COUNTY LAOIS
HEDGEROW SURVEY REPORT

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This Survey has been carried out for Laois County Council

as part of the Laois Heritage Plan 2002-2006

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Acknowledgements

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1. Summary

Laois' hedgerow network is a huge asset to the county, being valuable in terms of agriculture, landscape, wild flora and fauna, water quality, carbon sequestration, and employment. Prior to this survey, relatively little detailed information was known about the resource.

In the late spring and summer of 2005 field recording of hedgerows was carried out using a standard methodology in 19 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. An equivalent and concurrent study was carried out in County Offaly.

Results from the Laois survey were compared with those from the Offaly survey and from similar hedgerow surveys conducted in Roscommon and Westmeath during 2004.

Based on the results from the sample, the total length of hedgerow in County Laois was estimated at 12,427 km, and the average figure for hedgerow density as 7.28 kilometres per square kilometre (km/km²). This is the highest density found in any of the four county hedgerow surveys.

When compared with an earlier, more general habitat survey (which used the same sample squares) carried out by the Department of Agriculture and the National Parks and Wildlife Service, hedgerow loss can be estimated at approximately 6% over the last 12 to 16 years. In Offaly hedgerow loss over the same period is estimated at 3.8% and in Westmeath at 1.1%.

A very wide range of shrub and tree species were found in Laois hedges. A total of 32 shrub and tree species, including 21 native species, were found in the hedge layer of sampled hedges. 20 tree species, including 15 native species, were recorded growing as hedgerow trees. Whitethorn is the most frequently occurring shrub species found in 98% of hedges, with ash the most common tree species, occurring in 47% of hedges.

There is very high species diversity in a high proportion of individual hedges, with almost half of hedges found to contain an average of four or more native species in a 30m strip. This is considerably higher than any other county surveyed to date. This diversity is most likely to be due to various historical, and landscape factors. Roadside and townland boundary hedges were found to contain a higher diversity of native shrub species than other hedges.

Using data analysis software, seven main hedgerow types were identified across Laois and Offaly, according to their floristic composition. The groups represent hedge types varying from species poor hawthorn hedges, through to an elm and holly group, a gorse group, and both a species rich group and a wet species rich group.

The majority of Laois' hedges occur within the context of intensive farming (i.e. improved grassland and arable land), indicating that they provide much needed habitat in intensive agricultural landscapes. A good proportion of hedges in Laois were found to link with other natural and semi-natural habitats, suggesting that they may have an important role as wildlife corridors aiding the movement of wildlife in the landscape.

Although most hedges are constructed on a hedge bank, interestingly, only half of the hedges surveyed in Laois had an associated drain. Associated walls are not a common feature of Laois hedges.

Almost a third of the counties hedges have gaps for more than 10% of their length, and more than half display open, 'scrawny', or weak growth in the base of the hedge. These traits reduce the agricultural and wildlife value of hedges, and are not good for the long term viability of the hedges. However, Laois did record more hedges with a dense base than found in any of the other county surveys.

The majority of hedges are actively managed, with the flail by far the dominant means of trimming. The style and standards of current trimming practices could be improved. Over a fifth of hedges are cut to less than one metre high. In terms of agricultural and environmental best practice this proportion of very low hedges in Laois should be reduced. As a result of management levels and practices, levels of flowering and fruiting were also found to be low. Trimming of roadside hedges during the prohibited cutting period of the bird nesting season was noticed, particularly around late June. Safety issues could justify the cutting, but none were apparent in most cases.

One fifth of surveyed hedges displayed clear evidence of having been laid, at least in part, in the past. This demonstrates that hedge laying was a traditional form of hedge management in Laois. Current rates of rejuvenation are not sufficient to maintain a sustainable resource, with evidence of recent laying being found in only three hedges.

Laois has a particularly rich, distinct, and interesting hedgerow resource, but appropriate efforts must be made by various bodies (and individuals) if the resource is to be sustained in to the future.

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

Key Recommendations for Laois County Council

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

No.	Recommendation
1.10	As part of the County's Biodiversity Action Plan, Laois County Council should draw up a Hedgerow Conservation Policy Document.
1.12	Guidelines should be produced for planners and road engineers dealing with hedgerows in planning applications.
1.14	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.
1.15	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 All of the relevant stakeholders (including Laois County Council) 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.

2.1 As a base line, in order to achieve management objectives, stakeholders (including Laois County Council) should commit to ensuring hedgerow management works carried out under their responsibility should conform to recognised, basic minimum standards.

3.1 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 hedge species found in County Laois. This information should be disseminated to interested parties.

4.1 Ensure all relevant staff (and any contractors used) have the necessary skills and data sources to implement or evaluate best practice hedgerow conservation.

4.2 Provide appropriate training for staff in aspects of hedgerow conservation relevant to their position.

4.3 A number of showcase sites of best practice covering different aspects of conservation and management should be developed around County Laois.

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

5.5 Techniques should be investigated for the re-location of mature hedgerows as part of a thoroughly researched and costed project. Laois County Council could be proactive in initiating and implementing such a project.

2. 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"

The importance of hedgerows to County Laois is recognised in the Laois Heritage Plan 2002-2006, which contains a number of actions relevant to hedgerow conservation.

Objective 8: To Maintain and enhance the landscape quality of County Laois

8.1 Carry out landscape character assessment of County Laois.

8.2 Parish Natural Heritage Survey to collect baseline information on habitats.

8.5 Seminar for Tidy Towns re incorporating wildlife.

8.10 Promote awareness of SACs, SPAs NHAs and importance of biodiversity.

8.11 Promote the concept of conservation plans.

8.15 Audit of County Council property and the heritage responsibility of same.

Objective 9: To Recognise and Value Hedges and Verges as an Integral Part of the Landscape.

9.1 Provide training for hedge cutters and contractors.

9.2 Provide training for farmers.

9.3 Replant native / local species as part of road widening projects.

9.4 Maintain or replace hedges / walls where possible as part of new development.

9.5 Promote the Golden Mile competition.

9.6 Carry out a hedgerow survey in County Laois.

9.7 Advertise in local papers and radio in autumn to start hedge cutting 1/9 and be finished by 1/3.

9.8 Pilot areas of hedge laying.

9.9 Set best practice examples of hedge management.

11.1 Establish what materials crafts and skills were traditional and examine mechanisms to preserve same.

This survey fulfils Action 9.6 of the Plan, as well as providing essential background information which will be useful to a number of other actions.

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

This information can then be used to further the objectives of the Laois Heritage Plan to promote and strengthen positive hedgerow management and conservation in the county.

3. Background

3.1 The History of Hedgerows in Co. Laois

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.

It was the Normans who introduced the concept of land ownership. As they spread throughout Ireland during the thirteenth century, 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. They were bounded by banks or ditches, which 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 estate system also emerged in the seventeenth century, resulting in major agrarian landscape change and the associated establishment of fields in the more prosperous agricultural regions of Ireland including Laois (Aalen et el. 1997).

Current townland boundaries were regularised by the first Ordnance Survey carried out in Laois in 1838/39, although there is evidence that some hedged boundaries shown as townland boundaries in the survey around the Great Heath, near to Portlaoise, may be of less antiquity and were related to further enclosure of the Heath just prior to that period (Jackie Hyland, personal communication).

There have been two main periods of enclosure in Laois. The first during the Tudor Period (1460-1600) was associated with the Plantation of Queen's County (In 1557 an Act of Parliament was passed to set up King's and Queen's Counties). According to Feehan (1983) resulting hedges tend to have an interesting mix of species, and often contain a lot of hazel".

Following on from the earlier plantation, 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.

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 need for young plants to establish new hedgerows resulted in the development of nurseries to meet demand. Feehan (1983) refers to 3 small nurseries on the lands of Ballyfin, another near Clonsna, and three relatively large ones at Mountmellick. Two year old quicks (young hedging plants, usually whitethorn) were bought at 4 shillings for one thousand in 1801 (Coote, 1801b).

The noted French cartographer, Bernard Scalé, travelling in Laois in 1776 commented that farms were in general well enclosed with quickset hedges, though dry fencing" was more common around Ballacolla. He also commented on the frequency of well grown ash.

Arthur Young travelling between Naas and Roscrea (mostly in Laois) in the 1770s commented favourably on the condition of the hedges. In particular on the road from Mountrath to Gloster (King's County), he observed, it is all well inclosed, with fine hedges. I could have imagined myself in a very pleasing part of England."

The push for enclosure was supported by awarding prizes at Agricultural Shows. At the Show in Durrow in 1801 there was a prize £5 13s 9d for the farmer not occupying more than 50 acres who shall plant with timber trees and whitethorn quicks, the greatest number of perches of ditching not less than 5 feet wide and 4 feet deep" (Queens County Agricultural Show Catalogue, 1801). In these environmentally enlightened times a contemporary award might be a nice idea.

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. An example, taken from the Stradbally Assizes is reproduced in John Feehan's book on Laois (1983).

In 1801 Sir Charles Coote produced his Statistical Survey of Queen's County. Numerous references are made to the condition and management of inclosures".

A Barony by Barony account is given below. Figure 3.1.1 shows the Baronies of County Laois.

<u>Barony of Cullenagh</u>
Fences are very bad, and naturally so from the loose sandy soil."
Near to Abbeyleix – quickset hedges are, with difficulty, brought to perfection here." Other parts of the barony have no such excuse but their fences are so poor, though they have a strong and favourable soil to the growth of thorn."
The hedgerows throughout are suffered to grow wild, and not at all trimmed, except …. adjoining the houses of gentry, where they are neatly plashed and dressed."

<u>Barony of Upper Ossory</u>
The fences in Clarmallagh are pretty good, and thorn is favoured to the soil. Mr Despard, of Donore, dresses his hedgerows extremely neat, with saddle copings. In Clondonagh, they are far less exact, and the whitethorn grows without any trimming."

<u>Barony of Maryborough</u>
Fences are very good, of whitethorn."

<u>Barony of Ballyadams</u>
A few ditches are well quicked, the rest have very indifferent fences."

<u>Barony of Portnahinch</u>
A good many thorn fences, well kept."

Barony of Tenehinch
Fences are loose ditches, and little thorn, all slovenly and ill constructed, without any judgement, thrown up so loose and wet, that every rain is sure to destroy them."

Barony of Stradbally
Hedges were plash'd and trimmed very neatly, besides laid and bound down carefully with rods and twigs"

Barony of Slewmargy
Fences excellent and favourable to thorn, but not much pains taken with them; they decay below from the luxuriance of their tops, which are never dressed."

Coote also describes the technique of laying or plashing.
When hedges of whitethorn get up strong, and are not thickly planted, tis usual to nick the grossest shoots with an implement termed a bill hook, from its formation; it is a curved hatchet, very well fitted to the hand for laying fences. There shoots are laid lengthways; before spring, or in autumn, is the best season for laying, and this fence becomes inaccessible to cattle; after laying, they scour up the dyke, throwing a part of the mud on the branches, which helps to bend it, and to force its vegetation."

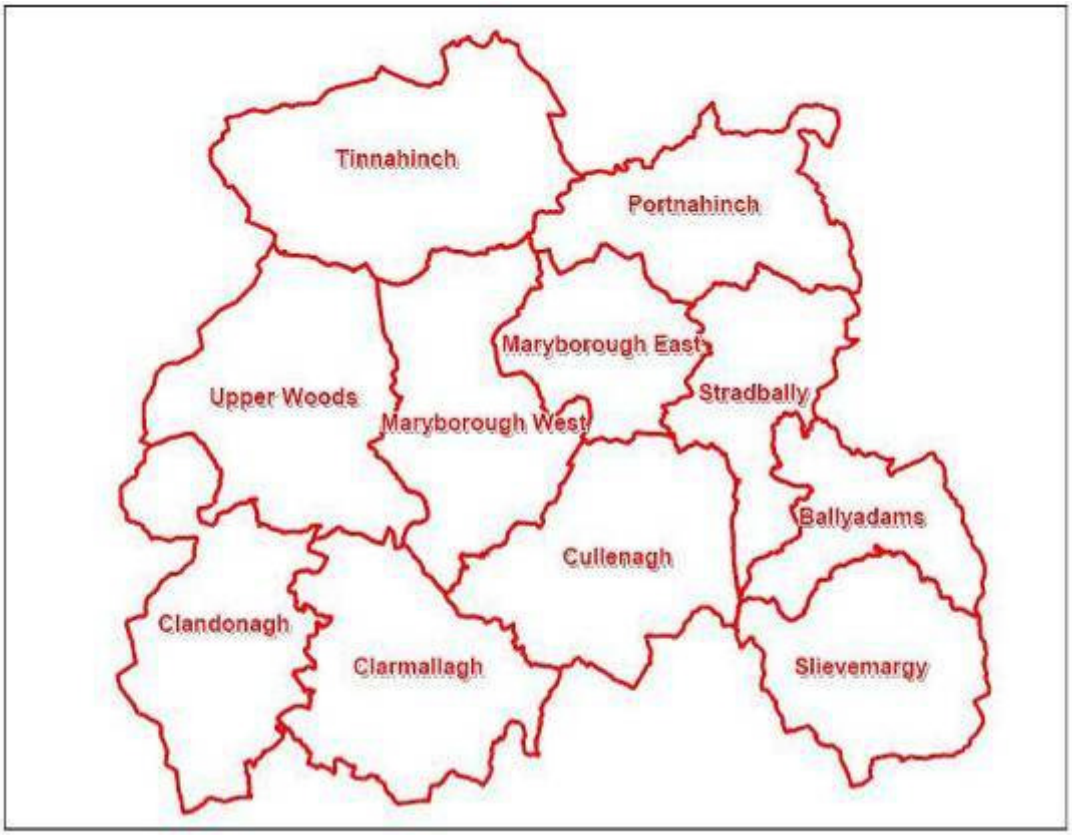

Figure 3.1.1 Map showing the Baronies of County Laois

Other hedgerows in the county may owe their origin to other transport routes. The development of the Grand Canal between 1753 and 1830, and the building of Railways (1847-1860s), would also have involved the planting of many miles of hedgerow.

Anecdotal evidence from landowners spoken to during the survey suggests that during the Second World War (the emergency") men would travel the countryside cutting (coppicing) hedges and

hedgerow trees. They were paid for their labours by taking the cut timber from the hedge to sell for firewood.

Intensification of farming and the development of larger machinery resulted in hedgerow removal on many farms particularly during the 1960s and '70s. The absence of any 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 series 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.

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.

3.2 The value of hedgerows for County Laois

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 Laois was 13,225 km (3.5% of the national total). This is a huge asset to the county and the country.

Landscape
Perhaps more than any other landscape element, hedgerows, along with stonewalls, endow the countryside with a distinctive and attractive appearance. In particular, regional and local variation in hedgerows contributes significantly to the distinctiveness of Laois's landscape character. They make up the familiar setting that is so central to cultural heritage & tourism, and 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 an essential wildlife habitat in the modern countryside, especially in the light of the low percentage native woodland cover in County Laois (and Ireland as a whole). Hedgerows may be the only significant wildlife habitat on many farms. They 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 vital to the conservation of much of our native flora and fauna, especially in parts of the county where intensive 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, but even a relatively poor hedge may be important in an otherwise very intensive agricultural landscape.

Hedgerows act as wildlife corridors in the Laois landscape

Water Quality

Hedges contribute a great deal to 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. Survey Rationale and Objectives

4.1 The need for a Hedgerow Survey in County Laois

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 Laois.

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 used was different to the current survey. Results from a hedgerow survey carried out in County Roscommon (Foulkes and Murray, 2004) showed a huge discrepancy in the extent figures between its results and the Badger and Habitats data. For the record, the estimated length of the hedgerow network in Co. Laois based on Smal's survey was 13,225 km. Assuming an average hedgerow width of 2m; this would represent an area of almost 25 km², which is approximately 1.5% of the area of the county. This is clearly a substantial cultural, agricultural, and environmental resource which deserves to be better understood.

In the early 1980s John Feehan initiated attempts to carry out a survey of hedgerows in the County, but no formal reports were published. As part of Feehan's initiative, Peter Walsh-Kemmis carried out individual surveys of 64 hedgerows in seven townlands in an area east of Stradbally in 1980. The results from the Walsh-Kemmis surveys have been incorporated into a Microsoft Excel data file and included for reference in the electronic information package that accompanies this report. The methodology and sample base for the Walsh-Kemmis study does not allow for a meaningful comparison of the results with the results from current survey.

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

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.
- With repeat surveys this will be a useful tool in monitoring environmental change.
- By assessing the results in light of current conservation best practice it is possible to identify current and potential future threats facing the resource.
- The survey identifies plant life local to the county, and looks at the different floristic types of hedges across Co. Laois.
- Comparisons can be drawn between hedgerows under different management regimes.
- Detailed information from this survey can complement data collected as part of other habitat related studies, e.g. the Badger and Habitats Survey of Ireland, the Countryside Bird Survey, ongoing Habitat and Eskers surveys in Co. Laois.
- When viewed alongside other surveys based on the same methodology, it puts the Counties hedgerow resource in its national context.

- Provides valuable baseline data which will be essential in planning and implementing a future Biodiversity Action Plan for County Laois

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

The Hedgerow Survey is necessary for the full implementation of the Laois Heritage Plan (2002-2006) and, in the future, for the County Biodiversity Plan.

4.2 Aims and Objectives of the County Laois Hedgerow Survey

- To estimate the extent of hedgerows in County Laois based on extrapolating data from a known sample area.
- To establish the species composition of the county's hedges and classify groups of different hedge types.
- To examine the general environmental and historical context of hedgerows in County Laois.
- To record the general construction types of hedgerows in the county.
- To record the structure and condition of hedgerows in the county based on a sample study.
- To assess the data collected and produce recommendations that will promote the future conservation of the resource.

4.3 Legislation & 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) 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)
  - (EU) 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) & 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.

- *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."

Under Integrating Biodiversity into Sectors", Action 10 states that: Each Local Authority to prepare a Local Biodiversity Plan in consultation with relevant stakeholders."

- National Heritage Plan (2002)
- The Roads Act, (1993)
- Planning and Development Act, (2000)
- Electricity Supply Act, (1927)
- Communications Regulations Act, (2002)
- The Forestry Act, (1946)
- Sustainable Rural Housing Guidelines (2005)

5. Methodology and Field Survey

The initial methodology developed for county wide hedgerow surveys in Ireland was produced by Murray (2003). This methodology was refined during the course of hedgerow surveys carried out in Counties Westmeath and Roscommon by the authors of this report during 2004, (Foulkes and Murray, 2005b, 2005c). The initial methodology and any adaptations made during the field surveys were thoroughly reviewed and a new paper, A Methodology for the recording of hedgerow extent, species composition, structure, and condition in Ireland" (Foulkes and Murray, 2005) was produced in spring 2005. The County Laois 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 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 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 will allow for some joint assessment of these data sets in the future.

Samples areas are 1 km square, with the exception of two part squares which fall on the County boundary (in which case only the area in County Laois was surveyed). A total of 19 samples (17 full and two part) were selected in this way. The sample area is approximately 1% of the total area of the County. The grid references and townland details for each survey square in Laois are listed in Appendix 12.1.

Within each sample square a maximum of 10 hedges were selected for detailed study using randomly generated points on a transparent overlay. The points on the overlay were selected at random using a random number generator and an appropriately scaled, numbered grid marked by subdividing the square, and then matching the randomly chosen numbers with points on this grid. The overlay was then placed on top of the aerial photographs 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 175 metres) 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.

5.3 Maps and Aerial Photographs

Discovery Series Ordnance Survey maps (scale 1: 50,000) were used to physically locate the sample squares. Vector maps (regularly updated), aerial photographs (taken in 2000), and second series Ordnance Survey maps from the early 1900s, all at an approximate scale of 1:6000 with the 1km square outline overlaid were supplied by the GIS Department of Laois 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 series Ordnance Survey maps were used mainly for the identification of townland boundaries.

5.4 Period of Fieldwork and Fieldworkers

Fieldwork commenced on 12th April 2005 and was concluded by 8th July 2005. The authors of this report were assisted in the recording of data by two fieldworkers, Niamh Ní Bhroin and Gloria Carter. The fieldwork was carried out by teams of two, with one of the authors working alongside one of the fieldworkers.

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 surveyors, efforts were made to secure permission for access from the landowner.
Fieldworkers were furnished with a letter from the Laois Heritage Officer explaining the purpose of the survey and requesting the co-operation of landowners. 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 with just one exception. In this case allowing access was not considered safe by the landowner due to a dangerous bull. In a number of cases landowners provided useful additional information to the surveyors. Their co-operation and assistance was much appreciated.

All fieldworkers had full public liability insurance cover for their 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 by the authors, was used to record the characteristics of each hedge and its associated features (see Appendix 12.5)

Recordings were made in 24 categories, grouped under the following headings: context, construction, structure/condition, and management. Each category field has a corresponding code that is entered in to the appropriate box on the data recording grid.

Context
Each hedge is placed in the context of the type of farm in which it is located, 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), 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
This 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 30 metre 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 30 metre strip is a generally accepted as an adequately representative sample size for recording woody species in a hedge. By recording woody species along a standardised length, 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. This 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).

Where other species were present in the hedge but did not fall within either sample strip, species were recorded as present separately from the sample strips.

The presence of Ivy *(Hedera helix)* at canopy level, and brambles (*Rubus fruticosus agg.)* were recorded according to the Domin scale. The presence or absence of the following species was also noted.

Common Name	Latin Name
Wild Rose	*Rosa spp*
Honeysuckle	*Lonicera periclymenum*
Clematis	*Clematis vitalba*
Bindweed	*Calystegia sepium, Convolvulus arvensis*
Blackcurrant	*Ribes nigrum*
Gooseberry	*Ribes uva-crispa*
Bilberry	*Vaccinium myrtillus*
Raspberry	*Rubus idaeus*

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 samples

For the purposes of this survey the extent of hedgerows within a sample square was 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. 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 in hedges a green line was used to mark the gap section. This was done 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 about specific hedges.

5.10 Photography

A Nikon Coolpix 3700 digital camera was used to document some of the 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 data file for subsequent analysis, with the exception of the Target Notes which were recorded in a Microsoft Word file and, where applicable, cross-referenced to the data file. The information recorded for extent purposes was digitised into the Laois Council GIS System. The position of each of the sample hedges was also tagged and referenced to the information contained in the data file.

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

6. Data Analysis

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

6.1 Floristic Classification of hedge types

A process called numerical classification was carried out on the floristic data. The classification finds groups of samples (hedges) that equate to distinct hedge types based on their floristic composition. A TWINSPAN (Two Way INdicator SPecies ANalysis) classification was carried out using the software 'PC Ord' (McCune and Mefford, 1999). In order to make a more meaningful distinction of hedges types across the region, data for County Laois was combined with the data from an equivalent and simultaneous study in County Offaly.

The data set used for the classification consisted of an average recording from the two 30 metre strips for each hedge (see section 5.2), meaning that all species recorded from both 30 metre strips along the hedge were averaged to produce one set of percentage cover figures for each hedge. Averages were calculated by averaging the midpoint of the Domin category of each of the two sample strips.

Species that occurred in less than 2 % of samples were not included in the classification process. Pseudo-species cut levels were set manually.

The output of this analysis is a 'two way ordered table', which breaks up all the samples (hedges) according to their floristic composition, based on the frequency of certain 'indicator species'. The groups are subjectively pulled out from the table by the user according to ecological understanding and indicator values. The classification process was considered a success, as seven distinct and ecologically meaningful hedge types were drawn out from the table. These groups are presented and discussed in section 7.3.

Both the floristic and structural characteristics of hedges in each group were fully examined using basic statistical procedures such as means (species numbers), frequency, and mode. These are presented in section 7.2.

6.2 Statistical analyses

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 7.2 to 7.8.

7. Results

The results from the sample survey are presented in this section, with comments on the significance of the data discussed further 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 Extent of Hedgerows in County Laois

Table 7.1.1 shows the extent of hedgerows and remnant hedgerows in the individual sample squares of County Laois. The total area surveyed was 18.22 km² which is approximately 1% of the total area of the county.

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

OS Grid Reference	Square Reference	Nearest Town/Village	Area km²	Hedgerow Length (km)	Remnant Length (km)	Density (excluding remnant) (km/km²)
N 30 10	LS01	Clonaslee	1	4.04	0.00	4.04
N 40 10	LS02	Rosenallis	1	6.76	0.12	6.76
N 50 10	LS03	Portarlington	1	0.00	0.00	0.00
N 60 10	LS04	Monasterevin	0.32	2.80	0.00	8.75
N 30 00	LS05	Slieve Bloom	1	1.67	0.03	1.67
N 40 00	LS06	Ballyfin	1	10.50	0.00	10.50
N 50 00	LS07	Portlaoise/Ballydavis	1	10.54	0.07	10.54
N 60 00	LS08	Vicarstown	1	11.22	0.00	11.22
S 20 90	LS09	Borris in Ossory	1	7.30	0.56	7.30
S 30 90	LS10	Pike Of Rush Hall	1	3.36	0.00	3.36
S 40 90	LS11	Kilbricken/Cromoge	1	7.14	0.06	7.14
S 50 90	LS12	Ballyroan/Timahoe	1	8.92	0.00	8.92
S 60 90	LS13	Stradbally	1	9.40	0.00	9.40
S 20 80	LS14	Errill	1	5.11	0.43	5.11
S 30 80	LS15	Rathdowney	1	8.85	0.67	8.85
S 40 80	LS16	Ballacolla	1	9.76	0.00	9.76
S 50 80	LS17	Ballinakill	0.90	6.40	0.29	7.11
S 60 80	LS18	Newtown	1	10.31	0.07	10.31
S 70 80	LS19	Ballickmoyler	1	7.58	0.00	7.58

Assuming the squares surveyed to be a representative sample of the county as a whole it can be estimated that County Laois has a hedgerow length of 12,427 km.

The corresponding figures for remnant hedgerows would give an estimated length of remnant hedgerow of just 217 km.

The figure of 217 km for remnant hedgerow is 1.7% of the total of hedgerow and remnant hedgerow length. This compares with the results of the more detailed survey of hedges within each sample, which found that 3.1% of sample hedgerows recorded were remnant.

The length of hedgerows in the sample squares varies from 0 in the part square (LS03) near to Portarlington, and 1.67 kilometres per square kilometre (km/km²) in LS05 in the Slieve Blooms up to 11.22km/km² in square LS08 (Vicarstown). 11.22km/km² is below the highest figure recorded in an individual 1 km² in any of the previous specific Irish hedgerow surveys, which is 15.28km/km² in a square near to Clonbullogue, in County Offaly.

The average figure for hedgerow density in Laois is 7.28 km per km². This is substantially higher than the average figures for the other county surveys which 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	Average Density (km/km²)	Standard Deviation
Laois	2005	7.28	3.15
Offaly	2005	5.81	4.32
Roscommon	2004	5.43	4.75
Westmeath	2004	5.82	3.28

Figure 7.1.1 illustrates the distribution of hedgerow density throughout the sample. It can be seen that half of the sample squares have a hedgerow density in excess of 8.5 km/km². There is a further group of squares which have densities between 6.75 and 7.75 km/km². The remaining five squares which have the lowest density of hedgerows have an impact on reducing the average density figure.

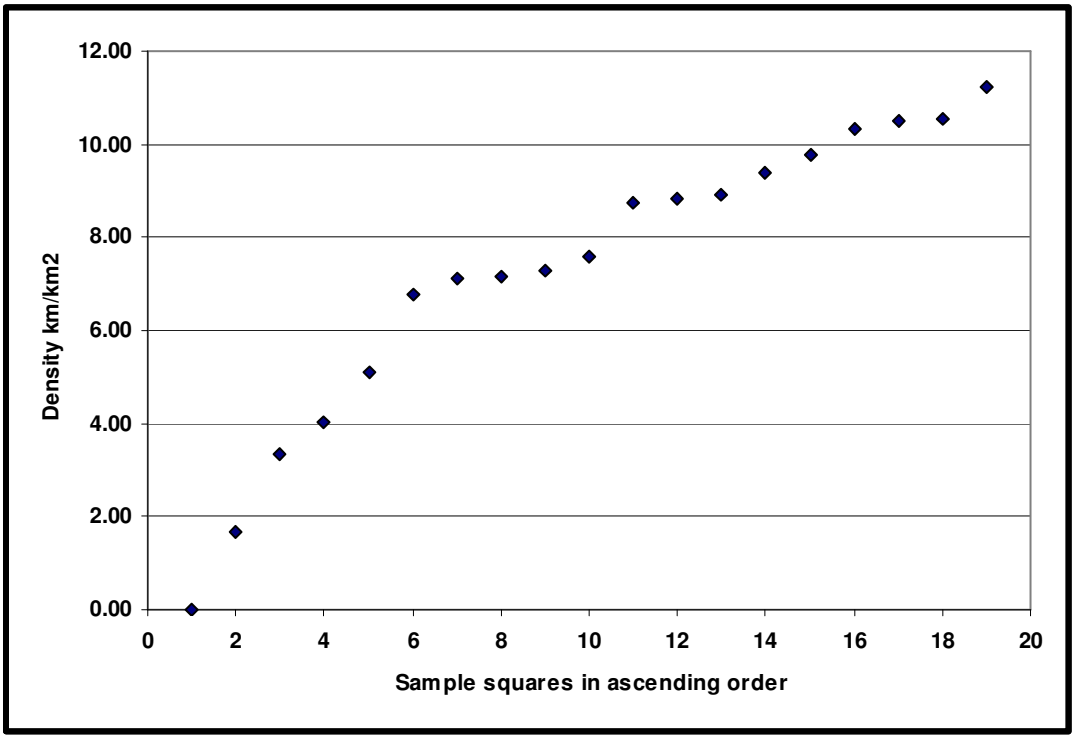

Figure 7.1.1 Distribution of hedgerow density per km² in sample squares

Potential Error in Extent Values

Recording Error

Recording non hedgerows as hedgerows
Close inspection of every hedge within each 1 km 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 certain 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.

