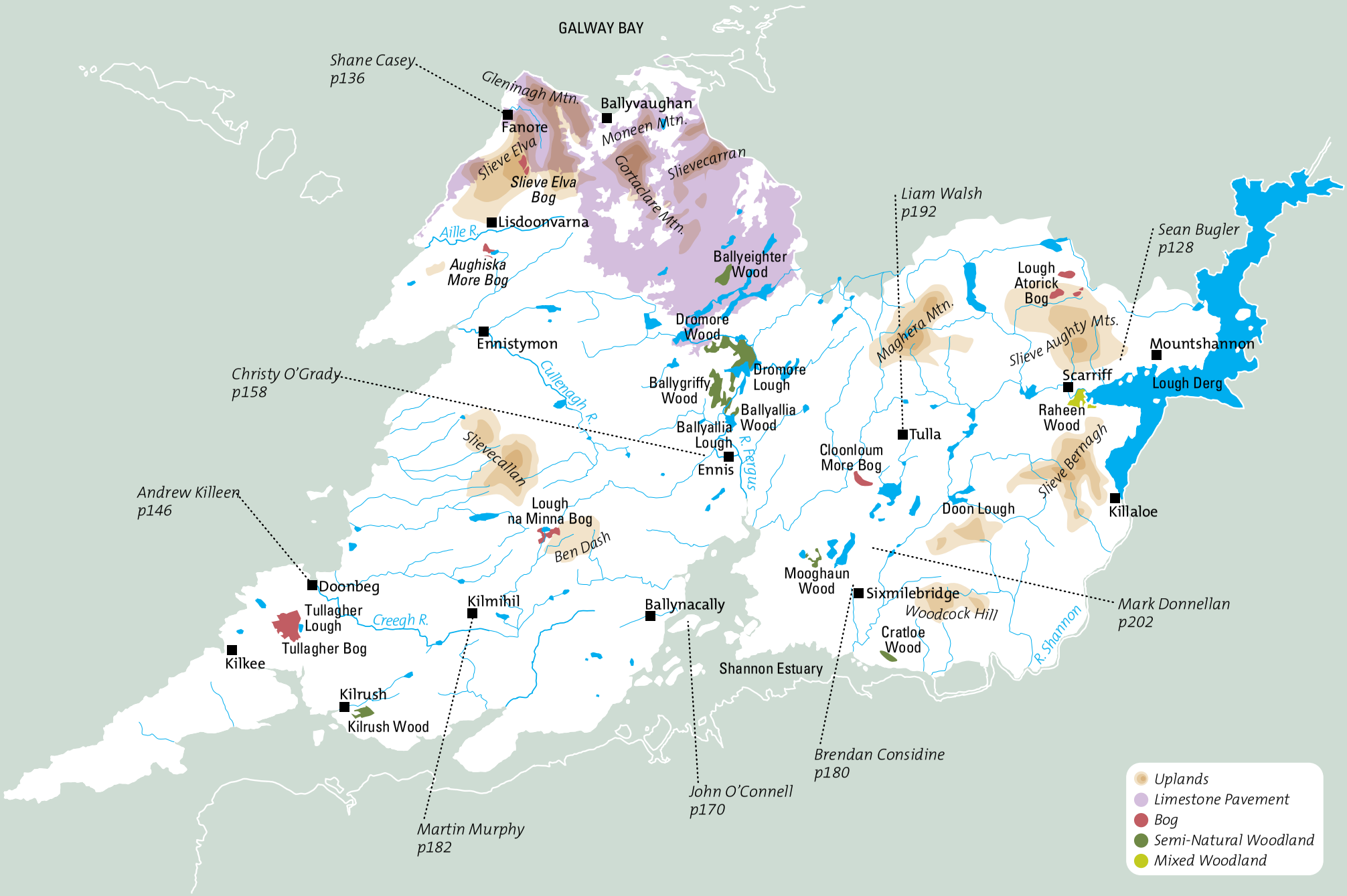
the Living Farmland

a guide to farming with nature in Clare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an Talamh Curaíochta Beo

Treoir ar fheirmeoireacht leis an dúlra i gContae an Chláir

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The importance of design cannot be underestimated in a publication of this type. We greatly appreciate the contribution of David Rice of Optic Nerve Design Group whose hard work, skill and patience transformed this book into something which we can all be proud of.

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Réamhrá / Foreword

Tá cáil mar is ceart ar chontae an Chláir – ní hamháin in Éirinn ach go hidirnáisiúnta – mar áit sáráilleachta nádúrtha agus sároidhreachta. Tá tírdhreacha breátha tuaithe sa chontae, a chuireann flúirse gnáthóg nádúrtha ar fáil do réimse flóra agus fána atá uathúil in Éirinn.

Ní ón nádúr amháin, dar ndóigh, a fuaireamar oidhreacht tírdhreacha iontach chontae an Chláir a bhfuil an oiread sin measa againn uirthi. Tá lorg coise daonna na feirmeoireachta le feiceáil beagnach i ngach áit inár dtírdhreacha. Léiríonn an t-idirghníomhú agus an t-idirspleáchas idir feirmeoireacht agus an nádúr i gcontae an Chláir éabhlóid a théann siar 6,000 bliain nuair a lonnaigh na chéad fheirmeoirí anseo agus nuair a ghlan siad coillearnach chun barra a shaothrú agus beostoc a choinneáil.

Is ceiliúradh é The Living Farmland sa chéad áit ar thírdhreacha agus ar thailte feirme tuaithe an Chláir. Is leabhar faisnéiseach é le léiriúcháin áille a shainaithníonn agus a dhéanann cur síos ar réimse leathan gnáthóga fiadhúlra i gCo. an Chláir, lena n-áirítear go leor gnáthóg atá mar thoradh ar chleachtais feirmeoireachta.

Is treoir phraiticiúil atá sa leabhar seo go bunúsach ar "feirmeoireacht leis an nádúr" i gcontae an Chláir. Is éard a bhí mar aidhm leis an leabhar seo lámhleabhar a chur ar fáil d'fheirmeoirí a bheadh ina shaothar tagartha luachmhar le comhairle shimplí ar chaomhnú an dúlra agus cosaint na ngnáthóga tábhachtacha i gcomhthéacs na feirmeoireachta praiticiúla. Áirítear sa leabhar seo, ocht bpróifíl ar fheirmeoirí i gcontae an Chláir a insíonn a scéal maidir leis an gcaoi ar éirigh leo bainistíocht chomhshaoil a iomlánú ina bhfiontair feirmeoireachta ar bhealaí a spreagfaidh daoine eile.

Cuirim an-fháilte roimh an bhfoilseachán seo, ar comhthionscnamh é idir Rural Resource Development, grúpa LEADER i gCo. an Chláir, Feirmeoirí Aontaithe na hÉireann i gCo. an Chláir, Teagasc agus Comhairle Contae an Chláir. Léiríonn cur chuige tionscnaimh an leabhair seo an treo ar cheart a thógáil le hoibriú le chéile ar bhealach cuiditheach chun talmhaíocht beomhar a chothabháil a chosnaíonn agus a leasaíonn an comhshaol.

Padraig Walshe
Uachtarán, Feirmeoirí Aontaithe na hÉireann
President, The Irish Farmers' Association

Clare is rightly renowned—not just in Ireland but also internationally—as a place of great natural beauty and outstanding heritage. The county is blessed with magnificent rural landscapes, which provide a wealth of natural habitats for a range of flora and fauna that is unique in Ireland.

The wonderful landscape heritage of Clare that we all admire is, of course, not solely a product of nature. Virtually everywhere, our landscapes bear the human imprint of farming. The interaction and interdependence of farming and nature in Clare represents an evolution that stretches back over 6,000 years when the first farmers settled here clearing woodlands to cultivate crops and keep livestock.

The Living Farmland is in the first place a celebration of Clare's rural landscapes and farmlands. It is an informative and beautifully illustrated book that identifies and describes the great variety of wildlife habitats in County Clare, including many which are the product of farming practices.

The book is primarily intended as a practical guide to 'farming with nature' in Clare. The aim was to produce a book for farmers that would be a valuable reference work providing simple advice on nature conservation and the protection of important habitats in the context of practical farming. The book includes eight profiles of Clare farmers who tell the story of how they have successfully incorporated environmental management into their farming enterprises in ways that will inspire others.

I very much welcome this publication which is a joint initiative between Rural Resource Development, the LEADER group in County Clare, Clare IFA, Teagasc and Clare County Council. The partnership approach symbolised by the book points the way forward in how we can work together constructively to maintain a vibrant agriculture that protects and enhances the environment.

The Background

Trying to capture the relationship between farming and nature is never easy. In truth, our living landscape has largely been shaped by centuries of farming and settlement. Farmers and nature have lived closely with each other for a very long time. There is a great deal of pride in how the land has been taken care of and passed down through the generations. As the signposts clearly point to a future of farming in greater harmony with nature, much can be learned from the farmers of Clare.

Inside these pages, you will find places that are truly special and farmers who are inspired by a love of the land. The beauty and mystery of the creatures which inhabit our farmland reminds us of what we have to gain from being close to nature. Much of what we aspire to in this book has been inspired by what people have already done. There is no 'rocket science' in these pages, just simple, practical ideas and information which will contribute to a greater harmony between farming and nature.

The seed for this publication was sown quite some time ago when we commissioned a report on environmental education in the county. The report concluded that there was very little accessible educational material for Clare farmers who wanted to learn more about the natural environment, outside of the compulsory REPS training courses. Thus 'The Living Farmland' was conceived.

Nowadays, much of the farmer's interaction with the environment is bound by regulations, directives and a long list of requirements, focused mainly on what not to do. Not enough attention is given to promoting the benefits of living and farming more closely with the natural environment.

For that reason, we decided to produce a publication for farmers in County Clare which would be informative, practical, of local interest and above all, be positive about farming with nature. Our intention is to inspire farmers, not to weigh them down further. This book demonstrates that there are many ways to give nature a helping hand, whilst still staying true to our long tradition of farming.

Our aim is that some of the ideas contained in this book will be taken up by those who read it. Our hope is that this book will in some way contribute to the conservation of our beautiful living landscape and all of the magnificent creatures who dwell there.

Doirin Graham – Rural Resource Development
Joan Tarmey – Clare County Council
Congella McGuire – Clare County Council
Seamus Kelly – Clare IFA
Declan Murphy – Teagasc

L–R. *John Murphy, Declan Murphy and Seamus Kelly* **Front** *Doirin Graham and Joan Tarmey*

Navigating this Book

Contents: See inside the back cover for a fold-out Contents for your convenience.

Colour Coding: This book is divided into three sections with each one having its own colour scheme. These colours are used in text headings, tables and the footer bar at the base of each page.

Section: To help you locate where you are, each section is titled in the running footer of each page.

Photographs: All images requiring explanation have a number to their left with their relating text at the base of the page.

Focus Pages: Throughout the book, there are focus pages on specifics. These are colour coded to;
Management Techniques in sand
Farmer & Organisation Profiles in green
Species Profiles in blue

Contents

the Living Farmland

General Introduction

The Irish countryside is made up of many elements, but one in particular stands out as being of overwhelming importance. Farmland is this essential element, with fields, hedges, stonewalls, winding boithríns, trees and ponds forming the very fabric of our rural areas.

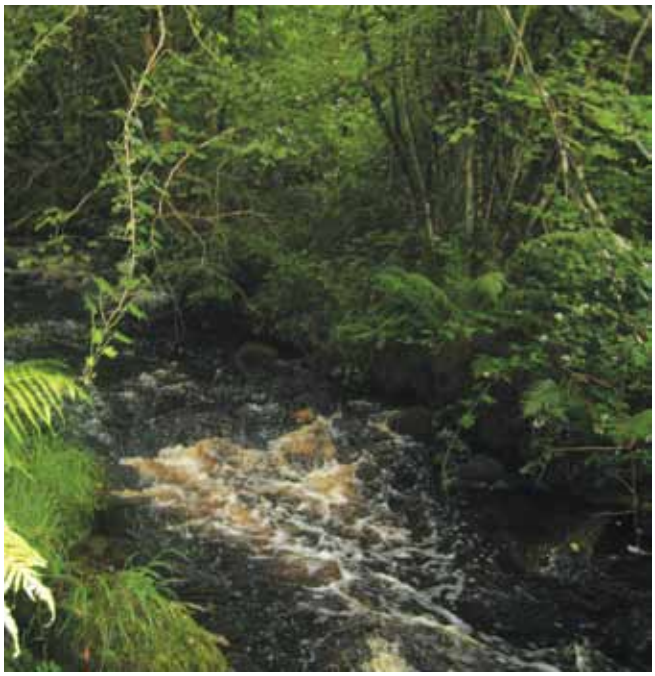
Farming affects even the county's wildest regions, from the high Slieve Aughty mountains to the sand dunes of Doonbeg.

Many of our most rare and valuable habitats such as the herb rich pastures of the Burren actively require agricultural management to survive, having evolved through many centuries of traditional farming practices.

Although National Parks, Nature Reserves and other protected areas are important for the conservation of rare and unique wildlife, these cover a very small land area when compared to the large areas of privately owned farmland in the county. This land is often seriously undervalued as habitat for a diverse range of wildlife, and the role of the farmer, as caretaker in its maintenance, is often overlooked.

Times of rapid change for farmers and the countryside have seen traditional farming practices replaced with modern, more efficient methods that allow increased productivity from the land, often at the expense of important wildlife habitats. In many areas this has led to the loss of once common species such as the Corncrake, which is now extinct in County Clare. Many other farmland species are showing a steep decline, as their habitats are lost to a more intensive form of agriculture.

There are often specific requirements necessary for the continued survival of a species. Once identified, these may not require a radical transformation in farming methods but can often be met with relatively small changes. Farmers and others who have responsibility for the countryside are often unaware of the extent of the ecological value of their land. Now and in the future, they will play an extremely important role in sustaining and enhancing our natural heritage.



Using the Book

The book begins with a look back at our past, explores how our landscape was shaped and describes what defines it today. The second section looks at agriculture in Clare today, including policy changes over time, cross compliance, REPS and organic farming. Here the book also looks at the key environmental issues of water and waste.

The third section looks at all of the nature conservation designations that farmers may encounter today. It describes many of the wildlife habitats found in County Clare and shows how each one can be identified. It provides up-to-date advice on the best practice management of these habitats for wildlife and shows how small changes in farming can have big benefits for nature.

It includes case-studies, profiling farmers throughout the county and gives examples of how they deal with environmental issues on their land. The handbook also profiles public bodies including the National Parks and Wildlife Service and Teagasc with whom farmers deal on a regular basis.

This publication is intended as a reference book for every landowner in County Clare, a book that can be revisited again and again, both as an aid to identifying potential wildlife habitats around the farm and as a best practice guide for their management. It is colour coded to offer easy navigation to specific sections of the book.

It is hoped that this book will offer inspiration to farmers who have an interest in wildlife management and provide more insight into the benefits of the recommended management practices.

Above all, it is intended that this book will highlight the considerable wildlife value held within the farms and land-holdings of County Clare, alert the reader to the threats that are facing this environment and show how it can be protected and enhanced through small changes in management.

Section 1

An Introduction to County Clare

From the Past to the Present...

This section sets the scene for the rest of the book by looking in detail at what makes the land of County Clare what it is. Although the county has its own unique identity, it is built of many different elements. Each region has its own local character that forms a small part of the overall picture.

The geology and soils of Clare provide the first layers of paint on the canvas and largely dictate which plants will grow in a specific area and which will not. It was on this base that man first put the land to use. Some parts of Clare were suitable for intensive grazing, others for tillage and others which were less favourable for agriculture were less intensively managed. The ability of the land to cater for the needs of Man determined where the first settlements were made, where towns were first established, and how society was shaped and developed.

Our influence, past and present, has had a dramatic effect on the varied landscapes of County Clare and provides the next level of detail in this painting. The County we see today is the product of many factors in its past, and to fully understand the environment in which we live and work we should first be aware of the framework and history behind it.

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1. *Cork Screw hill in North Clare* **2.** *Lough Derg in East Clare* **3.** *Shannon and Fergus Rivers meeting in South Clare*

Landuse...A step back in time

Farming has a long history in County Clare, spanning roughly six thousand years. To help us understand the agricultural practices in use today, it is important to be aware of Clare's rich farming heritage. Although Clare is mainly rural in character, signs of human influence are present throughout the countryside, showing us how the landscape developed with human interaction.

As the current managers of the land, the farming community in County Clare can trace a long lineage back to the first farmers, the first people to actively manage the land.

Clues from the Past

Archaeology helps us to discover clues about the lifestyles of our ancestors through the excavation of archaeological sites. In addition, pollen analysis or the examination of ancient pollen grains trapped in bogs and lake mud have helped us to build a picture of the landscape and the types of farming practiced by earlier farmers in prehistoric times.

Prehistory is the story of man before writing began. The 'Three-Age System' was devised by dividing up the prehistoric period according to the material used for tool-making. The Christian or historic period has also been split into three distinct periods as shown below.

	Main Divisions in Human Settlement	Subdivisions	Approximate dates
Prehistory	Stone Age	Palaeolithic (Old Stone Age)	Unknown in Ireland
		Mesolithic (Middle Stone Age)	7000 – 4000 BC
		Neolithic (New Stone Age)	4000 – 2500 BC
	Bronze Age	Early Bronze Age	2000 – 1500 BC
		Middle Bronze Age	1500 – 1000 BC
		Late Bronze Age	1000 – 600 BC
	Iron Age		600 BC – 400 AD
History	Early Christian Period		400 – 1170 AD
	Medieval Period		1200 – 1540 AD
	Modern period		1600 onwards

Landuse...A step back in time

Mesolithic (7000 – 4000 BC)

The first humans settled in Ireland during this era. Stone implements were used.

- Little information is available
- Tools, weapons and other implements were made from stone
- Hunter gatherers on the move, living a nomadic lifestyle.

This slate spearhead dates from the Mesolithic Age and was found at O'Briens Bridge. This spearhead shows that Mesolithic Clare was inhabited by groups of hunter-gatherers who depended on hunting for everything: food, fuel, clothing and shelter.

Neolithic (4000 – 2500 BC)

The first farmers practiced crop cultivation and animal husbandry in this period.

- Permanent homesteads
- Clearance of woods for crop cultivation and animal husbandry
- Land ploughed with wooden mattocks (A digging tool with a flat blade set at right angles to the handle)
- Barley and wheat harvested with flint sickles
- Mainly cattle and sheep livestock, with wild pig also domesticated
- Cattle were used for traction but by late Neolithic/Early Bronze Age domestic horses were introduced
- Megalithic Tombs (Late Neolithic/Early Bronze Age)

  Greek 'mega' = large, 'lithos' = rock
- Stone tombs in the Burren indicate rich farming economy.

Dating from the Neolithic period, this stone axe was found in May 1999 at St Brechin's Well, Kilbrechin, Doora.

Perforated Mace Head from Raheen, Tuamgraney, dates from the Mesolithic Age.

Saddle Back Quernstone found near Ennistymon from the Neolithic period. They were used in conjunction with a rubbing stone to grind wheat into flour in order to produce bread.

All items can be seen on display in the Clare Museum, Ennis

Spear Head and Axe Head from the Early Bronze Age.

