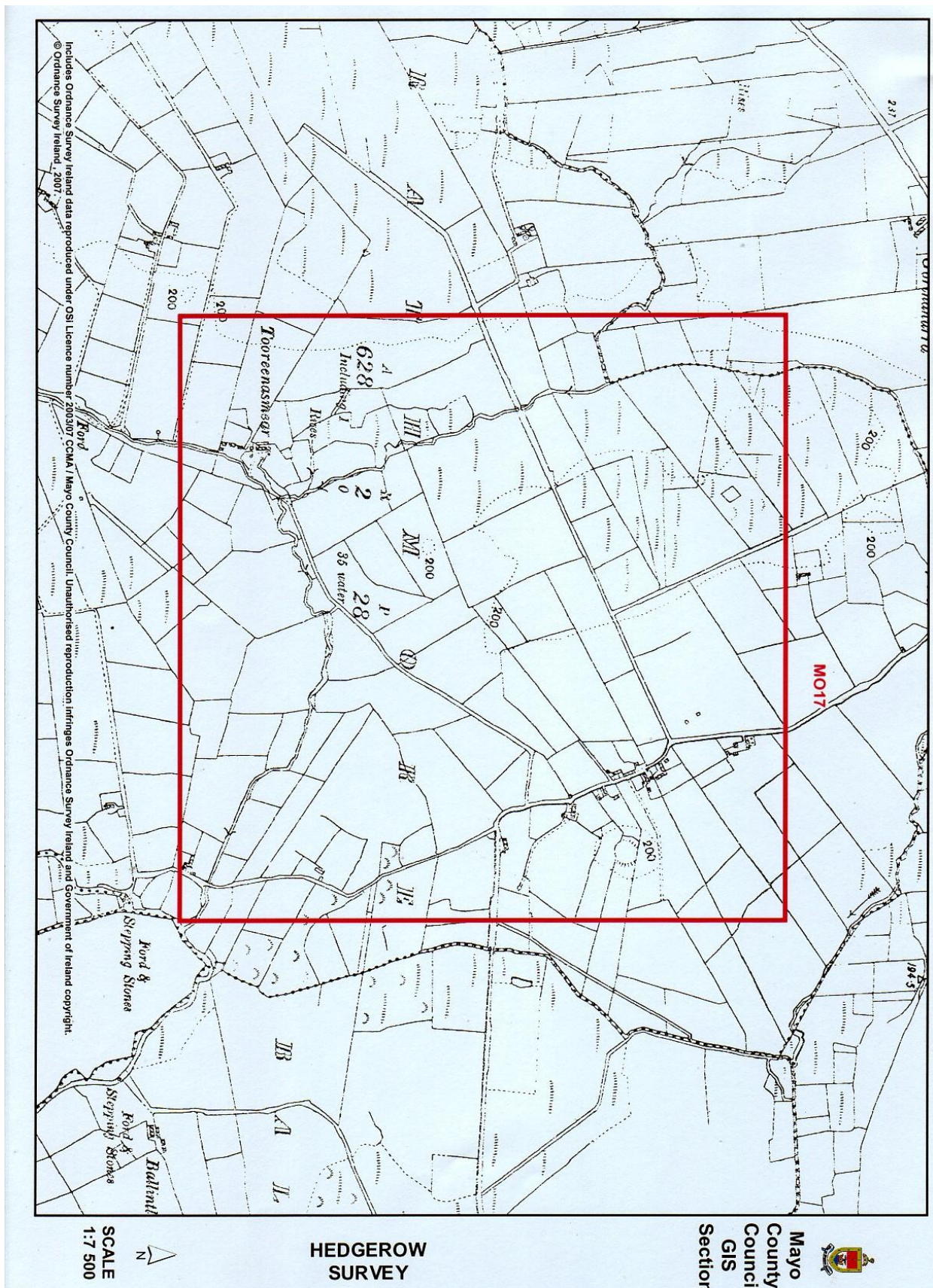
MO17 - Crossmolina

12.2 EXAMPLE OF VECTOR MAP



MO17 - Crossmolina

12.3 EXAMPLE OF ORDNANCE SURVEY MAP



MO17 - Crossmolina

12.4 BLANK 'FIELD RECORDING SHEET'

2007 Mayo Hedgerow Survey

Square ref.:
Grid ref.:

Survey duration:

Date:
Surveyors:

<p>Context A FARM TYPE a tillage b dairy c cattle d sheep e mixed stock f mixed stock + crops g stud h other</p> <p>B HISTORY 1x infill 2x townland boundary 3x canal side boundary 4x railway line boundary x1 + roadside x2 + stream</p> <p>C ADJACENT LAND USE & D LINKS WITH OTHER HABITATS a arable (BC) b improved grassland (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) h peatlands (P) i lake/pond (FL) j watercourse (FW) k other (target note) l. none m. hedge,treeline (WL1,2)</p> <p>E BOUNDARY FUNCTION 1 hedge redundant 2 active boundary</p>	<p>Construction F OUTLINE a linear /regular b non-linear/irregular</p> <p>G BOUNDARY TYPE 1x Single Line Hedge 2x Double Line Hedge 3x Random Line</p> <p>x1 + Bank x2 + Wall x3 + Shelf</p> <p>xa + External Drain xb + Internal Drain xc + Internal Path, Track-way, etc.</p> <p>x0 None of the above features</p> <p>G1 Fossitt Class 1 WL1- Hedgerow 2 WL2 - Treeline</p> <p>H BANK/WALL/SHELF SIZE a < 0.5m b 0.5 – 1 m c > 1m d not applicable</p> <p>I DRAIN SIZE 1 not present 2 small (<0.5m) 3 medium (0.5 – 1m) 4 large (>1m)</p>	<p>Structure/Condition J PROFILE a remnant b relict (derelict) c boxed / A shape d overgrown/irregular e. top heavy / undercut f straight sided xa. losing structure xb. outgrowths at base</p> <p>K HEIGHT 1 <1.5m 2 1.5 – 2.5m 3 2.5 – 4m 4 >4m xa overhead wires/cables</p> <p>L WIDTH a < 1m b 1 – 2m c 2 – 3m d 3 m+</p> <p>M GAPPINESS 1 complete 2 < 5 % gaps 3 5 – 10 % gaps 4 10 – 25 % 5 25 – 50 % 6 > 50 %</p> <p>N BASE a open c scrawny d dense e. very dense xa plus vegetation</p>	<p>Structure/Condition O BANK /WALL/SHELF DEGRADATION 1 not applicable 2 none 3 severe 4 minor 5 drain blocked/waterlogged xa general xb isolated</p> <p>P TREES a none b few c scattered d abundant e line</p> <p>Q TREE AGE COMPOSITION 1 all mature 2 young trees present 3 no trees</p> <p>R VERGE a < 1m b 1 – 2 m c 2 -4 m d 4m + e none</p> <p>T OVERALL VIGOUR a poor b average c good</p>	<p>Management U MANAGEMENT a cut box profile b cut 'A' shape c cut on one side d cut on both sides e topped f excavator g fully laid h laid in part i coppiced j short term unmanaged k long term unmanaged l infill planting</p> <p>V MANAGEMENT METHOD 1 flail 2 circular saw 3 bar cutter 4 hand tools 5 excavator 6 other 7 unsure 8 not applicable</p> <p>W EVIDENCE OF LAYING a no evidence b past evidence c recent evidence</p> <p>X FENCING 1 none 2 fixed to stems 3 electric 4 post & wire 5 sheep wire 6 timber fence</p>
--	--	--	---	--

	A	B	C	D	E	F	G	G 1	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
01																										
02																										
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09																										
10																										

12.5 DOMIN SCALE

The Domin scale is used to record the percentage cover of each woody shrub species in sample hedges. Total percentage cover may add up to more than 100% because of layering of the vegetation.

Domin scale	% cover
10	91-100
9	76-90
8	51-75
7	34-50
6	26-33
5	11-25
4	4-10
3	<4

12.6 DAFOR SCALE

The DAFOR scale was used to record a subjective assessment of the frequency of occurrence of certain shrub and climber species in sample hedges.

Code	Description	Meaning
D	Dominant	Comprises most of the sample
A	Abundant	Very frequent in the sample but not dominant
F	Frequent	Frequently seen in the sample
O	Occasional	Seen but not frequently occurring
R	Rare	Hardly ever found
x	Absent	Not present in the sample

12.7 LANDSCAPE CHARACTER AREAS

A	Achill, Clare and Island Complex
B	North West Coastal Moorland
C	North West Coastal Bog
D	North Coastal Plateaux
E	North Mayo Mountain Moorland
F	North Mayo Inland Bog Basin
G	North Mayo Drumlins
H	East Mayo Uplands
I	Central Mayo Mountain Moorland
J	Clew Bay Glacial Drumlins
K	East Central Drumlin Spine
L	South East Mayo Plains
M	Lakeland Drumlins
N	South West Mountain Moorlands
O	Croagh Patrick Association
P	South West Coastal Basin

12.8 METHODOLOGY REVIEW

Previous County Hedgerow Surveys have recommended that any subsequent surveys conducted to the same methodology should include a review of that methodology.