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, and overall any potential error would be deemed to be insignificant.

Non detection of new hedges
Young hedges that would not be included on old OS Maps and that would be 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.

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 estimation of hedgerow length in County Laois based on the definitions and results of the Badger and Habitats Survey of Ireland was 13,225 km.

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 12 and 16 years as the Badger and Habitats Survey was conducted during the period 1989-1993).

Our results would imply that there has been a loss of 797 km of hedgerows throughout County Laois in the period between the two surveys. This figure is 6% of the original estimate figure.

Comparing the current surveys with the Badger and Habitat survey results from Westmeath and Offaly indicated hedgerow loss at rates of 1.1% and 3.8% respectively in a similar period.

It is important to note that the discrepancy between the figures produced in a comparative survey in County Roscommon (Foulkes and Murray, 2005b) (where hedgerow length appears to have almost doubled in the intervening time) would suggest that any direct comparison between the two surveys should be treated with caution until the sources for the discrepancy can be deduced.

7.2 Species Composition of hedgerows in County Laois

The species composition of hedgerows is individually examined in respect of the shrub layer and the tree layer. Making a meaningful record and examination of ground flora was outside the scope of this survey.

SHRUB LAYER

Shrub species occurring in the hedge layer
Hawthorn and Blackthorn are the most frequently occurring hedge shrubs and have the highest percentage cover in Laois hedges. Also, Holly was found in more than half of Laois hedges surveyed, while it was found at rates between 20% and 33% in the other counties surveyed. While Elder is found in a high proportion of hedges surveyed, it has a relatively low level of abundance. Gorse, while occurring less frequently than Willow, tends to be more abundant in those hedges in which it occurs. Gorse is found at similar levels in Roscommon, a lot more frequently than in Offaly and Westmeath.

Hazel is much more common in Laois and Offaly (33%) hedges compared to Roscommon and Westmeath where it was present in 7% and 10% of hedges respectively. Elm, Wild Plum, and Crab Apple are all found at relatively high levels in Laois. Elm occurs twice as frequently in the Laois sample compared to Offaly which has the second highest frequency of occurrence of the four counties surveyed. Crab Apple is five times more frequently occurring in Laois and Offaly compared to Roscommon and Westmeath. On the other hand, Spindle was found less than half as frequently in Laois than it was in Offaly. Guelder Rose too was more frequently found in Offaly hedges than in Laois, but it is still more common here than in Roscommon or Westmeath. 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.

Table 7.2.1 Frequency of species occurrence and mean abundance in Laois Hedges

Woody Species *(*denotes non-native species)*	Frequency of occurrence (%)	Mean Domin abundance level
Hawthorn*(Crataegus monogyna)*	98	7 (34–50%cover)
Blackthorn (*Prunus spinosa)*	72	5 (11-25% cover)
Holly (*Ilex aquifolium)*	52	5 (11-25% cover)
Elder (*Sambucus nigra)*	40	4 (4-10% cover)
*Privet (*Ligustrum vulgare*)	34	5 (11-25% cover)
Willow (*Salix* species)	30	5 (11-25% cover)
Gorse (*Ulex europaeus)*	28	5 (11-25% cover)
Hazel (*Corylus avellana)*	25	5 (11-25% cover)
Elm (*Ulmus spp)*	18	5 (11-25% cover)
Wild Plum (*Prunus domestica*)	16	4 (4- 10% cover)
Ash *(Fraxinus excelsior)*	14	4 (4- 10% cover)
*Sycamore (*Acer pseudoplatanus*)	14	4 (4- 10% cover)
Spindle *(Euonymus europaeus)*	11	4 (4- 10% cover)
Crab Apple *(Malus sylvestris)*	10	4 (4- 10% cover)
Wild Cherry (*Prunus avium)*	7	4 (4- 10% cover)
Guelder Rose (*Viburnum opulus*)	6	4 (4- 10% cover)
*Beech (*Fagus sylvatica)*	6	3 (< 4% cover)
Rowan (*Sorbus aucuparia)*	5	3 (< 4% cover)
Birch (*Betula spp.)*	4	3 (< 4% cover)
Alder *(Alnus glutinosa)*	3	4 (4- 10% cover)
*Snowberry (*Symphoricarpos albus)*	2	7 (34-50% cover)
Oak (*Quercus spp.)*	1.2	4 (4- 10% cover)
*Lilac *(Syringa vulgaris*)	1.2	6 (26-33% cover)
*Hemlock (*Conium maculatum)*	1.2	3 (< 4% cover)
Aspen (*Populus tremula*)	0.6	5 (11-25% cover)
*Horse chestnut (*Aesculus hippocastanum)*	0.6	3 (< 4% cover)
Bird cherry (*Prunus padus)*	0.6	4 (4- 10% cover)
Yew (*Taxus baccata)*	0.6	3 (< 4% cover)
Mock Orange *(Philadelphus coronarius)*	0.6	4 (4- 10% cover)
Spruce *(Picea spp)*	0.6	8 (51-75% cover)
Dwarf Box *(Lonicera nitida)*	0.6	3 (< 4% cover)

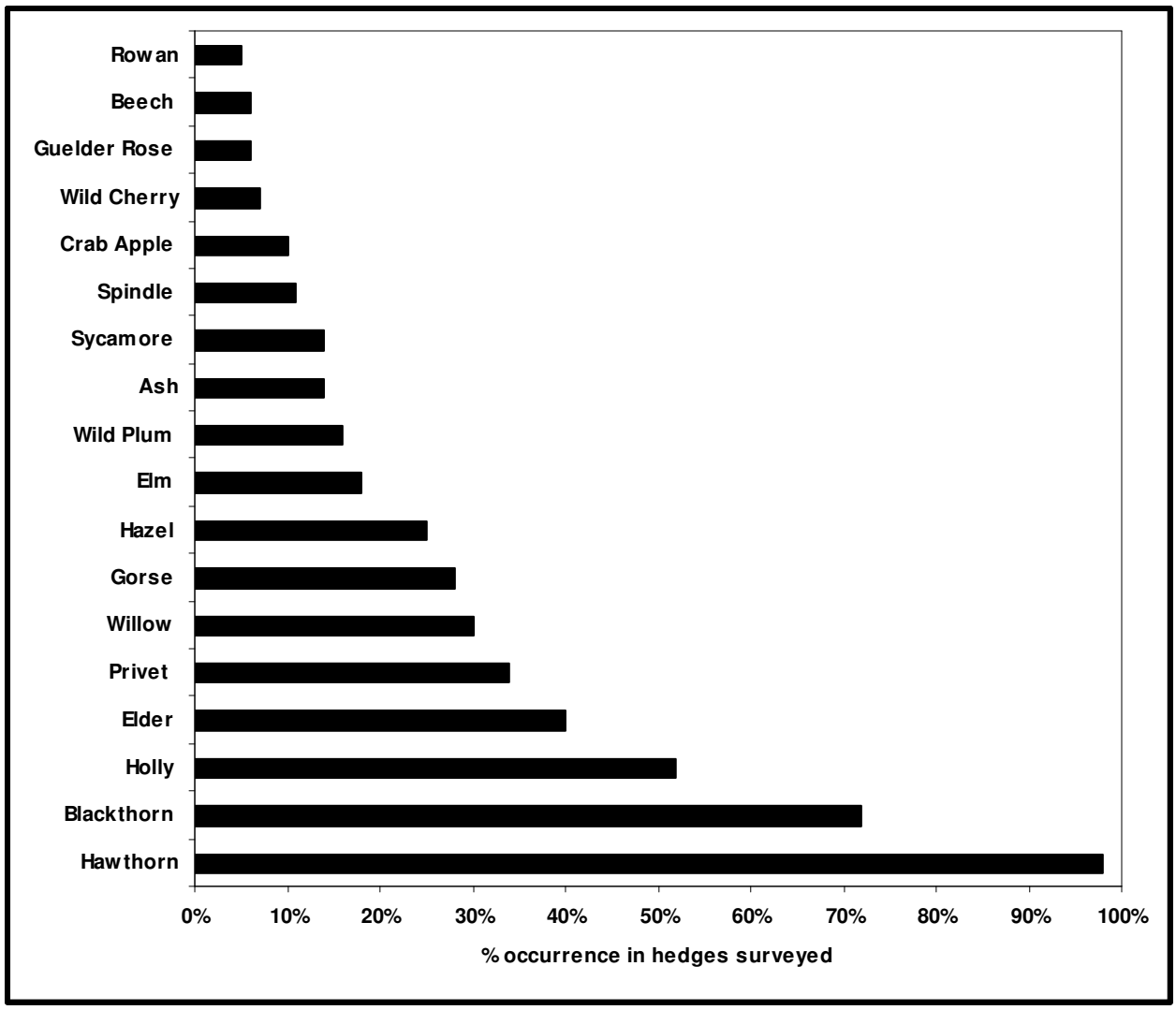

Figure 7.2.1 Frequency of occurrence of main shrub species in sampled hedges in Laois

Woody Climbers

Bramble (*Rubus fruticosus)* was recorded as being present in a total of 97% of Laois hedges surveyed. Wild Roses (*Rosa* species) were recorded in 77%, and Honeysuckle (*Lonicera periclymenum*) in 53% of Laois hedges. Offaly was found to have a greater occurrence of Wild Roses in their hedges (85%), but a lower occurrence of Honeysuckle (33%).
Recordings of woody climbers are presented in Table 7.2.2 below.

Table 7.2.2 Frequency of woody climber species occurrence in sampled hedges

Woody climber	**Frequency of occurrence (%)**
Bramble	97
Wild Rose	77
Honeysuckle	53
Clematis	1
Bindweed	1
Blackcurrant	1
Gooseberry	1
Bilberry	1
Raspberry	2

Hedge Species Richness

Species richness in this survey is the number of shrub species found in a 30 metre sample strip of a hedge. As two sample strips were recorded for each hedge, the average number of species from the two strips is the most representative figure of species richness for each sampled hedge.

There are no defined criteria for what is considered to be a species rich hedge in Ireland. In the absence of a standard, we have based our 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. 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 (1997) are included for the calculation of native species richness.

Species Richness Figures

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

30m sample strip containing nine species

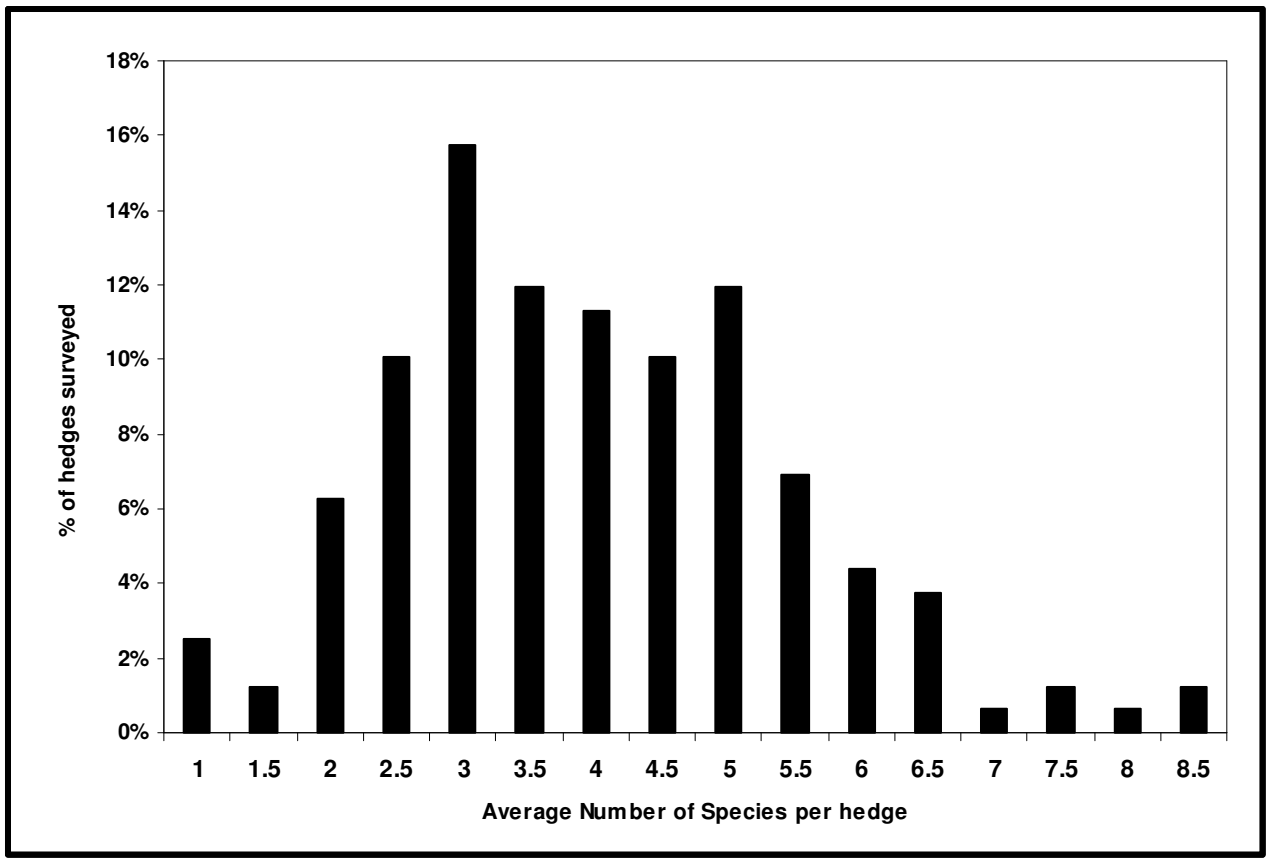

Figure 7.2.2 Percentage breakdown of (average) species numbers in hedges (all species)

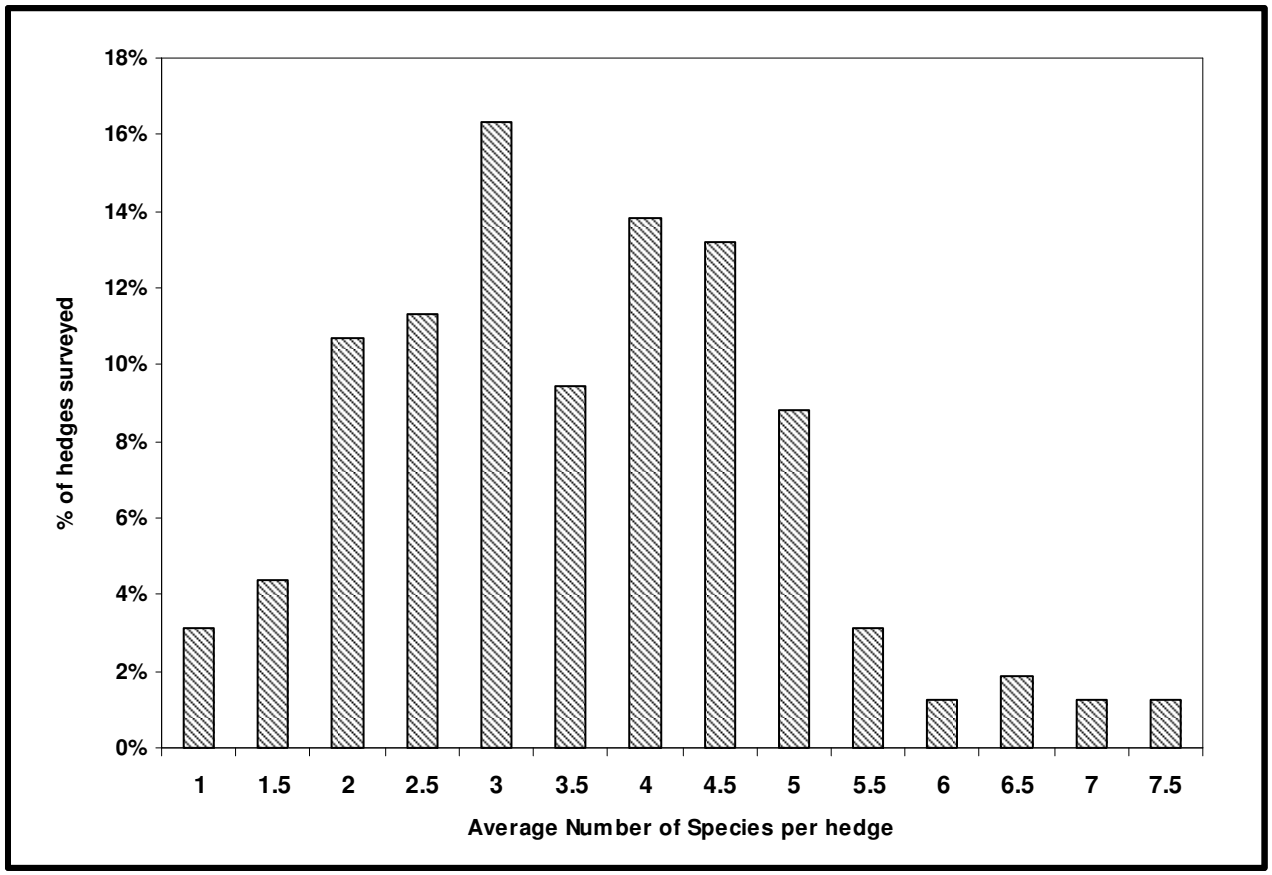

Figure 7.2.3 Percentage breakdown of (average) native species numbers in hedges

It is interesting to look at species richness results from different perspectives. Table 7.2.3 shows an analysis of the species richness figures for the sampled 30m strips in Laois and Offaly.

Table 7.2.3 Analysis of Species Richness figures in 30m sample strips in Laois and Offaly

Species Richness criteria in 30m sample strips	**% of sample in County Laois**	**% of sample in County Offaly**
4 or more native species in at least 1 strip	59.1	56.9
4 or more (all) species in at least 1 strip	69.2	69.2
an average of 4 or more (all) species	52.2	49.2
an average of 4 or more native species	44.7	31.5
a combined total of 4 or more native species in the two 30m strips	66.0	66.9

These results indicate the variability in the species composition of individual hedgerows. They also indicate that the Laois hedges are more consistently species rich along their length, particularly in terms of native species. Offaly hedges are a little more sporadic in their composition.
The results also show that in many hedges the species are not necessarily the same species in the two strips (especially in Offaly), which suggests that the hedges are even more diverse than the general species diversity figures might portray.

98 separate recordings were made in 159 hedges of species that were present in sample hedges but were not noted within the two 30m strips.

The average species richness for all hedges recorded in the four County hedgerow surveys is shown in Table 7.2.4.

Table 7.2.4 Comparison of species richness statistics in Midlands Counties

	Mean Species Richness (All)	**Standard Deviation**	**Mean Species Richness (Native)**	**Mean Total of 2 x 30m strips (All)**	**Mean Total of 2 x 30m strips (Native)**
Laois	4.00	1.5	3.56	5.10	4.45
Offaly	3.81	1.4	3.25	4.92	4.09
Roscommon	2.50	1.0	unavailable	unavailable	unavailable
Westmeath	2.80	1.1	unavailable	unavailable	unavailable

Relationship of individual species to overall species richness
The relationship between the presence of certain individual native species and the overall species richness of the hedge was examined. The overall average is the average species richness (all species) of all the hedges recorded in both counties. The mean species number is the average species richness of those hedges where the listed species recorded a Domin value in one or other of the two 30m strips for that hedge. The combined results for Laois and Offaly are shown in Table 7.2.5.

Table 7.2.5 Relationship between species occurrence and species richness (all species)

Hedges Containing	**Mean Species Number**
Overall average	*3.93*
Hawthorn	3.96
Elder	3.99
Blackthorn	4.28
Gorse	4.33
Elm	4.40
Holly	4.62
Willow	4.62
Crab Apple	4.74
Spindle	4.79
Hazel	4.90
Guelder Rose	5.30
Wild Cherry	5.41
Rowan	5.81

These figures from the two counties demonstrate that the presence of Guelder Rose, Wild Cherry or Rowan is a good potential indicator of species richness in a hedge. Rowan was only recorded in 5% of the hedges sampled, but all of them were species rich.

It would be expected that individual species would be more likely to occur in species rich hedges than the norm. Figure 7.2.4 shows the relationship between the occurrence of each of the major species in species rich hedges and their overall occurrence rate in County Laois.

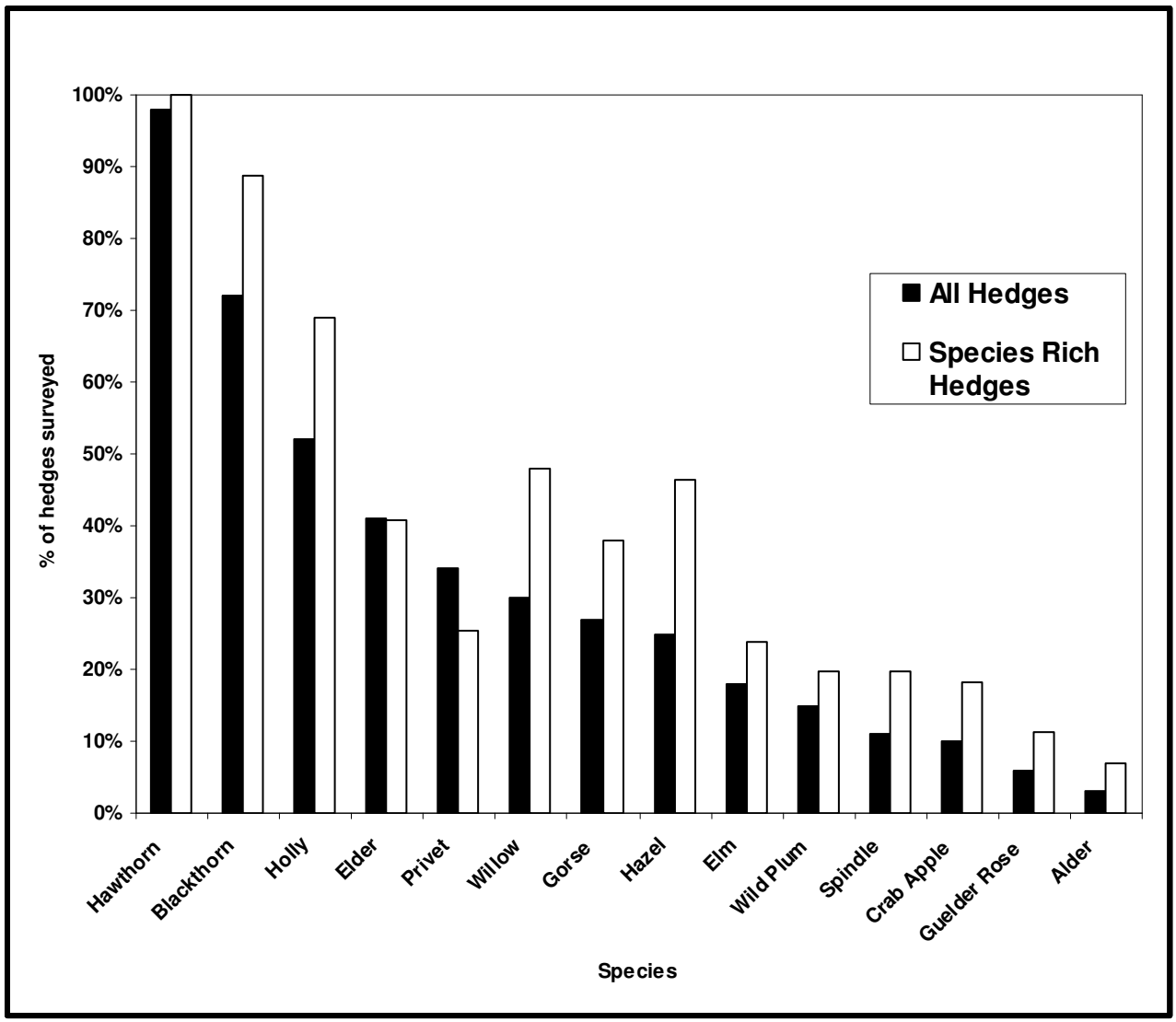

Figure 7.2.4 Relationship of individual species to overall species richness

Willow, Hazel, Spindle, Crab Apple, and Guelder Rose all occur substantially more frequently in species rich hedges than non-species rich hedges. Hazel in particular is interesting. While it occurs in 25% of all hedges, it is found in 46% of the species rich hedges. Conversely, Privet occurs less commonly in species rich hedges than the norm. Elder too is under represented in the species rich hedges compared with what would be expected given its frequency of occurrence in all hedges.

Townland Boundary and Roadside hedges

10% of all the randomly chosen hedges surveyed in Co. Laois were townland boundary hedges, and 13.8% were roadside hedges. Table 7.2.6 shows a comparison of the species richness of townland boundary hedges and roadside hedges with average species richness figures.

Table 7.2.6 Comparison of average species richness, townland boundary and roadside hedges

	Average Species Richness (All species)	**Average Species Richness (Native species)**
All hedges	4.0	3.56
Townland boundary hedges	4.53	4.06
Roadside hedges	4.73	3.84

The results confirm the findings in other counties, that roadside and townland boundary hedges are generally more species rich than non-townland and non-roadside hedges. Roadside hedges were found to be more species rich than townland boundary hedges when all species were taken into account. However, when just native species are considered, the townland boundaries are slightly more species rich.

Further substantiation of the species richness difference between roadside and non-roadside hedges is seen in the results of a previous survey undertaken in Knock, Co. Mayo (Condon and Jarvis, 1989) which showed the average species richness of roadside hedges in pre-1837 hedges to be 4.33 compared with 3.77 in non-roadside hedges. In post 1837 hedges the respective figures were 3.75 and 2.75.

These figures should be considered purely as a comparison between roadside and non-roadside hedges between the Condon and Jarvis survey and this survey. The difference in the actual values for species richness could be due as much to a different consideration of what species are counted between the two surveys (e.g. dog rose and bramble) as to a difference in species richness between the different areas.

Distribution of species rich hedges

An examination of the distribution of species rich hedges around Laois shows that, although species rich hedges can be found in all parts of the county, they tend to be more prevalent in certain areas rather than evenly distributed. It might be expected that species rich hedges would be found significantly less frequently in higher altitude areas, but this is not borne out by the results which show that 25% of all species rich hedges occur at altitudes of 150m or above. They are found at a similar frequency (40% of all higher altitude hedges are species rich) to the overall average of 45%.

These results would suggest that species richness is more likely to be a factor of soil type or other immediate environmental influence (for example their proximity to esker woodland) than historical factors. An illustration of the distribution of species rich hedges in County Laois is shown in Figure 7.2.5.