Early Bronze Age (2000 – 1500 BC)

Bronze was discovered and used in the manufacture of weapons and other implements.

- Better tools but similar farming practices.

Late Bronze Age (1000 – 600 BC)

More evidence of larger more fortified farming settlements such as hillforts.

- Rye and oats introduced
- Primitive plough called an 'ard' is used
- Main expansion of blanket bog. This is caused by the formation of an iron pan in the soil due to heavy rain and leaching of minerals
- Settlements closer to rivers, lakes and estuary
- Cooking sites called 'Fulachta Fiadh' used for cooking and possibly as prehistoric saunas!
- Good evidence from hillfort settlement at Mooghaun near Newmarket-on-Fergus.

Iron Age (600 BC – 400 AD)

Iron was discovered and was used in the manufacture of implements

- Downturn in agricultural activity 'Iron Age Lull' probably due to worsening climate
- After 500 AD invention of rotary quern for grinding corn
- Use of iron tools and weaponry
- Upturn in activity after 200 AD marked by large scale destruction of woodlands.

Early Christian Period (400 –1170 AD)

Christianity came to Ireland.

- Dairy and cattle most important enterprises
- Wealth based on cattle stocks
- Milder winters meant year round outdoor grazing was possible
- Summer upland and callow grazing
- No hay making
- Ringforts provided protection for stock and inhabitants
- Little evidence of Viking occupation in County Clare.

Poulnabrone Dolmen in the Burren

Landuse...A step back in time

Medieval Period (1200 – 1540 AD)

Colonisation of Gaelic Ireland commenced

- Manors and villages with open field system due to Norman influence
- Towns, roads and castles (e.g Bunratty 1250) developed
- Arable farming main enterprise on three year rotation
- Hay making introduced
- Climate downturn in 14th Century saw collapse of Anglo-Norman society
- Later medieval towerhouses built by Irish Chieftains (eg O'Brien's Gleninagh Castle).

16th and 17th Century

- Final phase of woodland clearance by English administration
- Cattle remain the main farm enterprise.

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18th and 19th Century onwards...

- Rundale farming system – family groups in 'clachans' or groups of small dwellings
- 'Infield' commonage in narrow strips near farmsteads
- 'Outfield' cultivation and rough grazing beyond
- The Enclosure Acts (1760 – 1830) divided up common land and redistributed plots
- Farmers were required to fence off their lands, leading to the pattern of field systems present in Clare today
- Lazy beds of potatoes – staple diet of population
- Blight caused Great Famine or the 'Great Hunger' in 1840s
- County Clare population dropped from 286,000 to 166,000 during the Great Famine
- After famine, large landowners consolidated properties
- 1880 Land Acts provided for ownership of land by tenants
- 1890 Congested Districts Board set up to improve conditions in West of Ireland
- Along the Clare coast, irregular patterns often survive. However the most widespread pattern is of small, reorganised 'striped' farms enclosed by walls or banks
- Since the 1950s increased use of machinery has led to the enlargement of fields and the removal of old field boundaries such as hedgerows and stonewalls.

1. *O'Brien's Tower* **2.** *Field patterns*

Archaeology—
Sites and Monuments

Preservation of Archaeology

By law, artefacts discovered by the public must be handed over to the National Museum of Ireland and the discovery of unrecorded monuments must be reported to the National Monuments Service. Many local museums, such as the County Museum in Ennis are now designated, which means that finds can now be presented to the National Museum locally.

Archaeological measures aimed at protecting monuments, enhancing their surroundings and providing improved public access are included in REPS 3 and the new REPS 4. Archaeological sites and monuments also have an important tourism and amenity potential and it is possible that they may provide the basis for alternative farm incomes in the future. A good example of such a farm-based enterprise is Caherconnell Stone Fort and Visitor Centre in the Burren.

The Field Monument Advisor Scheme co-funded by Clare County Council and the Heritage Council supports landowners in the care of archaeological monuments on their lands by providing information on the monuments themselves and advice on the best ways to preserve them. To date, the scheme has focused on the area south of the Burren from the coast at Lahinch as far as Dysert O'Dea.

As the day-to-day managers of the countryside, landowners make a valuable contribution to the present day landscape of County Clare. Their continued input is essential for the conservation of Clare's rich archaeological heritage.

Archaeology in the Landscape

Physical remains of ancient farming communities are still visible in the Clare countryside today as archaeological monuments or sites. Descriptions of commonly found site and monument types in County Clare are provided below so that they can be more easily identified in the field. Details of all recorded monuments in the county can be found in the Register of Monuments and Places (RMP), which can be consulted at the County Library, County Museum in Ennis and Teagasc Offices.

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1. *Dysert O'Dea castle* **2.** *Caherconnell Stone Fort* **3.** *Clare County Museum in Ennis*

2

Megalithic tombs

- Oldest archaeological monuments in Ireland (4000 to 2000 BC)
- Indicates a custom of communal burial at this time
- Almost 1,500 stone-built tombs have been recorded throughout Ireland
- Many are still prominent on the landscape, often covered by a stone mound called a cairn
- There are three distinct types in Clare: court tombs (Teergonean near Doolin), portal tombs (Poulnabrone) and wedge tombs (Parknabinnia near Kilnaboy)
- Wedge Tombs are most abundant in County Clare, with 133 sites recorded, mainly in the Burren
- Eleven of these tombs are found within 200 metres of each other in Parknabinnia near Kilnaboy.

Fulachta fiadh

- Primarily used as cooking sites but may also have been used as bathing places
- Cooking method involved heating stones in a fire before dropping them into a large water-filled trough.and then throwing in the food to cook
- Shattered stones were thrown onto a pile along three sides of the trough creating over time a horseshoe shaped mound
- Found extensively in County Clare.

Hillforts

- Relatively large enclosed areas located on high ground for security purposes, dating mainly from the late Bronze Age and Iron Age
- Mooghaun Hillfort near Newmarket on Fergus is a good example.

Ringforts

- Most common archaeological site in Ireland – 45,000 sites
- Used over a long period spanning the Early Christian Period to the seventeenth century AD
- Variable in size but generally small circular enclosures of 30 metres in diameter
- Earthen bank with a ditch outside enclosing a single farmstead
- 'Cashels' were ringforts with stone banks
- Other names, many of which form the basis of Irish place names include lios, rath, cathair, dun, cashel
- Most common in Counties Clare, Limerick, Sligo and Roscommon
- Well known examples in Clare include: Ballyallaban Rath near Ballyvaughan, Caherconnell Stone Fort in the Burren and Lisduff Fort near Kilkee.

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1. *Cahermacnaghtan ringfort* **2.** *Liscannor ringfort*

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Souterrains

- Underground chambers or tunnels, used for protection and usually built into design of ringfort
- Also used for storing perishable food
- Most souterrains found in County Clare are clustered in the north of the county such as Ballyvoe near Doolin and Poulawack near Carran
- Now provide winter habitat for bats

Crannógs

- Crannógs or Lake Dwellings were constructed mainly in the Early Medieval Period
- Also evidence from the Bronze Age up to the 17th century
- Settlements sited on semi-artificial islands in lakes or wet places for protection
- 'Crannóg' comes from Irish meaning young tree, as the base of man-made islands consists mainly of timber
- A reconstruction of the type of crannog found in Ireland during the Iron Age and Early Christian periods, is open to the public at Cragganaun, County Clare. The remains of older examples include one at Ballyallia near Ennis and Islandavanna near Clarecastle

Ecclesiastical Monuments and Holy Wells

- Christianity arrived in Ireland in the fifth century
- Many Ecclesiastical centres developed to form the centre of the first towns and villages such as Killaloe, Kilnaboy and Ennis
- Other important ecclesiastical centres included Scattery Island, Corcomroe Abbey and Holy Island (Inishcealtra)
- In the eighth century, carved high crosses were introduced to Ireland – unique to Ireland and Britain
- Best examples in County Clare are at Kilfenora and Dysart O'Dea, dating from the twelfth century
- Round towers, such as at Scattery Island, were constructed in the same period as bell towers, status symbols and protection from Viking raids.
- Around 226 holy wells have been recorded in County Clare, many of which are dedicated to saints such as St. Senan
- Many had pagan origins in the Iron Age and were later christianised in the Early Christian period
- Many placenames in Clare are derived from the word 'tobar', the Irish for well such as Toberpatrick or Tubber

1. *Craggaunowen* **2.** *Holy Island, Lough Derg*

Archaeology

Castles and Tower Houses

- The remains of over 200 castles and towerhouses are still present in Clare today
- The tradition of stone castle building was introduced by the Anglo-Normans in the twelfth century to Ireland but O'Brien resistance meant that their influence was not felt in County Clare until the mid-thirteenth century
- Norman castles in Clare include Bunratty Castle, Clare Castle and Quin
- Gaelic strongholds often resisted Norman influences in the poorer land in the west, and in the later medieval period towerhouses were widely built by Gaelic chieftains such as Gleninagh Castle, Dysert O'Dea Castle and Knappogue Castle.

Agricultural remains

- Remains of old farming structures provide a record of Clare's agricultural heritage. Rectangular medieval enclosures, crop marks, lazy beds used in previous centuries for the cultivation of potatoes, turf thuiles for drying out fuel, goat cros for keeping kid goats and water tanks survive in the less intensively managed areas of the Clare countryside, especially in the Burren uplands.

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Lime kilns

- Lime kilns date from the 15th / 16th century
- Generally consisted of a pit, where lime was fired using timber or charcoal as fuel
- In the medieval period lime-kilns were used for the production of mortar for building purposes
- Also used in production of lime for agricultural purposes
- An example can be seen in Dromore Woods, Ruan near Ennis.

Dwellings

- Thatch and natural slates from local quarries such as Broadford and Moher were the main roofing styles
- Traditional house styles and construction features are becoming increasingly scarce nowadays
- In particular traditional rectangular cottages and roofing styles made of flag and thatch are less visible in the modern landscape
- However, natural slates are once again becoming popular.

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1. *Clarecastle Towerhouse* **2.** *Lime Kiln in Tuamgraney* **3.** *Slate cottage in the Burren*

Traditional Agricultural Practices

Transhumance or Booleying

In the summer months, livestock were moved to upland pastures accompanied by herders and their families who lived in temporary dwellings, whilst producing milk and dairy products. It remained part of farming life until the seventeenth century but was practiced in some remote areas into the nineteenth and twentieth centuries. It preserved the open character of the hills as vast areas of rough grazing were required.

Winterage

In the Burren, the tradition was reversed with livestock being outwintered on the rich calcareous grasslands in the Burren uplands, where heat was retained by the limestone substrate.

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Best practice for landowners with archaeological monuments on their land

- Be aware of the location of archaeological monuments on your land and advise any contractors as to their whereabouts
- Adjust stocking levels to prevent poaching and erosion of ancient monuments
- Site any feeding troughs, drainage ditches, access tracks for livestock and farm machinery as far from the monument as possible to prevent damage
- Historic buildings should not be used to house livestock
- Control the growth of scrub and weeds on the monument. However, do not uproot trees as this could cause ground disturbance
- Avoid removing old field boundaries or historic farm structures
- Leave an unploughed margin of at least 7 metres as a buffer around the monument
- Minimise plough depths where there are known cropmarks or levelled sites. Use these areas as pasture where possible
- If planting trees, keep well away from ancient monuments.

2

1. *Church Ruin, south-west Burren* **2.** *Cows outwintering in the Burren*

Traditional Agricultural Practices

Townlands

The townland or 'baile fearann' in Irish is the smallest territorial division within a county. The Irish countryside is divided into over 60,000 townlands of varying size from the smallest at one acre to examples consisting of several thousand acres. The history of their development can be traced back to medieval times. According to Ordnance Survey maps, there are 2,401 townlands in the County of Clare.

In general, townland names derive from the Irish language and either describe physical features in the locality such as hills, rocks, rivers, bogs, marshes, mountains and woods or relate to local family names associated with the area. In County Clare, descriptive townland names such as Buncraggy or 'Bun craige' meaning the foot of the stony field in Irish or Doolin or 'Dubh Linn' meaning the dark pool, use local landscape features to characterise the locality. The use of surnames in townland names such as Ballyslattery, Cloontymurphy or Ballymoloney recalls the location of family strongholds in the county.

Townlands were generally delineated by streams and rivers, but, where this was not possible clay and stone ditches formed the boundary. In recent times these townland walls have decreased in significance as physical boundaries and many have been damaged or destroyed. However townlands are still important in rural Ireland as administrative units and the basis of rural postal addresses. Townland indices are available at the National Library, National Archives and at the Clare County Library.

The Clare Placenames Committee was established in 2002 to promote and encourage the recording and archiving of local placenames in County Clare and to provide advice on the selection of names for new developments. County Clare has a rich tradition of placenames, inspired by natural and historical features present in the local landscape and prominent local families. These names reflect the identity of a particular place and highlight the unique character of each locality.

Geology

The land around you, no matter where you live, sits on rock, and this geology provides the basis for the land and soils that are farmed. The geology of County Clare is made up mainly of sedimentary rocks, which were formed roughly 350 million years ago, from the erosion of older rock by water and air or from the remains of marine creatures. After being deposited, these eroded materials were compacted by pressure from overburden materials to form layers of solid rock. Sedimentary materials often have an abundance of fossils.

County Clare can be divided into three very general, yet distinct, geological areas.

North Clare Geology

North Clare, and in particular the area around the Burren, is recognised worldwide as a site of geological importance. Over 300 million years ago, the Burren area was covered by a warm, shallow sea. The rock in the limestone pavements of the Burren, is made from the calcium-rich remains of marine creatures.

During the last Ice-Age (10,000 years ago) the area was eroded by glaciers which carved out the distinctive landscape of terraces and pavements we see today. The joints in the rock were formed by ancient earth movements. Since then, weathering occurred, which deepened and developed the characteristic clint-grike systems.

Although some sediment was deposited by the ice sheets, less was deposited in this area compared to the rest of the country, resulting in the rocky landscape. The ice also transported rocks from other areas and deposited them here. That is why we find granite 'erratics' which originated in County Galway and beyond, among the limestone landscape of County Clare. Caves formed from the flow of underground rivers can be found throughout the Burren. Ailwee Cave and Pol an Ionáin in Doolin are popular visitor sites in the area.

Malbay

Geology

West Clare Geology

West Clare geology consists mainly of layers of mudstone, siltstone and sandstone laid down in sequence. This is evident at the Cliffs of Moher, where many series of layers can be seen. These materials were deposited during times of sea-level change, where the depth of water affected the type of material that was deposited.

The layered nature of these rocks is easily seen in stonewalls in the area made from thin 'sheets' of rocks. These rocks, such as Liscannor flag, are easily quarried in this form because they were laid down in layers. Unique fossil trails make them a popular ornamentation stone for many buildings.

East Clare Geology

The geology of East Clare is more difficult to describe. The area is made up of various groups of rocks including siltstone, shale, mudstone and conglomerate. The distinctive rock of the area is the 'Old Red Sandstone'. This was laid down when mountains in the area were subject to intensive erosion. Sand and gravel left behind by rivers formed the conglomerates and sandstones of the Old Red Sandstone. Differences in the geology of the area can be seen in the stone used in old buildings and walls in the area.

The majority of rock found in County Clare, with the exception of the Burren area, is overlain by sediment or drift material. This was laid down during the last Ice Age, which lasted until 10,000 years ago. As the ice sheet moved over the country, it eroded the bedrock underneath and sediment of varying sizes was formed within and beneath the ice. As the ice melted, this material called till (boulder clay) was deposited. It is the most widespread sediment type throughout the county. Soils were subsequently laid down on top of the boulder clay.

The geology of an area influences the type of soils found there. The main soil types found in County Clare are discussed in more detail in the next section.

Soils

Soil is the surface layer of the earth's crust which is capable of supporting life. Soils are formed mainly through weathering of geological materials. Most Irish soils date back some 10,000 years or more when the ice sheets of the last Ice Age melted.

As the weather got warmer, plants invaded and forests began to develop. This added organic matter to the surface and soil formation began to take place. Soil formation continues to occur through the breakdown of organic matter and is truly a legacy of nature.

The soils of County Clare may be divided into five broad categories:

1	Brown Earths, Grey Brown Podzolics and Brown Podzolics
2	Gleys
3	Podzolics
4	Peat
5	Rock

These categories are described in more detail below.

Soils tend to be very variable in nature and several different soil types may even be found within one field. As a result, it is difficult to classify the whole county accurately. Therefore these broad categories are meant only as an overview of the typical soil types found in the county.

Brown Earths

Brown Earths are older, mineral soils and tend to be uniform in nature. They usually have good drainage and are generally good arable soils. Although they may be naturally low in nutrients, they respond well to the addition of manure as a fertiliser. With good management they can support high quality grassland and a wide range of forest tree species. Brown Earths can be found throughout much of County Clare, especially the middle and east of the county. They are usually found in combination with other soil types, such as grey-brown and brown podzolics.

Grey-Brown Podzolics

Podzolics are formed by the leaching or washing-down of material through the soil. Grey-Brown Podzolics tend to have a relatively high clay content. Some limestone material may also be found within the soil that has been eroded from the rock underneath. These soils are 'heavy' compared to brown earths. They tend to be moderately well-drained and can be acidic to neutral.

'Lighter' textured grey-brown podzolics are good all-purpose soils, similar to brown earths. When adequately manured and managed they are very productive for most agricultural purposes. They are also suitable for most forest species. Grey-Brown Podzolics are found throughout County Clare, especially in the middle and east, and usually in combination with Brown Earths and Brown Podzolics.

Brown Podzolics

Brown Podzolics are "leached" and are recognisable by a strong red-brown or yellowish-brown coloured layer. This colouring is due to enrichment of iron-oxide which is washed down from the upper layers of the soil. Brown Podzolics tend to be acidic and have a lower nutrient content, but respond well to good management. As a result of good natural drainage and texture these soils are considered suitable for cultivation crops, and are good forest soils. Brown Podzolics are found throughout County Clare, often in combination with Brown Earths and Grey-Brown Podzolics.

Soils

Gleys

Gleys are soils that have developed under water-logged conditions. This is due to the high clay content of these soils, which hinders the flow of water through the soil. Gley soils can occur in depressions and on elevated sites. When wet, these soils tend to be sticky. Gleys have many unfavourable characteristics and as a result are generally unproductive for agricultural purposes. With good management and fertiliser application however, they may be used for pasture production, and are considered relatively good for forestry. Gleys are found throughout County Clare.

Rock

Much of the land in North Clare, around the Burren area, has little or no soil cover, and consists of bare limestone pavements. Where a thin layer of soil is found on the bare rock base, the dominant soil is Rendzina. This is most commonly associated with species-rich grasslands in the Burren uplands. There is a limited range of uses for soils of this type, due to the high percentage of outcropping rock associated with it. Tillage and forestry are not practicable. It is mainly used for grazing and overwintering of stock.

Peat

Peats are characterised by a high content of organic matter (over 30%) and by their depth. Two different types, basin and blanket peat, occur in County Clare. These are described in more detail on page 139.

Basin Peat

Basin Peat is peat that forms in lake basins, hollows, river valleys or where the sub-soil is impermeable. Two types, fen peats and raised bog peats, are found in County Clare.