My comments and suggestions are detailed below:

Sample Selection

At least 25% of a hedge must fall within the radius of circle.

30m Strips

When examining individual hedgerows the figure of 30m is generally considered as the standard sampling size for recording information on the floristic composition of the hedge. This is based on the work of Dr. Max Hooper (1970) in Britain. The U.K. Hedgerow Regulations, however, require that one 30m strip per 100 metres of hedge must be surveyed and the result is then averaged to give an average species diversity figure per hedge.

The methodology for this survey states that two randomly selected 30m strips per hedge should be selected from which to record hedgerow species composition data.

18% of the sample hedges in County Mayo showed a difference of 2 or more in the species count between the two 30m strips. The equivalent figures from other County Hedgerow Surveys are as follows County Kildare 28%, County Offaly 27%, County Longford 23%, County Laois 23%, County Roscommon 19% and County Westmeath 14%. These figures would justify the decision to record two strips and would suggest that there is a need to review the method for assessing representative sampling of hedgerows for species composition in Ireland.

This sample survey covers approximately 1% of the area of County Mayo, with the sample areas chosen on a semi-random basis. The nature of the County Mayo landscape is such that large areas of the county are devoid of hedgerows and of the 63 1km squares selected by the methodology only 35 contained sampled hedgerows. The sampling method outlined in the survey methodology has been used for numerous habitat related studies as a systematic approach is considered to be very efficient for sampling landscape types (Harrison and Dunn, 1993). In Britain it is considered that subdividing the sample into areas or 'strata' with similar characteristics is likely to improve the statistical accuracy of the survey sample (Bickmore, 2002). This stratification is usually based on landscape classification. 95% of sampled hedgerows in County Mayo fell in to just four of the categories used by the CORINE landscape classification system. These are *Land principally occupied by agriculture, Pasture, Peat bogs and Transitional woodland scrub*. The sampling method for county wide hedgerow surveys should be reviewed to see if more effective and accurate methods for recording data can be achieved.

"Hedgerow" Definition

In line with the definitions and methodology of this survey certain linear features which push the definition of hedgerow to the limit were recorded to the exclusion of other features which were unequivocally hedgerows. Some guidance is needed on how to assess 25% of a field or property boundary. A few bushes with a wide spread can cover 25% of a boundary without really passing an intuitive test for what constitutes a hedge. During the current survey linear features/ hedges were often described by landowners not as hedges but as "bits of bushes". The initial trials for the survey methodology included a category on stocking density (i.e. no. of woody shrubs per metre). It was dropped because it was felt to be impractical to assess in many situations. It might be a good idea to include it for gappy hedges (25% or more gaps). The stocking rate for a new hedge would be a min. of 4 plants /m (240 plants for 60m). To qualify as a "hedge" a linear feature should be within a fixed figure of this in terms of stocking density. The figure of 25% (of a field or property boundary) came from the Northern Ireland Countryside Survey (NICS) and needs to be justified.

A “field boundary” is easier to determine than a “property boundary” in most cases. What about hedge-like features in non-agricultural settings? If the surveyor is unable to determine property ownership and the land is non-agricultural (i.e. not a field) the feature cannot be categorically classified as a “hedge”. Is this desirable?

The term “*Deliberately established or managed*” – excludes colonised walls or banks where there is no management. This is not always easy to assess.

Townland boundaries should be assumed to be property boundaries.

Farm Context

This category needs revising to include “fodder” for silage or hay meadow, and category g. should be changed to “equine”.

Links

If there is a gap of 5m plus at the end of a hedge it should be treated as having no link.

% of Gaps

These should be recorded as “general” or “specific”. This can be done by including a suffix to the main category recording.

Vigour

Add a new category “Poor in part”.

Management

A suffix should be included to indicate “Out of season” management.

A character (I suggest a #) should be included as a suffix for any category where the relevant criteria is difficult to assess.