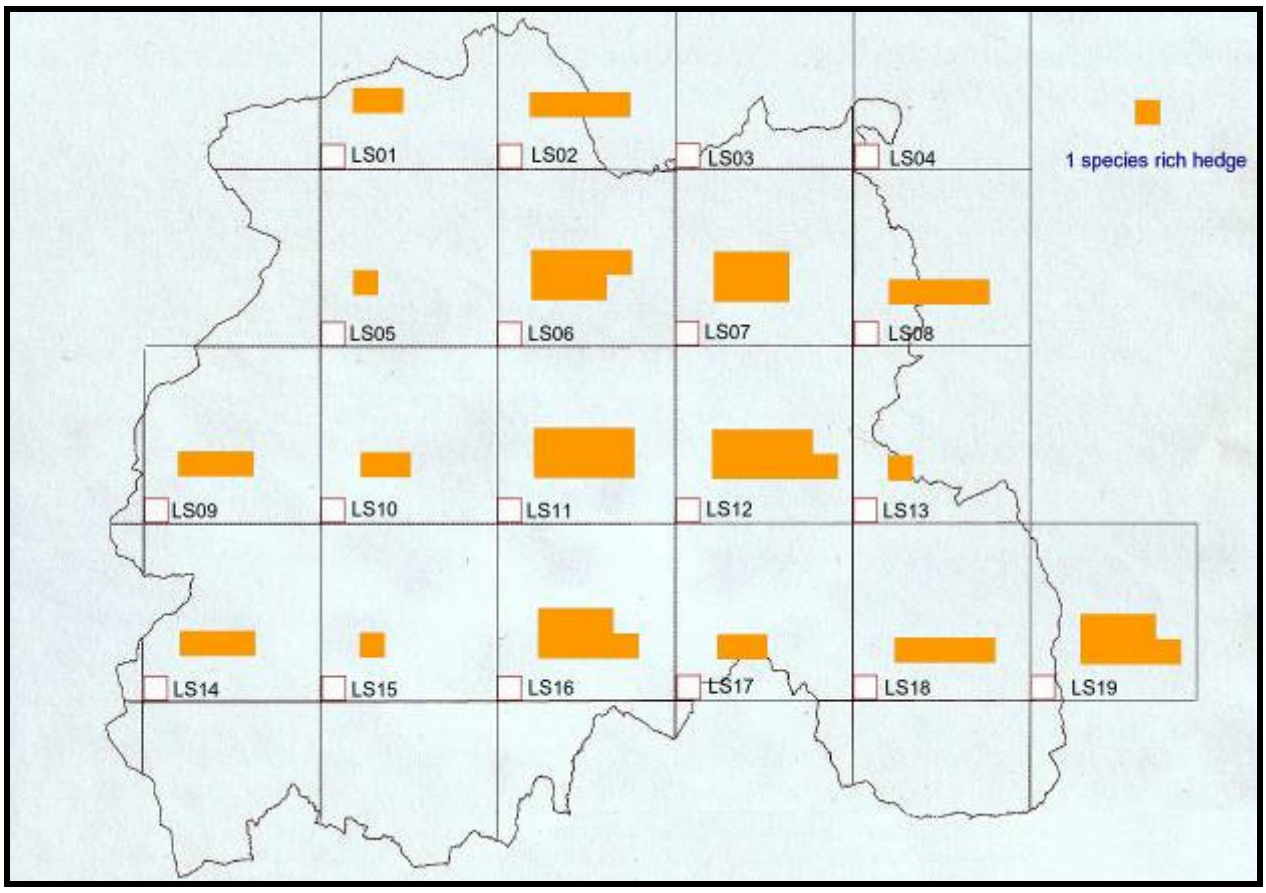

Figure 7.2.5 Distribution of Species Rich Hedges in Sample Squares

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. A total of 20 tree species were found in sampled hedges in Laois in this survey; 15 of these were native species. The most commonly occurring hedgerow tree in County Laois is by far the Ash *(Fraxinus excelsior)*, which is found in 47% of hedges (70% of hedges that contain trees). Two of the species in the top five based on frequency of occurrence are the non-natives Beech and Sycamore. Figure 7.2.6 shows the details.

Oak tree in roadside hedge near to Ballacolla

Tree Species Richness

50 % of the hedges where trees were recorded had just one tree species. 31% contained two tree species, 15% had three species, and a further 4% had four species.

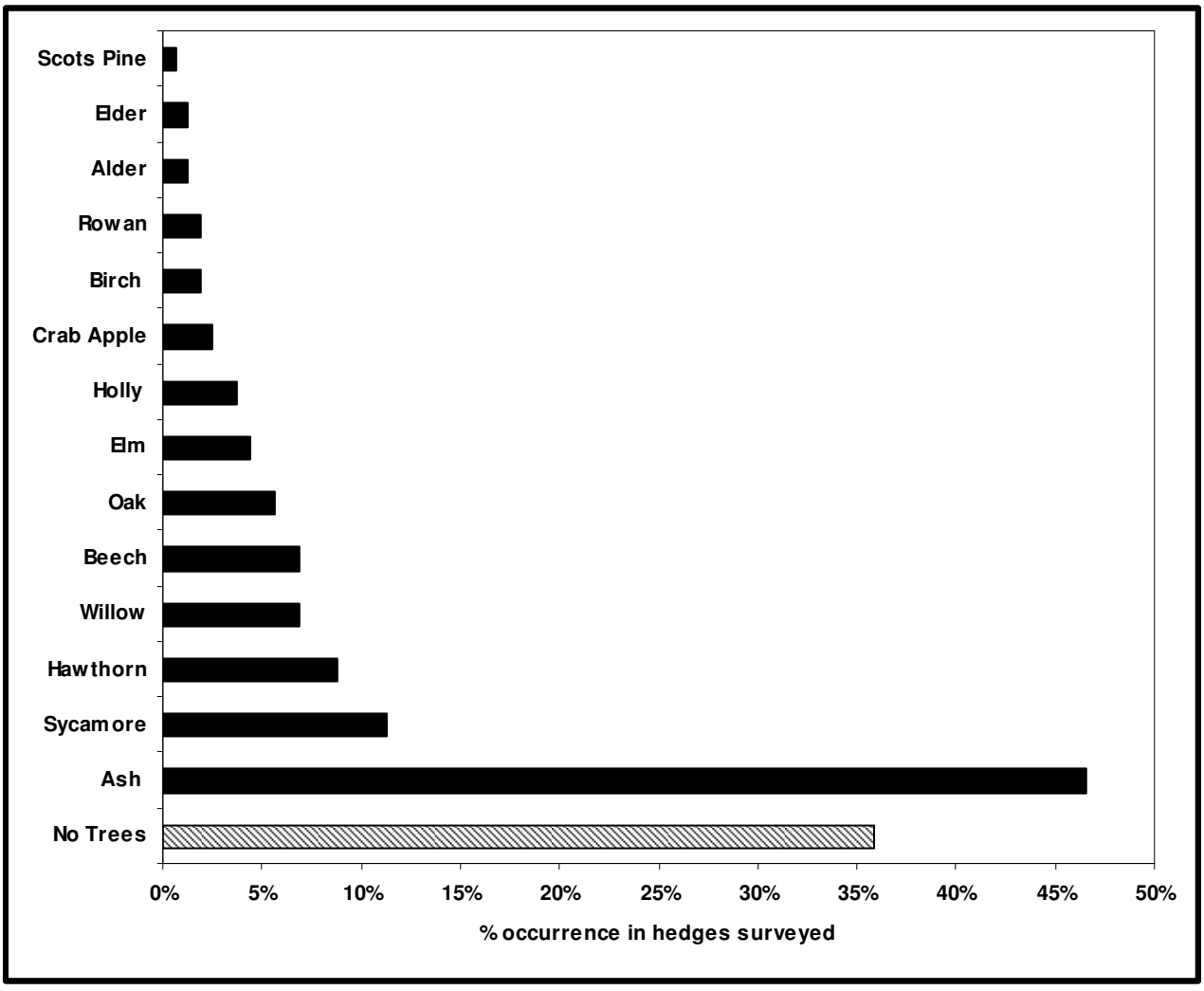

Figure 7.2.6 Frequency of tree species occurrence in sampled hedges in Laois

RARE SPECIES

Although it was not recorded in any of the Laois sample hedges, the wayfaring tree *(Viburnum lantana)*, shown below, was found in two separate hedges in the Ballacolla square (LS16). The tree, which in these instances was really just a bush because it was being managed as part of a trimmed hedge, is not native, but according to Webb (1977) is occasionally planted in hedges in the eastern half of the country.

Whitebeam *(Sorbus aria)* was found in one sample hedge in Rosenallis (LS02).

IVY

Ivy occurs frequently in Laois hedgerows. The specifications for the REP Scheme permit the control of ivy where it poses a threat to the stability or long term viability of hedgerows. This is set in the context of the importance of ivy for wildlife and the statement that Wherever possible ivy should be retained and allowed to develop".

Figure 7.2.7 shows the Domin level of ivy at canopy level in the sampled hedges.

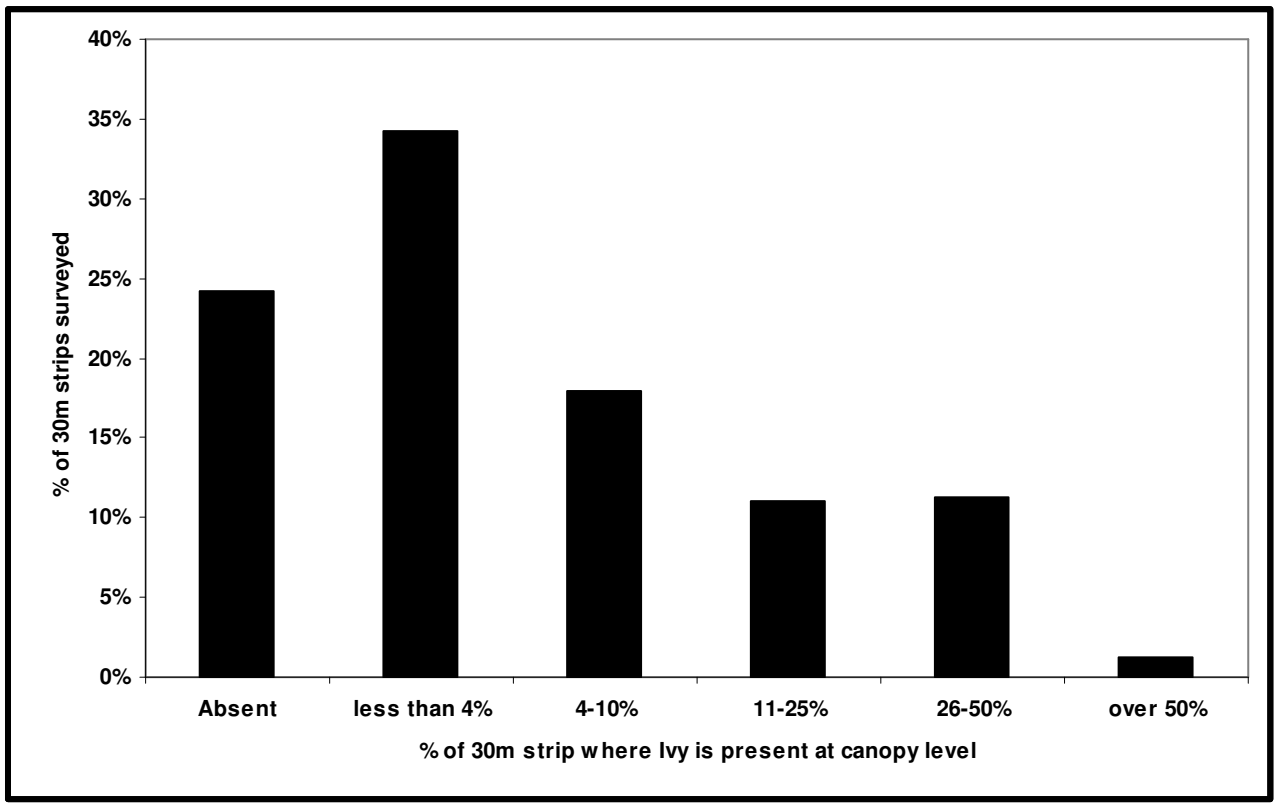

Figure 7.2.7 Percentage breakdown of domination of ivy at canopy level

Levels of ivy at less than 10% would not be considered a threat to the long term viability of the hedge. Where the domination exceeds 25% the alarm bells should begin to ring. This is the case in 12% of the hedges surveyed. The figure is a little lower in Offaly (9%) but as high as 20% in County Westmeath.

7.3 Floristic Classification into hedge types for Laois and Offaly

Hedges were classified according to their floristic composition. In order to give a broader assessment, data from the studies in Laois and Offaly were analysed together.

The process produces groups (or types) of hedges that are based upon the samples of both counties. Seven main groups of hedge types were identified, as listed below.

Group 1 Species Poor Hawthorn hedges
This is the most species poor of the groups, with a mean species richness of two species per hedge. Hedges of this group contain almost entirely Hawthorn, some have a little Elder. Only 6% of recorded hedges fall into this group.

Group 2: Hawthorn, Blackthorn, and Elder Group
These are hedges that have high levels of both Hawthorn and Blackthorn with Elder. The hedges of this group also contain some Spindle, but little else. The mean species richness of hedges in this group is 3.7 species per hedge.

Group 3: Privet Group
Hedges of this group contain mainly Hawthorn, Blackthorn, Elder, and Privet. They may also have some Hazel, Elm, Spindle, Crab Apple, and Wild Plum, but do not have Holly. The mean species richness of hedges in this group is 5 species per hedge.

Group 4: Elm and Holly Group
This group is made up of Hawthorn, Blackthorn, and Elder and is characterised by the presence of Elm and/or Holly. Hedges of this group may also contain Wild Plum, but almost no Privet. This type of hedge is much more common in Laois than in Offaly. The mean species richness of hedges in this group is five species per hedge.

Group 5: Species Rich Hazel and Holly Group
Hedges of this group are made up mainly of Hawthorn, Blackthorn, Hazel, and Holly, and also contain good amounts of Spindle, Wild Plum, and Ash. These hedges have less Elder than groups 1 -4. This group is probably the most representative of the ancient and species rich hedges. This group has a mean species richness of 5.8.

Group 6 Wet Species Rich Group
The hedges of this group are only different to group 5 in terms of having more Willow, Privet, and Gorse, with very little Hazel. Most of the hedges of this group have particularly large drains associated with them. This group is likely to be consistent with more acidic /wet soils than group 5. The mean species richness of hedges in this group is 6.3 species per hedge.

Group 7 Gorse Group
Hedges of this group are made up mainly of Gorse and, to a lesser extent, Willow. Most have some Hawthorn, but at low levels. Blackthorn and Holly can also be found in the hedges of this group. This type of hedge is mostly found in uplands areas and is a lot more common in Laois than in Offaly. The mean species richness of hedges in this group is 4.4 species per hedge.

Structural characteristics of each group
The groups described above are based solely on the species composition of the hedge. A study of the construction and structural characteristics of each group was made to try to establish whether there are any determining factors. The more notable findings are described below.

Group 1 Species Poor Hawthorn hedges
These are almost exclusively Infill hedges (hedges that are neither townland boundaries nor roadside) separating improved grassland. Many have no end connections with other habitats. These features, combined with the fact that they tend to have no drain or only a small drain would suggest that these hedges are of relatively recent origins; for example, hedges constructed as part of the Land Commission subdivision of land in the early to mid twentieth century. There is a tendency for hedges of this group to have a gappy structure and no trees (70% of this group have no trees).

Group 2: Hawthorn, Blackthorn, and Elder Group
Hedges in this group mostly have no drain or a small drain, and small banks, again consistent with probable recent origins. Although probably slightly older than Group 1, they are still likely to be post-famine. There is a tendency for hedges of this group to be of low height.

Group 3: Privet Group
There is a slightly higher incidence of townland boundary hedges in this group than in the group 1 or group 2 hedges. The structural characteristics of this group are variable.

Group 4: Elm and Holly Group
Most of the hedges of this group had small banks and no drains. There were no other distinguishing characteristics for this group.

Group 5: Species Rich Hazel and Holly Group
Hedges of this group tend to have a good cover of trees. This group was not found to have a distinctively larger banks or drains than average, as might be expected for species rich hedges.

Group 6 Wet Species Rich Group
There was a high tendency for large drains in this group. Group 6 hedges are often associated with a watercourse and also are more likely to link with semi-natural habitats, especially semi-natural woodland. This may be related to acidic or wet soil types in less intensively managed landscape types which have a higher occurrence of marginal or unimproved farmland with various wild habitats. Group 6 has the highest proportion of non-linear hedges (20%).

Group 7 Gorse Group
Hedges of this group tended to have no trees or few trees along their length. More than half of the hedges of this group had large drains, an interesting aspect of these predominantly upland hedges which has not been found in previous surveys.

Frequency of occurrence of Group types in Counties Laois and Offaly

There was a much higher occurrence of Group 4 (Elm and Holly Group), and Group 7 (Gorse Group) in Laois than in Offaly. Conversely, Groups 2 and 3 were more frequently represented in Offaly than in Laois. The details are presented in Table 7.3.1

Table 7.3.1 Frequency of occurrence of hedges in the different Group Classifications

Group Type	Laois	Offaly
1. Species Poor Hawthorn hedges	6%	8%
2. Hawthorn, Blackthorn, and Elder Group	10%	16%
3. Privet Group	11%	19%
4. Elm and Holly Group	20%	10%
5. Species Rich Hazel and Holly Group	23%	24%
6. Wet Species Rich Group	15%	18%
7. Gorse Group	15%	8%

Geographical Distribution of Group Types

Generally speaking, there is a reasonably even distribution of the different hedge groups across the county. This differs from County Offaly where the groups are much more concentrated. The main points of note are that Group 3 hedges tend to be found more frequently in the north eastern part of the County, and there were fewer examples of species poor hedges (Group 1), in the southern half of the county. Figure 7.3.1 illustrates the distribution.

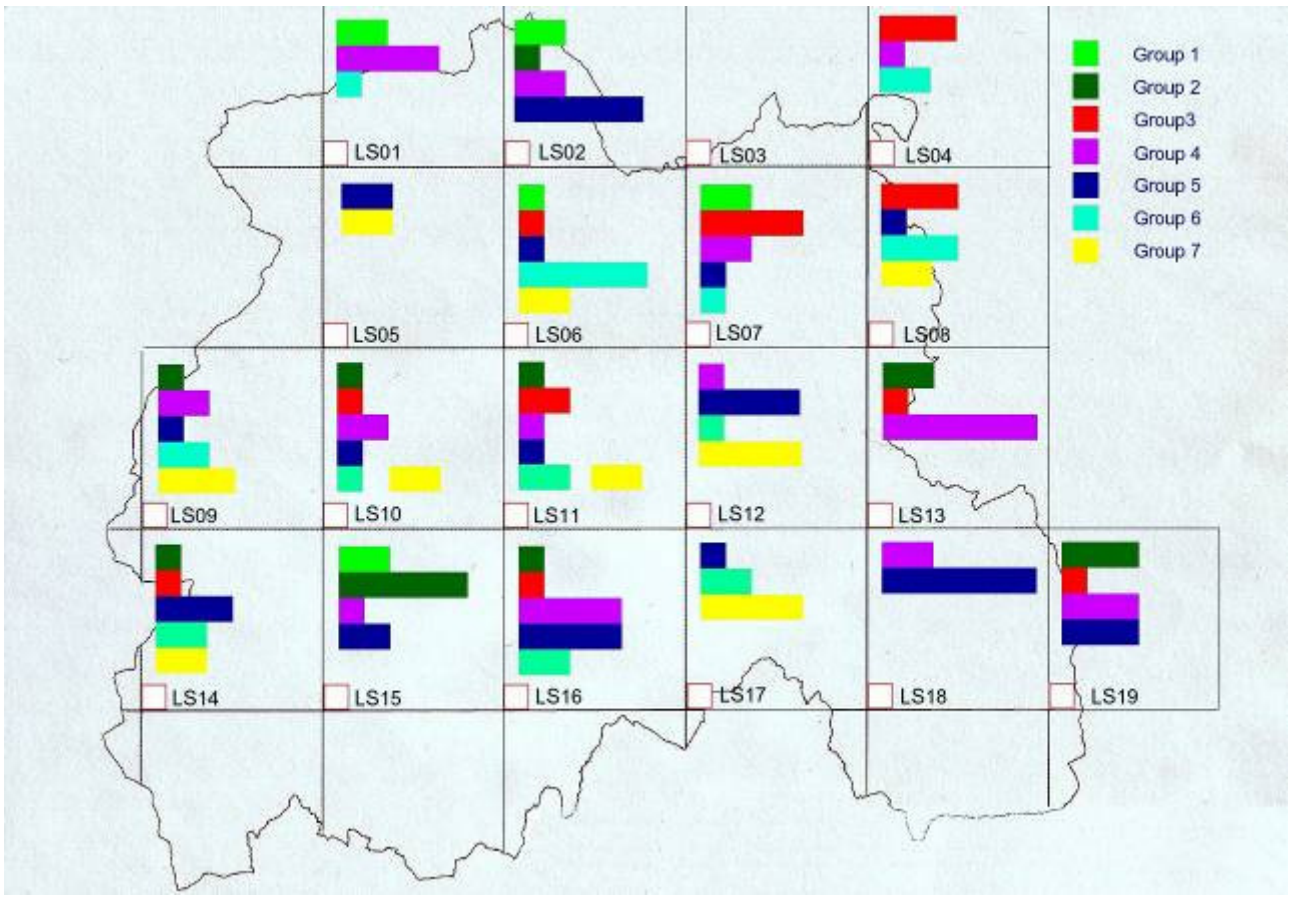

Figure 7.3.1 Distribution of Hedge Classification Types in County Laois

Relationship between Group classification and Townland Boundary, Roadside and Species Rich hedges

Figures 7.3.2, 7.3.3, and 7.3.3 show the relationship between the Group Classifications and Townland Boundary, Roadside and Species Rich Hedges respectively.

Figure 7.3.2 shows that there is a very high incidence of Group 3 (Privet Group) as townland boundary hedges. As would be expected, the Group 1 (Species Poor Hawthorn), are not represented in the townland boundaries. The incidence of Group 7 (Gorse group) as Townland boundaries was also much lower than the overall figure for these groups.

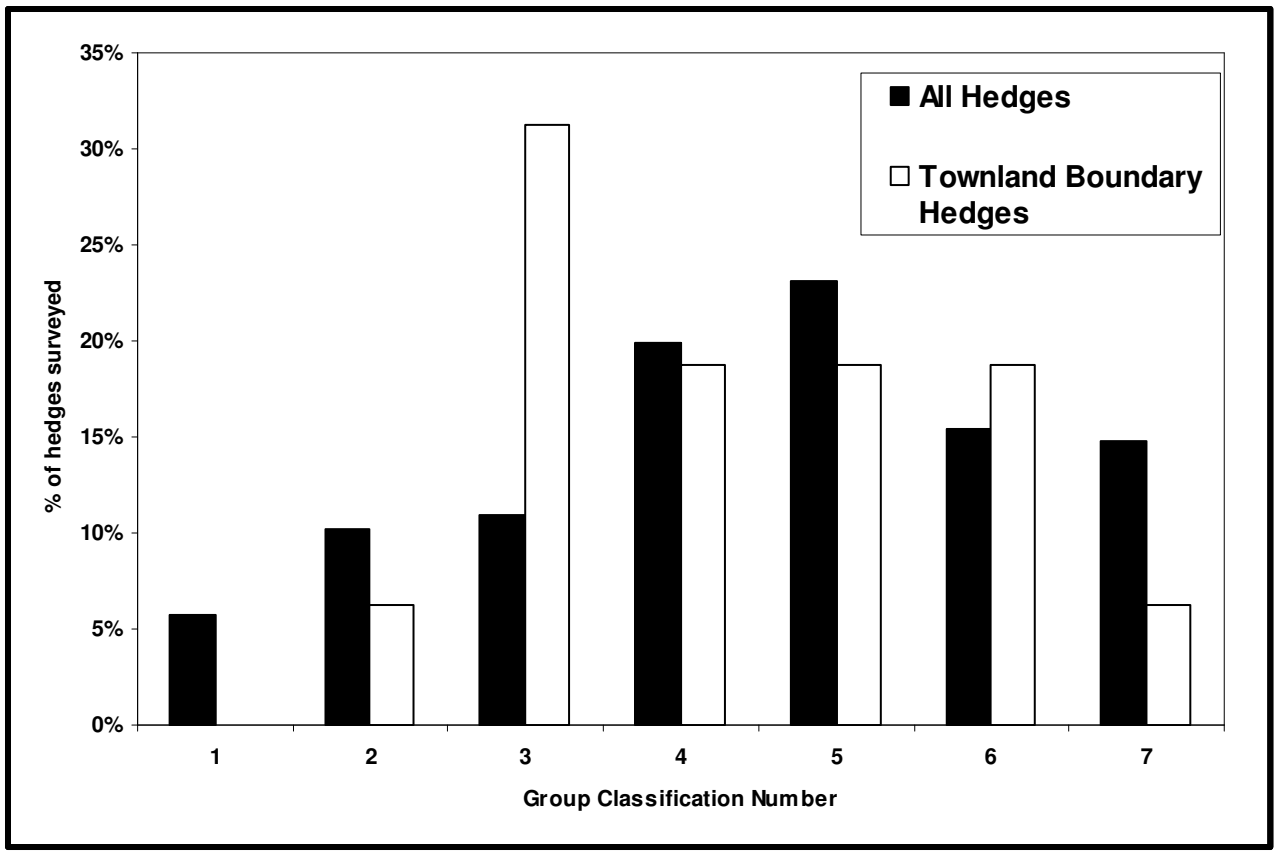

Figure 7.3.2 Group Classification related to Townland Boundary Hedges

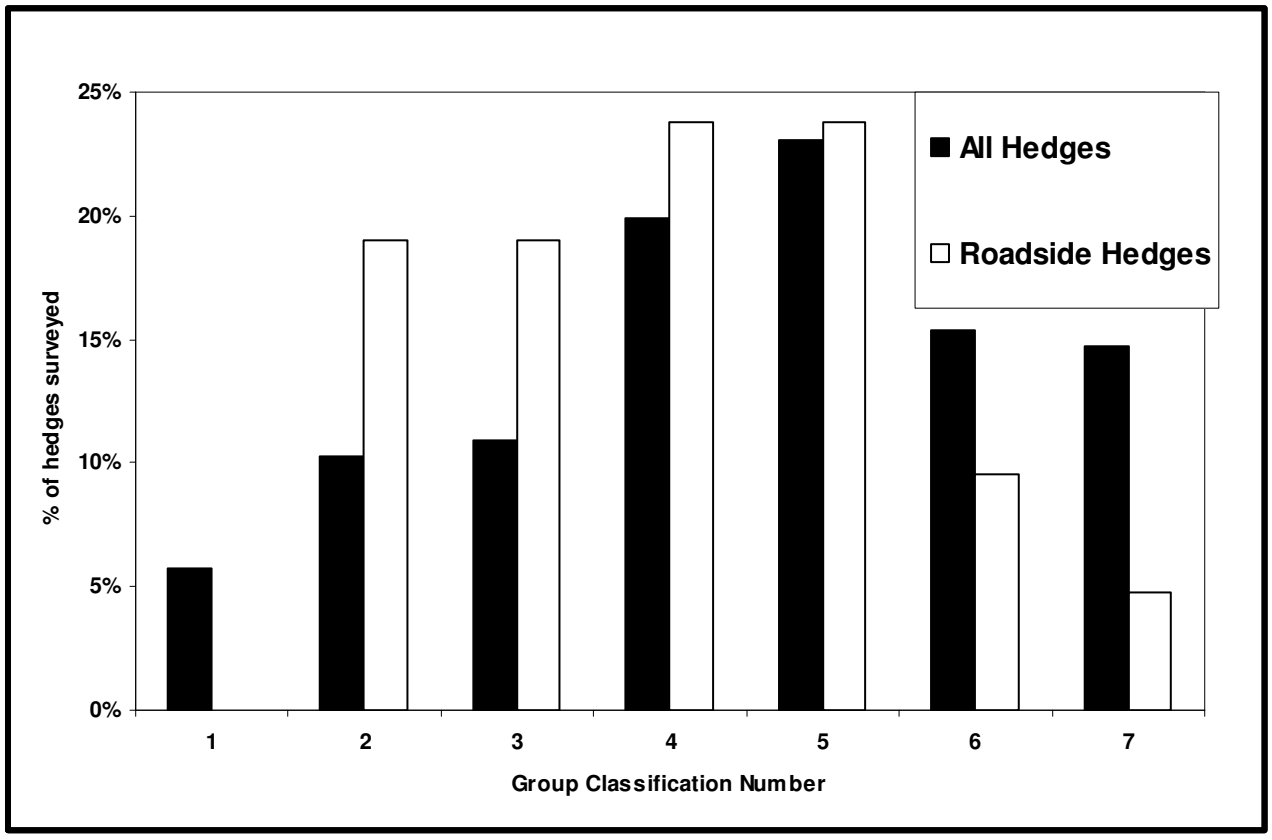

Figure 7.3.3 Group Classification related to Roadside Hedges

As can be seen from Figure 7.3.3, almost twice the proportion of roadside hedges are classified as Groups 2 (Hawthorn, Blackthorn, and Elder Group) and 3 (Privet Group) than the overall figure for the groups. Conversely, none of the Group 1 (Species Poor Hawthorn Group) hedges were found along roadsides, as would be expected for this group type. The incidence for type 7 (Gorse group) as roadside hedges was also low.