Fen Peat

This peat type is formed under the influence of base-rich (alkaline) groundwater and is composed mainly of the remains of reeds, sedges and other semi-aquatic or woody plants. Peat soils of this type occur in river valleys and hollows between drumlins.

Raised Bog Peat

Under suitable climatic conditions, raised bog peat may be built up on top of fen peat. As the depth of fen peat increases, its living vegetation is less influenced by groundwater and more dependent on rain as a source of moisture. This change in moisture supply results in the growth and development of a raised bog with a characteristic dome-shaped surface. In their natural state in County Clare they vary from about 3 to 10 metres in depth and are typically acidic. Extensive areas of raised bog have been cut-over.

Blanket Peat

Blanket peat accumulates under conditions of high rainfall and humidity. For this reason it is more commonly found in the western part of County Clare, and in the upper regions of Slieve Bernagh and Slieve Aughty, due to high altitudes and weather conditions. The profile of the peat varies from four to eight feet in depth and usually has a base layer of pine overlain by a peat layer. The main plants found are bog cotton, purple moor grass and black bog rush. Large areas of blanket peat have been cut-over and reclaimed, particularly in the west of the county.

Landscape Character Areas of Clare

No	Landscape Character Areas (LCAs)	Sensitivity Weighting
1	Burren Uplands	Unique
2	Low Burren	Special
3	Cliffs of Moher and Lahinch	High Sensitivity
4	Fergus Loughlands	High Sensitivity
5	Sliabh Aughty Uplands	High Sensitivity
6	Lough Graney	High Sensitivity
7	Lough Derg Basin	Special
8	Sliabh Bernagh Uplands	High Sensitivity
9	River Shannon Farmlands	Moderate Sensitivity
10	Sixmilebridge Farmlands	Moderate Sensitivity
11	East Clare Loughlands	Moderate Sensitivity
12	Tulla Drumlin Farmland	Moderate Sensitivity
13	Ennis Drumlin Farmland	Moderate Sensitivity
14	Fergus Estuary	High Sensitivity
15	Kilnamona High Drumlin Farmland	High Sensitivity
16	Cullenagh River Farmlands	Moderate Sensitivity
17A	Sliabh Callan Uplands	High Sensitivity
17B	Ben Dash Uplands	Moderate Sensitivity
18	Shannon Estuary Farmlands	High Sensitivity
19	Kilmihil Farmlands	Moderate Sensitivity
20	Malbay Coastal Farmlands	High Sensitivity
21	Loop Head Peninsular	Unique

Landscape can be defined as the type of land typical of a particular area. It is the name we give to the combined elements of geology, soils, landuse and archaeology which have already been discussed, and ecology, which will be discussed later in this book, which make an area unique.

A Landscape Character Assessment of County Clare was commissioned by the Heritage Council in 2002. The objective of the Landscape Character Assessment was to analyse the character, value and sensitivity of landscapes within the county. By recognising the variety of landscape within County Clare, it is easier for the relevant authorities to make decisions relating to the management and planning of the landscape.

County Clare was defined in terms of 21 Landscape Character Areas (LCAs), which have their own distinctive character, based upon patterns of geology, landform, landuse, cultural, historical and ecological features. The table opposite details each of the 21 LCAs identified in the county. A measure of the sensitivity of these areas is also given.

The sensitivity rating of a landscape character area can be used with other designations including visually vulnerable areas and scenic routes, to identify areas where developments could have a harmful impact on the surrounding landscape.

The Burren Uplands (LCA 1) and Loop Head Peninsula (LCA 21) are classified as 'unique' landscapes. It is the combination of features at these locations which make them unique in the country and therefore so highly valued.

Cullenagh River farmlands

Landscape Character Areas of Clare

Clare Seascapes

As part of the Landscape Character Assessment, 12 Seascape Character Areas (SCAs) were also identified. County Clare has 344km of coastline, of which approximately 317km is on mainland Clare with the remaining 27km on the islands of the county. Of this, 99.8km is considered scenic while 46km is considered highly scenic (An Foras Forbartha, 1972).

These twelve seascapes are detailed below.

No	Seascape Character Areas (SCAs)
1	Blackhead Bay
2	Burren
3	Cliffs of Moher
4	Liscannor Bay
5	Malbay
6	Mutton Island and White Strand
7	Ballard Bay and Donegal Point
8	North Loop Head Peninsular
9	South Loop Head and Shannon Mouth
10	Lower Shannon
11	River Shannon
12	Fergus Estuary

2

1

1. *Bridges of Ross, north of Loop Head* **2.** *Black Head bay*

Top to Bottom *Shannon Estuary farmlands, Cliffs of Moher and Lahinch, and River Shannon farmlands*







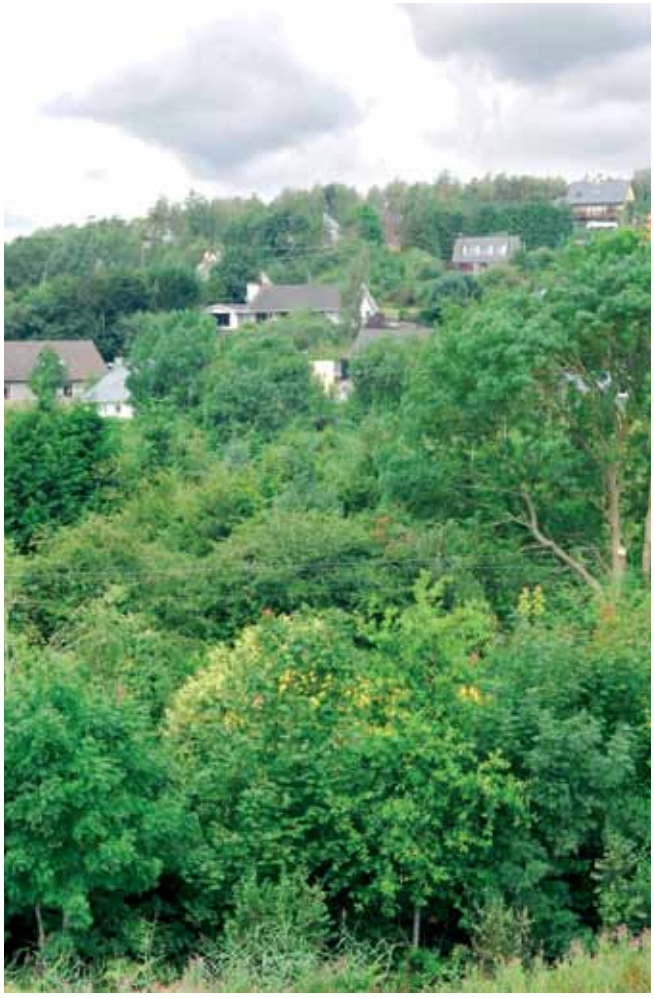


Landscape & Development

Planning Policy

One of the roles of Clare County Council is to conserve and protect the character of the landscape. A summary of some of the objectives and policies of the County Council in relation to development and landscape, are given below. This should be used only as a guide, and further information can be obtained in the Clare County Development Plan 2005, available from Clare County Council or on their website www.clarecoco.ie.

Publications providing guidance for design such as 'Guidelines for Incorporating Landscape Features into Development' and 'County Clare Rural House Design Guidelines' are also available from the County Council.



The current policies and objectives of the Planning Authority in relation to development and landscape are summarised as follows:

- Only developments of the highest quality of design and siting will be considered for rural developments so that they complement the landscape setting
- Developments that have a significant adverse impact upon the character, integrity or uniformity of the landscape will not be permitted
- Views from areas of scenic value, including uplands, seashores, lakes, ridges and hills will be protected
- Developments in vulnerable areas will be tested against certain criteria to determine the impacts of developments on landscape and natural resources
- There will be a presumption against developments on the islands of Lough Derg, where these would detract from the remote character, uninhabited nature or wildlife value
- Development will only be permitted outside settlements where it is clearly shown that regard has been given to the recognised landscape values and character of the area
- Landscape features and items of interest should be preserved where possible, to help preserve the local character of the area
- Features such as hedgerows, walls and ditches should be retained, where it is safe to do so, as they are an important visual element of the landscape
- Trees and groups of trees of high amenity value should be retained where possible. Suitable replanting will be required within or adjacent to the site where retention is not possible
- Development will not be permitted along Scenic Routes where there would be obstruction or degradation of the views towards and from vulnerable landscape features, or significant alterations to the appearance or character of the area

Section 2

Farming the Living Farmland

What will you find in this section?

This section of the book gives an overview of the major current issues relating to farming and the natural environment. It begins with an overview of agriculture in Clare, looking at the impact of environmental policies at farm level. Cross-compliance, REPS and organics are covered here.

Water is the big environmental issue of our time. The major water pollution issues in Clare are examined and best farming practice to protect the quality of surface and groundwater is looked at in detail.

Waste is an unavoidable environmental issue for every farmer. This section looks at the big issues and advises on best farming practice, in this highly regulated area of farm management. Emerging opportunities for Clare farmers in renewable energy are also looked at.

Agriculture in County Clare

Introduction

From the late 20th century onwards, the need for efficiency in farming and the introduction of inorganic fertilizers led to radical changes and a move away from the traditional in favour of more intensive systems. Agriculture is now a far more efficient industry than it was in the past, but this has come at a price, which may prove unsustainable in the long term. The increase in intensity has not only affected wild flora and fauna but has also led to pressure on other key areas of the environment such as water and air.

In recent years, environmental considerations have played a much more important role in EU agricultural policy. In the past, policy and guidance focused mainly on production targets and was not as mindful of the need to preserve and sustain the natural environment. Agricultural policy and farming practice today reflect our increased knowledge of local geology, soil, archaeology, landscape and their role within the environment as a whole.

In this first chapter of Section 2, we profile a Teagasc REPS advisor in County Clare and look at some of the plants that pose a threat to farming and wildlife. We also outline the agri-environmental schemes and farming systems, which are available to farmers and review policies which affect the farming community. These policies form the backbone of agricultural environmental protection and aim to enhance and protect our lands for future generations.

Introduction

A delegation from the West and Midland regions led by IFA President, Tom Parlon, met Ministers for Arts Heritage and the Gaeltacht Síle de Valera and Minister of State, Eamon O'Cuiv to request the Government honour its agreement on SACs.
(l-r) Michael O'Donoghue (Tubber), Clare IFA National Council rep; Ger Kerin, Belharbour; Eamon O'Cuiv; Tom Parlon; Síle de Valera and IFA Vice-President John Slattery. July 1998.

Recent Agricultural Policy 1970–2000

"There is only one rule of good husbandry – leave the land far better that you found it. In the soil lies all that remains of the works of countless generations of the dead. We hold this sacred trust, to maintain the fertility and pass it on unimpaired to the unborn generations to come. The farmer above all must have faith in the future...for a civilisation lasts but a thousand years, while in his hands lies the destiny of all mankind'.

George Henderson (1944)

Farming has a long history in Ireland, spanning roughly six thousand years. In that time farming practices and husbandry have undergone many changes, but never in farming history has change been so rapid or profound as in the last fifty years. Much of this is down to the widespread food shortages experienced throughout Europe in the aftermath of World War II when food production became the priority in agricultural policy for governments.

1970 '71 '72 '73 '74 '75 '76 '77 '78 '79 1980 '81 '82 '83 '84 '85 '86 '87

In 1973 Ireland entered the EEC one of the main attractions being in CAP

The Farm Modernisation Scheme was introduced in 1974. The scheme funded land improvement and new farm buildings.

1981, An Foras Forbartha, the Irish Planning Agency, published its National Heritage Inventory: Areas of Scientific Interest in Ireland, which identified the most valuable areas for wild nature, and provided the basis for the current Natural Heritage Areas (NHAs) and Special Areas of Conservation (SACs)

The milk super-levy and milk quotas were introduced in 1984

The first Direct Payment scheme was introduced in 1975, on headage payments for Livestock

The first EEC Nature Conservation Law was brought into force in 1979.

In 1980 the Ewe Premium Scheme

In 1981 afforestation grants were available from the EEC

The Suckler Cow Premium was introduced in 1981

In 1985, the EEC passed the Agricultural Structures Regulation which introduced the Farm Improvement Programme in 1986

Seamus Murphy, Chairman Clare IFA in discussion with Commissioner Fischer Boel at the 2008 IFA AGM

In 1962 the Common Agricultural Policy (CAP) was developed by the European Union as a policy to influence agricultural production and trade. Advances in science and technology led to more intensive farming techniques throughout Europe. The intensification of agriculture in Ireland was particularly rapid after we entered the European Economic Community (EEC—now known as the EU) in 1973.

CAP encouraged production of a constant supply of home produced food by providing farm price supports. Since membership, Irish farmers have benefited greatly from EU funding, however it is not only the Irish farmer that has benefited. The Irish consumer is provided with a higher quality product, where origin and ingredient can be measured and easily traced.

Unfortunately the same cannot be said for the Irish environment. From the mid 1970s to early 1980s the drive to intensification, pushed by financial incentives, encouraged the removal of hedgerows, the draining of wetlands and resulted in much of the countryside becoming unsuitable as a habitat for traditional farmland wildlife. Since its inception, the CAP has been reformed many times.

The latest reforms, known as Agenda 2000 have placed a much greater emphasis on food safety, the environment and sustainable agriculture.

'88 — Reform of the EC Structural Funds in 1988, included the CAP Guidance Fund resulting in Ireland designated as an 'Objective 1' region qualifying for a larger share of EC co-funding for agricultural programmes.

'89 — The National Development Plan 1989-1993 was approved by the EC. It included the Operational Programme for the Control of Farmyard Pollution Scheme (CFP), the Headage Payment Scheme, and an Afforestation Grant Scheme

1990 — July 1990, the EC published proposals to extend and revise environmental schemes within the CAP.

'91 — An Organic Farming Unit was set up in the Department of Agriculture in 1991 and the Irish Organic Farmers and Growers Association (IOFGA) was awarded grant aid for marketing and promotion of organic produce.

INTERREG was launched by the EC in Ireland 1991. A joint operational programme for Ireland and Northern Ireland included measures for agriculture and forestry, and environmental measures such as improving water quality

'92 — the 'Habitats' Directive, was passed in 1992 which required the designation of Special Areas of Conservation to protect habitats and species of European importance.

The MacSharry CAP reforms were completed in May 1992. An Extensification Scheme was made available for less intensive farmers.

'94 — The Rural Environment Protection Scheme (REPS) was introduced in 1994.

'97 — The European Communities (Natural Habitats) Regulations, 1997 were passed in March 1997 and a compensation package was introduced and the then Department of Arts, Culture and the Gaeltacht launched a payment scheme for farmers in SACs.

'99 — Agenda 2000 was agreed in 1999 and covered the 2000-2006 period which mandated a mid-term review in 2003. It was devised to prepare CAP for the future enlargement of the EU with the inclusion of countries from Central and Eastern Europe

2000 — In June 2003, the Agenda 2000 review was held in Luxembourg and the key elements include: Decoupling, Single Farm Payment. Eligibility for payments is subject to Cross-Compliance. Transfer of money between CAP objectives.

'03 — July 2005, Minister Dick Roche launches First Major 'Farming for Conservation' project it the Burren. The aim of the project is to develop a new model for sustainable agriculture in the Burren in order to conserve the habitats designated under the EU Habitats Directive.

'05 — December 2005, sees the launch of County Clare Wood Energy Farm Forestry Project. An initiative to encourage the development of renewable energy from wood biomass in County Clare

Cross Compliance

What is Cross Compliance?

The aim of cross compliance is to link, at farm level, the payment of farm supports to legal obligations on the environment. Following the Luxembourg Agreement on the reform of the CAP in 2003, Ireland introduced full decoupling of premia and arable aid payments from farm production with effect from 2005. This led to the introduction of the Single Payment Scheme in 2005.

An important cornerstone of decoupling is the link between the Single Payment Scheme and measures aimed at protecting the environment, as well as achieving high standards in food safety, animal health and welfare. Under the Single Payment Scheme farmers are required to meet the various Statutory Management Requirements (SMRs) set down in EU legislation and to maintain land in Good Agricultural and Environmental Condition (GAEC). This is what is known as cross-compliance.

A booklet, 'The Single Payment Scheme, Guide to Cross Compliance 2005' published by the Department of Agriculture and Food sets out the standards and requirements that farmers must meet in the first nine Statutory Management Requirements (SMRs). These SMRs must be observed under the Single Payment Scheme from 1st January 2005. Local Authorities are obliged to inform the Department of Agriculture of any breaches of SMR2, 3 and 4 when carrying out inspections.

Details of how farmers should carry out their farming activities in relation to Good Agricultural and Environment Condition (GAEC) is also set out in the 2005 publication. Further guidelines were issued in August 2006 on additional Statutory Management Requirements that must be observed. A summary of the main requirements under GAEC and a listing of the SMRs are listed here.

Statutory Management Requirements (SMRs)

- SMR1 Conservation of Wild Birds
- SMR2 Protection of Groundwater against Pollution
- SMR3 Protection of the Environment and Soil when Sewage Sludge is used in Agriculture
- SMR4 Protection of Waters against Pollution caused by Nitrates
- SMR5 Conservation of Natural Habitats and of Wild Flora and Fauna
- SMR6/7/8 Identification and Registration of Animals.

Statutory Management Requirements (applicable 2007)

- SMR 9 Authorisation, Placing on the Market, Use and Control of Plant Protection Products
- SMR10 Concerning the prohibition on the use in stock farming of certain substances having a hormonal or thyrostraic action and of beta-agonists
- SMR11 General principles and requirements of food law and laying down procedures in matters of food safety
- SMR12 Rules for the prevention, control and eradication of certain transmissible encephalopathies
- SMR13 Community measures for the control of foot and mouth disease
- SMR14 General Community measures for the control of certain animal diseases and specific measures relating to swine vesicular disease
- SMR15 Specific provisions for control and eradication of bluetongue
- SMR16 Minimum standards for the protection of Calves
- SMR17 Minimum standards for the protection of Pigs
- SMR18 Rules concerning the protection of animals kept for farming purposes.

Farm Inspections

On-farm inspections are carried out by the Department of Agriculture and Food to ensure compliance with Good Agricultural and Environmental Condition requirements and the various Statutory Management Requirements. Some of the main points that arise during these inspections are listed below.

Good Agricultural and Environmental Condition (GAEC)

Issues to be considered during the inspections:

- Do fields, which are not in process of crop establishment have cover or is stubble present?
- Commonage — Is applicant complying with Commonage Framework Plan with regard to outwintering and stock levels?
- Is there evidence of soil movement at feeding points/sacrifice paddocks?
- Are sand dunes overgrazed resulting in erosion?
- Has soil been unduly rutted due to use of machinery?
- Non Tillage Land — Is the management regime (grazing, cutting, topping) adequate to allow agricultural production to take place the following year?
- Tillage Land — If a crop is planted, is it grown in accordance with normal husbandry practice?
- Land under set-aside — Is it managed in accordance with Single Payment Scheme (SPS) terms and conditions?
- Where monuments or archaeological sites exist is there evidence of damage/disturbance?
- Is there evidence of damage/removal of habitats designated as Special Protection Areas (SPA) or Special Areas of Conservation (SAC)?
- Burning — Is there evidence of burning growing vegetation on non-cultivated land between March 1 and August 31?
- Is applicant taking appropriate measures to prevent the encroachment of invasive species?
- Is applicant taking appropriate measures to prevent the establishment of noxious weeds?
- Are external field boundaries maintained?