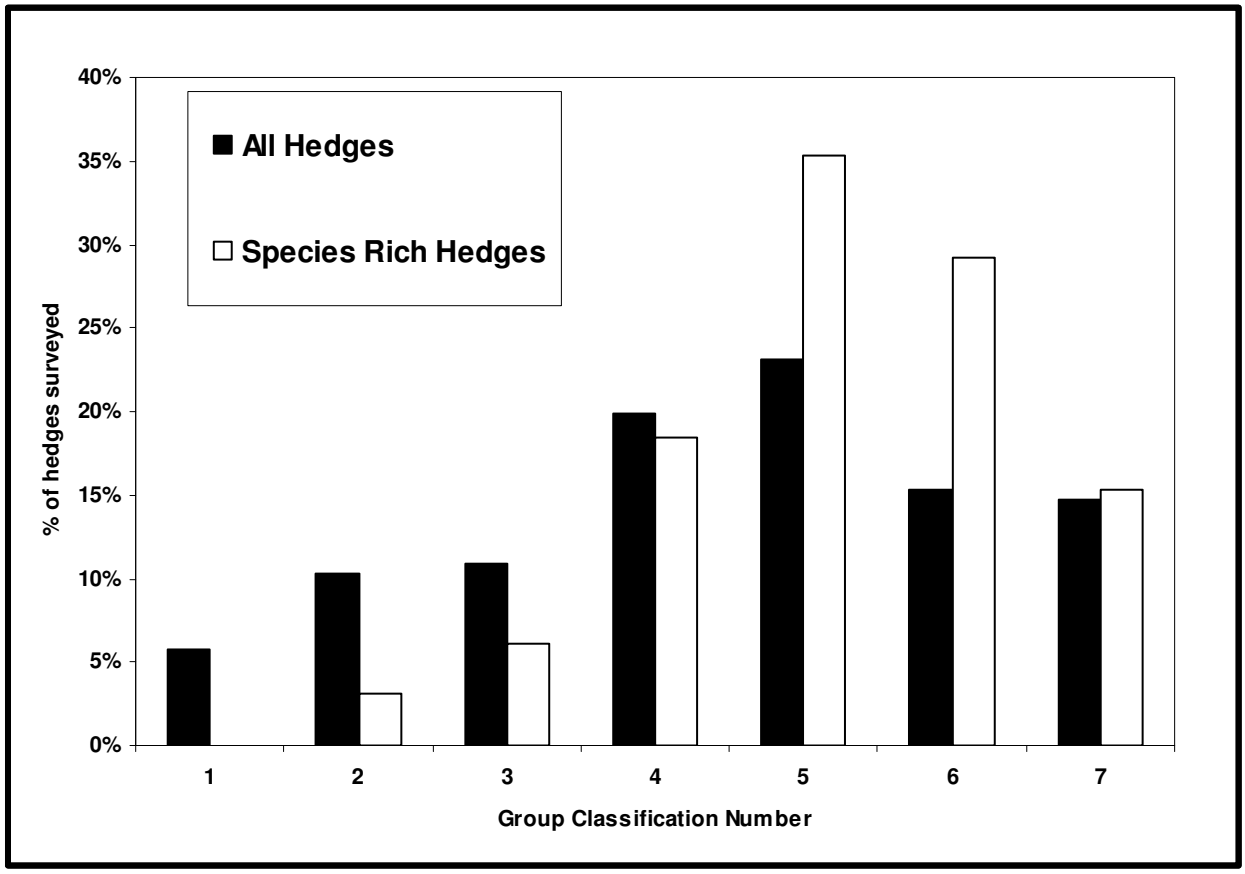

Figure 7.3.4 Group Classification related to Species Rich Hedges

From Figure 7.3.4 we see that species rich hedges are significantly more likely to be Group 5 (Species Rich Hazel and Holly Group) or Group 6 (Wet Species Rich Group) type hedges than other hedge types. As would be expected, species rich hedges do not occur in Group 1 (Species Poor Hawthorn hedges) and are poorly represented in groups 2 (Hawthorn, Blackthorn, and Elder Group) and 3 (Privet Group).

7.4 General ecological, historical, and agricultural context of hedgerows in Co. Laois.

Adjacent Land Use

Figure 7.4.1 shows the breakdown of the adjacent land use of the sampled hedgerows. As might be anticipated, 75% of adjacent land use is related to intensive farming, with improved grassland the dominant category. In Laois, 10% of adjacent land use was categorised as being semi-natural. In Offaly the comparative figure is 7%. This does not mean that more of the land cover in Laois is semi-natural, the figures simply relate to hedged landscapes.

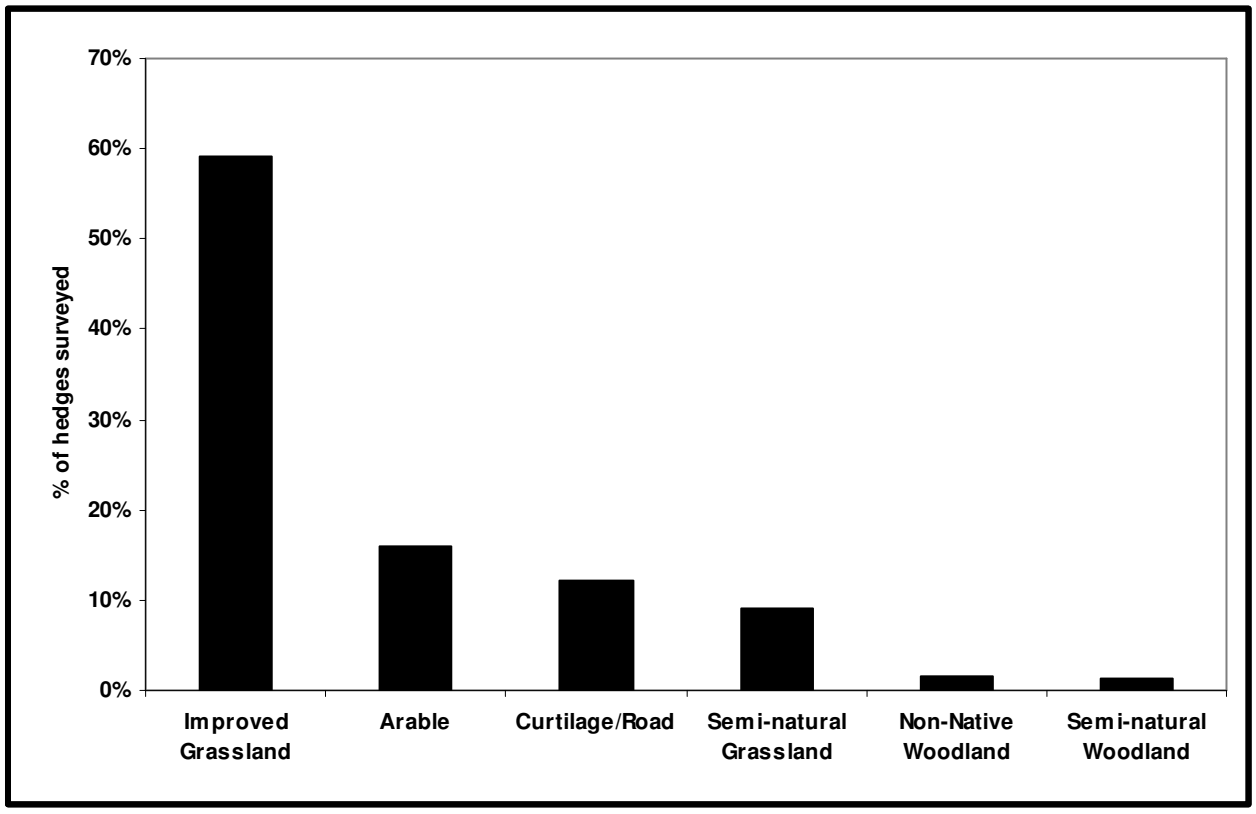

Figure 7.4.1 Habitat category of land adjacent to sampled hedgerows.

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 7.4.2 shows the breakdown of how the ends of sampled hedgerows linked with other habitats. Laois hedgerows compare favourably with the results from the other hedgerow surveys. 95% of hedges sampled link, at least at one end, to other hedges. Just 13% of hedges had no end link with any natural or semi-natural habitat (including other hedgerows) at one end. Only one hedge had no end link at either end. Hedges that link into the built environment are included in this category. Increasing development of one-off housing in the countryside may have a negative impact on hedgerow connectivity, leading to a fragmentation of habitat networks.

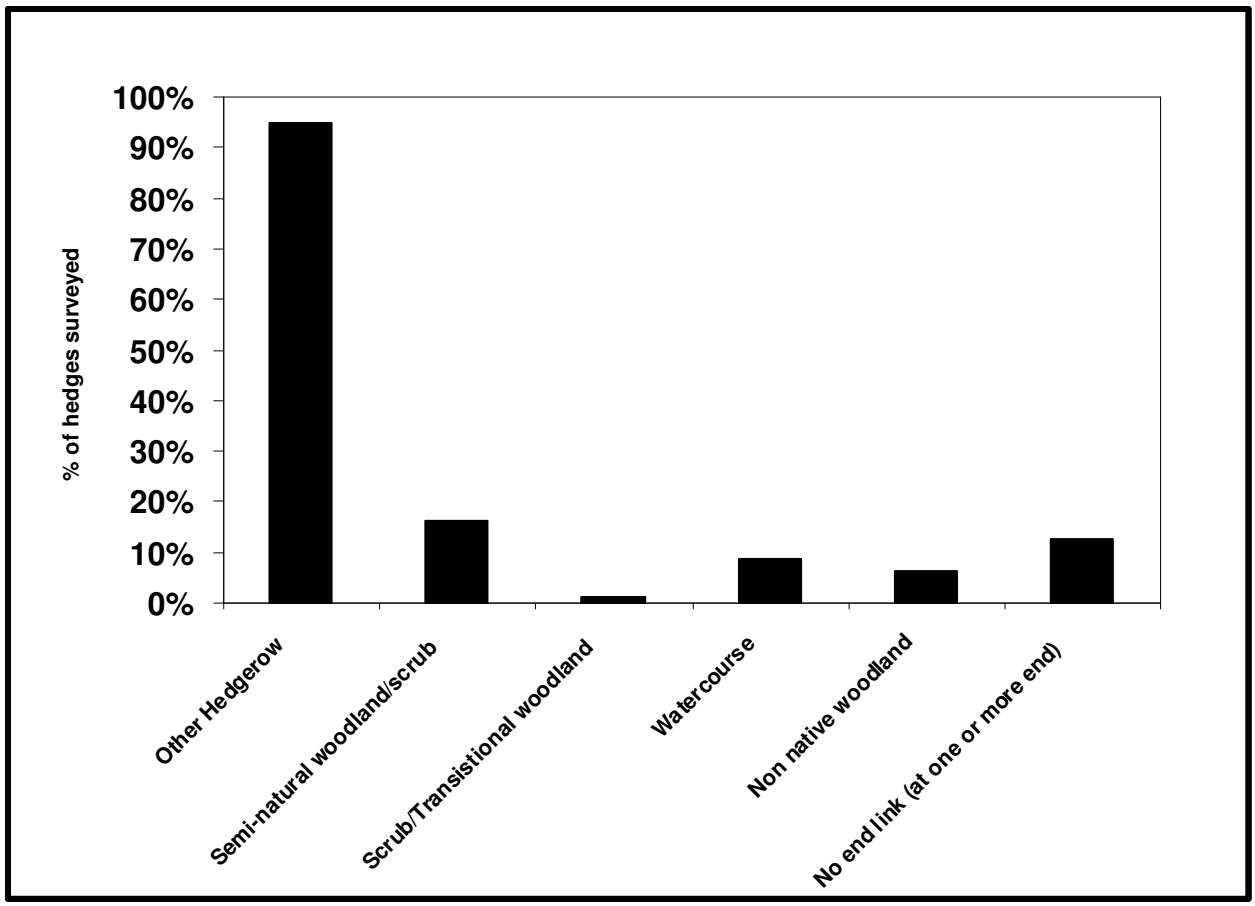

Figure 7.4.2 Links of sampled hedgerows with natural or semi-natural habitats in Laois

Hedgerows link into woodland and scrub

Hedgerow History
Figure 7.4.3 compares the historical origins of sampled hedgerows. Townland boundary hedges are identified from the relevant Ordnance Survey Map. 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 Laois, 14% of hedges surveyed were road side. Assuming that the survey sample is representative of the network as a whole, roadside hedges form a significant proportion of the whole resource.
The proportion of townland boundaries associated with a stream is higher than for infill hedges.

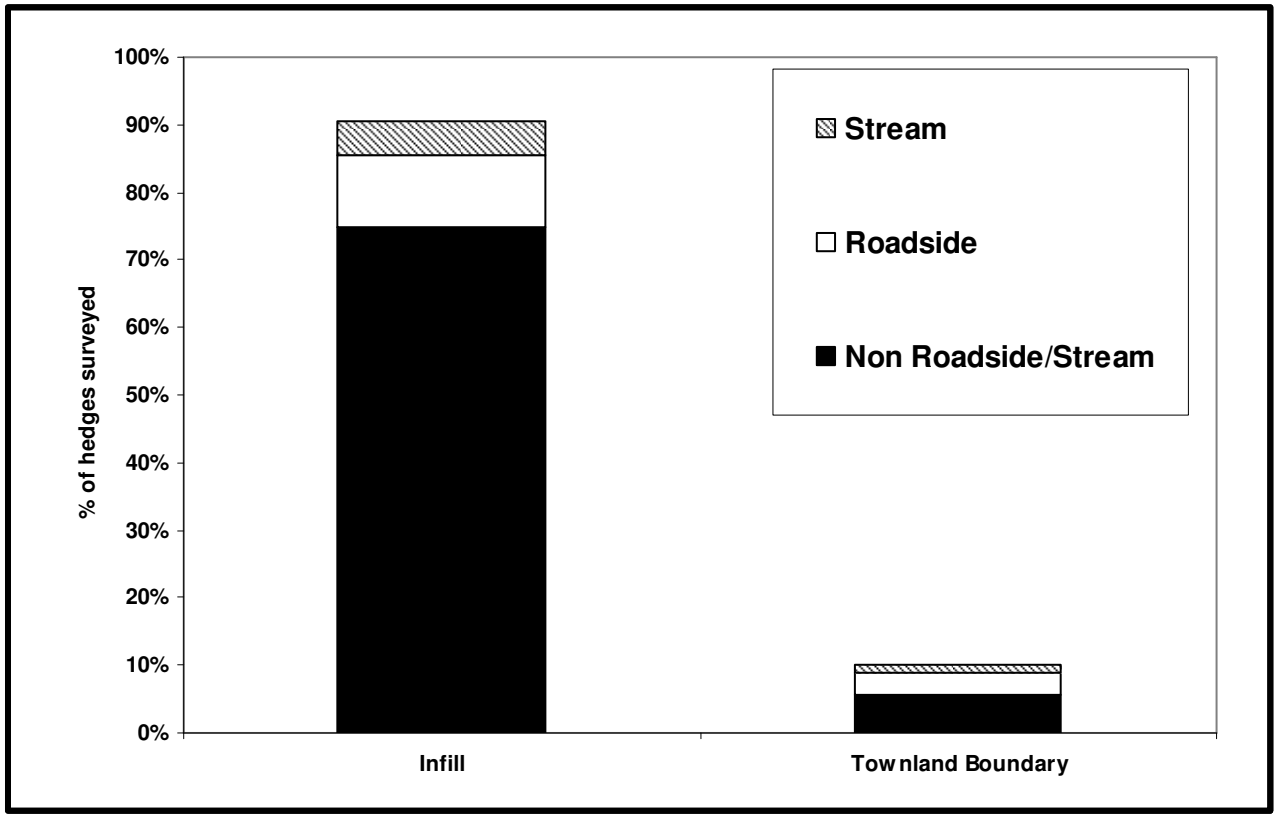

Figure 7.4.3 Historical context of sampled hedgerows

Boundary Function
To try 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. 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.

92% of hedgerows in Laois are considered to still be active, with just 8% redundant in terms of the division and sub-division of farms. An equivalent ratio was found in Co. Offaly, with Counties Westmeath and Roscommon having ratios of 86:14 and 82:18 respectively.

7.5 Construction of Hedges in Co. Laois.

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 Laois, 84% of the hedges surveyed were considered to be linear and regular in outline. Of the 16% having a more irregular outline 40% were part of townland boundaries and 12% were associated with a stream.

Figure 7.5.1 shows a breakdown of the construction type of the Laois hedges surveyed. A single line of shrubs with a bank is the most common form of construction, with almost an even split between those hedges that have a drain and those that don't. Results from the other surveys varied between 72% with drains in Roscommon down to 41% in Offaly. Walls are not a significant feature of Laois hedgerows.

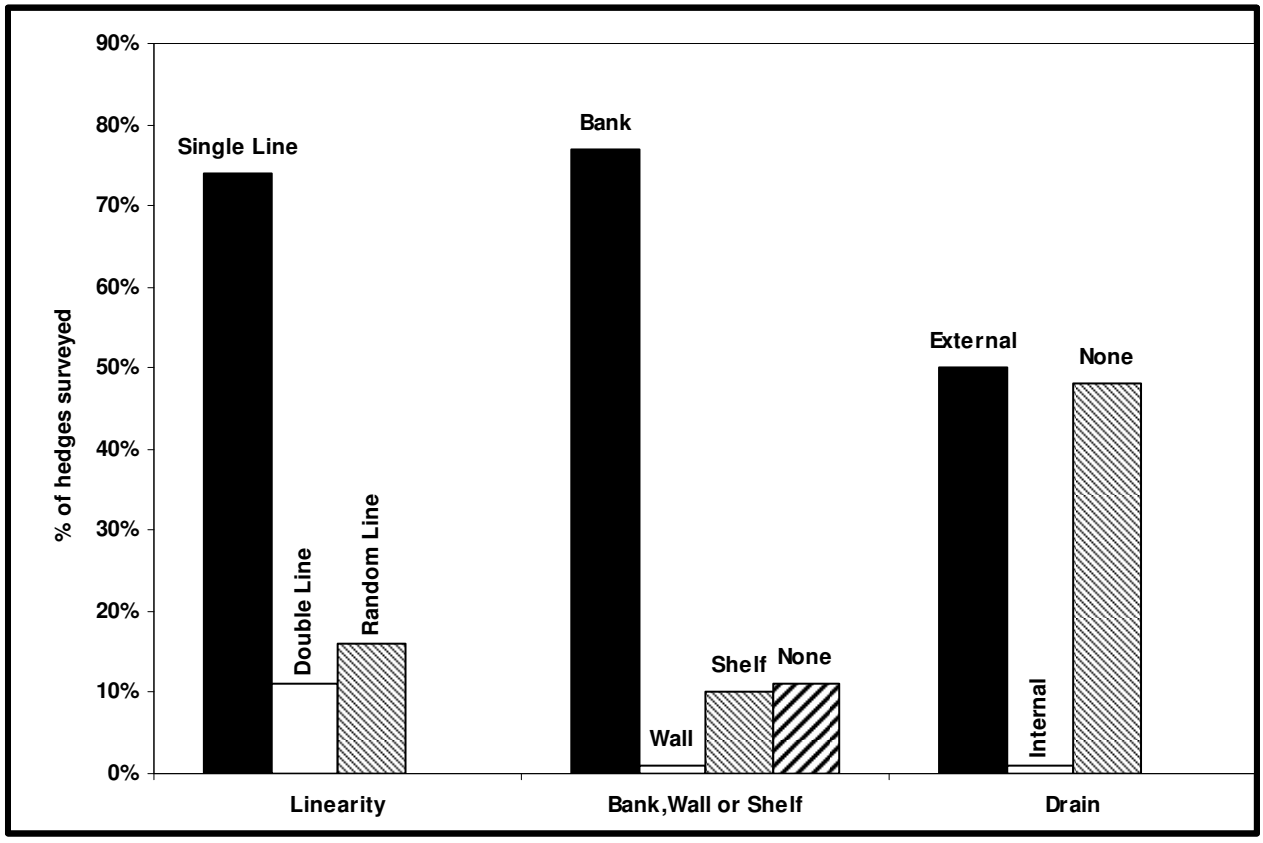

Figure 7.5.1 Boundary construction of samples hedgerows

Figure 7.5.2 shows how the sampled hedges fared in the various size categories for banks, walls or shelves. Almost a quarter of hedges surveyed were in the largest size category. This is consistent with findings in Roscommon and Westmeath. Offaly has fewer hedges with large banks (12%).

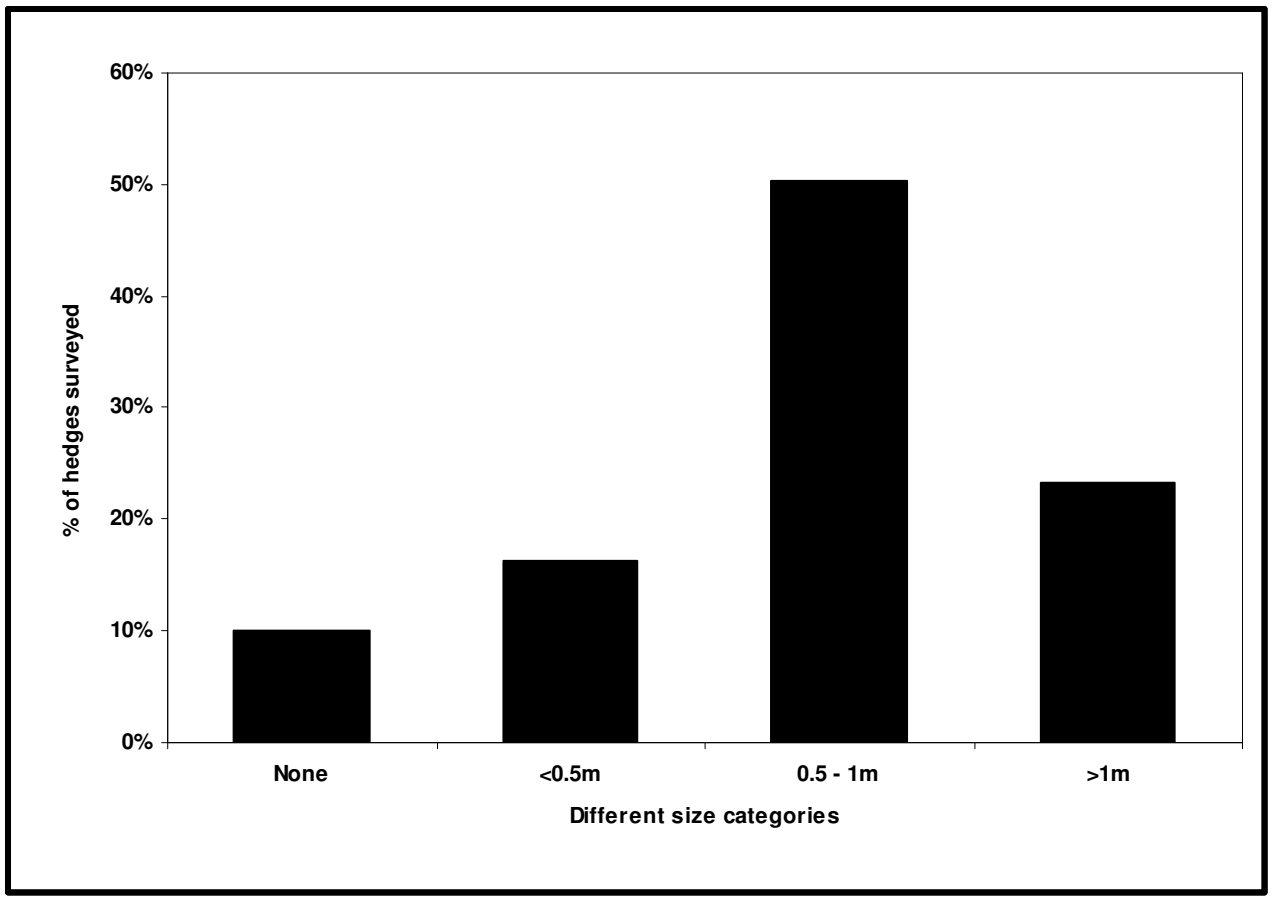

Figure 7.5.2 Proportion of hedges in the different bank/wall/shelf size categories

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Double line hedge with a very large (degraded) bank

There is an almost 50:50 split between those hedges that have an associated drain and those that don't. Where a drain is present, its dimensions are predominantly large. The size of many drains did not appear to be related to any necessity to carry large volumes of water and some of the largest drains were found in the areas with the most free-draining soils. Figure 7.5.3 shows the breakdown of the various drain size categories

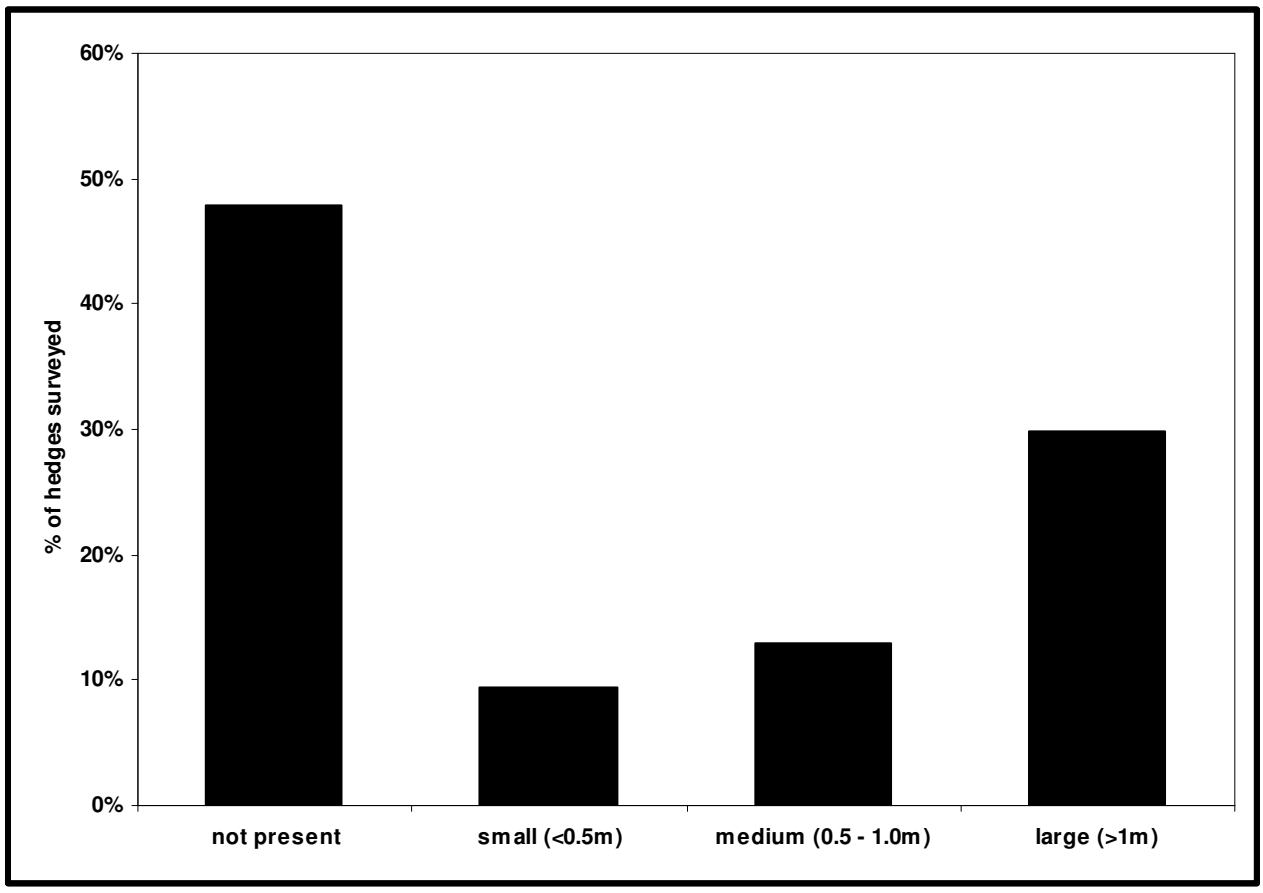


Figure 7.5.3 Proportion of hedges in the different drain size categories

7.6 Structure and Condition of hedges in County Laois

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 like bank/wall erosion, tree age composition, degree of fruiting, and overall vigour. These factors can be indicators of the long-term viability or sustainability of the hedge.

Hedge Height
Figure 7.6.1 shows a breakdown of the sample in terms of the various hedge height categories.