Cross Compliance

Statutory Management Requirements

Conservation of Wild Birds (SMR1)

SMR 1 specifies the actions that are permitted or unauthorised on lands designated as Special Protection Areas (SPAs). It also outlines standards that are applicable to all land. Special Protection Areas are areas of European significance for birds.

Certain activities are restricted within SPAs and can only be carried out with the consent of the Minister for the Environment.

These are called "notifiable actions" and vary depending on the bird species and habitat types present on the site. "Notifiable actions" are dealt with in Section 3 of this handbook. Landowners would have been notified by the National Parks and Wildlife Service if their land was designated as a SPA. In addition, REPS participants generally have any SPA details incorporated into their REPS plan.

On all land (whether SPA or not) wild birds should not be killed or captured. Game birds in season and species which are a threat to crops, livestock or to human health may be shot only in adherence to the Wildlife Act. Growing vegetation must not be grubbed, burned or destroyed during the bird-nesting season (March 1st - August 31st). This does not apply to vegetation normally harvested for hay or silage or vegetation which may have to be destroyed (other than burning) in the ordinary course of farming or forestry.

Protection of Groundwater against Pollution (SMR2)

SMR 2 relates to the protection of groundwater from contamination caused by dangerous substances. The management requirements are based on the EU Groundwater Directive. This Directive splits these dangerous substances into two categories, which are referred to as List I and List II.

List I substances are considered more dangerous to the environment than List II substances. Examples of List I include chemicals found in some sheep dips, products used for plant protection (herbicides, fungicides etc.), biocidal products (e.g. disinfectants etc.) and hydrocarbons such as fuel and waste oils.

Examples of List II include biocidal products not included in List I, metals such as lead, or other substances such as phosphorus, dairy detergents, ammonia or silicon or any substance that affects the quality of groundwater such as slurry or effluent.

The Groundwater Directive also considers how these substances might enter groundwater and makes a distinction between direct and indirect discharges. This issue is dealt with in more detail in the Water and Waste Sections.

Protection of the Environment and Soil when Sewage Sludge is used in Agriculture (SMR3)

This is dealt with in detail in the Water and Waste sections.

Protection of Waters against Pollution caused by Nitrates (SMR4)

Arrangements for the implementation of SMR 4, which deals with nitrates, will reflect the national regulations. The European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2005 more commonly known as The Nitrates Regulations, which are to be implemented on a phased basis over four years, came into force on 1st February 2006.

The regulations were amended in August 2006 in the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2006. Derogations were agreed and, where necessary, farmers can apply for a derogation to the Department of Agriculture. The Regulations set standards and requirements in relation to:

- The timing and procedures for the land application of fertilisers;
- Limits on the land application of fertilisers;
- Requirements on the capacity of storage vessels for livestock manure;
- General provisions on storage management; and
- The monitoring of the effectiveness of such measures.

Conservation of Natural Habitats and of Wild Flora and Fauna (SMR5)

SMR 5 specifies the actions that are permitted or unauthorised on lands designated as Special Areas of Conservation (SACs). It also outlines standards that are applicable to all land. SAC sites are areas of importance for natural habitats and for wild flora and fauna on a European as well as an Irish level. Certain activities known as 'notifiable actions' are restricted within SACs and can only be carried out with the consent of the Department of Environment, Heritage and Local Government (DoEHLG).

These 'notifiable actions' vary depending on the types of habitat and species that are present on the site. In general if you have a SAC designation on your lands, you will have been notified by the National Parks and Wildlife Service. Conservation Rangers are available regionally to provide clarification in relation to SACs including 'notifiable actions'. In addition, REPS participants have SAC details incorporated into their REPS plan.

Three rare plants are given special protection under the Habitats Directive on designated and undesignated lands: Killarney Fern, Marsh Saxifrage and Slender Naiad (see Appendix I). These rare species cannot be picked, cut, uprooted or destroyed. They cannot be kept, transported or destroyed. Non-native plant species cannot be introduced that will change their natural habitat.

Identification and Registration of Animals (SMR6/7/8)

The Inspecting Officer will check that:

- animals (cattle, sheep and pigs) on the farm are tagged in line with Department of Agriculture and Food requirements
- animal movement documentation is completed and the required animal records are being kept

Further information

Publications on farmers' responsibilities in relation to Cross Compliance were distributed by the Department of Agriculture and Food to all farmers in the country in March 2005 and in August 2006.

Profile
Declan Murphy, Teagasc

Declan Murphy is an Agricultural Adviser with Teagasc, working mainly in South East Clare. This area includes Clonlara, Parteen, Bridgetown, Broadford, Kilkishen, Sixmilebridge and Cratloe.

Teagasc in Clare

Teagasc is the government body that provides education, research and advisory services to the farming industry and farm families. The advisory service operates on a county basis and in County Clare the Teagasc head office is located in Ennis. There are also offices in Ennistymon, Kilrush and Scariff.

REPS Role

Declan's work mainly involves providing technical advice to farm families covering all aspects of farm production, including nutrient management planning, animal husbandry and grassland management. Declan also provides a REPS advisory service to local farmers and acts as a mentor to REPS planners working in Clare. 'This involves training new REPS planners working for Teagasc in Clare and delivering a quality control service on their work. I also provide an environmental backup service to the REPS planners.'

Most of Declan's time is spent on farm visits, whilst the rest is spent in the office, preparing new REPS plans, working with Teagasc REPS planners and dealing with general queries.

Farmer Issues

As an adviser, Declan deals with many of the issues that arise in the farming community. The issues most commonly relate to EU reforms, including the Single Payment Scheme and the Nitrates Directive. Also, which system of farming should be adopted and what levels of production and efficiency should be followed. Other issues include, how farmers can meet the REPS regulations to qualify for the scheme and farm building grant queries.

Client Service

In Clare, Teagasc has a list of clients that it deals with on a consultancy basis. Declan spends much of this time out in the farming community, meeting with farmers everyday; he tries to visit every farm twice yearly to deal with all their advisory needs. Teagasc regularly get referrals from the Department of Agriculture on issues such as farm building grants, animal welfare and also from Clare County Council in relation to serious pollution / environmental incidents that might have arisen on a farm.

Water Pollution Issues

Declan feels that the main pressure from agriculture on the Clare environment is the enrichment of watercourses, from both point source pollution (farmyard) and diffuse sources of pollution (spreading of slurry and chemical fertiliser). Farms participating in REPS tend to use less nitrogen and less phosphorus resulting in less diffuse sources of pollution. Their farmyards have pollution control facilities, which reduce the risk of pollution. Declan has seen the progression on many farms since they entered REPS and believes that the scheme is successfully combating pollution problems in the county.

Land Abandonment

Declan is particularly concerned about land abandonment in the county. He says, 'Poorer lands especially in the western part of the county will not continue to be farmed as they were in the past because of the low returns from farming. The results will be more commercial forestry — Sitka Spruce — and increased spread of scrub (hazel) in the Burren area of North Clare which will destroy the species rich grassland due to low grazing levels. The spread of bramble and whitethorn scrub will also be an issue in abandoned areas. All this will lead to reduced biodiversity in grassland areas with a low grazing intensity.'

He feels that farmers can be encouraged to stay farming through the continuation of REPS. While the existing scheme is working well, Declan believes that participation needs to be encouraged by making schemes more proactive, where farmers are paid to continue farming by having livestock rather than a single payment system which reduces livestock numbers.

The Future

Declan's thoughts on the future are that farming will become even more part-time in Clare due to small average farm sizes and the inability to generate the average industrial wage. The environment will be 'safe' while the environmental schemes continue, because farmers will see that they are getting paid for protecting the countryside. Farmers who are working outside of farming will continue to invest in buildings and facilities (slatted houses) to reduce their workload and the knock-on effect is that new facilities will improve farmyards and reduce pollution.

A Guide to REPS – Rural Environment Protection Scheme

One of the outcomes of the 1992 CAP reforms was the requirement for each Member State to put in place a national agri-environmental scheme to cover a minimum period of 5 years. In 1994, the Rural Environment Protection Scheme or REPS was launched in Ireland. The three main objectives of the scheme are:

1. To establish farming practices and production methods which reflect the need for environmental conservation and landscape protection
2. To protect wildlife habitats and endangered species of flora and fauna
3. To produce quality food in an extensive and environmentally friendly manner

REPS 1 (1994 to 1999) was voluntary and open to all farmers. Under the terms of the regulations, an evaluation report was submitted to the EU. As a result of the very positive report, the European Commission approved a new REPS scheme (REPS 2) which commenced in 2000.

Following that, REPS 3 was introduced in 2004. Near the end of 2005, there were over 47,000 farmers in REPS with almost half in REPS 3. This represents approximately one quarter of all farms in Ireland, but accounts for one third of all the land in the country being farmed. Applications for REPS 3 closed in the autumn of 2006. The autumn of 2007 saw the commencement of the new REPS 4.

In County Clare alone, approximately 28,193 hectares of land is being managed under REPS, with over €108 million paid to Clare farmers from the launch of REPS in 1994 to 2006.

1

2

The Principles of REPS

Applicants to REPS must:

- Be farming at least 3 hectares or 1 hectare in the case of small-scale organic or vegetable producers
- Undertake to implement the General REPS Programme measures and include all of the land farmed by the applicant in an agri-environmental plan
- Submit an application accompanied by an agri-environmental plan prepared by an approved planner/ planning agency
- Have land included on the Department of Agriculture and Food's (DAF) IACS database by making an Area Aid application.

1. *Wren* **2.** *REPS 3 publication*

Basic Measures

There are eleven basic measures in REPS 3 which are compulsory and must be implemented over the five-year period of the programme. These measures include:

Measure 1	Nutrient Management Scheme
Measure 2	Grassland Management
Measure 3	Protection of Watercourses and Wells
Measure 4	Maintenance of Wildlife Habitats
Measure 5	Maintenance of External Farm Boundaries
Measure 6	Careful Use of Pesticides and Chemicals
Measure 7	Protection of Features of Historical and Archaeological Interest.
Measure 8	Maintenance of the Visual Appearance of the Farm and Farmyard
Measure 9	Produce tillage crops leaving a specified field margin and without burning straw or stubble
Measure 10	Become familiar with environmentally-friendly farming practice
Measure 11	Prepare, monitor and update the agri-environmental plan and keep such farm and environmental records as may be prescribed.

1

2

Biodiversity Options

Here REPS provides further opportunities to enhance biodiversity at farm level. By providing farmers with a choice from a series of optional undertakings, each farmer can select actions most appropriate to the environmental or landscape features of the farm. Every applicant must undertake two options with at least one coming from Category 1.

Category 1	Category 2
4A. Creation of a New Habitat	2A. Traditional Hay Meadows
5A. Hedge Rejuvenation (Coppicing and laying)	2B. Species Rich Grassland
5B. New Hedgerow Establishment	3A. Increase Watercourse Margin
5C. Additional Stonewall maintenance	3B. Exclude all bovine access to watercourses
9A. Green Cover	4B. Broadleaved Planting
9B. Environmental Management of Setaside.	4C. Nature Corridors:
9C. Arable Margins	7A. Increase in Archaeological Site and Historical Buffer Margins
	7B. Archaeological Site Access.
	8A. Landscaping around the Farmyard
	9A. Green Cover
	9C. Arable margins

1. *Fox* **2.** *Stoat*

Voluntary Supplementary Measures

There are also a number of voluntary supplementary measures that offer additional payments on top of the basic scheme and these are set out in the table below:

Supplementary REPS Measure	Objective	Application
Supplementary Measure A	To provide a comprehensive approach to the conservation and/or regeneration of designated target areas.	Applies in Natural Heritage Areas (NHAs), Special Areas of Conservation (SACs), Commonage
Corncrake Habitats	To enhance the habitat structure and availability of breeding sites for the corncrake over the summer and autumn months.	Corncrake habitat areas.
Traditional Irish Orchards	To create and maintain apple orchards with specific varieties traditional to Ireland to ensure the survival of this unique resource.	Countrywide
Riparian Zones	To provide shade to overly exposed designated river channels to stabilize riverbanks, to provide a suitable habitat for flora and fauna and to intercept nutrients transported in overland flow.	Applies to 22 designated Salmonid Waters
Conservation of Animal Genetic Resources (Rare Breeds)	To encourage farmers to rear animals of specific breeds traditional to Ireland, that are in danger of being lost to farming.	Countrywide
Organic farming	To deliver enhanced environmental and animal welfare benefits and to encourage producers in REPS to respond to the market demand for organically produced food.	Countrywide
LINNET (Land invested in Nature Natural Eco-Tillage)	To encourage the small-scale production of cereal plots, especially in areas dominated by grassland to provide an overwintering food source of seeds and small insects for finches and other bird species.	Countrywide

2

Financial Impact of REPS

REPS has been a major contributor to farm income for participating farmers and since 1994 €1.98 bn has been spent supporting the scheme nationally. The funds available currently for REPS 3 are:

- REPS annual payment of €200 per hectare for the first 20 hectares, €175 per hectare for the next 20 hectares, €70 per hectare for the next 15 hectares and €10 per hectare for the remaining hectares.
- REPS annual payment of €242 per hectare for eligible Commonage land, Natural Heritage Areas, Special Areas of Conservation and Special Protection Areas up to a maximum of 40 hectares. €24 per hectare is payable per hectare for areas above 40 hectares and under 80 hectares, €18 euro per hectare for areas above 80 and under 120 hectares and €15 per hectare for areas over 120 hectares.
- Additional payments are made for participating in Supplementary Measures.

REPS 4

The new REPS 4 was approved in Brussels in July 2007 and opened for applications in the autumn of 2007. The new scheme will largely follow the format of REPS 3 but will have more measures to enhance biodiversity at farm level.

The 11 Core Measures of the scheme are unchanged. The number of Optional Measures has increased to 26 and farmers can now choose from 13 Voluntary Supplementary Measures. Basic payments per hectare will be higher, as will the supplementary measure payments. Training (for new REPS entrants) and record-keeping will continue to be key requirements of the scheme.

1

1. *EU Parliament Buildings in Brussels* **2.** *Traditional Irish orchard*

REPS 4 Optional Measures

Farmers must choose two further measures from 16 options divided into two categories, one from each category. These options are numbered according to the Basic Measure that they relate to.

Core Measures	Category 1 Options	Category 2 Options
1 Nutrient Management		
2 Grassland Management	2A Traditional Hay Meadows 2B Species Rich Grassland 2D Use of Clover in Swards	2A Traditional Hay Meadows 2B Species Rich Grassland 2C Mixed Liverstock Enterprises 2E Use of Trailing Shoe 2F Control Invasive Species
3 Protection of Watercourses		3A Increased Watercourse Margin 3B No bovine access top watercourses 3C Reduce Nutrient Inputs and Protect Vulnerable Soild in the Catchment area.
4 Retain Wildlife Habitats	4A Creation of New Habitats 4B Tree Planting 4D Establish Farm Woodland	4B Tree Planting 4C Nature Corridors
5 Maintain farm and field boundaries	5A Coppicing of Hedgerows 5B Laying of Hedgerows 5C Plant New Hedgerows 5D Additional Stone Wall Maintenance	5A Coppicing of Hedgerows 5B Laying of Hedgerows 5C Plant New Hedgerows 5D Additional Stone Wall Maintenance
7 Protect Historical / Archeological Features		7A Increased Archeological site margins 7B Site Management where public access
8 Visual appearance of Farm & Farmyard	8A Traditional Farm Enterprise / Skills	8A Traditional Farm Enterprise / Skills
9 Produce Tillage Crops respecting Environmental Principles	9A Green Cover Establishment 9B Environmental Management of Set-Aside 9C Increased Arable Margins 9D Low input cereals/root 9E Bio-energy crops	9A Green Cover Establishment 9C Increased Arable Margins 9D Low input cereals/root crops 9F Eco Tillage Crops

REPS 4—Voluntary Supplementary Measures

Farmers can top up their basic REPS by availing of up to two supplementary measures.

Supplementary Measure	Payments
Conservation of animal genetic resources (rare breeds):	€234 / livestock unit of breed registered with a breed society
Riparian Zone	€850 / ha up to maximum of 2.5ha, in salmonoid and crayfish sites, and on pearl mussel sites payment is paid up to 4ha.
LINNET	First ha €700. 1–2.5hs €400 / ha
Low input tillage	€370 / ha up to maximum of 2.5hs
Importation of Organic N	€4.50 / per cubic metre of slurry mainly applies to Tillage Farmers. Grassland farmers can qualify if there is a P requirement
Eco tillage	€25 / ha up to maximum of 40ha
Traditional farm enterprises	€300 / holding
Traditional sustainable grazing	€50 / ha up to area of 20ha (marginal non commonage land—with breed traditional to area).
Mixed grazing measure	maintain a minimum of 70 sheep (min stocking 0.5la / ha) and a min of 3 cows (or cattle equivalent)—€50 / ha on up to 20ha—of private land.
Lake catchment (eg organic N reduction)	Payments vary depending on the environmental plan e.g. traditional hay meadows €120 / ha up to 2.5 / ha; Buffer zones €30 / ha up to maximum of 40 ha.
Clover Swards	€30 / ha up to maximum of 40ha
Heritage building	maximum €25,000 / approved project
Corncrake Project	€100 / ha

Organic Farming

From 2007, organics is a separate scheme under the REPS propgramme. Participants must hold a license with one of the approved organic certifying bodies and be registered with the organic unit of the Department of Agriculture. Farmers can opt to convert all or part of their holdings to organics.

Area	Payments
Up to 55ha	€212 / ha in conversion + basic REPS €30 / ha thereafter €106 / ha in organic status + basic REPS
Less than 6ha	€283 / ha in conversion. €142 / ha in organic status.

Further information about REPS

Further information regarding REPS may be obtained from the local Agricultural and Environment Structures (AES) Office in Ennis or by contacting the REPS Section, Department of Agriculture and Food, Johnstown Castle Estate, County Wexford. Telephone 053 63400 or Lo-call 1890 200 509 or visit www.agriculture.gov.ie. Farmers can also contact their local Teagasc office.

Species Profile
Noxious Weeds

Noxious weeds are agricultural weeds that invade farmland, spreading over large areas and between farms, if left unchecked.

REPS Compliance

Certain species are listed under the Noxious Weeds Act 1936. Any person responsible for land on which these weeds are growing is legally liable and if convicted can be fined. Under REPS conditions, all weeds can be controlled in tillage and grass fields but the spraying of field margins is not allowed under REPS Measure 6. However, provision is made for the control of noxious weeds, and they may be spot treated with a suitable herbicide where mechanical control is impossible.

Ragwort

Ragwort is perhaps the most widely known of the noxious weed species. It is also known as buachalán buí. Ragwort is poisonous to livestock and they normally avoid it. After it has been treated with herbicide however, it becomes more palatable. Therefore, livestock must be kept away for some time after treatment. It should be pulled by the root before it sets seed and removed from the field to prevent spread to adjoining lands (see also page 126 for profile).