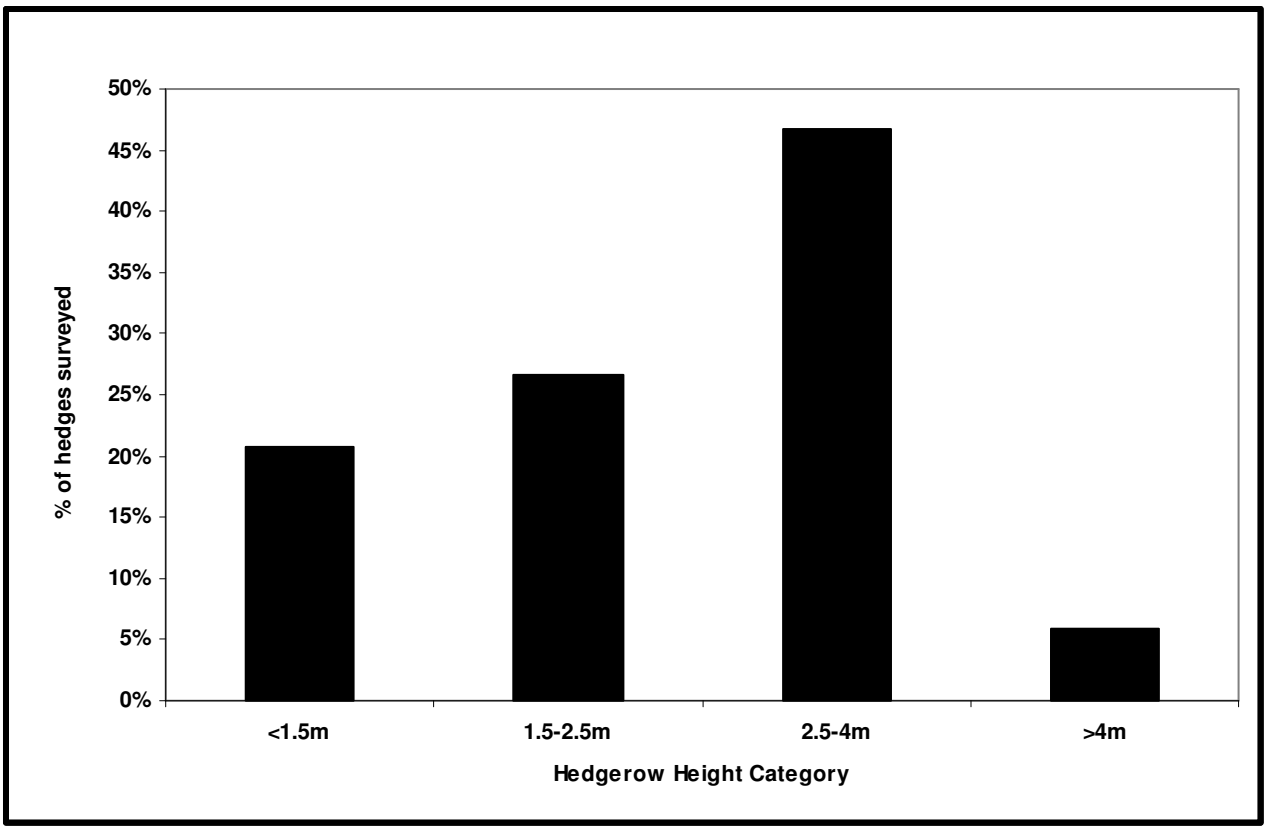


Figure 7.6.1 Proportion of hedges in different hedge height categories

Over a fifth of hedges are in the smallest height category. The figure is similar to that in Westmeath, but higher than Offaly and Roscommon, which had figures of 15% and 8% respectively. Relative to the other counties, Laois also has the lowest percentage of hedges in the tallest category; Offaly and Westmeath had 20% and 23% of hedges greater than 4m.

Hedge Width

As can be seen from Figure 7.6.2, the results of the survey show that 90% of hedges surveyed in County Laois are over 1m wide.

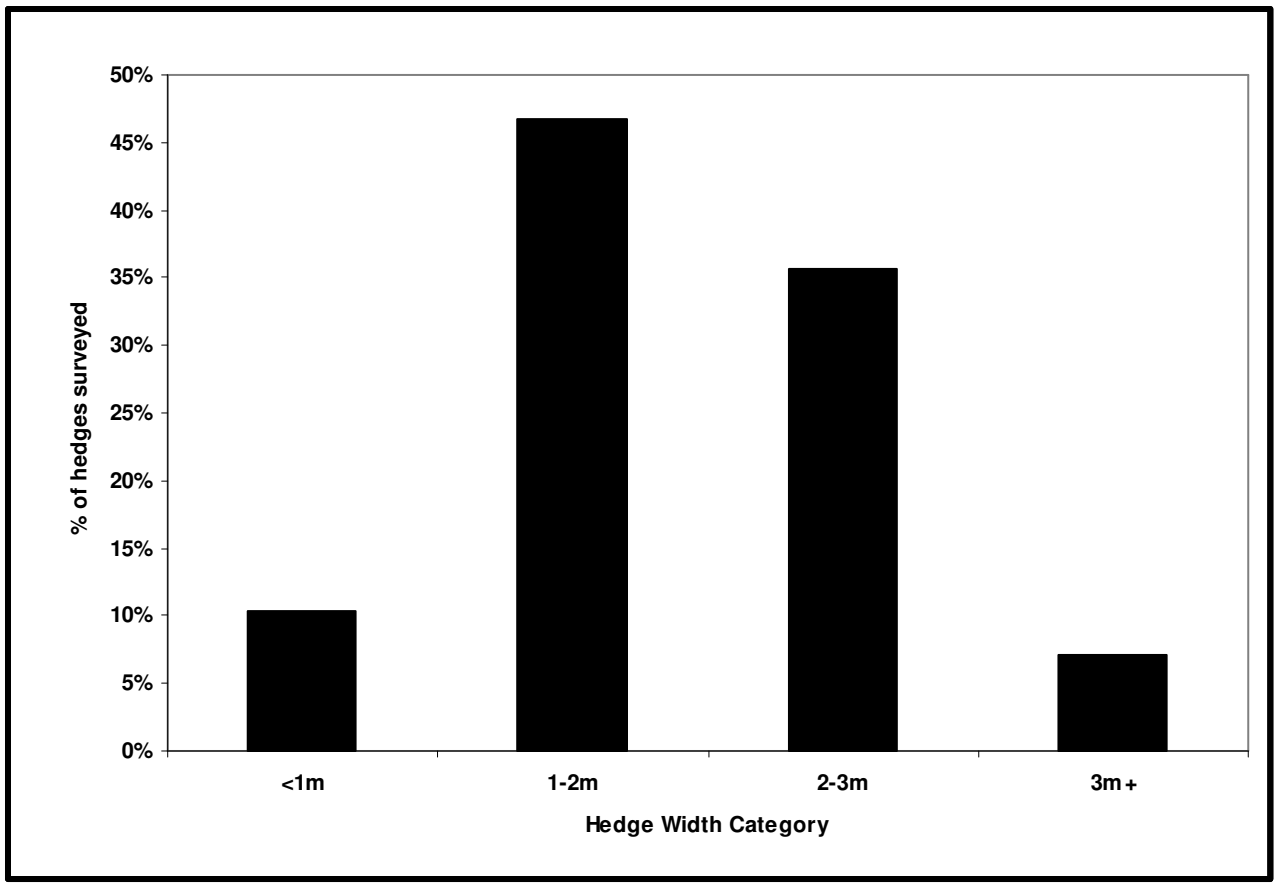


Figure 7.6.2 Proportion of hedges in the different hedge width categories

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 generally a symptom of the deterioration of the hedge, often caused by the demise of plants through age or inappropriate management. Figure 7.6.3 shows the breakdown of the sample in terms of percentage gaps over the length of the hedge.

Hedgerow with over 10% gaps

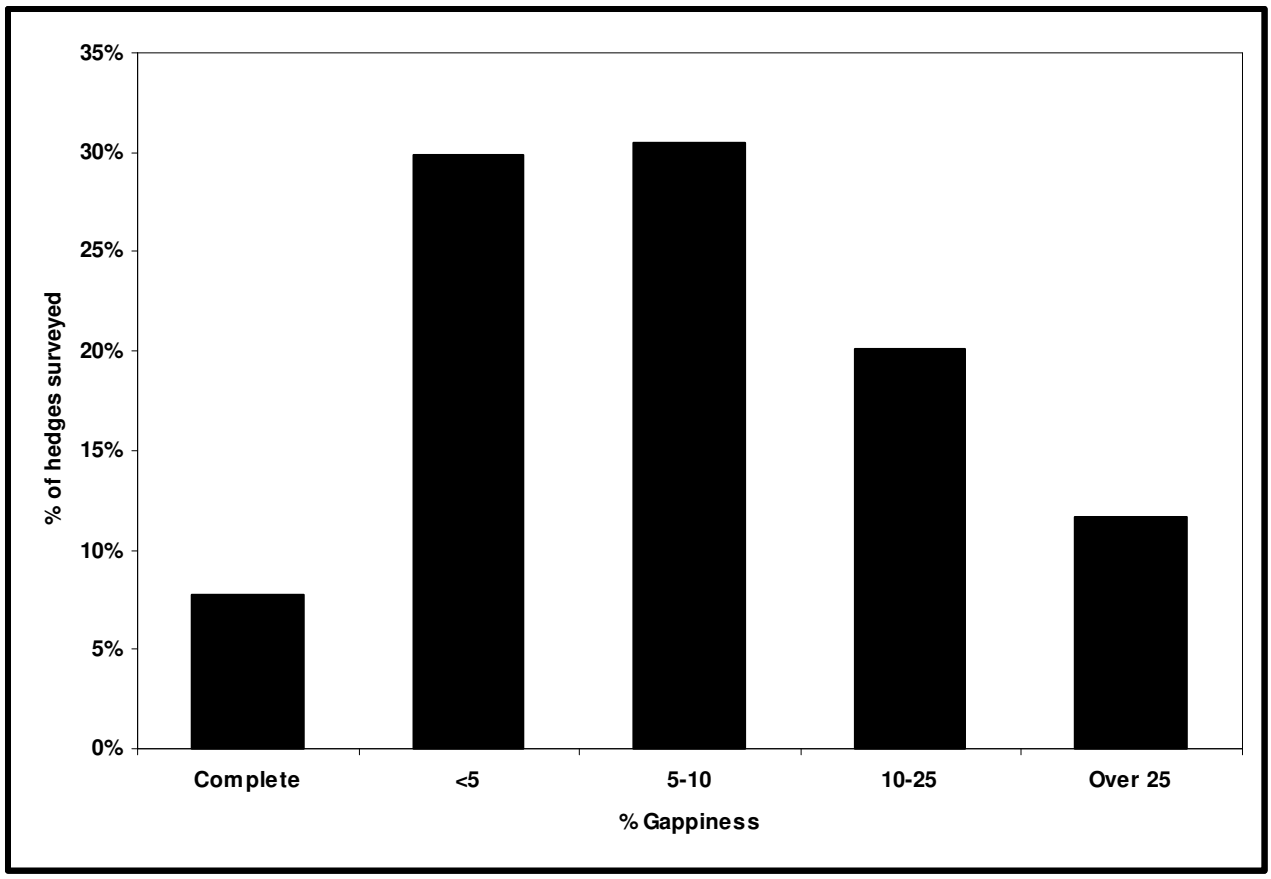


Figure 7.6.3 Proportion of hedges in different categories of % gappiness

Nearly a third of hedges were found to have 10% gaps or more, with 12 % of hedges having over 25% gaps. These figures exclude remnant hedges which by definition contain over 25% gaps. Although far from optimum, the results are better than those from the other county surveys which indicate levels of gappiness greater than 10% in between 42% (Offaly) and 56% (Roscommon) of hedges.

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. Figure 7.6.4 shows the breakdown of how the samples fared in terms of the hedge base categories. Again, although far from optimum, the figures compare favourably with those from the other County hedgerow surveys. Offaly at 40% is the only other county to record over a quarter of hedges with a dense base.

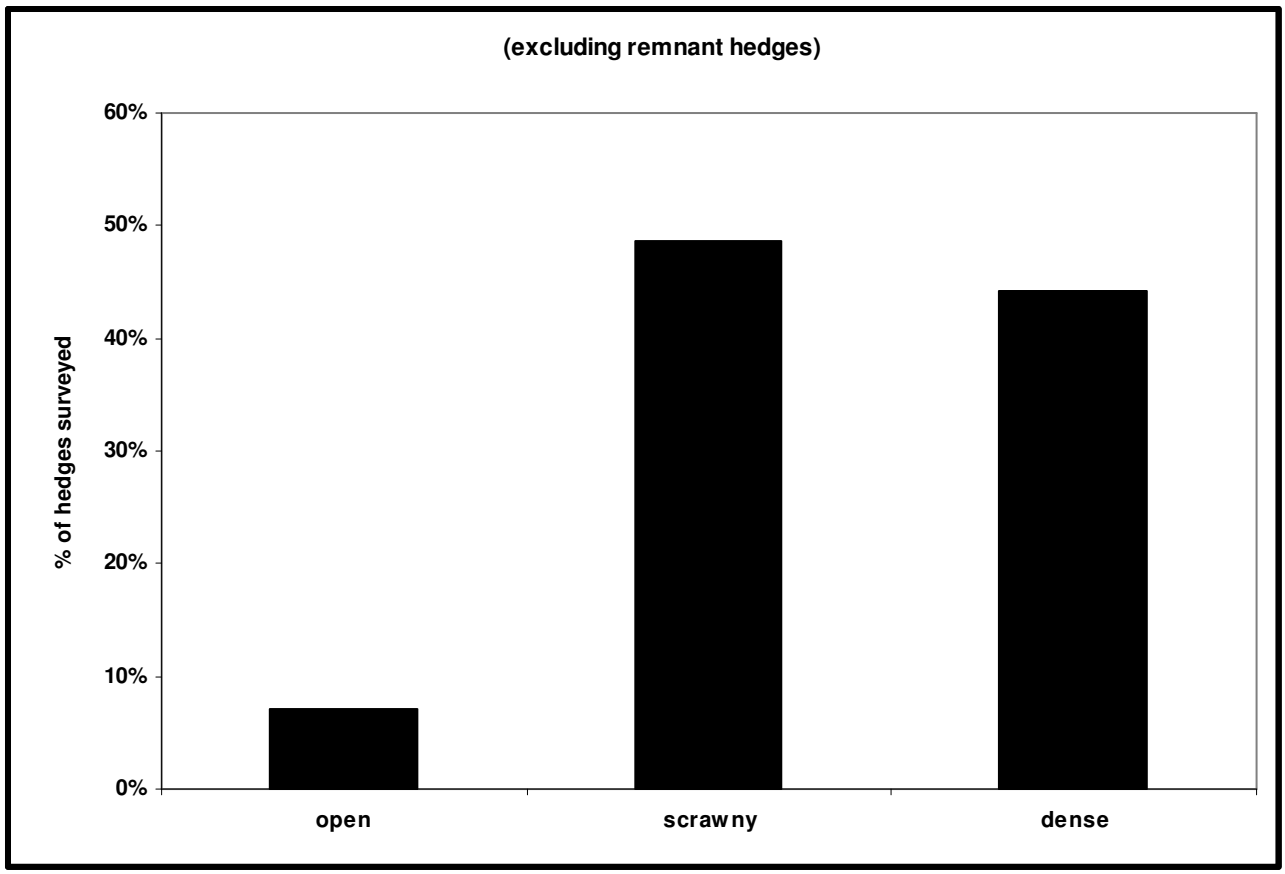


Figure 7.6.4 Proportion of hedges in different categories of basal density

Hedge Profile (cross section)

Maintaining a dense base in a hedge is working against the main instinct of the plants to grow up and produce fruit. As hedge plants mature they tend to become more open at the base, and without management intervention can revert to their natural tree form. 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. An assessment of hedge profiles in the sample hedges is shown in Figure 7.6.5.

Top heavy undercut profile

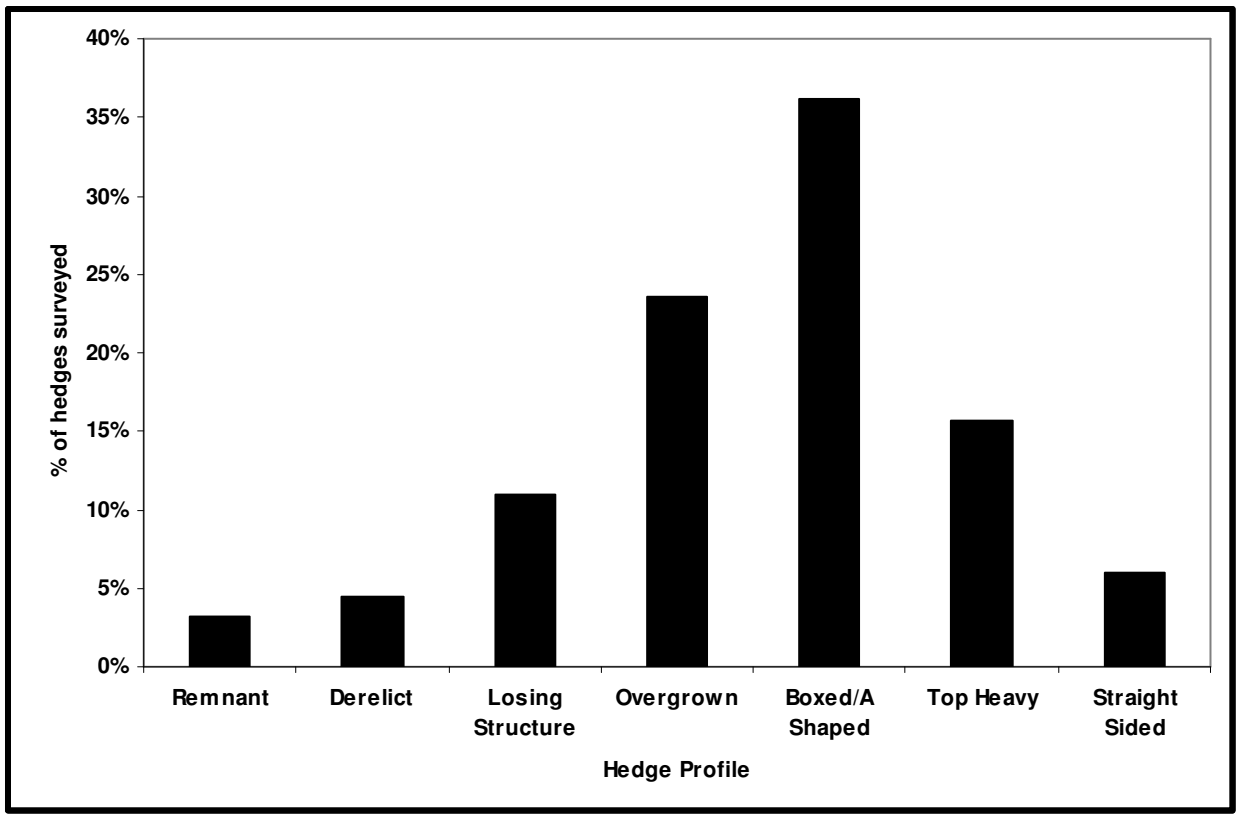


Figure 7.6.5 Proportion of hedges within the different profile categories

Hedgerow Trees

This survey looked at both the abundance of trees in hedges (Figure 7.6.6) and also the age composition of the trees (Figure 7.6.7). 36% of sampled Laois hedges have no hedgerow trees.

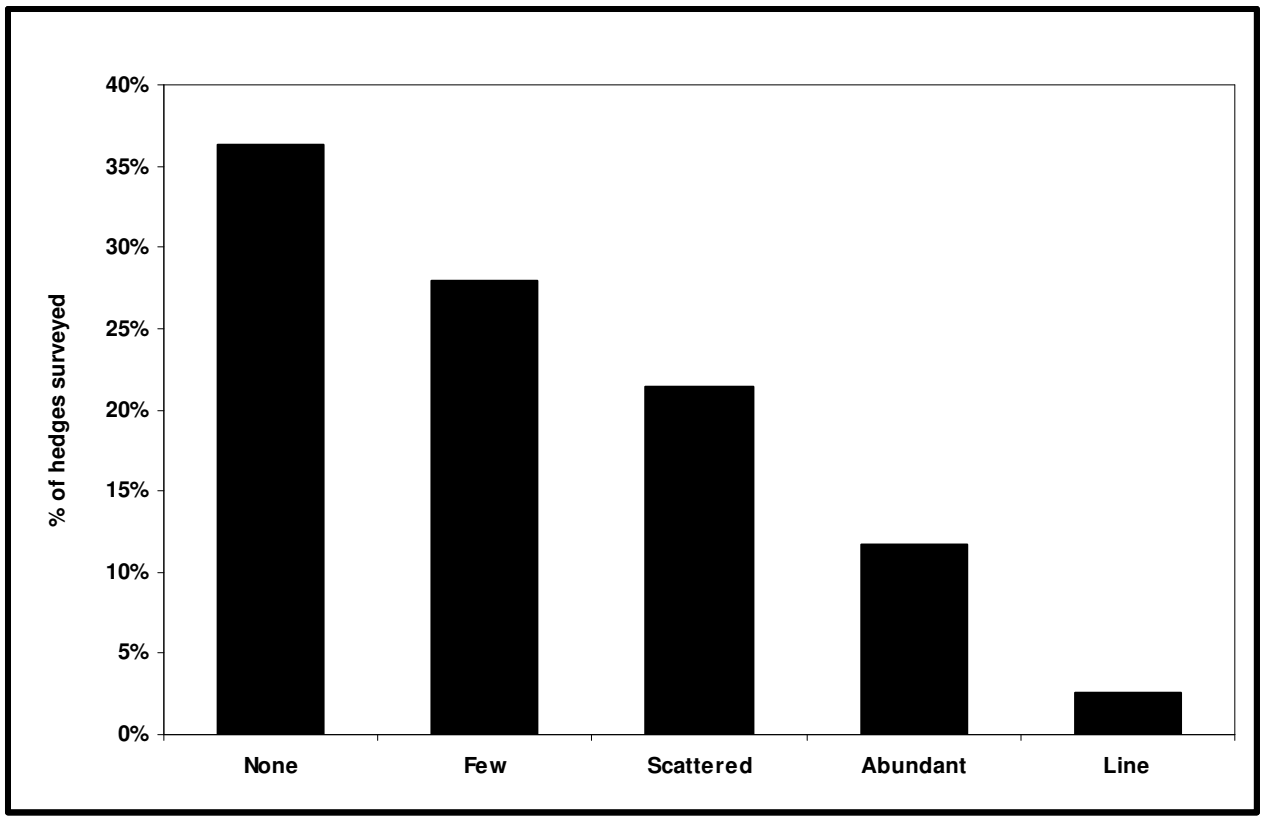


Figure 7.6.6 Proportion of hedges with different abundance levels of hedgerow trees

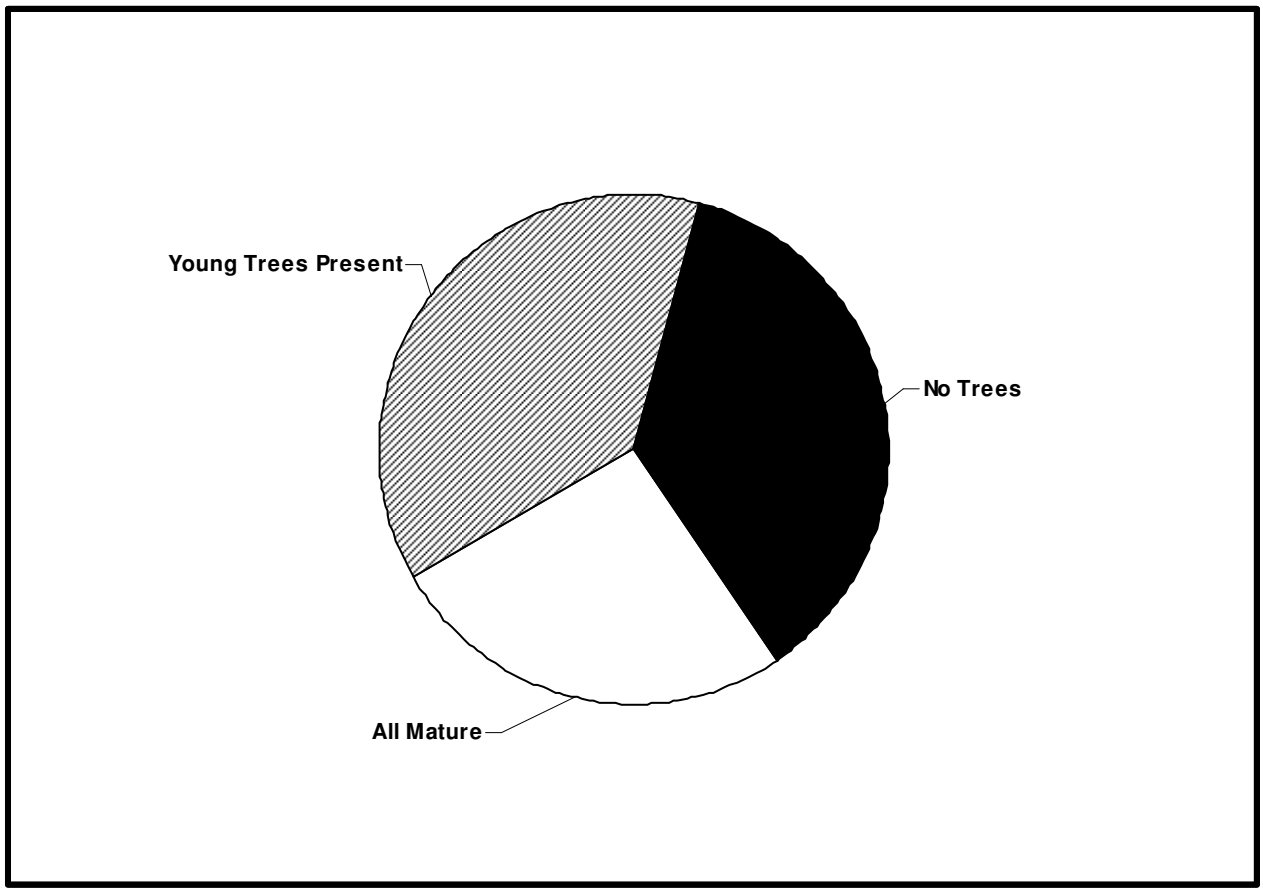


Figure 7.6.7 Tree age composition of sampled hedgerows

Abundant hedgerow trees

Tree Age Composition

It is generally considered that to achieve sustainable levels of hedgerow trees, a balance between young, medium and older trees needs to be maintained. 59% of Laois hedges with trees had young trees 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. Sampled hedges were examined for damage to the supporting structure and the results are shown in Figure 7.6.8.

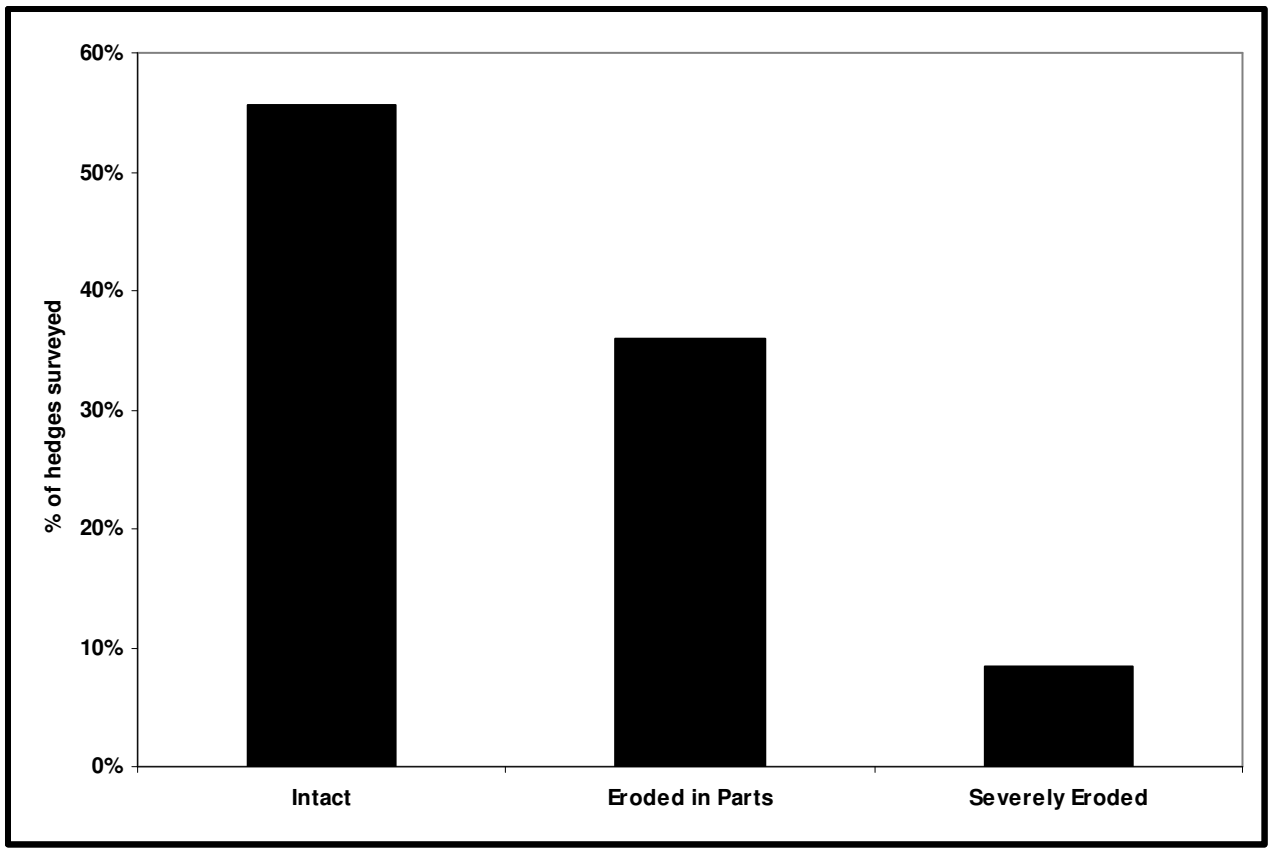


Figure 7.6.8 Proportion of hedges having degraded banks or walls

In common with the results from the other County hedgerow surveys, damage to banks and walls is a frequent occurrence in Laois, although not at such high proportions as seen in Roscommon where 48% were eroded in part, and 12% severely eroded.