1

2

Creeping Thistle

Creeping Thistle is another of the listed noxious weeds. Although it is not poisonous, it spreads very quickly as its roots can creep and create new plants. It thrives in reasonably fertile grassland and tillage. Winter poaching and overgrazing in spring encourage the spread of this weed. Other thistles are less invasive as they only spread by means of seed.

Docks

Docks are also listed among the noxious weeds. Docks are weeds of highly fertilized ground with the broad-leaved dock commonly occurring on tillage and grassland, and the curled dock being widely distributed on tillage land.

The above species are listed chiefly because their seed can travel for some distance and can infect neighbouring fields, making their spread difficult to control. Other species are listed in the Noxious Weeds Act for different reasons, but mainly relate to tillage crops.

1. *Ragwort* **2.** *Creeping Thistle*

Organic Farming

What is Organic Farming?

For some, organic farming is the most environmentally friendly type of agriculture. It is a way of farming that avoids the use of chemicals such as fertilisers, pesticides, growth regulators and feed additives. Traditional techniques, which rely on crop rotations, animal manure, clover, low stocking rates and good animal husbandry are used. The natural immunity of plants and animals are used to combat disease whenever possible.

Specific guidelines or rules which govern organic farming are specified in a document called 'The Standards for Organic Food and Farming in Ireland'. The conversion period from conventional to organic farming in Ireland is two years and farms must register with one of three organisations to be certified organic. A copy of the standards is available for a fee from any of the organic certification bodies; the Irish Organic Farmers and Growers Association (IOFGA), Organic Trust or Demeter Standards.

Organic farming and food is described by the Department of Agriculture and Food as follows:

'Organic food is quality food produced to strict, legally backed internationally recognised standards. Organic farming represents a different view of farming systems, which puts a strong emphasis on welfare. Organic farming avoids the use of synthetic fertilisers, chemicals and/or additives'.

Standards for Organic Food and Farming in Ireland

- A two-year conversion period is required before a farm is given organic status
- Soluble mineral fertilisers are prohibited, but some fertilisers are permitted, such as lime and rock phosphate
- Clover and other legumes supply nitrogen. The balance between fertility building crops, such as grass, clover lea and exploitative crops such as cereals and potatoes is critical in a tillage rotation
- Most manufactured agro-chemicals (e.g. weedkillers) are prohibited
- Ruminant livestock must be fed a diet, which is at least 60% roughage. The livestock diet should consist mainly of organically produced foods. Tillage crops should be considered on organic farms as it may be cheaper to grow than to buy in concentrates. Cereals also produce straw for bedding and an opportunity to re-seed ground to a clover lea
- The highest standards of animal welfare are required. Housed animals must be provided with bedding. Good ventilation and a generous floor area for each animal are required
- Routine preventative treatment of healthy animals is not allowed. The emphasis is on disease prevention rather than cure. Obviously, sick animals must be treated and treatment is also allowed in the case of a known farm problem (permission is required in this case)

Organic Farming

Organic Economics

Output per acre from organic farms is considerably lower than from those that use synthetic chemicals. During conversion, extra costs are often incurred through the need for new buildings and clover establishment. Costs of fertiliser and chemicals obviously reduce when the system is established on the farm, but there are additional expenses for straw and concentrates.

However, a higher retail price is placed on organically produced goods and organic farmers can also receive support under the REPS 3 Supplementary Measures. In REPS 4 also, additional support for organic production will be available. These factors combine to make the financial returns from organic farming comparable with non-organic production. In recent years there has been a considerable increase in consumer interest in organic food. Organic produce is becoming more mainstream and is taking up more space on Irish supermarket shelves and in farmers markets.

In 2004, the Food Safety Authority of Ireland conducted a survey which estimated that the market for organic food in Ireland was worth approximately €25 million per year, with a current market growth rate estimated at 25% per annum. Organic food sales in Ireland represent less than 0.5% of the total food market, considerably lower than the 2% European average.

Approximately 70% of the organic food on the Irish market is imported, and there are those who would argue that the transportation costs involved in importing organic foods outweighs the environmental benefits of the farming system employed.

These figures highlight the fact that demand for organic produce in Ireland is far greater than domestic production and, in line with international trends this demand should continue to rise. Fruit and vegetables comprise the largest organic food type (approximately 45%) on the Irish market, while meat (approximately 25%), dairy (approximately 10%), and other organic groceries make up the balance.

Organic Farming in Clare

According to Department of Agriculture statistics, there were 81 registered organic farmers in County Clare in 2006. As with non-organic farming, the vast majority are involved in livestock production with only 20 farmers both growing crops and producing livestock. Only fourteen were registered as purely tillage farmers. Organic farmers represent 1.29% of all farmers in Clare. This compares well with a national average of 0.83% and shows an increase in the numbers of registered organic farmers in Clare from the 2003-2004 period.

Disadvantages of Organic Farming

- Marketing of organic produce is difficult unless there is a continuous supply available
- Many consumers are not willing to pay a premium price for organically grown lamb and beef
- A higher degree of farm management skills and animal husbandry are necessary to successfully farm organically
- Organic farming is only sustainable at lower stocking rates and so returns per acre will be lower

Advantages of Organic Farming

- It is a healthy, environmentally friendly method of food production
- There is an increasing demand for organically produced food which commands a premium price
- There is a REPS subsidy for Organic Farming
- There is scope for further expansion of the industry
- Animal health problems are reduced due to better animal welfare standards

Water

In the last decade, County Clare like the rest of Ireland, has experienced increased population growth, housing development and the intensification of agriculture. As a result, environmental pressures on our county have increased significantly. Water quality, in particular, has come under considerable pressure. Responsibilty for the future quality of our water and our health belongs to us all, as householders, landowners and citizens.

In this section we look at the importance of groundwater, lakes, rivers and streams and how landowners can play their part in reducing pollution pressures on them. As the European Water Framework Directive is the main piece of EU legislation which will shape the management of water into the future, it is important to understand how it will affect us, and farming in particular.

The Water Framework Directive

The European Water Framework Directive (WFD) became part of Irish law in December 2003. Its purpose is to protect and improve the quality of all waters throughout the European Union. In Ireland this includes rivers, lakes and estuaries as well as groundwater, and coastal waters up to one nautical mile from the shore.

The Objectives

Under the WFD, the quality of water will be assessed on the natural plant and animal life it supports. The quantity of water will also play a part in the assessment of a water body's status.

The WFD has two main objectives:
(1) To prevent any deterioration in waters;
(2) To reach at least 'good ecological status' for all waters by 2015.

North Western IRBD
Western RBD
Shannon IRBD
South Western RBD
South Eastern RBD
Eastern RBD
Neagh Bann IRBD
North Eastern RBD

IRBD = International River Basin Districts cover both Northern Ireland and Republic of Ireland.

The River Basin Districts (RBDs)

The WFD is implemented on the basis of River Basin Districts rather than individual counties. A River Basin District (RBD) is an area of land that is drained by a large river or number of rivers, as well as the adjacent coastal areas. These follow natural boundaries, which don't always coincide with county boundaries. Therefore most counties fall into two or more river basin districts.

The whole island of Ireland is divided into 8 RBDs, and Clare is divided between the Western and Shannon RBDs.

The Western RBD extends from north of Sligo town to Black Head in Clare, and includes about 5% of the area of Clare – comprising the areas around Ballyvaughan, Bellharbour, New Quay, Boston and a very small area north of Flagmount.

The remaining 95% of Clare is in the Shannon IRBD. This is the largest RBD in Ireland, with an area of 18,000 km^2 and 1,500 km of coast, and covering parts of 18 counties. It stretches from the source of the River Shannon in Cavan to the tip of the Dingle peninsula in Kerry.

The Management Plans

The most important requirement of the WFD is that a River Basin Management Plan must be made for each RBD before the end of 2009, and renewed every six years afterwards. The River Basin Management Plan must give details of all the water bodies in a River Basin, the environmental objectives which all of the water bodies must meet, and the measures that will be adopted to achieve those objectives. Both the Western and Shannon RBDs have set up project teams which have been working since 2002 to gather information and ask questions, including the following:

- What fish and plant life should an unpolluted river or lake have?
- What are the main pressures on our waters?
- How does taking water from a river for drinking affect the river?
- How does pollution from industry, agriculture, septic tanks or sewage treatment plants affect our water?

When these questions have been answered, and when we understand what is affecting our waters and how, the next phase is to plan how we are going to deal with these problems. The River Basin Management Plans will be the end result of this process.

Public Consultation

In June 2007 each of the River Basin District Projects published its report on Significant Water Management Issues (SWMI) for its own RBD. These reports are an essential part of public consultation on water quality issues. They show what the project teams have identified as the main issues affecting water quality in their own RBDs, and invited the public to express their views on them. The public consultation period was completed in December 2007. When the SWMI reports are finalised after the consultation period, they will lead to the preparation of Programmes of Measures, which will be at the heart of the River Basin District Management Plans to be made in 2009.

To get more information on the Water Framework Directive and the River Basin District Projects, including the SWMI reports, you can contact the Environment Section of Clare County Council. More detailed information is available from the two Project Offices whose work directly affects County Clare (see page 214 for contact details).

Banded Damselfly, commonly found by rivers and lake shores

Surface Water

Introduction

Clare is blessed with a plentiful supply of rainwater that fills our streams, rivers, lakes and reservoirs. This water, or surface water as it is referred to, is greatly valued for providing us with drinking water in our homes, an abundance of wildlife and fisheries to enjoy and an important raw material for farming and industry.

With over 300 lakes, Clare is home to some of Ireland's most beautiful lakes and wetlands. Surrounded by water on three sides, the trip is never too far to appreciate the rich wildlife habitats of the Shannon and its estuary, or the magnificent scenery of the Atlantic Ocean.

Most cities, towns and villages in Ireland have developed around rivers, lakes, and streams and from a very early age, mankind has worked alongside surface water, using it as an important resource.

Lough Derg

Water Quality Decline

Ireland's record rate of population growth, housing development and agricultural intensification has given rise to a decline in water quality resulting in the loss of salmon and trout from many of our waters.

Although very serious cases of water pollution in rivers and lakes have decreased, Clare rivers are now more likely to be slightly or moderately polluted. Slight and moderate pollution is caused mainly by increased nutrients coming from urban and agricultural sources, such as sewage discharges, surface run-off in urban areas or the leaching of excess nutrients from agricultural land, all of which reduce the natural quality of rivers and lakes.

Phosphorous Monitoring

In 1998, Phosphorous Regulations were introduced which monitor changes in phosphorous concentrations against 1995-1997 baseline figures, in order to assess changes in water quality. In Clare, there has been an overall decrease in water quality since the commencement of the Phosphorous Regulations. The percentage of 'stations' on rivers and lakes meeting 'satisfactory' water quality status has decreased.

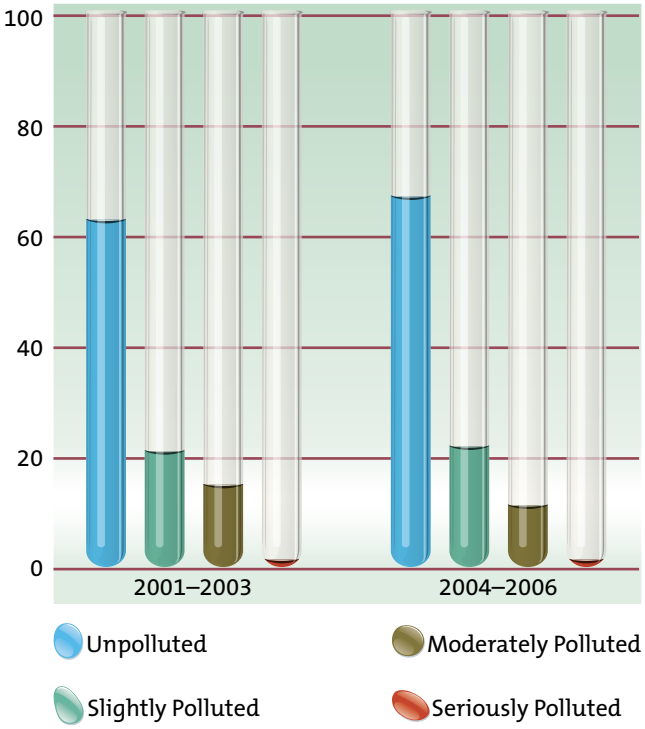
According to Clare County Council's Phosphorous Regulations Implementation Report in 2006, 50% of river stations monitored in Clare were classified as having 'satisfactory' water quality status. There has been a significant decline in the number of high quality stations (Q5) declining from 14 in the baseline survey (1995-1997) to six in 2005. Maintaining 'satisfactory' river quality status and providing improvement in low quality stations is proving to be a serious challenge in Clare.

Current Status of Surface Water in County Clare

Status of Shannon IRBD and Clare Rivers

A recent EPA report shows some mixed results for the Shannon International River Basin District (IRBD). On the positive side, the percentage of unpolluted river channel lengths surveyed has increased to 67% in 2004-2006, up 4% from 63% in 2001-2003. However, there has been a very slight increase in the seriously polluted class, up from 0.6% in 2001-2003 to 0.7% in 2004-2006.

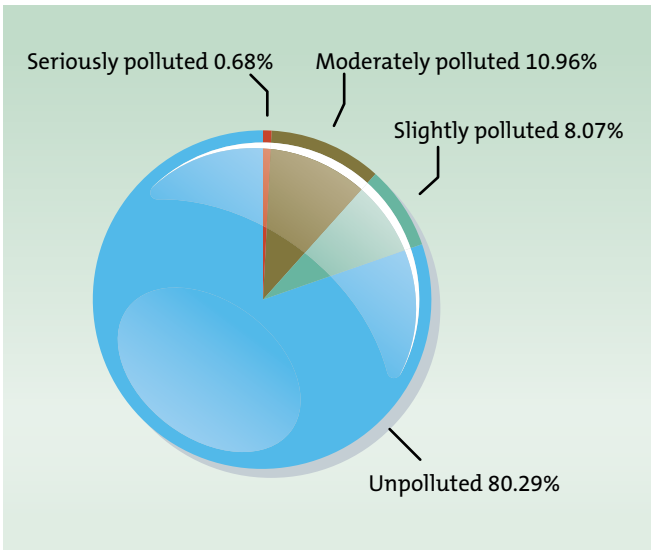
Trends in River Water Quality in Shannon IRBD



Source: EPA (2007). Water Quality in Ireland 2006 – Key Indicators of the Aquatic Environment.

According to the EPA's report Water Quality in Ireland 2001-2003 report, the biological quality of river water in Clare is relatively good with 80% or river channel lengths satisfactory (unpolluted category). However, 0.7% of river channel surveyed in Clare was classed as seriously polluted. When figures are compared to the previous reporting period of 1998-2000, it indicates an overall deterioration in river water quality.

River Quality in Clare 2001-2003



Source: EPA (2005). Based on data from 'Water Quality in Ireland 2001–2003'

Current Status of Surface Water in County Clare

Status of Clare Lakes

Lakes in County Clare are plentiful and are the core visitor attraction for many towns and villages. Clare hosts some of the finest game fisheries in the west such as Lough Cloonmackan and Lough Cullaunyheeda. Clare lakes also act as important supplies of public water and group water schemes, eg. Doo Lough, Castle Lake, Inchiquin, Lickeen and Namina.

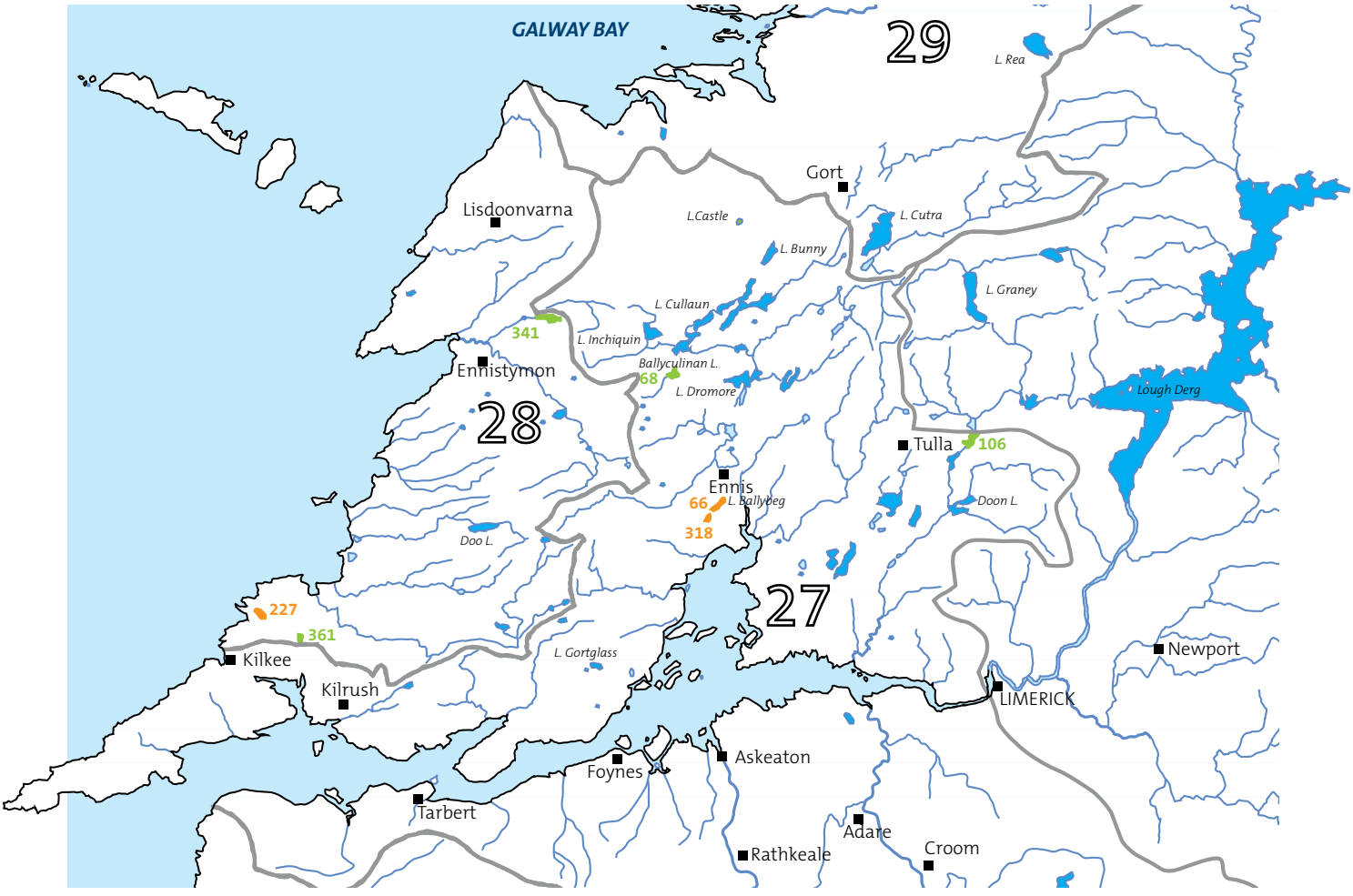
However, over the last few years the occurrence of algal blooms during the summer months, and an overall deterioration in our lakes have become an unfortunate feature. Brown trout have suffered a decline in some of Clare's most important trout lakes such as Inchiquin and Lickeen. It is now a vital goal to source and eliminate the causes of these water pollution problems.