Fruiting Levels

Levels of flower/fruiting were gauged predominantly by assessing the flowering/fruiting of whitethorn which is the most frequently occurring and abundant hedgerow species. The results depicted in Figure 7.6.9 show that half of the Laois hedges surveyed had below average levels.

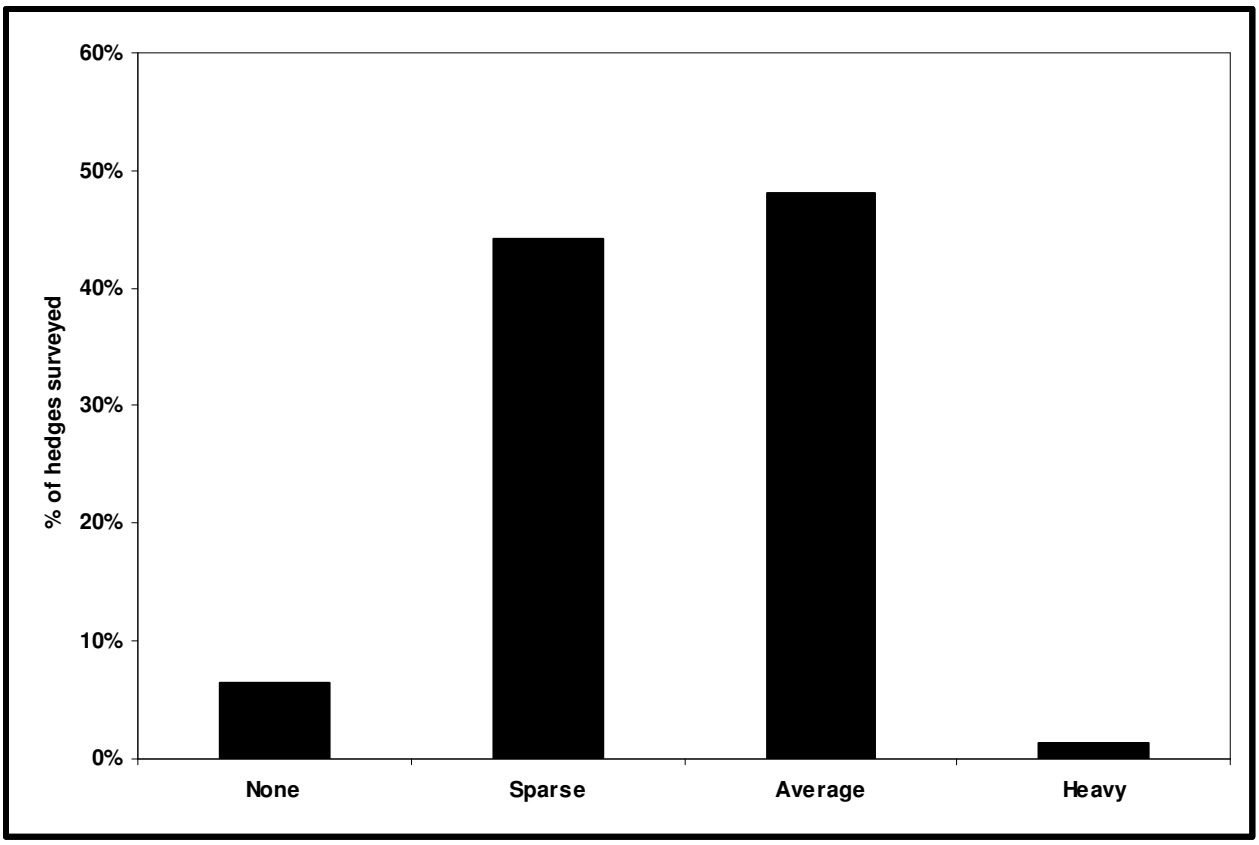
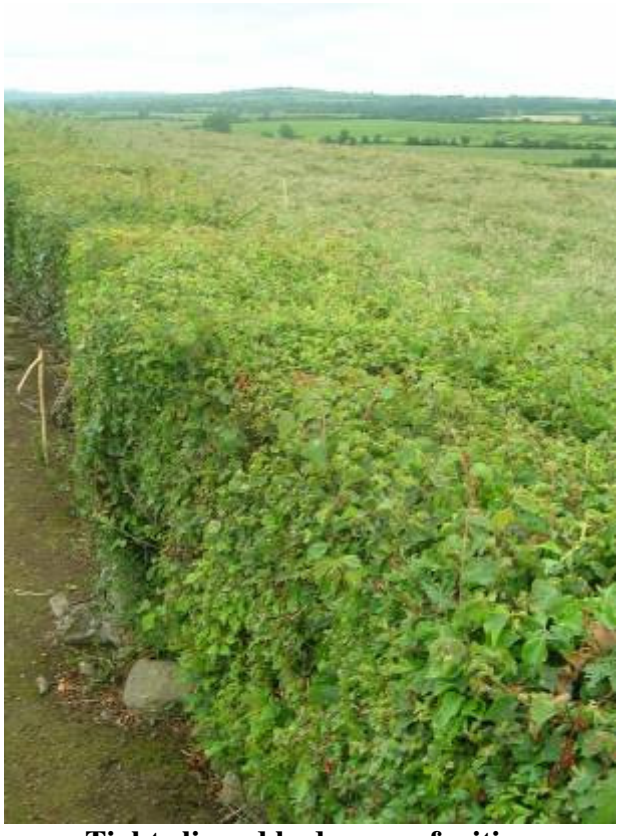


Figure 7.6.9 Proportion of hedges in the different flowering/fruiting categories



Tight clipped hedge – no fruiting

Research in the UK (Sparkes, 2000) has shown that routine maintenance significantly reduces levels of fruiting in hawthorn (whitethorn). The impact of trimming hedges to the traditional box profile and the recommended A-shape profile on flowering/fruiting levels is well illustrated in Figure 7.6.10, which looks at degrees of flowering/fruiting related to the different hedge profile categories. The boxed/A-shaped category shows the highest proportion of sparsely flowering/fruiting and non-flowering/fruiting hedges and the lowest proportion of average flowering/fruiting levels. The two profiles which involve trimming the sides of the hedge without cutting the top (top heavy and straight sided) recorded flowering/fruiting levels similar to the overgrown category which can be considered as a control.

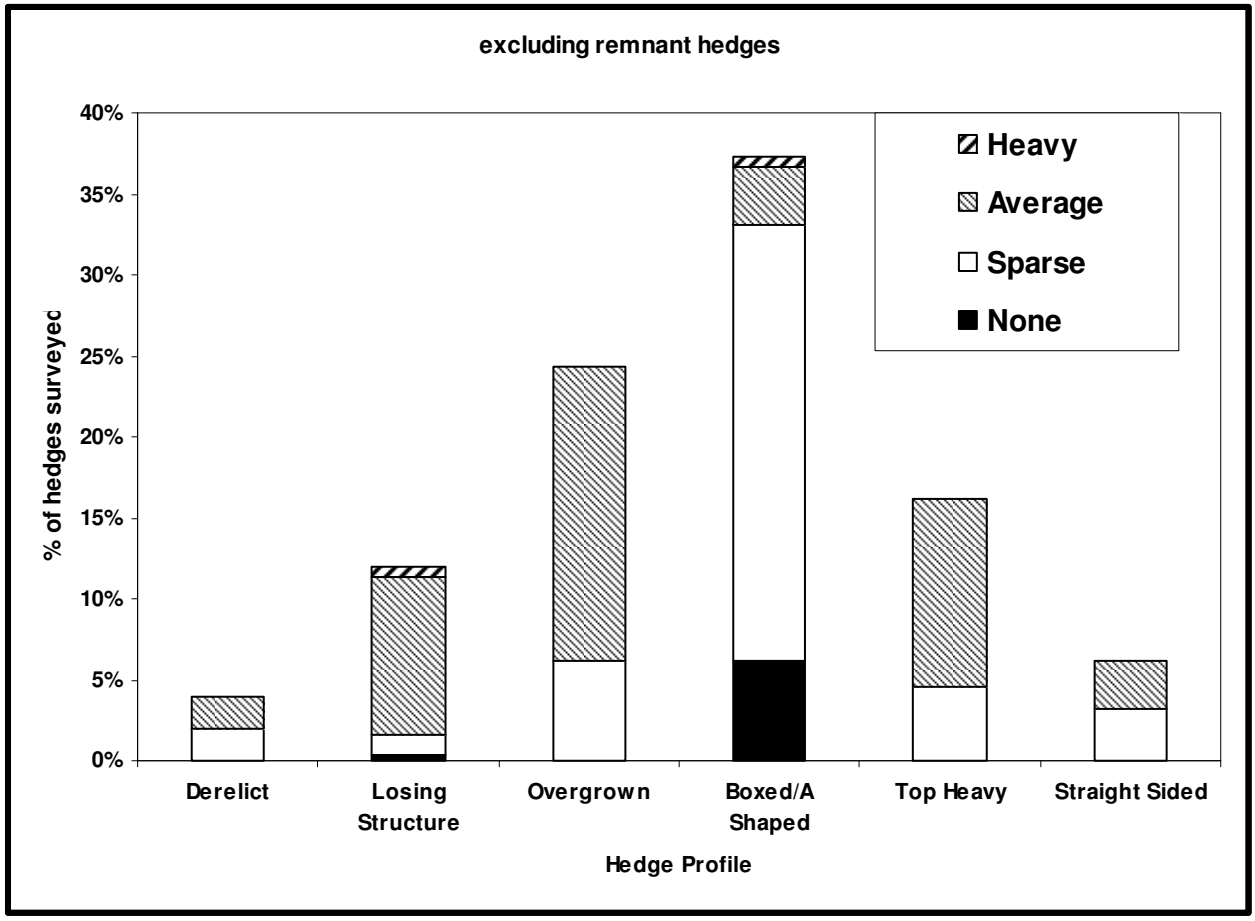


Figure 7.6.10 Levels of fruiting related to hedge profile

Vigour

With a view to long term viability, the surveyors made an assessment of the overall vigour of the sampled hedges. The results are shown in Figure 7.6.11.

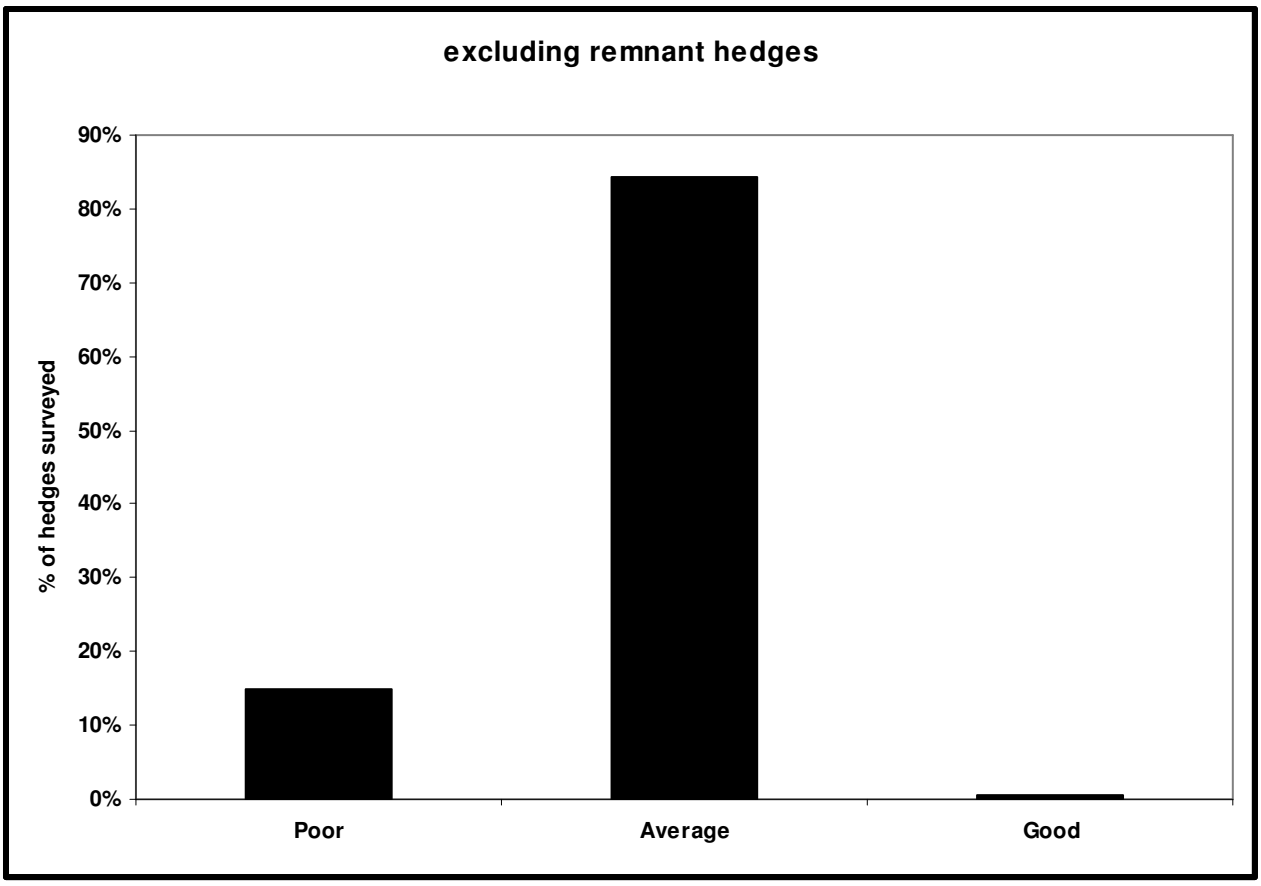


Figure 7.6.11 Percentage of hedges in the different vigour categories

The figure of 15% for hedges that were considered to be showing poor vigour would be initially of some concern. A more detailed investigation shows that 7 of the 23 'poor' hedges were at altitudes of 190m or greater (a further 3 hedges in this altitude range have target notes indicating a lack of vigour in some shrubs). Hedgerow shrubs at higher altitudes would be expected to be generally less vigorous than their lowland cousins. These statistics do not include remnant hedges.

7.7 Management of Hedges in Co. Laois.

The management of hedges is a hugely important factor influencing hedge structure, condition, viability, value, and sustainability. For these reasons an in depth assessment of hedge management forms a major part of this survey. The implications of management variables recorded are presented in section 8.0.

Figure 7.7.1 gives a breakdown of the hedgerows sampled by their type of management.

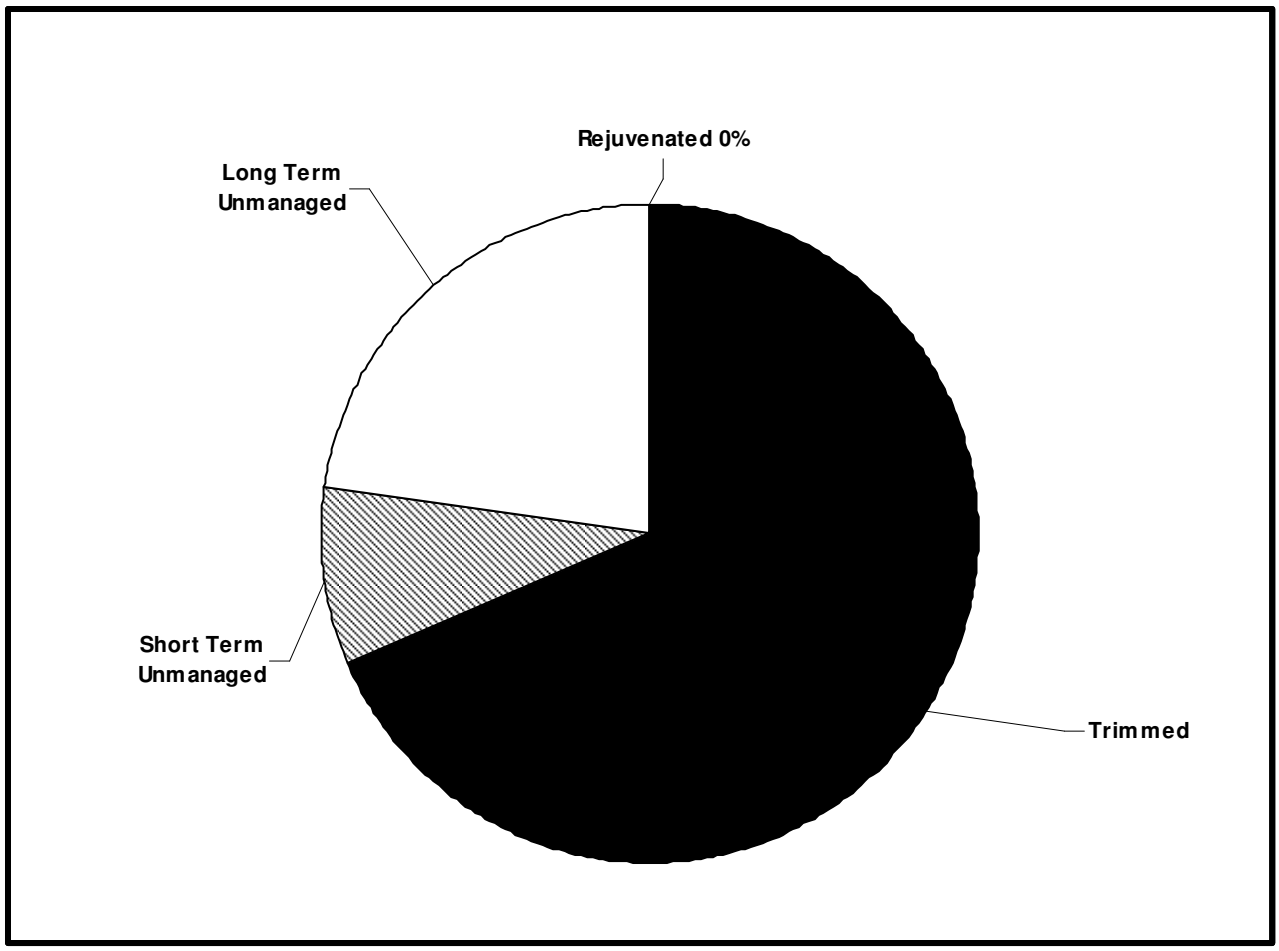


Figure 7.7.1 Breakdown of the Management Type of the sample

Over 75% of hedges have received some form of management in the recent past (last 8 years). This is the highest figure from any of the detailed surveys carried out. In Roscommon only 38% of hedges were included in recent management programmes. Abandonment of management is regarded by most experts as the principle cause of dereliction and eventually the demise of hedgerows. Almost a quarter of Laois hedges were considered to be long-term unmanaged, with no evidence of management within the last eight years. Many of these would not have been managed in decades. Although two hedges contained evidence of recent hedge laying, no hedges in the survey showed recent rejuvenation as the dominant management for the hedge as a whole.

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 7.7.2 shows the breakdown.

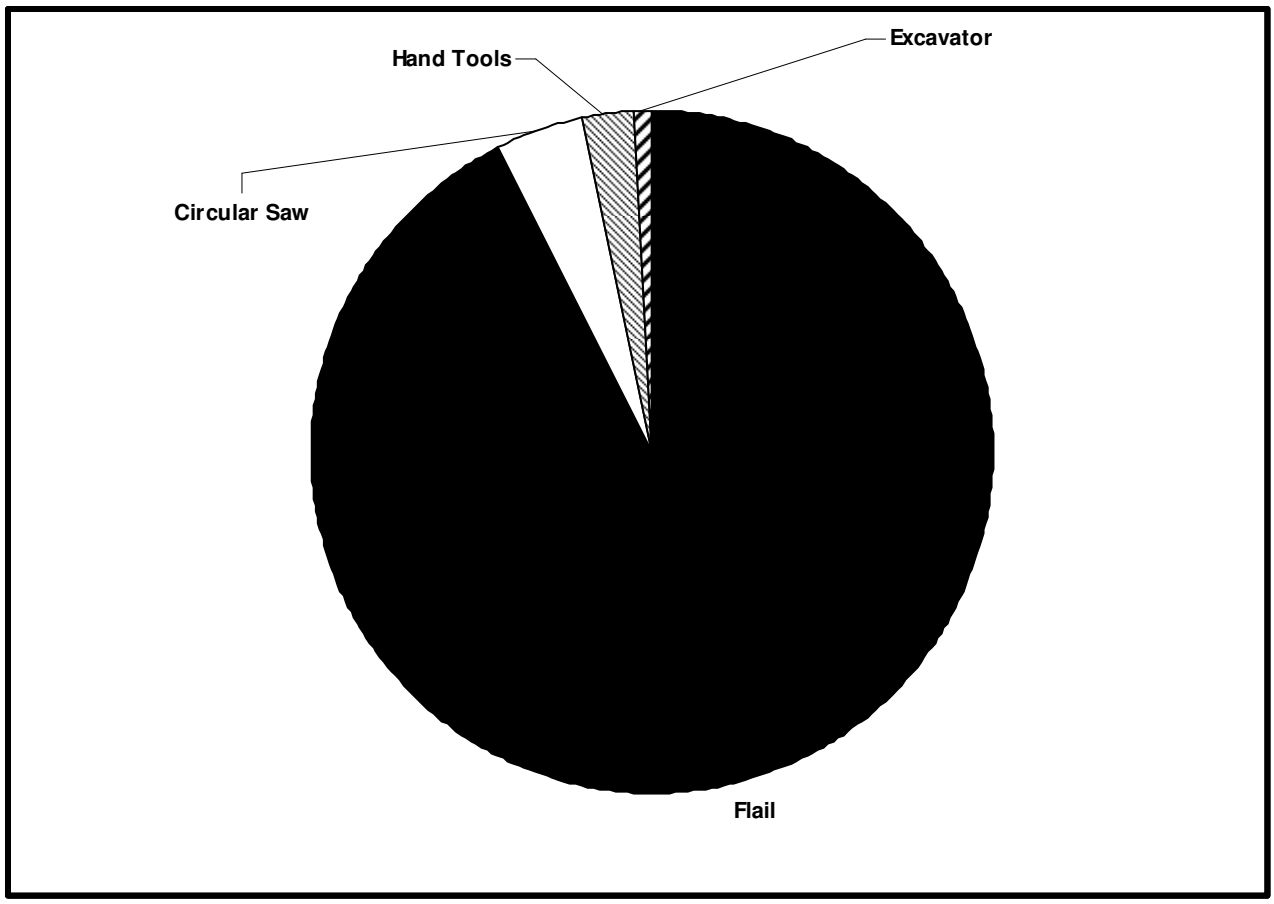


Figure 7.7.2 Proportion of managed hedges in each management method category

The flail is the main management tool, responsible for over 90% of the management.
A breakdown of the trimming profiles for routinely managed hedges showed that 93% were being trimmed to a box profile with only 7% trimmed to the A-shaped profile recommended by the REPS and Teagasc.

Hedge flailed to box profile

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 7.7.3.

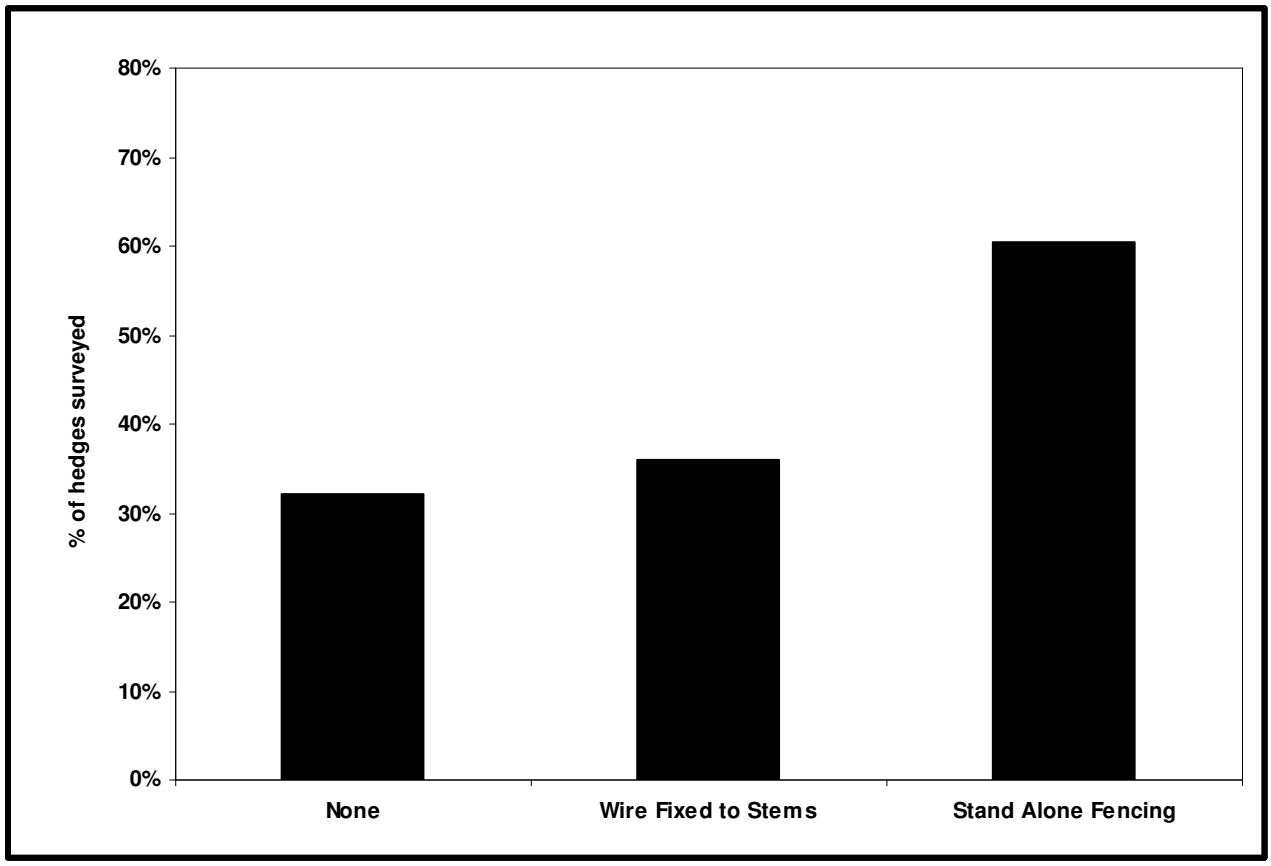


Figure 7.7.3 Additional Fencing of Hedgerows

Only a third of hedges form boundaries that are not reinforced with some other means of fencing. 10% of non fenced boundaries divide arable land, so it can be seen that most hedges do not have a direct stock control function. For 7.5% of hedges, wire fixed to hedgerow stems is the only means of strengthening the boundary.

Eliminating redundant boundaries from the analysis decreases the percentage of hedges that are unfenced. It also reduces the percentage of long term unmanaged hedges from 23% to 18%. Details are shown in Figure 7.7.4.

It is generally considered that hedge rejuvenation needs to be carried out at least every 30 years in order maintain sustainability. This means that overall 3.3% of hedges would need to be rejuvenated on an annual basis. 1% of hedges surveyed in Co. Laois showed evidence of hedge laying, at least in part, within the last few years, so current rates of rejuvenation are not sufficient to maintain a sustainable resource. Figure 7.7.5 shows the breakdown of the results. Evidence of old laying can be difficult to detect in very dense hedges or those with dense ground vegetation so it should be assumed that these results are on the conservative side.

The fact that 19% of the hedges recorded showed evidence of laying in the past (compared with 12% in Roscommon, and 26% in Westmeath) indicates that the technique was traditional. In Laois, 84% of the squares sampled contained at least one recorded example of a previously laid hedge.

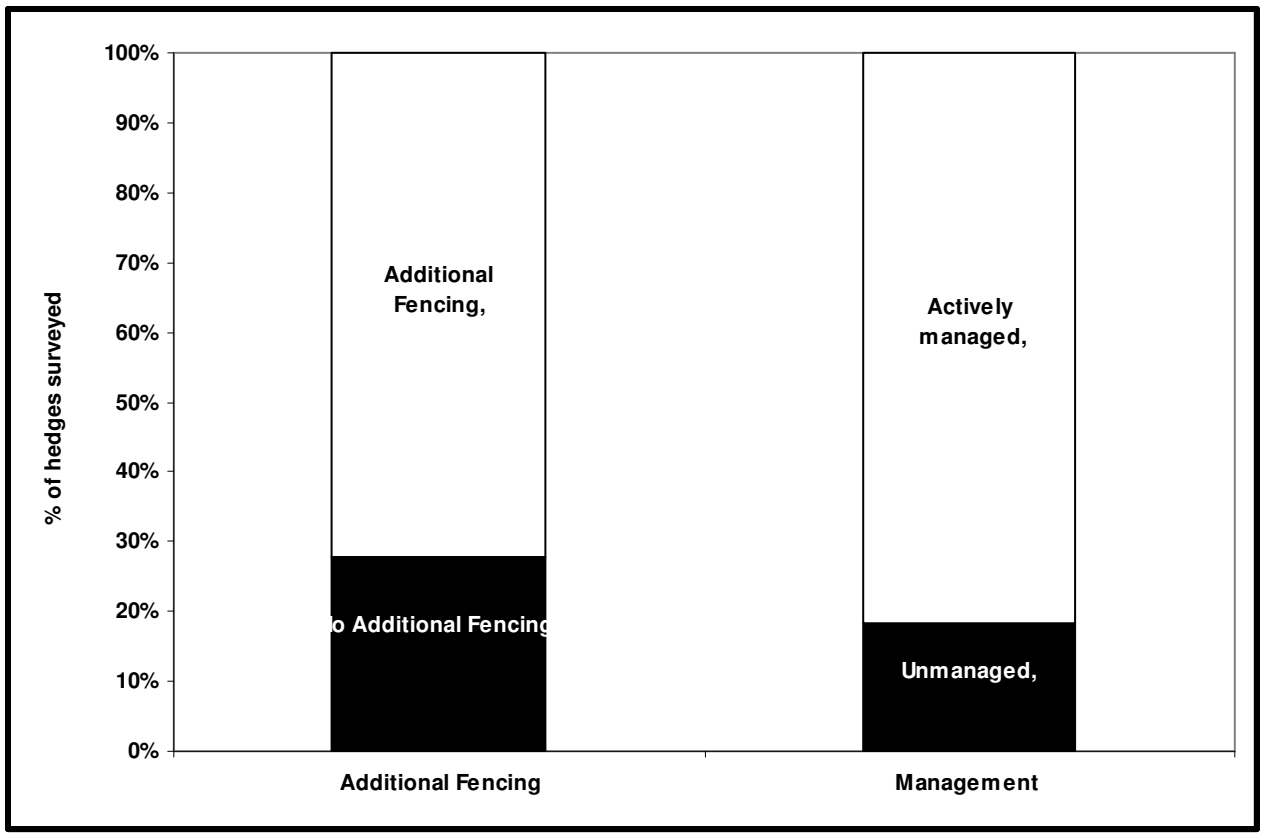


Figure 7.7.4 Fencing and Management of Hedgerows along Active Boundaries

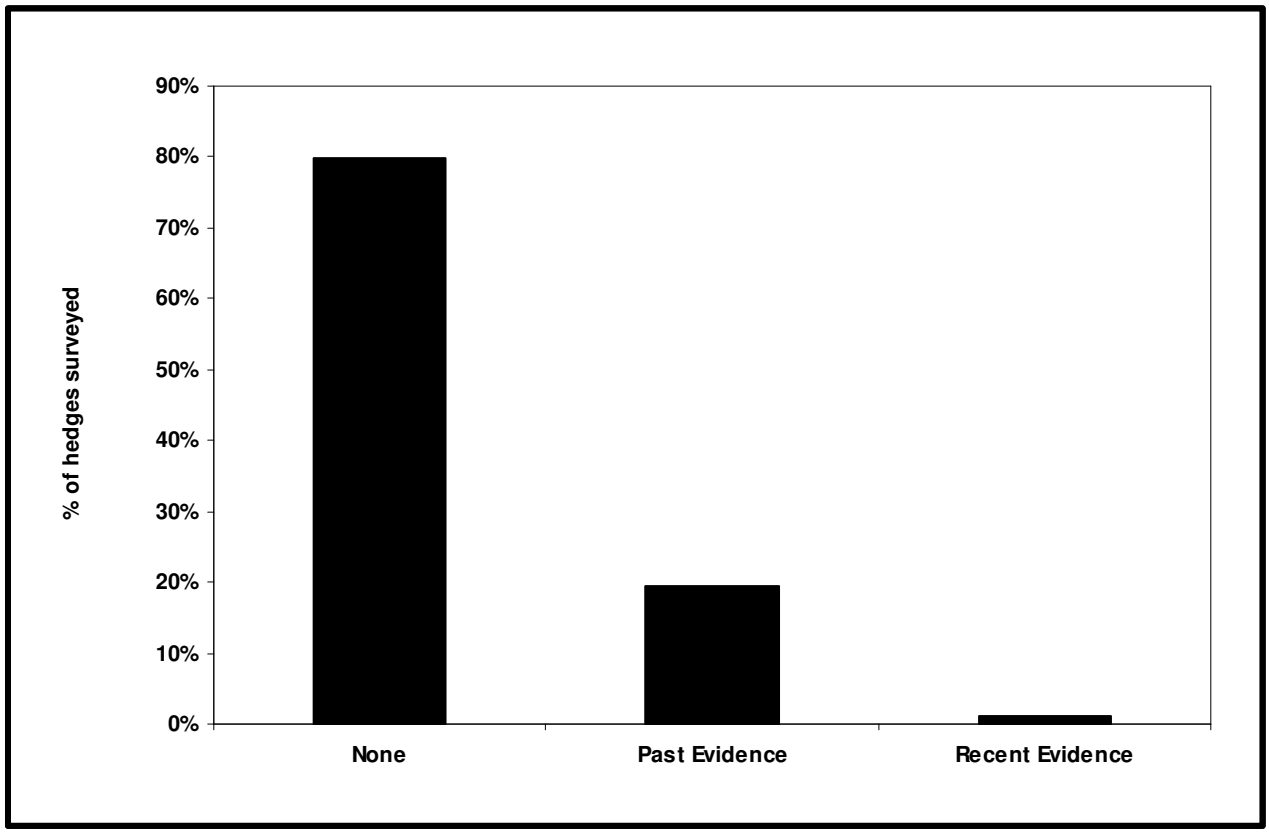


Figure 7.7.5 Proportion of hedges showing evidence of hedge laying

7.8 Quality of Hedges in Co. Laois

The species diversity is a very notable feature of Laois's hedges**.**

Condition of Species Rich Hedges
The Steering Group for the UK Biodiversity Action Plan (Website) has produced a list of nine criteria for what constitutes favourable condition" for species rich hedges. Of these only 5 were sufficiently consistent with data recorded in our survey to allow comparison. These were

1. Average height at least 2m
2. Average width at least 1.5m
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 standards we have based our assessment on British measures (see Recommendation 6.5).

Of the 159 sampled hedges in Co. Laois, 71 were classed as species rich and of these 23 (32.4% of the species rich hedges) passed the above criteria for favourable condition". This is 14.5% of the total hedges sampled. The comparative figures from the other County surveys are shown in Table 7.8.1.

Table 7.8.1 Comparison of the favourable condition" status of hedges in Midland Counties

County	No. of Samples	No. of Species Rich Hedges	% of Species Rich Hedges	No. of Species Rich Hedges in favourable condition	% of total sample in favourable condition
Laois	159	71	32.4	23	14.5
Offaly	130	41	31.5	10	7.7
Roscommon	189	9	4.8	5	2.6
Westmeath	152	7	4.6	1	0.7

Species rich hedge in favourable condition near to Stradbally

Figure 7.8.1 shows a breakdown of how the species-rich hedges failed to meet the favourable status criteria.

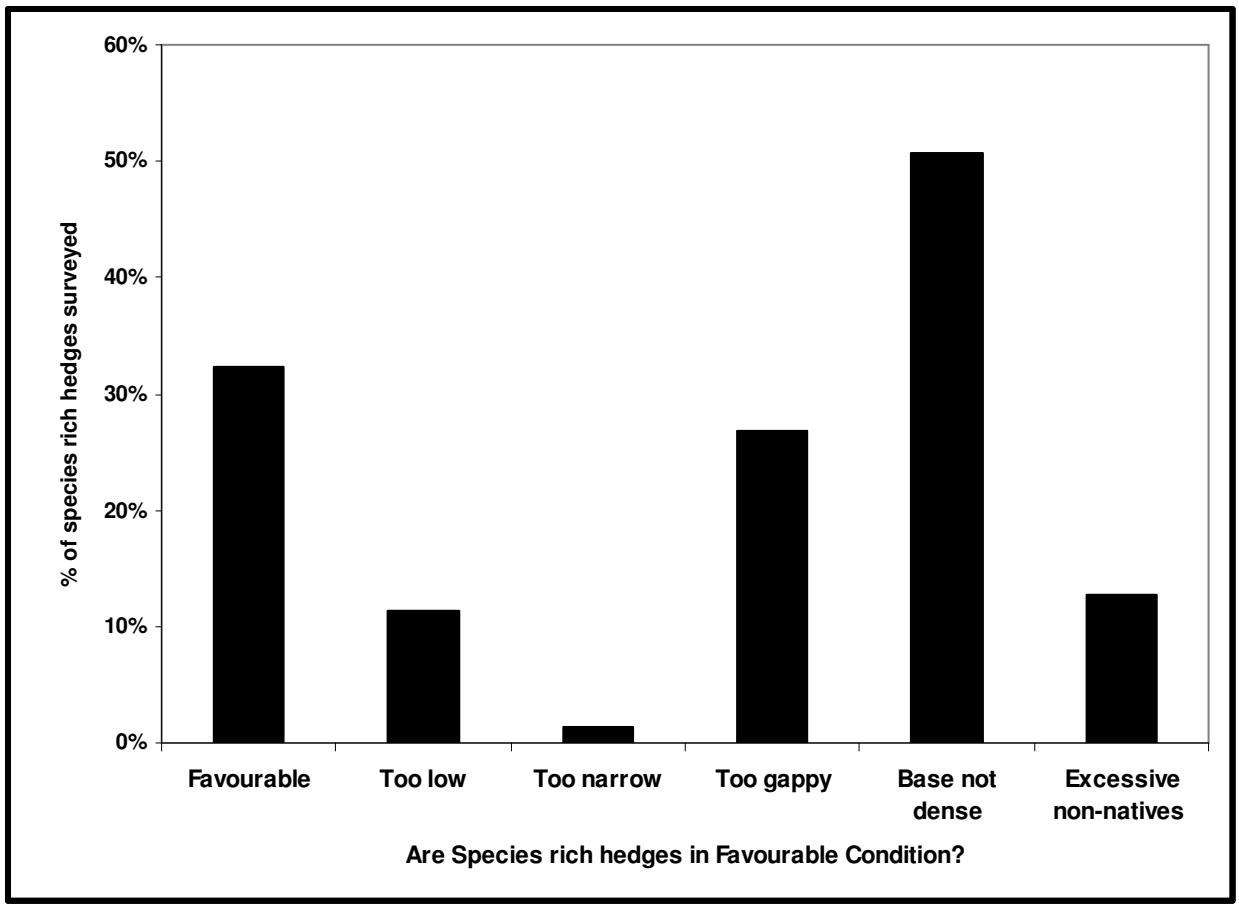


Figure 7.8.1 Condition of Species Rich Hedges

Allowing hedges to grow up to 2m or taller is quite easily rectified, as is allowing them to grow a little wider where they are less than 1.5m wide. Gappy hedges and those without a dense base will require more active intervention to bring them into 'favourable condition'.

The non-native species that are present to excessive levels are generally Wild Privet and Wild Plum. Wild privet is considered native to certain parts of Ireland (but not Co. Laois) and the fact that the wild plum is from the same family (*Rosaceae*) as whitethorn and blackthorn would make this category of less importance.

7.9 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 OS Maps and which would be too small to register as distinct linear features on aerial photographs (or have been planted in the five years since the aerial photographs were taken) 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 contribute to the overall hedgerow extent to any significance.

Summer Cutting
In the period from late June to mid July during the fieldwork stage of this project numerous examples were seen of recent hedgerow cutting which had no obvious justification on the grounds of Public Health and Safety. Cutting hedgerows during the growing season is potentially damaging to the health of hedgerow shrubs and to much wildlife dependent on the hedge.

Hedgerow Quality
A number of situations were encountered where land was becoming unkempt and reverting to scrub. Hedgerows in these areas tended to be unmanaged and often gappy. Anecdotal evidence would suggest that in most cases the land was leased to farmers from outside the local area. Stock, generally cattle (not always in the best of condition) were free to range over a wide area. Conversely, some of the best hedges were found on farms where the livestock were in the best condition.

Management for Management's Sake
Examples were encountered where hedges (particularly internal field hedges) had been cut with no obvious purpose. This situation is mirrored around the country and our general conclusion is that the work is part of poorly conceived REPS plans which are resulting in management for the sake of having something to put into the REPS plan. A particular example was observed in the square near to Borris-in-Ossory (LS09) and involved the topping at approximately 1 metre from the ground of a mature hedge which previously had been unmanaged. The work observed would not have complied with any of the objectives of the REP scheme in terms of stock control, bio-security, scenic appearance or enhancement of wildlife value.

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. However, during the course of the fieldwork a number of direct and indirect observations were made of the wildlife associated with hedges, including badger sets, sightings of yellowhammer, and cuckoo. The plethora of rabbits is a threat to the stability of hedge-banks in some areas.

Many of the Laois hedges had a profusion of bluebells in the hedge-banks, far more than seen in any of the other surveys. Bluebells *(Endymion non-scriptus)* are generally more associated with woodland than hedgerows.

8. Discussion

In this section, the results of the survey are assessed in light of current thinking on best practice conservation, favourable status, and data from comparable studies, especially the Hedgerow Surveys of Counties Roscommon, Westmeath and Offaly.

Hedgerow Extent

Laois has an extensive network of hedgerows throughout the county, with an estimated total length of 12,427km. The general extent of hedgerows is best expressed by the density of hedgerows per square kilometre, and in this respect County Laois compares well to the other counties surveyed to date (Westmeath, Roscommon, and Offaly), with the average figure of 7.28 km of hedgerow per km² being the highest recorded (standard deviation 3.15). It must however be noted that the average figures for Offaly and Roscommon are brought down by the large areas of non-hedgerow landscapes such as bogs, afforestation, etc. This is reflected in their higher standard deviation figures of 4.32 and 4.75 respectively. The Laois landscape is consistently more agricultural, with 15 of the 19 1 km squares surveyed having hedgerow densities in excess of 5 km per km². Hedgerow density is lower in the upland areas of the Slieve Blooms.

The hedgerow density figure also compares favourably to England, which has an overall average density of 2.91 km per km^2 (Barr, 1993), and the County of Suffolk, a county of rolling agricultural land, which has a mean hedgerow density of 3.6 km per km^2 (Parker)

Hedgerow Loss

In comparison with the data from the Badger and Habitats Survey of Ireland (Smal, 1994), hedgerow loss in Laois in the last 12 to 16 years can be estimated at 6%. The methodologies of the two surveys are not totally consistent so the figure cannot be treated as substantial. However, the authors consider it to be plausible based on their observations.

Direct loss through removal for agricultural or development purposes is likely to be the main cause of hedgerow loss, but loss through deterioration in quality and ageing is also likely to be a factor. 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).

Greater care and protection is thus 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.

Research is needed to investigate the practicalities of physically moving mature hedgerows. If this can be done 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.

Species composition

A total of 32 shrub species, including 21 native shrub species, were found in the hedge layer of this sample of the county's hedges. There is also very high species diversity within a good proportion of

individual hedges, with almost half of hedges found to contain an average of four or more native species in a 30m strip, with one hedge recording nine native species in a single strip. In addition to this, wild Rose and Honeysuckle were both found in a high proportion of hedges.

The Laois and Offaly species richness figures are significantly higher than results from the Roscommon and Westmeath hedgerow surveys. The figures also compare favourably to Britain, where a total of 42% of hedges are considered to be either ancient or species rich, and Northern Ireland, where the figure is 33% (UK Biodiversity Action Plan Website). The British results are boosted by the fact that, unlike this survey, the wild rose is counted in their species richness totals; this further emphasises the richness of Laois hedges.

It is not possible to say for certain how this species richness has happened, whether through natural processes or human intervention, or a combination of the two, but a number of theories can be speculated.

For natural processes to be at work there would need to be sources of seed (individual trees or, more probably, woodland) from which the hedges could be colonised. The fact that 17% of the hedges surveyed linked to semi–natural woodland, scrub, and transitional woodland would indicate that this is a distinct possibility. Esker woodlands would be a prime source of species that would be found in hedgerows. Laois has numerous eskers but so too does County Westmeath where hedgerow species diversity is more limited. A detailed study of the tree and shrub composition of eskers around the country may shed more light on the subject (esker surveys are ongoing in Laois and Westmeath).

Since different tree and shrub species have different preferred soil types and growing conditions it must be assumed that the nature of the Laois soils are not at the extremes (of acidity, moisture retention, etc.) making them favourable to a wider range of species.

A more thorough analysis of this subject could be made by examining data from this survey in conjunction with the results from the ongoing Habitat and Esker Surveys of the County and also with soil analysis data.

A higher proportion of species rich hedges in a given area mean that there is a greater potential source of seed to colonise other local hedges by natural processes (wind, bird distribution).

As a general rule, older hedges are more species rich than younger ones. This is based on the fact that it takes a considerable period of time for new species to colonise a hedge. One theory from Britain suggests that, on average, one new species colonises a hedge every one hundred years. Since Laois and Offaly, ‘Queen’s’ and ‘King’s’ Counties, were the first Plantations in Ireland, they would have been subject to Anglicisation earlier than other parts of the country. Although there is no documentary evidence to say that hedgerow planting featured as part of this process it is certainly possible that some hedgerows were established in what is now County Laois during the 16th century. Any hedges established during this period would have simply had a greater amount of time to be colonised by species other than those planted initially.

If this theory were the sole explanation of species richness we would expect to see a few very species rich hedges that would date back to the Tudor enclosures with other hedges displaying less variability in their species composition dependent on their period of origin. This is not the case, there is a good degree of diversity in a large proportion of the hedges, so although we cannot rule out the fact that there may be hedges of 16th century origin in Laois we would not be of the opinion that this is a significant cause of the relatively high levels of species richness in the County as a whole.

One factor that does contribute to the higher species richness figures in Laois is greater levels of management. Trimming of hedges tends to restrict tree species such as Ash, Sycamore, and Wild Cherry to the hedge layer. As a high proportion of hedges in Co Laois are routinely trimmed, the presence of these tree species in the hedge layer (as opposed to the tree layer) is likely to have raised the figure of species richness somewhat in comparison to the less managed hedgerows of Offaly, Westmeath and Roscommon. This is supported by a higher presence of most of the tree species in the hedge layer of Laois hedges than in the hedge layer of Offaly hedges. For example, Ash is recorded in the hedge layer of more than a third of Laois hedges compared to just over a quarter of Offaly hedges.

Certain species were found to be closely associated with species rich hedges. Crab Apple, Spindle, Hazel, and in particular Guelder Rose, Wild Cherry and Rowan, are good potential indicators of species richness in a hedge, all being more likely to occur in species rich than non species rich hedges. These species are less likely to have been planted in to hedges than to have colonised hedges naturally. Conversely, Elder and Privet occur less frequently in species rich hedges than would be anticipated given their widespread nature.

Townland boundary and roadside hedges have been found to contain higher mean species richness than non townland boundary or roadside hedges. Similar results have been found in the Offaly, Westmeath and Roscommon Hedgerow Surveys, a study of hedges in Co. Kildare (Murray, 2001), and in Northern Ireland (Hegarty and Cooper, 1994). This is assumed to be due to townland boundary and roadside hedges being generally of more ancient origins and with larger banks and ditches than non-townland boundary hedges.

The higher species richness 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 removal wherever possible.

A good variety of tree species were found in the hedges of this survey, with the majority of hedges having trees along their length (although Laois has the highest proportion of hedges without trees in the counties surveyed to date). The most commonly occurring hedgerow tree in County Laois is by far the Ash *(Fraxinus excelsior).* Two of the more commonly occurring trees in Laois hedges are the non-natives Beech (*Fagus sylvatica)* and Sycamore (*Acer pseudoplatanus).* Both of these tend to have a dense canopy which can shade out the shrub layer and are generally not considered as being suitable hedgerow tree species

The great variation and diversity of hedge species composition in Laois (and Offaly) has allowed the hedges to be classified into seven hedgerow types (groups) using data analysis software. This compares with just five groups in the Westmeath and Roscommon Surveys. There is a strong measure of overlap between the classifications from the two studies, with greater distinction being possible between types of species rich hedges in the current study. The groups represent hedge types varying from species poor Hawthorn hedges, through to an elm and holly group, a gorse group, and both a species rich group and a 'wet' species rich group. There is no apparent pattern to the distribution of hedge types across the county. More detailed analysis of the data, particularly in relation to soil types may help in further refining and defining the classification groups

Methodology

Based on work by Dr. Max Hooper (1970) in Britain, the figure of 30m is generally used as a standard measure for recording a representative sample of hedgerow information. Some UK methods of hedgerow survey allocate the number of strips arbitrarily, with 30m normally considered an adequately representative floristic sampling size, but additional strips can be recorded

at will (CPRE Hedgerow Survey, 2000; Bickmore, 2002). The UK 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 richness figure per hedge.

The methodology for this survey indicates that two randomly selected 30m strips per hedge should be selected from which to record hedgerow species composition data.
23% of the sample hedges in Laois showed a difference of 2 or more in the species count between the two 30m strips including one strip where the difference was five and one where the difference was six. In Offaly the figure was 27%. In Roscommon and Westmeath, where species diversity was much less than in Laois and Offaly, the figures were 19% and 14% respectively. 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.

Ivy

Ivy was recorded as present in 76% of the 30m strips recorded in Co. Laois. 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 school suggests that ivy can dominate its host and cause it to lose vigour and even eventually kill it. The other school 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. 12% of 30m strips recorded had ivy dominant at the canopy level for over 25% of their length. This is significantly lower than the 20% recorded in Westmeath but is still an issue which needs to be monitored.

History and Landscape Context

The majority of the current hedgerow landscape in Laois was established between the mid 18th century and 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 are often demarcated by natural features such as watercourses. The proportion of townland boundaries in Laois associated with a stream is higher than for infill hedges. This is consistent with the findings in Roscommon, Westmeath and Offaly. More recently established hedges (that are not present on the early 20th century OS maps), most likely associated with Land Commission property divisions, are almost invariably species poor.

The vast majority of hedges surveyed in Laois were linear in outline, constructed with a single (as opposed to double) line of hedging shrubs, and a hedge bank. A high proportion of the non–linear hedges recorded form part of a townland boundary. This supports other findings that non–linear hedges are normally associated with hedges of antiquity (Murray, 2001). A high proportion of the non–linear hedges recorded were also constructed alongside natural features such as streams. Hedges which have an inverted S-shape, which fall in to the non-linear category, are reputed to have facilitated the ploughing of fields by horse drawn ploughs since medieval times.

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. The fact that three-quarters of Laois hedges surveyed occur within the context of intensive farming (i.e. improved grassland and arable land) indicates that they can provide much needed wildlife habitat in intensive agricultural landscapes.

A high proportion (17%) of hedges surveyed link in to semi–natural woodland, scrub, and transitional woodland, thus facilitating the movement and distribution of wild flora and fauna associated with wooded habitats through the landscape. Protection and enhancement of these hedgerow corridors, and the promotion of further corridor establishment, will have a positive impact on the connectivity of wildlife habitats throughout the countryside and the stability of wildlife populations.

On the other hand, increasing development of one-off housing in the countryside is likely to be having a negative impact on hedgerow connectivity, leading to a further fragmentation of habitat networks.

In regard to the functional value of the hedgerow resource in County Laois, agricultural practices and methods are continually changing. Holdings now are generally larger than the period when the hedgerow network was being established. Some hedgerow removal, most probably during the 1960s and 1970s, has led to increasing field size, often to accommodate larger machines. Only a small proportion of hedges in Laois (and Offaly) were found to be redundant as boundaries, suggesting that the present field sizes are generally considered appropriate to current agricultural practices. Hedges recorded as active field boundaries are not necessarily stockproof, but they form part of an active sub-division of a farm or a boundary between holdings. Counties Westmeath and Roscommon were found to have a significantly lower proportion of active field boundaries.

Hedge Construction

Hedgerows vary in their construction based upon numerous factors including 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. Many landowners included such details as clauses in tenants' leases.

Only half of the hedges surveyed had an associated drain, but where drains were present they were predominantly large, very much in line with the description in section 3.1 (page 12).

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 Laois, 23% of hedges had very large hedge banks, which are often also a good indicator of hedges of antiquity. Associated walls are a very uncommon feature of Laois hedgerows.

Hedge Structure and Condition

As hedges are functional features of agricultural landscapes, and occur by their nature on private land, their meaningful survival is linked to their usefulness and hence their value to the farmer.

Over a fifth of hedges recorded in County Laois are kept below one metre high. This has been shown to be least beneficial to nesting birds. Increasing hedgerow height has been shown to correlate positively with increasing diversity of bird species in a hedge (Arnold, 1983; Lack, 1987). Taller hedges also provide better shelter for farm animals. So from farming, landscape, and wildlife perspectives the proportion of very low hedges in Laois could be reduced. The percentage of low cut hedges in Laois is similar to that in Westmeath, but higher then Offaly and Roscommon, where there is a tendency for hedges to be less intensively managed. Relative to the other counties, Laois also has the lowest percentage of hedges in the tallest category.

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. 90% of Laois hedges surveyed were greater than one metre wide.

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 richness (Murray, 2001), as do smaller and lower hedges. Just over a tenth of Laois hedges surveyed have more than 25% gaps. This level of 'gappiness' should be of some concern, as most hedge functions are diminished if the level of gappiness is too high.

The density of shrub growth in the bottom metre of the hedge is also an important indicator of the hedge structure. Almost half of Laois hedges surveyed display 'scrawny' or weak growth in the base of the hedge. A scrawny, weak, or open base is normally associated with a hedge that is moving towards becoming a tree line and losing its principal agricultural value. Continuous hedges with a good basal structure are more agriculturally valuable as they do not need additional fencing, and good growth from the bottom of the hedge also allows it to function as a stock proof boundary on a longer time scale. Several studies have shown that density of growth in the hedge base also influences the hedges capacity for supporting wildlife (Arnold, 1983; Osborne, 1984). Thus from agricultural and wildlife perspectives the basal density of Laois hedges could be improved, but on a more positive note, Laois has a higher proportion of hedges with a dense base than other counties surveyed.

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).

By far the most commonly occurring hedge profile category in Laois is the 'boxed and A-shape' profile category. The results of the survey also show that a high proportion of boxed and A-shape hedges have sparse or no flowers or fruit 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. However, hedges that are regularly cut to a box or A-shaped profile produce less flowers and fruit than hedges which are allowed to grow unchecked. For best practice, it is necessary to achieve a balance between maintaining hedge structure and density, and allowing hedges to flower and fruit. 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.

In Laois the figure for remnant and derelict hedges is relatively low, consistent with the fact that there is a low percentage of redundant boundaries. 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 Laois as they are in Counties Westmeath and Roscommon.

In common with the results from the other county hedgerow surveys, damage to banks is a frequent occurrence in Laois, although not at such high proportions as seen in County Roscommon. Livestock, particularly sheep, are almost certainly the main agents of erosion. A higher proportion of land in tillage, greater levels of fencing and fewer sheep are probable factors in the difference between the two counties.

Management of hedgerow trees

Hedgerow trees are not only a very significant landscape feature; they are, especially when mature, also beneficial to the overall ecology of the hedge. More than a third of Laois hedges have no hedgerow trees. This figure is slightly higher than that recorded in Offaly and Roscommon, and significantly higher than Westmeath, where only 18% of hedges were without trees. Higher levels of management often result in fewer hedgerow trees as saplings may be cut during management activities. Although nearly 40% of hedges surveyed in Laois had young trees present, 40% of the hedges that had hedgerow trees had no young trees present which would not be considered sufficient to ensure sustainable hedgerow tree populations into the future.

With such diversity in the species composition of the hedges in Laois it is disappointing to see so few examples of small native tree species such as spindle, rowan and crab apple that had been allowed to mature rather than being clipped as part of the hedge.

Routine maintenance regimes carried out on hedgerows that have a proportion of young ash trees tend to favour the growth of ash over the thorny species. This is particularly evident underneath overhead cables where hedges are topped on a regular basis.

For hedgerow condition, trees can pose their own set of problems in terms of competition for light and moisture with the shrub layer. Heavily shading non-native species such as Beech and Sycamore can be a particular problem, while the leaf structure of the Ash tree allows greater penetration of light and thus does not impact hedge structure to the same extent.

Roadside Trees

The view has been expressed to the authors 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. This view must be weighed against the enormous aesthetic and wildlife value of roadside trees. Over 72% of roadside hedges surveyed in Laois contained hedgerow trees. It was 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 (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.

Hedgerow Management

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

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 REPS3, the most recent scheme, 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 indicate that, in County Laois, there were 1045 active participants in REPS on 31/08/05. This is almost 30% of all farms, and puts County Laois 18th in the table of number of participants in the scheme.