Trends in Lake Water Quality in County Clare

27 & 28
Hydrometric Area Number

- **Oligotrophic / Mesotrophic (unpolluted)**
- **Moderately Eutrophic (slightly polluted)**
  - 68 Ballycullinan
  - 106 Bridget
  - 341 Lickeen
  - 361 Moanmore
- **Strongly Eutrophic / Highly Eutrophic (moderately polluted)**
  - 66 Ballybeg
  - 227 Farrihy
  - 318 Killone

Source: EPA (2005). Based on Water Quality in Ireland 2001-2003



Monitoring Lake Water Quality

Lakes are classified into six 'trophic' categories depending on the level of nutrients or pollution present, namely:

- Oligotrophic (unpolluted)
- Mesotrophic (unpolluted)
- Moderately Eutrophic (slightly polluted)
- Strongly Eutrophic (moderately polluted)
- Highly Eutrophic (moderately polluted) and
- Hypertrophic (seriously polluted)

Although the majority of Clare's lakes are of good quality, according to EPA data for 2001–2003, the following lakes were either moderately eutrophic or had a higher trophic status consistent with being polluted; Ballybeg, Killone, Farrihy, Ballycullinan, Moanmore, Lickeen and Bridget.

Considerable efforts have been made to address these problems, including farm surveys.

Drinking Water Status

The purpose of the EU Drinking Water Directive which has been brought into Irish law, is to protect human health from the adverse effects of drinking water contamination.

Clare County Council analysed 518 drinking water samples during 2005. According to the EPA, the overall rate of compliance with drinking water standards in County Clare was 97.7%, which was above the national average in 2005.

Ennis Water Quality

However, of great concern was the outbreak of cryptosporidiosis in Ennis in 2005. This gave rise to a boil notice being placed on the Ennis Town supply for a number of weeks as a precautionary measure. In order to address immediate concerns, an interim treatment plant was put in place. There is a boil notice currently in place for under five year-olds, immuno-compromised and visitors. A new permanent water treatment plant for the town will be completed early in 2009.

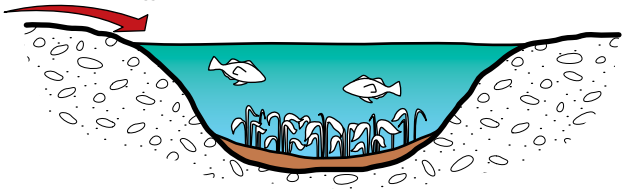
Surface Water Quality Problems

Eutrophication

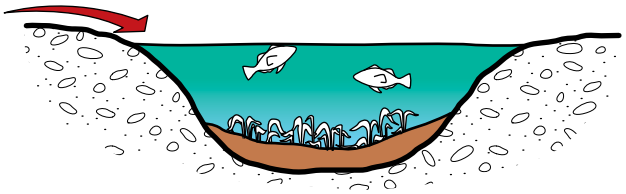
Eutrophication is the main freshwater pollution problem in County Clare. It is a process whereby water bodies, such as lakes, rivers, or slow-moving streams receive excess nutrients that act similarly to fertiliser, leading to an excessive amount of plant growth, which reduces the oxygen level in the water. In addition to urban and industrial activity, poor farming practice is one source of increased nutrients. Eutrophication can cause reductions in fish stocks, health risks to human and animals, and increased water purification costs.

The process of eutrophication

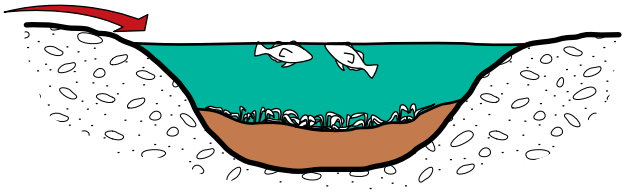
Nutrient run-off



1 *Algae grow fast, using up lots of oxygen and blocking sunlight*



2 *Aquatic plants begin to die*
3 *Dead matter provides food for microbes...*



4 *...increasing the competition for oxygen*
5 *Water becomes deoxygenated - fish die*

Choked for Air

In lakes, the main feature of eutrophication is a murky green colour in the water, which is due to the excessive growth of algae and other microscopic plants (often referred to as an algal bloom). In rivers, intense growth of algae along the riverbed, and nuisance weeds are signs of eutrophication. Because of this enhanced plant growth, eutrophication reduces the level of dissolved oxygen in the water, which further decreases when dead plant material decomposes.

Oxygen is vital for all fish and aquatic fauna to survive. In extreme cases of eutrophication, the river becomes choked for air which can result in fish kills, particularly during the summer months, when oxygen levels and water flow are naturally at their lowest. Almost all incidences of fish kills in Ireland reported to the Central Fisheries Board are caused by very low or zero oxygen concentration in water.

Farm Pollutants

The table below shows polluting substances that are associated with agriculture and compares their potential for pollution. All the substances have a high nutrient content, and if not managed properly, have the potential to cause pollution. Most agricultural related pollution incidents occur because of inadequate systems for the collection, storage or disposal of silage effluent, slurry or dirty water.

The BOD in the table below refers to the Biological Oxygen Demand of the pollutant i.e. the amount of oxygen which it removes from water.

Farm Waste	BOD Requirement Mg/litre Oxygen	
Whole Milk	100,000	Most Polluting
Silage Effluent	65,000	
Pig Slurry	25,000	
Cattle Slurry	17,000	
Dirty Yard Water	1,500	
Raw Vegetable Washings	500 – 3,000	
Parlour Washings	1,000 – 2,000	
Raw Domestic Sewage	300	
Clean Water	1-2	Least Polluting

Monitoring River and Lake Water Quality

River Quality Monitoring

River water quality is monitored by the EPA and Clare County Council at regular locations along a river channel (usually at bridges). Experts can tell the quality of a river by looking at the different species of river plants and animal life found in the water. Chemistry laboratory analysis of a river water sample can tell the amount of nutrients such as nitrogen and phosphorus and other polluting substances that are present in the water.

Mayfly Indicator

The EPA Biological Water Quality Monitoring Programme involves a scoring system which rates surface waters by studying the macroinvertebrates present in the river. Macroinvertebrates include mayflies, leeches, snails, beetles and shrimps, and can act as indicators of good or bad water quality depending on their tolerance to pollution. Mayflies or stoneflies are sensitive to pollution and their presence can act as effective indicators of good water quality, whereas midge flies and worms in general are linked with poorer water quality.

Kick Sample

In order to see and identify macroinvertebrates it is necessary to take a 'kick sample'. A kick sample involves kicking up the water whilst standing in the river and dislodging any insects or worms living in the river channel debris and catching them in a net.

Quality Rating

Depending on the community of macroinvertebrates species present, rivers are classed with a 'Q' or Quality-rating value that ranges from Q1 (poorest water quality) to Q5 (excellent water quality) as follows;

Indicators of Good Water Quality- EPA quality ratings Q5, Q4-5, Q4	Indicators of Poor Water Quality- EPA quality ratings Q3, Q2, Q1
A high number of different macroinvertebrate species including: Stoneflies, Mayflies, Caddis Flies	A low number of different macroinvertebrate species.
	The presence of aquatic worms, midge and gnat fly larvae, alder flies and especially bloodworms
The river is free of sewage fungus and green algae	Sewage fungus and algal growth present
Many different types of plants present	No aquatic plants present or very few types of plant present
Trout and Salmon present	Only coarse fish
Dissolved oxygen measurements are high	Dissolved oxygen measurements low
Low silt/mud within the river channel	Heavy mud/silt within the river channel

Monitoring River and Lake Water Quality

Lake Quality Monitoring

The EPA, Shannon Regional Fisheries Board and Clare County Council carry out lake water quality monitoring. Lakes are monitored differently to rivers. The three key indicators of lake water quality measured by the EPA are:

Total measurement of Chlorophyll

Chlorophyll is the green colour found in lake algae and bacteria. These grow best in nutrient rich waters where pollution occurs. If there is a green colour in the lake, it indicates that the water is enriched and polluted.

Water Transparency

This is a measurement of how clear the lake water is. In general, the clearer the lake water, the more suitable the water is for recreational uses of game fishing and swimming.

Total Phosphorus Content

Excess levels of phosphorus are commonly a cause of pollution in lakes.

2

More Information

The EPA's website has an interactive map www.epa.ie/OurEnvironment/Water/ which gives the results of water quality for all its sample sites in Clare since monitoring began in the early 1970's. You can use it to see what the river water quality is like in your area. Biological Quality Ratings for pristine or unpolluted water usually score Q5 or Q4-5 or Q4. Rivers with a poorer water quality usually score Q3, Q2 or Q1.

Water Framework Directive Role

Since January 2007 special programmes of water quality monitoring on selected rivers and lakes have been taking place under the WFD. These are aimed at providing detailed information on key rivers and lakes to feed into the Programmes of Measures, which in turn will be included in the River Basin District Management Plans to be made in 2009. Although there is some overlap, these special monitoring programmes are additional to the quality monitoring programmes already in place as described above.

1

1. *Mute Swans* **2.** *Common Frog*

Surface Water Good Practice Guidelines

Best Practice Agriculture for Surface Water

Good farming practice can eliminate and minimise the risk of eutrophication. The main causes of pollution from agriculture are watering animals, farmyard runoff and inappropriate slurry spreading (or dumping). This section describes some of the best practice methods that can be adopted, specific to the Clare landowner.

Slurry

Slurry is rich in plant nutrients, in particular nitrogen, phosphorus and potash. Although it is an excellent fertiliser, run-off or leaching of slurry can result in damaging effects on aquatic life as well as on drinking water.

Slurry Storage

It is essential to have sufficient, well-designed and constructed slurry stores on the farm. These storage tanks should never overflow or have an inadequate storage capacity – aim for six months slurry storage capacity to avoid having to spread when ground conditions are unsuitable.

The best time to spread slurry is early in the growing season so that the application of the nutrients will coincide with the nutrient uptake by growth of crops and grass.

Spreading of Slurry should not take place:

- When heavy rain is forecast, within the next 48 hours
- When the soil is wet or waterlogged
- On frozen or snow-covered land
- On land sloping steeply towards rivers, streams or lakes
- On exposed bedrock
- Between the period 31st August to the 15th January inclusive (according to REPS guidelines).

Silage slab

Keep your distance!

To protect water quality, it is vital to keep best practice buffer distances when spreading organic and chemical fertilisers as well as farmyard manure.

Water Supplies for Human Consumption

Where a water source on or beside your land is used to supply public or private water schemes, various buffer zones apply, ranging from 300 metres to 50 metres, depending on both the volume of water supplied and the number of people the water supply serves.

If you are unsure whether your landspreading area falls into any of the first three listed on the next page, please check with the Environment Section of Clare County Council on 065–684 6331. Be particularly mindful of the water sources for Group Water Schemes operating in your area, since these supplies are numerous and may be less obvious. The table on the next page outlines the various buffers that apply.

Surface Water
Good Practice Guidelines

Buffer Distances

Organic fertilisers i.e. slurry, soiled water, livestock manure or farmyard manure (FYM) should not be applied to land within:

Minimum Buffer Distance from Waterbodies	
300m	Sources of Public Water Supplies, Sources of Private/Public Group Schemes serving 500+ persons or supplying 100m^3+ of water
100m	Sources of Private/Public Group Schemes serving 50-499 persons or supplying between 10m^3 and 99m^3 of water.
50m	Domestic wells, boreholes, springs, including private/public group schemes supplying <10m^3 of water or serving <50 persons.
20m	Surface Watercourse or Other Lake shoreline, main channel, and rivers designated as SAC.
10m	Watercourse (other than a lake or water supply serving >50 persons).
3m	Open drain or narrow strip of land adjacent to a watercourse (< 1 ha and < 50m wide)
10m	If average incline towards watercourse > 10%. (supersedes the above 5m and 3m limits)
15m	Exposed cavernous limestone or karst limestone features (e.g. swallow holes and collapse features).
50m	Public building
Chemical fertilisers: i.e. manufactured by an industrial process, should not be applied to land within:	
1.5m	Surface watercourse

Sources: REPS, Good Farming Practice, Good Agricultural Practice Regulations 2006, National Parks & Wildlife Service and planning conditions. This information is not a legal interpretation of the legislation but is considered best practice.

Although, no organic fertiliser application is permitted during the months of November and December, there is an exemption for soiled water, and chemical fertilisers to meet crop requirements of Autumn-planted cabbage or crops grown under permanent cover.

It is recommended that at least half the slurry produced during the winter housing period is spread on land before 1st July, the remainder before 30th September. In any event, local circumstances must be taken into consideration when applying slurry on lands.

Solid Manure (Farmyard Manure)

Solid manures are less likely to cause pollution than slurry. However, seepage from manure can be highly polluting if it enters a waterway.

FYM Storage

Permanent stores of manure should have the correct capacity for your livestock, and should be built to reduce the risk of pollution and allow for easier handling of manure.

All seepage/runoff from manure stores or straw bedded livestock housing should always be collected and should never be allowed to enter a drain or waterway. The base of manure stores should be solid and should be sloped so that liquids run off into a collection channel across the front and sides of the store. Liquid waste should run into a tank.

Keep your distance!

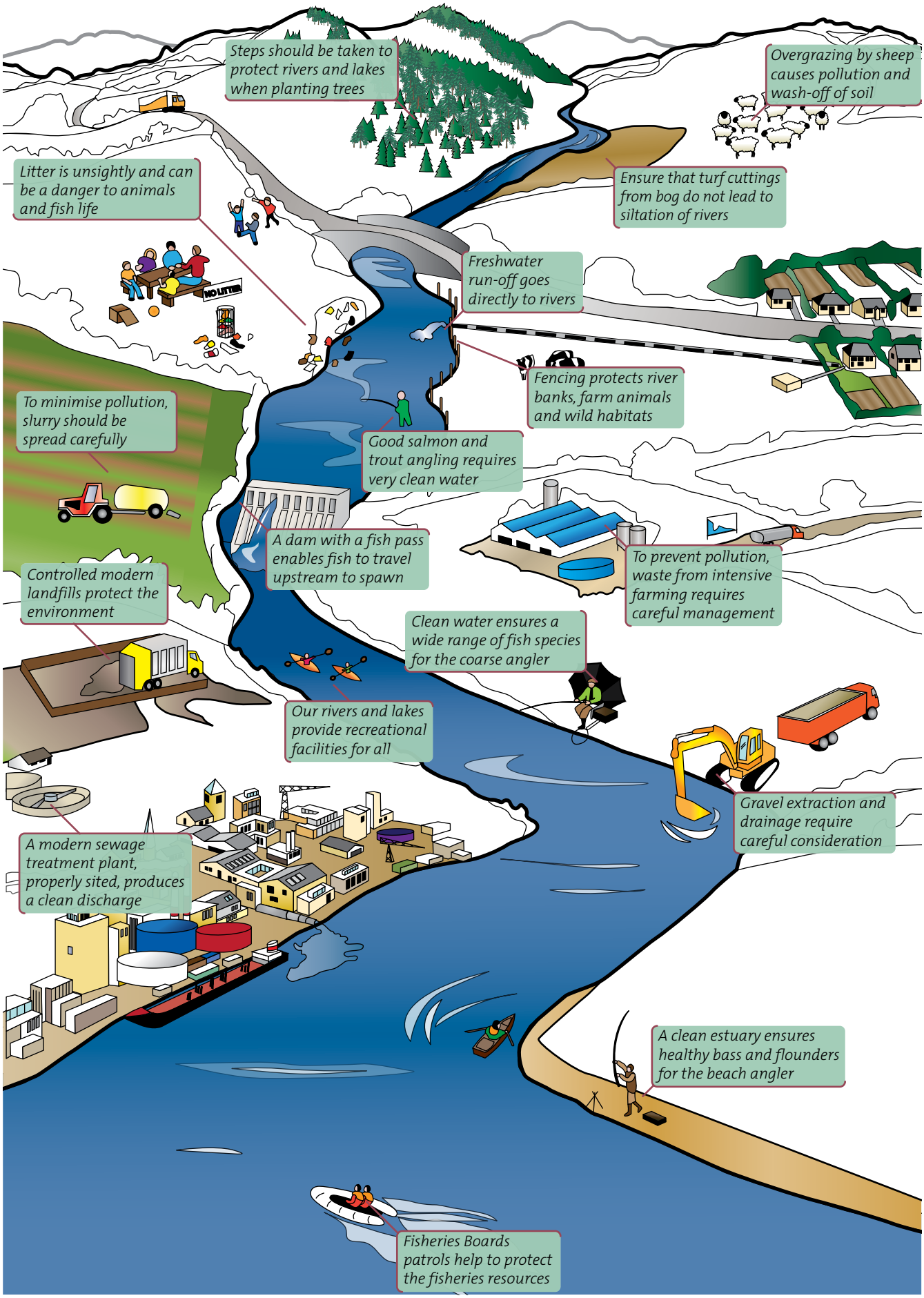
Where farmyard manure is held in a field prior to landspreading it should be held in a compact heap and should not be placed within the following:

Minimum Buffer Distance from Waterbodies	
250m	Sources of public water supplies, private/ public group schemes serving 50+ persons or supplying 10m^3+ of water
50m	Domestic wells, boreholes, and springs used for human consumption (other than above).
20m	Lake shoreline
10m	Water course other than a lake or water supply serving 50+ persons
50m	Exposed cavernous limestone or karst limestone features such as swallow holes and collapse features.

Spreading or storage of farmyard manure is not permitted from 1st November – 15th January inclusive.

A synopsis of the GAP Regs 2006 is available in the Appendices, page 212.

From Source to Sea—The Story of an Irish River



Surface Water
Good Practice Guidelines

Silage Effluent

Silage Effluent is 200 times more polluting than untreated sewage. It has immediate and devastating effects on animal and plant life if it reaches a waterway.

Effluent Storage

- Pit silage should be stored on a concrete slab with or without walls
- Drainage channels in the floor of the concrete slab should be provided to collect all effluent and convey it to suitable storage tanks – especially in older slabs
- Intermediate channels within the pit will collect effluent when the pit is open
- Check the silage slab for joint leakage and breaks, as silage is very corrosive
- If the slab is leaking and has to be re-laid, put in drainage channels to collect all effluent and potentially polluting wastewater

Further details on the requirements of the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2006 are available in the Appendices page 212.

Nitrogen and Phosphorous

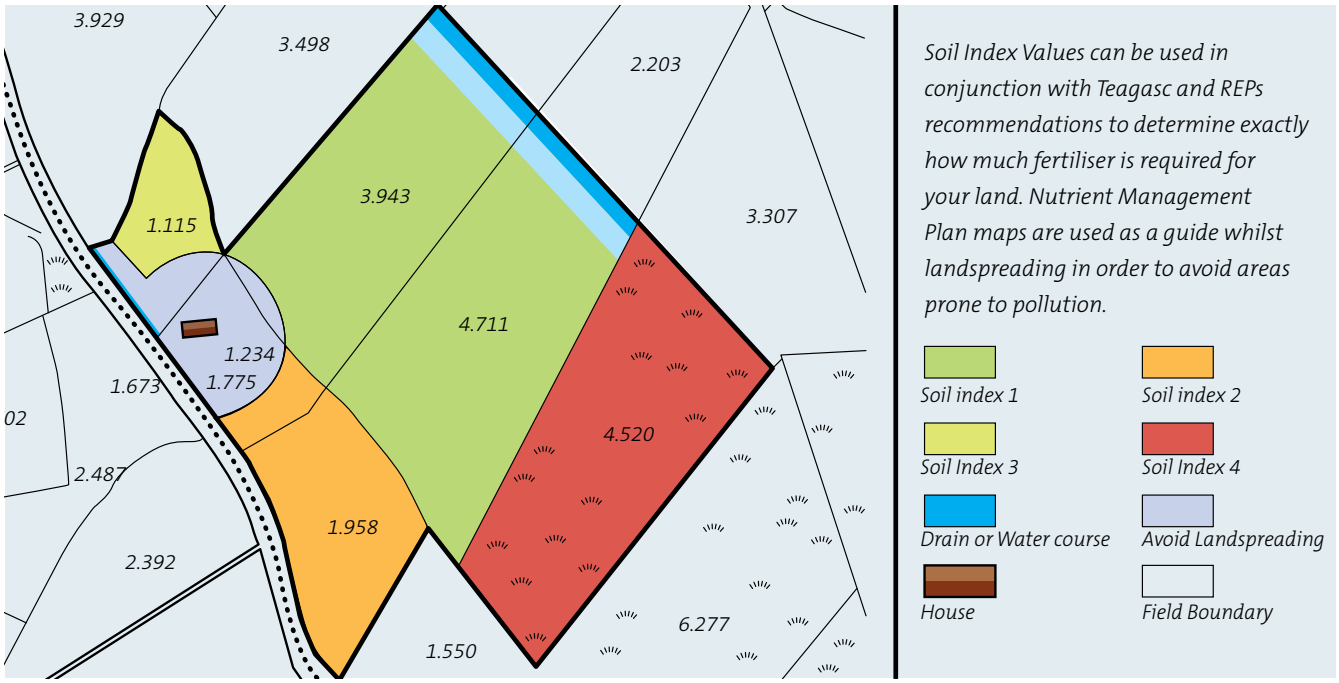
Nitrogen and phosphorous are essential nutrients for crops but when they are applied inappropriately, an influx of nitrates and phosphates to rivers, drains and other waterways can cause pollution.

Factors to consider when planning the area of land required for the safe disposal of slurries, manures and other wastes include:

- Quantities of material to be spread
- Nutrient value of the waste
- Soil Index 3 is the target soil index level for most farms
- Plots with a Soil Index 1 and 2 require fertiliser
- Fertiliser should not be applied to plots with a Soil Index 4 until the soil Phosphorous falls to the target level
- Buffer zones
- Soil type, depth and underlying geology
- Soil fertility levels and crops grown
- Areas where no spreading can occur
- Time of year
- Wetness of soil
- Maintenance of spreading equipment

Chemical fertiliser should not be spread within 1.5metres of a surface watercourse.

Sample Nutrient Management Plan Map:



Recommendation – Prepare a Nutrient Management Plan

Nutrient Management Plans should be referred to when landspreading organic and chemical fertiliser;

- Quantify the amount of nutrients required for your land—this involves lab analysis of the soil for the phosphorus and nitrogen concentrations already there.
- Find out the nutrient requirements of the crop you intend to sow—Teagasc have all the relevant information.
- Map all watercourses and the areas where nutrient leaching to waterways is a risk.
- Map areas where no landspreading can occur e.g. buffer zones, areas with a soil index 4 or lands liable to flooding.

Dirty Water

Water used on the farm can be contaminated by manure, urine, effluent, milk and cleaning materials. Dirty Water Includes:

- Run-off from open concrete yards contaminated by manure or silage
- Run-off from manure and slurry tanks
- Run-off from cleaning work
- Unsold milk and dairy washings from the milking parlour, collecting yard and from washing milking equipment
- Vegetable or fruit washings

Dirty Water Collection

All dirty water produced on the farm should be disposed of and collected properly. It is best to collect all contaminated water at a single point for storage. It is important to note where dirty water is mixed with slurry or FYM, it is classed as slurry and requires a full winter storage period of up to 18 weeks.

Tanks used to collect dirty water should be:

- Checked regularly and avoid overflowing
- Fitted with a security cover to prevent anyone from falling in
- Automatic pumping system to another suitable storage tank can be a good option
- Reduce volumes of dirty water to be stored and handled by taking rainwater away from roofs and clean yards directly to a suitable outfall.

Watering Animals

Cattle access to waterways can cause unnecessary pollution by churning up the river/lake/stream bed and banks causing heavy siltation and muddying. The resulting environment can be harmful to aquatic life; blocking out light, encouraging decomposition of dead organic material and lowering oxygen levels. In addition, manure from roaming cattle can be the origin of eutrophication.

Protect Watercourses

- Where it is not possible to provide a piped water supply for animals, access points should prevent animal movement up and downstream, and as far possible restrict animals standing in the waters.
- Where it is possible to provide a piped water supply, access to watercourses by animals should be restricted, fencing off 2.5 metres from the watercourse.

Farm Chemicals

Chemicals such as pesticides, herbicides, fungicides, insecticides and other products, such as growth regulators, rat poisons and wood preservatives have high polluting potential when used incorrectly. Sheep dip is classified as veterinary but has similar harmful effects.

Potential for Harm

Careless storage, application or disposal of these products can have devastating effects on river life and water supplies. Herbicides can damage or kill many aquatic plants, upsetting the balance of flora and fauna resulting in a major loss of plant diversity. Pesticides, as well as damaging wildlife, may leave residues in water that are harmful to humans and animals.

Distance is the Best Solution

- Pesticides should not be used/mixed/or sprayed near hedgerows, ponds, streams and wells
- Keep a distance of more than 10 metres from field margins, hedgerows, ponds and streams, and a distance of more than 50 metres from wells
- Use pesticides only when necessary and do not apply more than the recommended dose—measure carefully
- Choose chemicals with care—only buy approved products
- Never fill spray tanks directly from waterways
- Never discharge waste pesticides or other chemicals into a waterway, drain or sewer
- Store chemicals safely

Recommendation – Plant Trees and Hedgerows along Riverbanks

Plant a hedgerow to fence off rivers. Trees are excellent at absorbing nutrients that leach from farmland and can act as a buffer for 'diffuse' agricultural pollution. However tree planting is not a substitute for following best practice on the farm.

Trees along riverbanks provide shelter for aquatic habitats and encourages biodiversity.

Watercourses should be fenced off to restrict livestock access

Groundwater
Our Hidden Asset

Introduction

We are all familiar with surface water features such as lakes, rivers and streams but there is another significant body of water that is often forgotten—groundwater. As the name suggests, groundwater is found within the rocks under the ground, where it is held in 'aquifers'.

Aquifers

An aquifer can be described as an underground reservoir. Groundwater can flow naturally to the earth's surface via springs or can be pumped with wells. Water passes through the soil and rock, which act as a natural filter system, on its way to the aquifer. Some rocks, such as limestone, allow water to pass more easily through them and are said to be more 'permeable'.

Turloughs

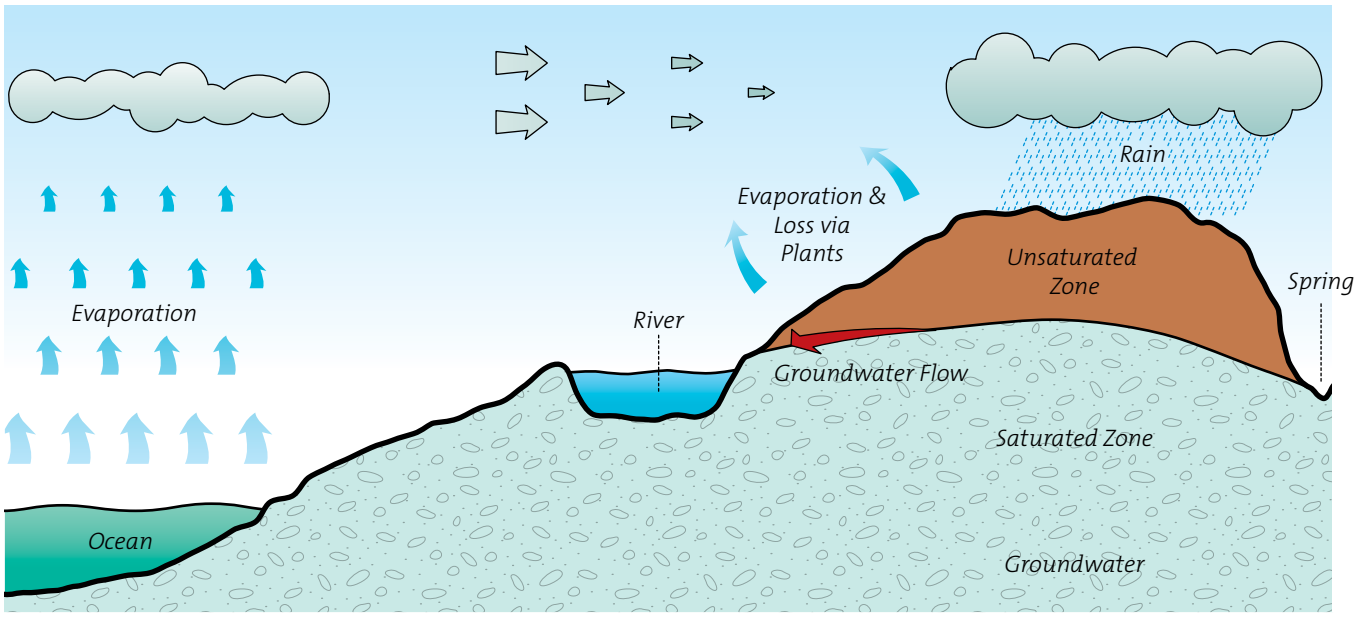
A common water feature associated with groundwater are turloughs. The term 'turlough' is derived from the Irish words tuar and loch meaning 'disappearing lake'. Turloughs are transient (mostly seasonal), shallow, groundwater-fed lakes. They are generally filled and drained through discrete openings called 'swallow holes' which are connected with the water table. The largest turlough in County Clare is found at Carran in the central Burren. Because of seasonal flooding, the plant communities associated with turloughs are unique. This is discussed in more detail in 'Freshwater Habitats' in Section 3.

In Ireland, groundwater is an important water resource. Nationally, it comprises one quarter of the public and private drinking water supply, while the proportion rises to 86% in some rural areas.

Groundwater is also an important water resource in County Clare. It is a major source of supply for public schemes in the county. At present 14 Public Water Supplies and 19 Group Water Supplies use groundwater as their supply source in the county.

Recent EPA reports show that groundwater in Ireland has an unacceptably high level of contamination, mainly from bacterial sources. This type of contamination indicates a problem with pollutants entering the groundwater from the surface and highlights the need for better controls over the siting of wells, improved design and management of potential contamination sources and the importance of water quality testing.

The nature of groundwater flow means that if pollution occurs it can spread easily and lead to contamination of neighbouring supplies. Once groundwater is contaminated it is very difficult to clean it up due to the slow rates at which it flows.



Threats to Groundwater Quality

Groundwater is sometimes forgotten, 'out of sight out of mind', and because the effect of pollution is not immediately obvious, the threat is often underestimated or not considered. The main threat to groundwater is pollution from the surface.

Sources of Pressure

Groundwater quality is coming under increasing pressure for the following reasons:

- Increased spreading of slurry on the land
- Increased quantities of domestic and industrial wastes with landfill as the main disposal route. Effluent from landfill, if they are not carefully designed and managed, poses a threat to groundwater
- Significant increase in the amount of inorganic fertilisers and pesticides used since the 1960s
- Greater volume of road traffic, and more storage and transport of fuels/chemicals

Point sources are where the pollution can be traced back to a certain location or incident. Diffuse source pollution of groundwater is over a wide area and cannot be pinpointed back to one location. This makes it difficult to remedy the problem and needs co-operation from landowners. There is evidence to suggest that diffuse sources are increasingly affecting groundwater quality.

The main contamination threats to groundwater are from:

Point sources

- Septic tank effluent
- Inadequate wastewater treatment facilities
- Accidental leakages and spillages
- Illegal dumping
- Leachate from unauthorised or badly managed waste disposal sites
- Farmyard wastes, mainly silage effluent and soiled water
- Herbicides/Pesticides used for non-agricultural purposes
- Oils

Diffuse sources

- Spreading of fertilisers (organic and chemical)
- Application of pesticides

How Pollution Occurs

Where the soil covering is thin, there is little chance for pollutants to be removed or filtered before they reach the aquifer. The permeability of rock due to cracks and fissures, such as the limestone found in County Clare, will act as a direct route for pollutants to enter the groundwater.

When choosing the location for a well it is important to be aware of potential pollution sources nearby. For example, a well should not be located close to or downhill from a septic tank, from which pollutants could flow into and contaminate the well. Similarly, when installing a septic tank, it is important to locate it away from existing wells or other sensitive receptors such as streams or wet areas that may easily become contaminated.

Groundwater Protection Scheme

Groundwater protection schemes allow planning authorities and other regulatory bodies to consider geological and hydrogeological factors when locating developments.

In 2000, the Geological Survey of Ireland (GSI) in co-operation with Clare County Council developed the 'County Clare Groundwater Protection Scheme'. The GSI is the body responsible for providing advice and information on geological issues in Ireland.

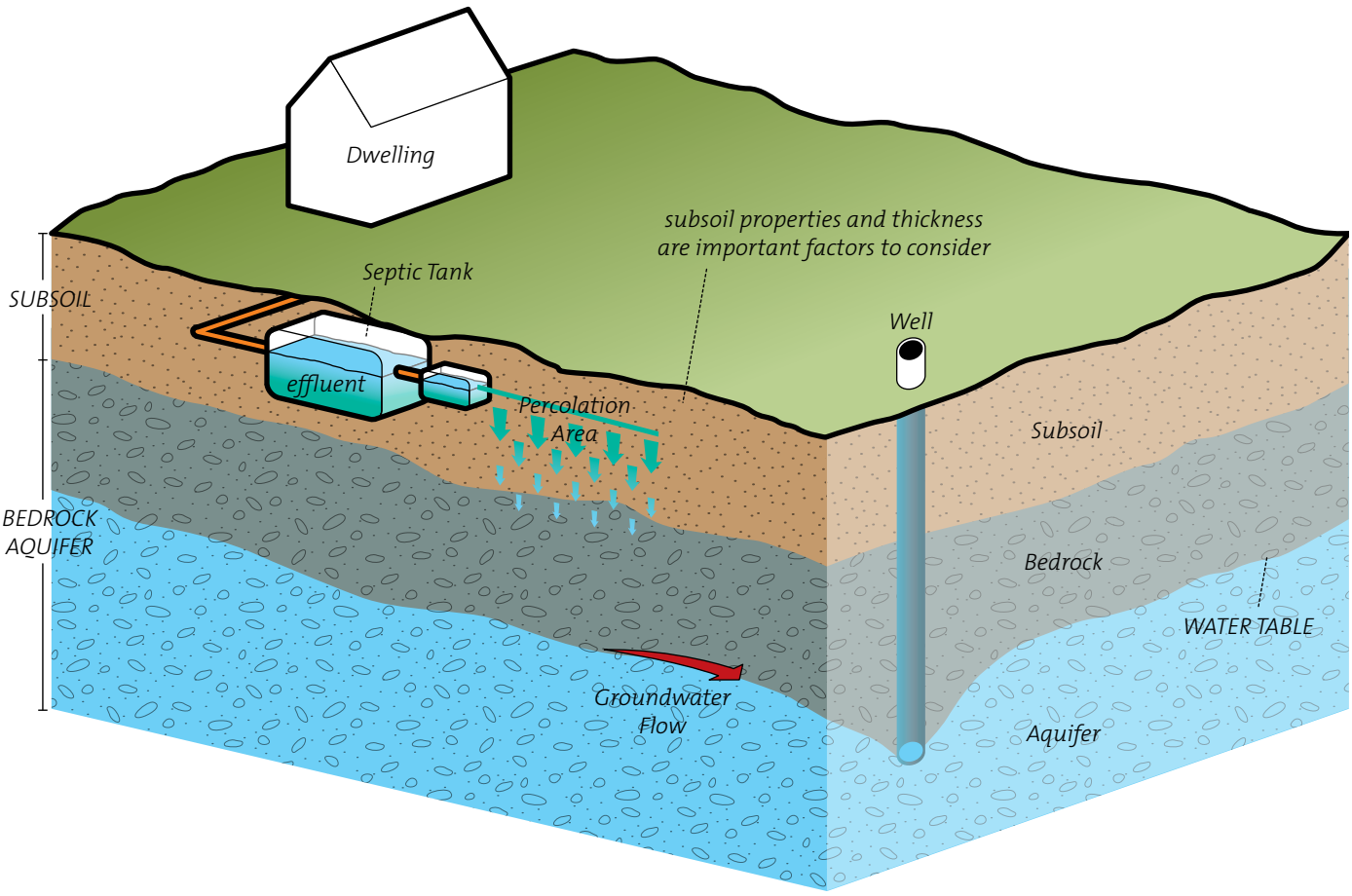
Aim of the Clare Scheme

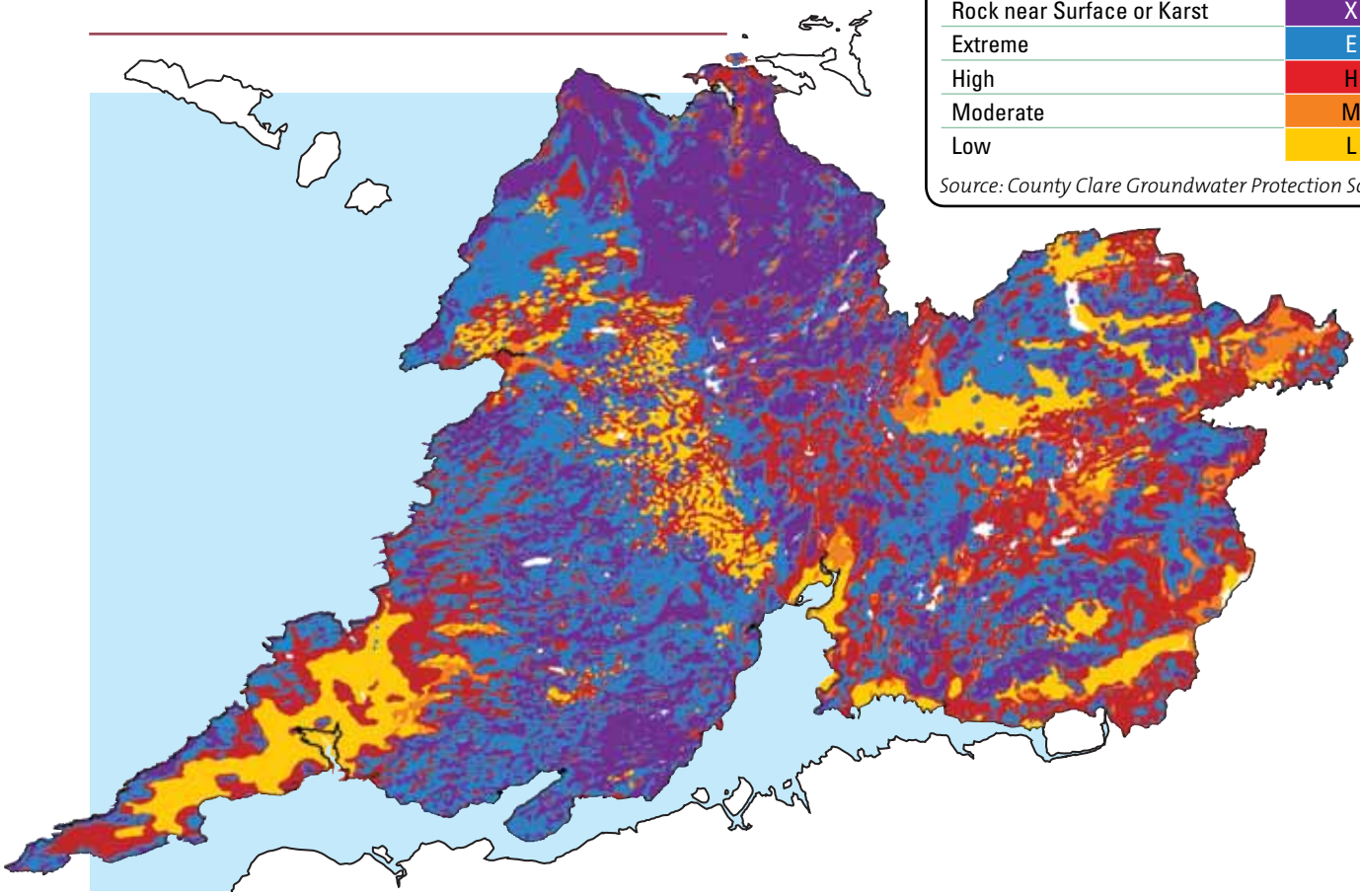
The aim of the scheme is to preserve the quality of groundwater for the benefit of present and future generations and is based on two main elements:

- Land surface zoning – dividing the county into groundwater protection zones according to the risks to groundwater
- Groundwater protection responses – planning and preventative measures to deal with the risk, i.e. potentially polluting activities. These are rated from R1 (acceptable) to R4 (unacceptable).