Results of this survey show that a very high proportion of Laois hedges are actively managed, with 68% being trimmed. Of the managed hedges, 92% are flailed. A breakdown of the trimming profiles for routinely managed hedges showed that 93% were being trimmed to a box profile with only 7% trimmed to the A-shaped profile recommended by the REPS and Teagasc. With such a strong bias towards one method of management it is imperative that those carrying out the work be well informed and operating well maintained machines for optimum results. The failure to trim hedges to a recommended best practice profile is a consistent theme of the other detailed surveys carried out to date. It is likely that most work is carried out by contractors rather than individual farmers, but this would need to be confirmed through further research. In either case it is apparent that education and training of flail operators could lead to improved standards of hedgerow care. Teagasc run a FETAC accredited training course for hedge-cutting machinery operators.

More than a third of hedges surveyed had wire attached to the hedgerow stems. 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 (over 70% of hedges containing wire were trimmed by mechanical means). 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.

Evidence of hedge laying in the past was quite high in Laois, with a fifth of surveyed hedges displaying clear evidence of past laying. This demonstrates that this was a traditional form of hedge management in Laois. The huge majority of the sample squares contained at least one recorded example of a previously laid hedge, so knowledge of the technique was also widespread.

Rejuvenative hedge management refers to hedge laying and coppicing. 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 failed to register a score. Only two hedges showed evidence of recent laying, but not as the dominant management for the hedge as a whole. Rejuvenation of hedges by laying should also reduce levels of gappiness. Current rates of rejuvenation are not sufficient to maintain a sustainable resource.

Interestingly, 25% of redundant boundaries are still being actively managed. Although the sample base is small the results are broadly consistent with those from the other county surveys. It would be interesting to canvass the opinion of farmers on what they consider to be the main benefits of hedgerows from an agricultural perspective and what are their management objectives.

The results of this survey demonstrate that improved understanding of hedgerow management issues is needed if the resource is to be managed sustainably. That greater effort is required to have a positive influence on farmer's attitudes and awareness is also one of the recommendations of Kenny (2004) in his study of hedgerows in County Roscommon.

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.

An issue in relation to this 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 any better. 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.

Only 32% of the species rich hedges sampled in Laois met all of those favourable condition" criteria of the UK Biodiversity Action Plan which were consistent with the recording details of this survey. All of the criteria can be influenced by management, leaving the potential, with appropriate management, for all species rich hedges to be in favourable condition.

It would be beneficial if criteria were agreed by relevant stakeholders as to what constitutes favourable condition" for Irish hedgerows.

Managed hedge in favourable condition" - Ballickmoyler square (LS19)

9. Recommendations

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 the section, with lead partners identified, where appropriate.

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 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 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 shelter and maintenance of soil quality is more highly regarded. The role played by hedges in maintaining water quality is insufficiently understood, but, in the 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) and the REP scheme. Within the context of these changes, the wildlife and aesthetic aspects of hedgerows must be regarded.

Changes in the Common Agricultural Policy are expected to reduce livestock numbers in Ireland considerably. It is yet to be seen 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 habitat 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 a 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; 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 needs 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 in 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 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 large percentage of the current network has fallen in to disrepair over a period of decades. Reparation of degraded hedgerows involves substantially higher costs than would be incurred if appropriate maintenance had been timelier.
- 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 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.
- The number of agricultural holdings in 2002 in Ireland was 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. Also, the decline in the number of people engaged in agriculture is of consequence.

9.2 National Policy Recommendations

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.

1.1 A full cost / benefit analysis of the hedgerow resource should be carried out.

REPS

REPS plans should show a distinction between active and redundant farm boundaries.

1.2 Unless there are very 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.

1.3 REPS 3 needs to prioritize the filling of gaps in existing hedgerows over the planting of new hedgerows.

1.4 The restoration of degraded hedge banks and walls should be fully costed and included in the options for hedgerow management under REPS 3.

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.

1.5 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.

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).

1.6 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.

1.7 Planners and Inspectors 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.

1.8 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

Hedges were recorded during the survey which were beginning to be colonised by species from adjacent forestry lands. Afforestation with non-native forestry species, e.g. sycamore, has the potential to impact on the species composition of hedgerows in the longer term.

1.9 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 Laois 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.

1.10 As part of the County's Biodiversity Action Plan, Laois County Council should draw up a Hedgerow Conservation Policy Document.

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 richness or those containing rare species, should be safeguarded more stringently in roads, construction, and other development operations.

1.11 In the planning process, greater consideration should be paid to individual hedgerows in light of their particular qualities and characteristics.

Simple and systematic methods should be developed for dealing with hedgerows within the planning process.

1.12 Guidelines should be produced for planners and road engineers dealing with hedgerows in planning applications.

Significant future developments are expected in Laois with the re-zoning of 29 villages. This is certain to have an impact on the hedgerow resource.

1.13 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".

1.14 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.

1.15 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.

1.16 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

1.17 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.

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

Roadside Hedgerows

Although roadside hedges make up only approximately 10% 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.

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

In the period from late June to mid July during the fieldwork stage of this project numerous examples were seen of recent cutting of roadside hedges which had no obvious justification on the grounds of Public Health and Safety. Cutting hedgerows during the growing season is potentially damaging to the health of hedgerow shrubs and to much wildlife dependent on the hedge.

1.20 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.

1.21 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.

1.22 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

Many of the species rich hedges within the County fall outside 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.

1.23 Incentives for the conservation of, or renovation to, favourable condition of all 'species rich' 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.

1.24 Local Authorities jointly should set consistent standards for the interpretation and implementation of the section of the Air Pollution Act relevant to disposal of hedgerow waste. This interpretation should be communicated to farmers, landowners and contractors.

1.25 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.

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

1.27 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.

1.28 A repeat hedgerow survey for the county should be carried out no later than 2015.

9.3 Recommendations in relation to Hedgerow Management in County Laois

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.

2.1 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.

2.2 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.

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

2.4 Farmers and landowners in Laois 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.

2.5 A greater degree of rejuvenation of old and degraded hedgerows should be encouraged.

Hedgerow Trees

Figures on the age composition of hedgerow trees in Laois would indicate that the number of hedgerows containing trees is likely to fall in the future unless there is increased tree planting or retention of saplings in some hedges.

2.6 Achieving sustainable levels of hedgerow trees should be promoted through appropriate management advice.

The species diversity in the shrub layer of Laois hedgerows is not proportionately reflected in the frequency of occurrence of many of those species in the tree layer.

2.7 Landowners should be encouraged to allow more of the wider variety of native species already present in hedges to mature into trees.

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

Safety

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

2.10 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.

3.1 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 hedge species found in County Laois. This information should be disseminated to interested parties.

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

Supply and Demand of Nursery Stock

Contact with nursery grower and other professionals has indicated a likely shortfall of native provenance whitethorn for the 2005/6 season. Plans need to be made to ensure that the planting requirements predicted as a result of the introduction of REPS 3 can be met from indigenous stock. This will require a degree of forward planning.

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

Support of nurseries

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.

3.4 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

The use of excavator machinery for the purpose of hedgerow management is not permitted under the specifications of the REPS. Its use is largely confined to poorer draining soils.

3.5 The practicality of adapting conventional hedge cutting machinery for use on tracked machines should be explored as a means of enabling hedgerows on poorly drained land to be suitably managed during the appropriate season.

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.

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

9.5 Recommendations for Education and Awareness

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.

4.1 Ensure all relevant staff (and any contractors used) have the necessary skills and data sources to implement or evaluate best practice hedgerow conservation.

4.2 Provide appropriate training for staff in aspects of hedgerow conservation relevant to their position.

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

4.3 A number of showcase sites of best practice covering different aspects of conservation and management should be developed around County Laois.

The exceptional diversity of Laois hedgerows should be promoted.

4.4 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.

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

9.6 Recommendations for future research

Ecology

Comparative Ecological Value of Hedgerows in different farm landscapes

5.1 Studies should be undertaken to determine the extent to which adjacent land type and use influences biodiversity in hedgerows, particularly species rich hedges.

Ivy

5.2 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.

5.3 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.

Fruiting

A relatively high proportion of Laois hedges showed below average levels of fruiting.

5.4 The impact of different levels of fruiting in hedgerows on bird populations could be investigated.

Relocation of Hedgerows

In the case of road widening, one off housing and some other developments hedgerow removal is a necessary corollary of the site work rather than an objective: Hedges are in the way. Moving hedges short distances (within the site area) can satisfy development goals with less impact on biodiversity. This process also may be cost effective.

5.5 Techniques should be investigated for the re-location of mature hedgerows as part of a thoroughly researched and costed project. Laois County Council could be proactive in initiating and implementing such a project.

Effects of non traditional management techniques

5.6 A thorough research programme should be carried out to assess the full implications of managing hedges with excavator machines and until such time the precautionary principle should be applied.

Disposal of hedge cuttings

5.7 Alternative methods to burning should be explored for the disposal of woody waste from hedge management activities, including cost effective, practical methods for chipping or shredding.

Investigating Data Sets from other surveys

This survey uses the same sample areas as the Badger and Habitats Survey of Ireland, and the Countryside Bird 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.

5.8 Data from the Hedgerow Survey could be related to previous surveys using the same sample area to enable more specific analysis.

5.9 Species composition data and Group Classifications from the Hedgerow Survey should be investigated in relation to soil types.

5.10 The method of selecting the sample squares used in this survey should be used to generate the sample base for any general habitat related studies.

9.7 Recommendations in relation to hedgerow surveying

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.

6.1 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.

6.2 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.

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

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

6.5 Criteria for what constitutes 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

6.6 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																											
	1.1	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									*						*			*		
Developers																*	*			*					*			
Environmental NGOs																						*						
Farmers/Landowners		*	*														*		*	*	*	*			*	*		
Forest Service/Foresters	*								L											*		L				L	L	
Heritage Council	*																					*	L					
Laois 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**																			
	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10	3.1	3.2	3.3	3.4	3.5	3.6	4.1	4.2	4.3	4.4	4.5
Agri/Environmental Consultants	*		*	*	*	*	*	*	*	*							*	*			
Community Groups	*		*														*		*		
Department of Agriculture	*	*	*		*									*			*	*			
Developers	*																*	*			
Environmental NGOs																				*	
Farmers/Landowners	*		*	*			*	*	*	*							*	*			
Forest Service/Foresters	*					L						L	L	L			*	*			
Heritage Council														*							*
Laois County Council	*		*	L													*	*	L	L	L
Management Professionals			*												*	*	*	*			
National Parks & Wildlife Service	*		*														*	*			
Nurseries / Garden Centre											*	*	*				*	*			
Research Institutions											*				*	*					
Semi-State Bodies	*																*	*			
Teagasc		L	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 Survey Recommendations to Stakeholders

Stakeholder Group	Recommendation reference number															
	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	5.10	6.1	6.2	6.3	6.4	6.5	6.6
Agri/Environmental Consultants						*						*	*	*	*	*
Community Groups																
Department of Agriculture	*					*									*	
Developers					*	*										
Environmental NGOs				*												
Farmers/Landowners						*										
Forest Service/Foresters																
Heritage Council											L	L			L	L
Laois County Council					L	*					*					*
Management Professionals					*	*	*									
National Parks & Wildlife Service															*	
Nurseries / Garden Centre																
Research Institutions	L	L	L	L	*	*	*	L	L	L		*	*	L	*	*
Semi-State Bodies																
Teagasc	*	*	*	*	*	L	L								*	
Tourist Sector																

* denotes relevant recommendation; L indicates Lead Partner/s

10. Conclusions

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

When making an assessment of the Laois hedgerow resource we would make a distinction between a relative and an absolute appraisal.

When viewed in relative terms, in comparison with other counties that have been surveyed and the authors' knowledge of hedgerows around the country, Laois would be high if not on top of any league table for hedgerows in Ireland.

In terms of species diversity and richness and overall best practice management results from Laois consistently compare favourably with other parts of the country.

The resource should be a source of pride to the County and is largely a credit to the agricultural community that has been responsible for its conservation over the years.

If we look in absolute terms we can see a number of areas where improvements, particularly in quality can be made:

- Laois has fewer hedges with hedgerow trees than other counties surveyed, and insufficient levels of sapling retention to ensure maintaining future levels.
- Levels of rejuvenative management are below those that would be desired.
- Many hedges are maintained at a height below what would be considered best practice and structurally the base of almost half of hedges could be improved.

The recommendations presented if implemented should go a long way to conserving and enhancing this particularly rich and interesting resource into the future.

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U.K. Hedgerow Regulations (1997) (S.I. Number 1160)

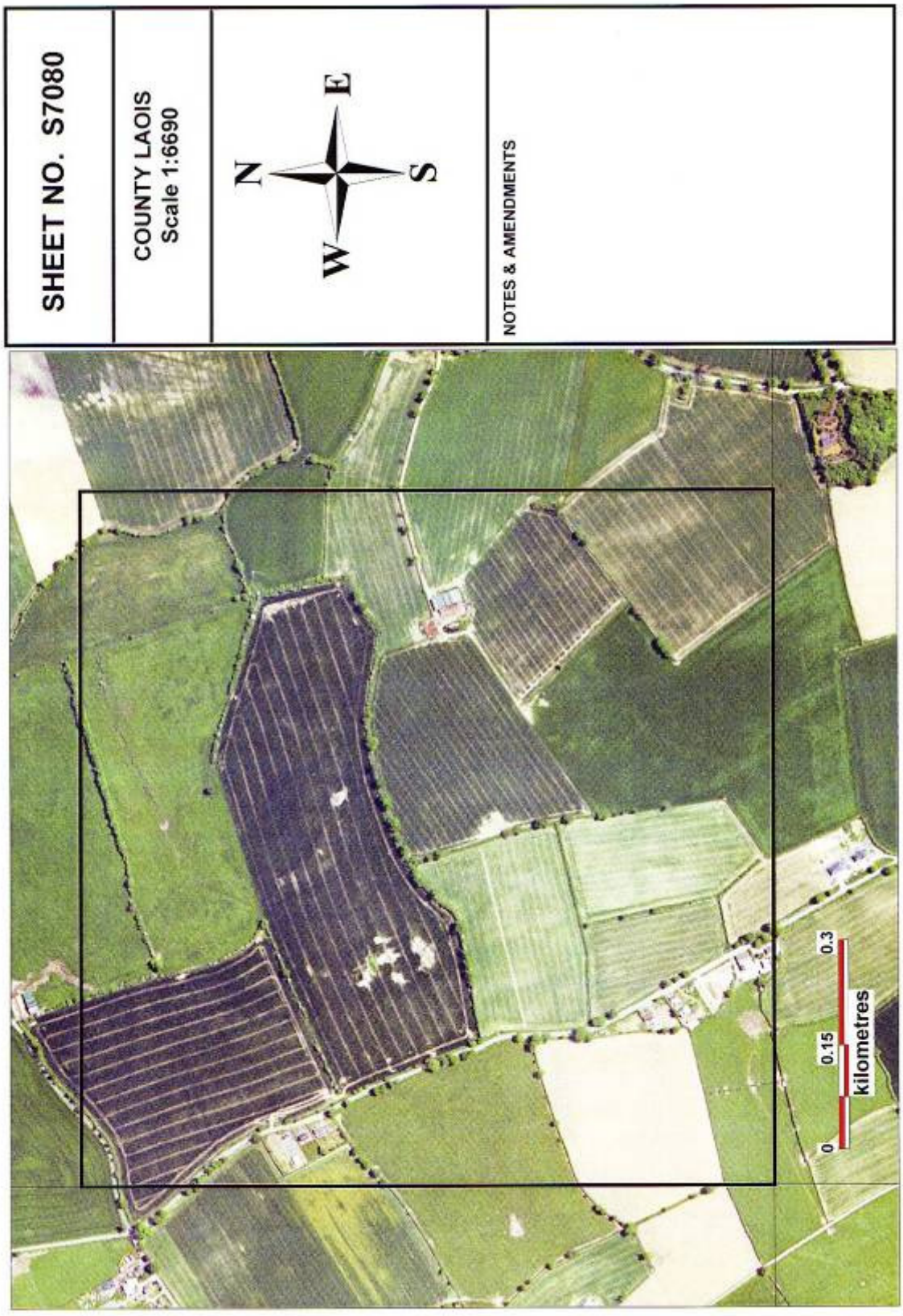
12. Appendices

12.1 Sample Squares

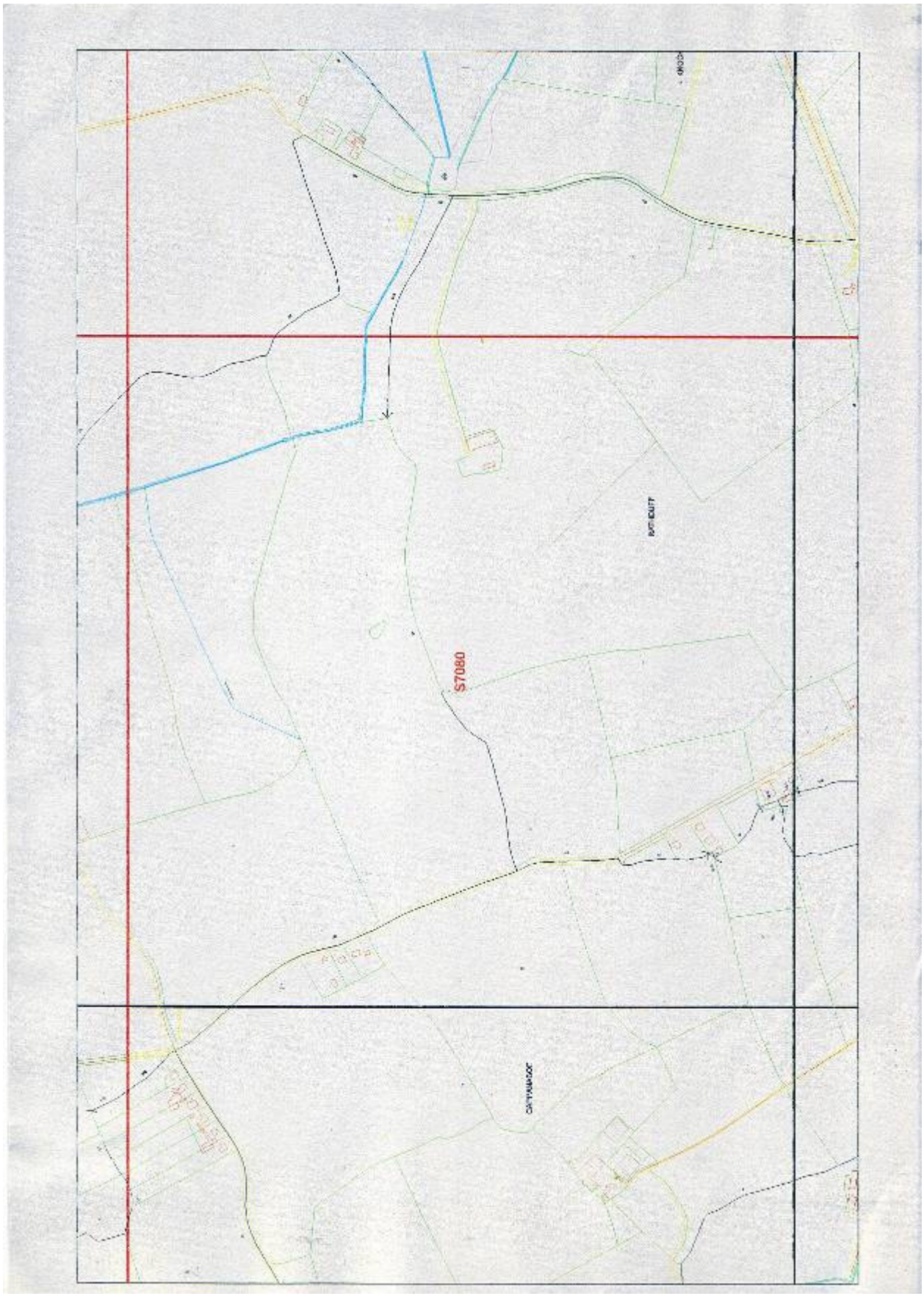
OS Grid Reference	Square Reference	Nearest Town / Village	Townlands
N 30 10	LS01	Clonaslee	*Brittas* *Scarroon*
N 40 10	LS02	Rosenallis	*Mellick* *Nutgrove* *Rinn* *Shanbeg*
N 50 10	LS03	Portarlington	*Tinnakill* *Coolnavarnoge & Coolaghy*
N 60 10	LS04	Monasterevin	*Clonanny*
N 30 00	LS05	Slieve Bloom	*Inchanisky* *Mountainfarm* *Bockagh*
N 40 00	LS06	Ballyfin	*Knocknakearn* *Springfield* *Iry*
N 50 00	LS07	Port Laoise	*Ballydavis* *Kilminchy* *Derrygarran* *Rathbrennan*
N 60 00	LS08	Vicarstown	*Raheenaniska* *Rosnamullane* *Vicarstown (Dodd)* *Vicarstown (Cosby)* *Derrybrock*
S 20 90	LS09	Borris-in-Ossory	*Ballinla* *Ballaghmore Upper* *Lackey*
S 30 90	LS10	Pike of Rushall	*Knockbrack* *Rush Hall* *Butterisland*

OS Grid Reference	Square Reference	Nearest Town / Village	Townlands
S 40 90	LS11	Kilbricken	*Bawnaree* *Mountfead* *Doon* *Rosskelton* *Cromoge*
S 50 90	LS12	Ballyroan/Timahoe	*Cullenagh* *Baunree* *Raheenduff Big*
S 60 90	LS13	Stradbally	*Tullomoy* *Raheenbarnagh* *Raheenahown* *Loughlass*
S 20 80	LS14	Errill	*Castlefleming (Giles)* *Castlefleming Heath* *Garryduff*
S 30 80	LS15	Rathdowney	*Coolfin (ED Donaghmore)* *Kilbreedy* *Bordwell Big*
S 40 80	LS16	Ballacolla	*Kylebeg* *Kyle* *Parkbawn* *Dunmore*
S 50 80	LS17	Ballinakill	*Boleybawn* *Ironmills or Kilrush*
S 60 80	LS18	Newtown	*Doonane* *Farnans*
S 70 80	LS19	Ballickmoyler	*Hollymount* *Cappanaboe* *Rathduff*

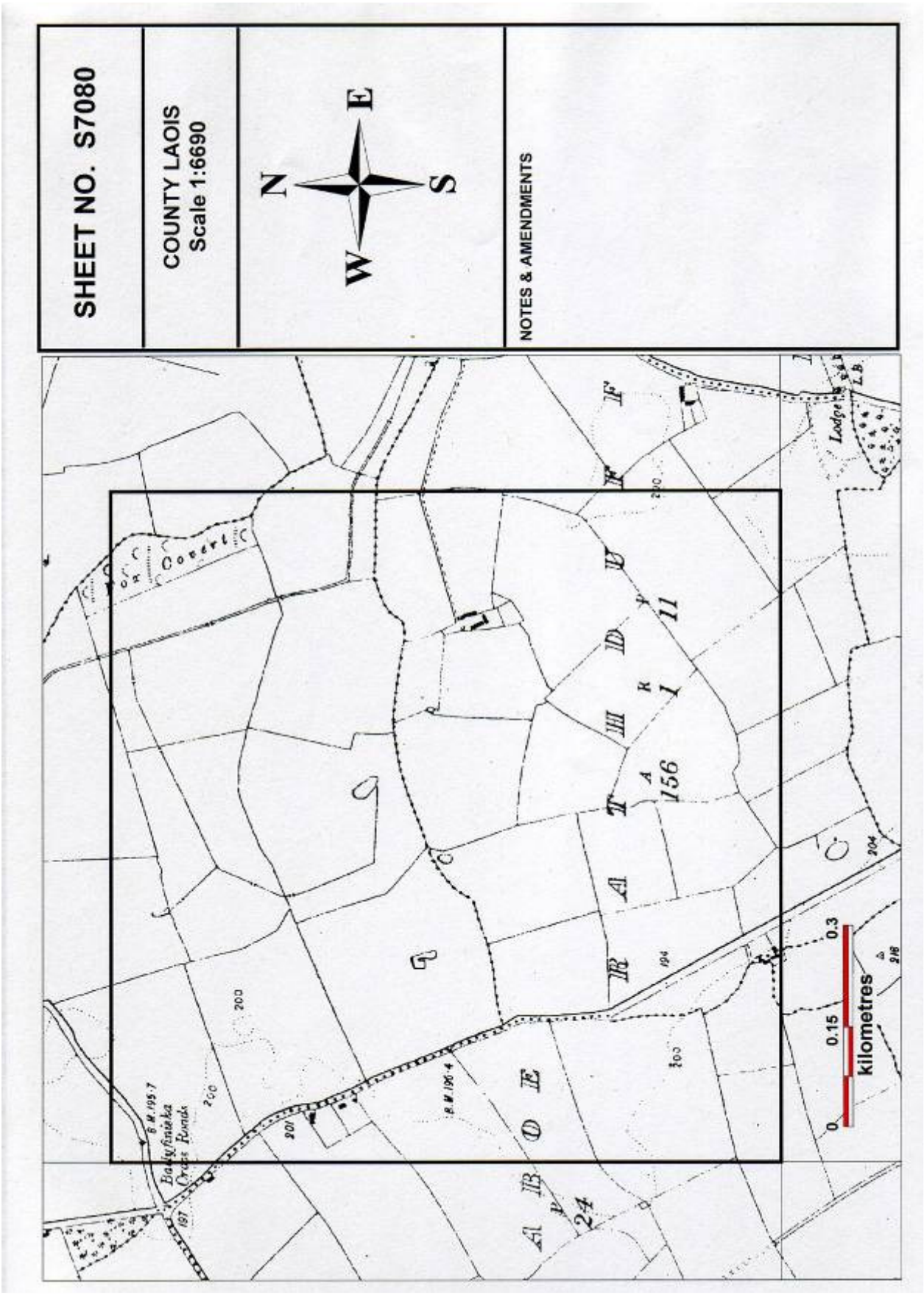
12.2 Example of aerial photograph



12.3 Example of vector map



12.4 Example of Ordnance Survey Map



12.5 Blank Field Recording Sheet

2005 LAOIS & OFFALY Hedgerow Surveys

Square ref.: Survey duration: Date:
Grid ref.: Surveyors:

Context

A FARM TYPE
a tillage
b dairy
c cattle
d sheep
e mixed stock
f mixed stock + crops
g stud
h other

B HISTORY
1x infill
2x townland boundary
3x canal side boundary
4x railway line boundary
x1 + roadside
x2 + stream

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

E BOUNDARY FUNCTION
1 hedge redundant
2 active boundary

Construction

F OUTLINE
a linear /regular
b non-linear/irregular

G BOUNDARY TYPE
1x Single Line Hedge
2x Double Line Hedge
3x Random Line

x1 + Bank
x2 + Wall
x3 + Shelf

xa + External Drain
xb + Internal Drain
xc + Internal Path, Track-way, etc.

x0 None of the above features

H BANK/WALL/ SHELF SIZE
a < 0.5m
b 0.5 – 1 m
c > 1m
d not applicable

I DRAIN SIZE
1 not present
2 small (<0.5m)
3 medium (0.5 – 1m)
4 large (>1m)

Structure/Condition

J PROFILE
a remnant
b relict (derelict)
c losing structure
d boxed / A shape
e overgrown
f overgrown + outgrowth at base
g top heavy / undercut
h straight sided

K HEIGHT
1 <1.5m
2 1.5 – 2.5m
3 2.5 – 4m
4 >4m

L WIDTH
a < 1m
b 1– 2m
c 2 – 3m
d 3 m+

M GAPPINESS
1 complete
2 < 5 % gaps
3 5 – 10 % gaps
4 10 – 25 %
5 25 – 50 %
6 > 50 %

N BASE
a open
b open + vegetation
c scrawny + vegetation
d dense
e very dense

Structure/Condition

O BANK /WALL/SHELF DEGRADATION
1 severely eroded
2 eroded in parts
3 bank intact
4 not applicable

P TREES
a none
b few
c scattered
d abundant
e line

Q TREE AGE COMPOSITION
1 all mature
2 young trees present
3 no trees

R VERGE
a < 1m
b 1 – 2m
c 2 - 4m
d 4m +
e none

Management

U management
a cut box profile
b cut 'A' shape
c cut on one side
d cut on both sides
e topped only
f excavator
g fully laid
h laid in part
i coppiced
j short term unmanaged
k long term unmanaged
l infill planting

V MANAGEMENT METHOD
1 flail
2 circular saw
3 bar cutter
4 hand tools
5 excavator
6 other
7 unsure
8 not applicable

W EVIDENCE OF LAYING
a no evidence
b past evidence
c recent evidence

X FENCING
1 none
2 fixed to stems
3 electric
4 post & wire
5 sheep wire
6 timber fence

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
01																								
02																								
03																								
04																								
05																								
06																								
07																								
08																								
09																								
10																								

Where there is significant variability in any feature being recorded, include the suffix 'v' after the recorded category digit/s.
Definitions of categories are detailed in the Hedgerow Survey Methodology Paper (Foulkes & Murray, 2005)

12.6 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