The County Clare Groundwater Protection Scheme outlines protection areas for two public water supplies: Ballyvaughan and Drumcliff.

Potential Risk to Groundwater





Vulnerability Rating

Five groundwater vulnerability categories are used in the scheme as follows;

Rock near Surface or Karst	X
Extreme	E
High	H
Moderate	M
Low	L

Source: County Clare Groundwater Protection Scheme

Vulnerability Rating

The vulnerability rating for an area is a measure of the likelihood of contamination. Most of the groundwater areas in County Clare have ratings in the higher categories of vulnerability.

A vulnerability rating helps to ensure that a groundwater protection scheme does not restrict economic activity and allows for the most appropriate siting of developments. Most activities have the potential to impact on groundwater if they are not located, operated or managed properly. The Burren area in the north and some areas in the south along the Shannon Estuary have limestone rock near the surface and are particularly vulnerable to contamination. In these areas the aquifers are at a high risk of contamination from bacteria and excess nutrients, from septic tanks and from landspreading of slurry, manure and chemical fertiliser.

Useful Information & Advice

- A site character assessment, carried out by a person from an approved panel, is now required for all planning applications
- Clare County Council assesses forestry applications on the basis of land type, area, fertiliser application, etc. because where there are thin soils, there is a risk of phosphates and other nutrients leaching to groundwater. Conditions to minimise the impact are included in the assessment
- Guidelines on earth lined slurry storage lagoons and out-wintering pads are available from the Department of Agriculture
- Oils and other potentially polluting substances should be stored correctly, to prevent contamination of groundwater. For example, they should be stored in bunded storage tanks. Oil tanks at private houses need to be properly sited and maintained to avoid potential pollution of groundwater
- Prior to landspreading it is important to consider the vulnerability of the groundwater in the area when deciding on the rate of application.

Groundwater Good Practice Guidelines

Groundwater moves slowly, and so the impact of human activity lasts for a long time. Even if the source of pollution is removed, it can take a long time for the groundwater to recover. It is better to prevent or reduce the risk of groundwater contamination than to try to clean it up after it has occurred.

Groundwater also interacts with some surface water systems, many of which are used for water supply and recreational purposes. Therefore if groundwater becomes contaminated, surface water quality can also be affected, and so the protection of groundwater is important for sustaining surface water quality.

Best Practice for Nitrates, Phosphates and Groundwater

Measures which should be taken to reduce nitrate and phosphate leaching in vulnerable (shallow, light and free-draining) areas are listed below;

- Keep nitrogen and phosphorous application within crop requirements
- Do not apply chemical fertiliser between the 31st August and the 15th January
- Do not apply slurry between 31st August and 15th January – any nutrients that are not taken up by crops will be washed into the soil, groundwater and surface water
- In an area identified on maps as Extreme Vulnerability Areas (E) or on Karst Limestone Aquifers (X), soiled water should not be applied to land in quantities which exceed 25,000 litres per ha in any period of 42 days

1

2

- Do not apply slurry when ground is frozen—no nutrients can be absorbed into the soil and are liable to be washed away. As nutrients are available for up to six weeks after application, it is important that fertilisers and slurry are applied before the end of the growing season to allow all nutrients to be taken up by the crop. Make sure there is six weeks growth available after land spreading
- Control farmyard seepage in an environmentally friendly manner. Do not divert effluents to soakaways, as harmful pollutants will not be treated properly before they are released into the soil and groundwater
- Site paddocks and feeding areas away from areas with exposed rock and surface water, as pollutants from manure and urine can be easily washed into groundwater
- Use of 'Sacrifice Paddocks' is prohibited under the Nitrates Regulations. Move feeding points regularly
- Avoid over grazing by sheep, as this will destabilize the ground and can lead to the washing away of sediment into water features.

Based on requirements set out in REPS and the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2006.

1. *Brown Trout* **2.** *Site feeding areas away from surface water*

1

Safe Disposal of Slurry, Manure and Other Wastes

Consider:

- Quantities of material to be spread – how much land will be required to dispose of this material properly?
- Nutrient value of the waste – will there be more nutrients than the crop requires and will the excess be washed into local water features?
- Soil type, depth and underlying geology – what is the capacity of the land to 'filter' pollutants before they reach the groundwater? Is the underlying geology vulnerable to pollutants?
- Soil fertility levels – does this soil require additional nutrients? If so, how much is required?
- Crops grown – what types of crops will be grown on this land and what are their nutrient requirements?
- Identifying areas where no spreading can occur — can I avoid areas that are most vulnerable to pollution?
- Time of the year – is the weather suitable for landspreading?

Soiled Water

Soiled rainwater from open yards, silage pits, holding areas etc. can be a source of pollution and should not be allowed to flow directly into a watercourse or drain.

Tips to help minimise the production of soiled water include:

- Collect all roof water and pipe it to a watercourse or a rainwater barrel
- Check for blocked or broken gutters and down-pipes
- Direct all storm water run-off from clean surfaces to drains
- Use ramps to separate and direct, clean and dirty yard run-off
- Repair leaky taps, drinkers, ballcocks and plumbing
- Reduce the surface of unroofed dirty yard areas
- Tighten up animals in open yards
- Roof over silos and feeding areas
- Convert to roofed easy-feed system
- Keep dairy wash water to a minimum

1. *Many animals, including this blackbird, depend on clean water to bathe in*

Species Profile
Invasive Species — Zebra Mussel

Zebra Mussels (Dreissena polymorpha) are small freshwater shellfish (adults are the size of a human fingernail) similar to marine mussels. They take their name from the zig-zag stripes that mark their shells.

Rapid Reproduction

This species lives in freshwater rivers and lakes and may inhabit the upper reaches of tidal estuaries, but cannot survive in seawater. It is thought that they spread from the Black Sea area of Eastern Europe and have made their way across Europe attached to boats. Zebra Mussels are filter feeders, which means that they sieve plankton out of the water, while remaining attached to hard surfaces.

They reproduce at a very fast rate, producing thousands of offspring at a time, colonising lakes and rivers rapidly. They can also survive out of water for over a week, which means that they can be transported easily between waterbodies on boats.

Clare Infestations

In Ireland, the lower River Shannon, including Lough Derg, has been particularly affected by this species. Infestation by the Zebra Mussel has been reported at lakes such as Lough Rosslara, Lough Kilgory, Lough Cullaunyheeda, Lough Doon, Lough Avoher, Lough Clonlea, Castle Lake and Ballycullinan Lake in County Clare. Although the water quality appears improved, as it is clearer, this is as a result of the mussels removing all the plankton from the water, the source of food for other aquatic species.

Ecological & Industry Problems

Zebra Mussels pose a range of ecological problems by competing with native species for food and habitat. They also have a serious negative effect on Irish fisheries and the leisure industry; they can easily clog pipes, drains and screens, with as many as 100,000 individuals being found per square metre. This results in reduced water supply to boat engines, power plants, fish hatcheries, industries and wastewater treatment works. People using the shore for swimming and leisure complain of cuts from the sharp shells.

Prevention of Spread

As they are a relatively new in Ireland, we are not fully aware of the knock on effects that may occur as a result of these creatures. It is best not to move boats between waterbodies. However if you do, it is important to follow the recommended cleaning procedures below in order to prevent spread of this troublesome species.

- Steam clean and brush down boats. High pressure steam of 40°C will remove most of the mussels and exterminate the remainder. Facilities for this cleaning procedure are available at most filling stations. Take care that this wastewater does not enter uncontaminated waterways
- Drain all bilge water, live wells, bait buckets and waste
- Destroy and dispose of all live bait – do not transport to other water bodies
- Remove all weed from boats and trailers
- Clean down the engine by flushing it out to remove any larvae and leaving to dry for three weeks. Heavily fouled engines should be serviced
- Before moving, allow boats to dry out for three to four weeks, ideally in dry conditions
- Inspect and ensure that live Zebra Mussels are not returned to the water
- Inspect and ensure that nets are kept dry or immersed in hot water before use in another waterbody

Waste

Introduction

In this chapter we learn about the agricultural waste stream and get advice on how landowners can ensure farmyard waste is managed in accordance with best practice.

Waste is defined as any substance or object, which the holder discards, intends, or is required to discard. Waste Management is the manner in which we deal with our waste. While it has always been important, it has become much more so over the last ten years in Ireland because of our growing economy. This has led to increased purchasing of new items, often leaving old items unused or thrown out as waste. This growing volume of waste requires proper management.

Waste in Ireland

Millions of tonnes of waste are generated in Ireland each year (over 85 million tonnes in 2004). Agriculture, manufacturing, and construction waste are the main waste types generated. Each person in Ireland generates an average of 430kg of household waste each year. Paper, cardboard, glass, plastic, metal and textiles together add up as the bulk (51%) of this waste.

The majority of these wastes are easily recycled. Organic waste, most of which could be composted at home, makes up 36% of household waste. While it is necessary to landfill certain household waste, the amount could be reduced by each household making a greater effort to be reponsible.

While slurry, farmyard manure, farmyard soiled liquids (yard runoff, dairy washings, silage effluent, dungstead seepage) and mushroom compost are not strictly speaking waste as they can be re-used, care should be taken in dealing with them. This waste is organic and rich in nutrients and so is useful for soil nutrition.

However, the main nutrients in this waste; nitrate, phosphorous, and potassium, can cause severe water pollution. Where too much organic waste is landspread, or where it is spread in wet conditions or near watercourses, it can lead to pollution. Agricultural waste also includes farm plastics, discarded containers and farm utensils.

Waste in Clare

- In Clare / Limerick /Kerry, nearly 2.5 million tonnes of waste was generated in 2004, of which approximately 23% (563,101 tonnes) is of agricultural origin. *Source, Replacement Waste Management Plan for Limerick / Clare / Kerry Region 2006-2011*
- Preventing waste is a high priority. Every man, woman and child in Clare generated 431 Kgs of waste in 2006, which is significantly higher in comparison to 384 Kgs for the Clare/ Limerick/Kerry region
- There are five Recycling Centres in County Clare: Ennis, Lisdeen (Kilkee), Scariff, Shannon and Central Waste Management Facility (Ballyduffbeg) near Inagh
- There are 54 bottle banks throughout the county
- Details of opening hours, waste accepted, and contact phone numbers can be obtained from the Environment Section of Clare County Council (see appendix page 214).

Filling the compost bin

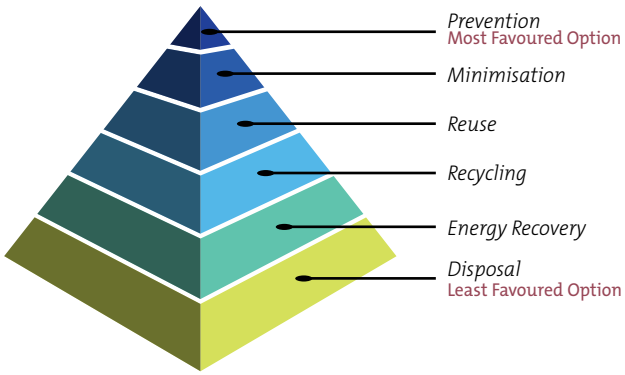
Waste Policy

The Waste Pyramid

The waste hierarchy or pyramid forms the basis of most waste management policies in Ireland. Preventing waste is the main aim of the hierarchy, followed by minimising waste, reusing, recycling, energy recovery and disposal.

The best option is preventing waste before it is ever generated. This can be achieved by carefully considering everyday actions that may result in waste being generated. The aim of the hierarchy is to increase waste prevention and decrease waste disposal levels.

One well-known waste management principle in waste policy is the 'Polluter Pays Principle', which holds the person who originally generates the waste directly responsible for environmental pollution that occurs as a result of that waste.



Waste Collection and Facility Permits

Any person or company collecting waste should hold a Waste Collection Permit from the Regional Waste Management Office based in Limerick (the waste collection permitting authority for the Clare, Kerry, Limerick region). This permit should be checked to ensure that it allows collection and transport of the particular waste type in the collection and transport areas.

Any facility to which waste is being sent should also hold a Waste Facility Permit, Waste Licence or Registration Certificate – this should be checked to ensure that it allows handling of the particular waste type. Staff in the Environment Section of Clare County Council will assist you if you require details of authorised waste collectors and waste facilities in the county.

Aerial view of Ballyduff Beg Landfill

Agricultural Waste

Wastes that arise on farms should be dealt with in a safe manner for environmental and human safety reasons.

Animal Waste

Agricultural wastes include slurry, farmyard manure, soiled liquids (yard runoff, dairy washings, silage effluent, dungstead seepage etc). Soil tests should be carried out, as necessary, to establish the level of nutrients required for crop growth and landspreading. The European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2006 more commonly known as the 'Nitrates Regulations' must be followed.

Each farm should have storage capacity to hold typical volumes of livestock manure over the winter period. In County Clare, 18-weeks slurry storage is required. The Department of Agriculture recently operated an Investment Aid Scheme for Farm Waste Management where farmers eligible under the scheme could apply for grant assistance to modernise their waste storage facilities.

Waste Collection Permits and Agriculture

Farmers should check in advance that the contractors they use to collect waste have the required permits. The following table is a summary of the various farm related scenarios that may arise, and whether a collection permit is required;

Scenario	Permit Requirement
Farmer collecting waste on his own land, and spreading it on his own land, including outlying lands in the same tenure.	No permit required.
Contractor spreading waste for a farmer, on the farm on which the waste arose, including outlying lands in the same tenure.	No permit required.
Contractor collecting waste from a farm and transporting it for disposal or recovery on another premises.	Permit required.
Farmer collecting waste not owned by him or her, and transporting it for recovery or disposal on another premises.	Permit required.
Contractor/Farmer collecting septic tank sludge for recovery or disposal off site.	Permit required.
Farmer transporting waste for recovery off site.	Permit required.
Contractor collecting waste from an IPPC (Integrated Pollution Prevention Control) licensed facility, and spreading on his or her own, or licensee-owned, or independently owned, spread lands.	Permit required.
Farmer collecting waste from an IPPC (Integrated Pollution Prevention Control) facility and spreading it on his or her own land.	Permit required.

Collecting farm plastics

Other Waste

The table below outlines the routes of various waste streams.

Waste Type	Examples	Notes
Asbestos	Old corrugated roofing	Only an authorised Waste Collector should collect this hazardous waste for transport to a licensed facility.
Contaminated Soil	Soil spoiled with oil	Only an authorised Waste Collector should collect this hazardous waste for transport to a licensed facility.
End of Life Vehicles (ELVs)	Unused or abandoned vehicles	Only an authorised Waste Collector should collect this waste for transport to an authorised facility.
Fallen Farm Animals		An approved knackery facility should be contacted. Coffeys of Clarecastle provide this service. The local Department of Agriculture office will advise on approved knackery facilities.
Farm Plastics	All plastic sheeting, bale wrap, or bale bags used for the wrapping of grass fodder	The Irish Farm Films Producers Group (IFFPG) is approved under the Waste Management (Farm Plastics) Regulations 2001 to collect and recover farm plastics. The IFFPG (Tel: 1890 300 444) will collect plastics provided that the farmer is registered with the group and the plastic purchase price included an environmental levy. A weight-based collection fee has being introduced. Bale wrap and silage pit cover should be stored separately. All contaminants (e.g. wire, paper, dirt, tape...etc) should be removed from the plastic before it is presented for collection.
Fertiliser bags		Contact your fertiliser company to find out if they operate a take-back scheme.
Hazardous Items	Oil, grease, antifreeze, diesel, paint containers, aerosol cans, medicines, batteries, and weed-killers	Some of these items are accepted at the recycling centres.
Household Waste	Dry Recyclables - Paper, Magazines, Cardboard, tetra-pak, Food tins, Drink Cans, Plastic bottles.	Wheelie bins for recyclables should be used wherever possible to increase recycling rates and reduce household waste disposal costs. All items for recycling must be rinsed out to clean them.
	Glass bottles	These can then be taken to a bottle bank at a recycling centre
	Food and garden waste	Could be managed at home using a composter. These are widely available to purchase and, as approximately one third of household waste can be composted would be a cost effective way of managing organic waste.
	Residual Waste - Soiled items, non-recyclables	Wheelie bins for residual waste should be used correctly and should not contain recyclables, hazardous, or electrical items.
	Clothes	Accepted at some of the recycling centres
	Bulky household items - Furniture and mattresses	Accepted at some of the recycling centres.
Metal	Sheet metal, old gates	Accepted at some of the recycling centres. May also be collected by an authorised Waste Collector for transported to an authorised facility.
Soil		May be taken to a waste permitted site.

Waste Type	Examples	Notes
Tyres		New regulations, still in draft form, have been prepared to control the disposal and reuse of waste tyres. These include provisions for the use of waste tyres by farmers for holding down silage covers, not to exceed 5 tyres per square metre of silage cover surface. As well as for silage covers, the draft regulations allow for the storage of a certain additional quantity of used tyres for other uses on farms. The regulations are expected to be finalised and passed in to law during 2007.
Waste Electrical & Electronic Equipment (WEEE)	Fridges, washing machines, fluorescent tubes, all battery or electric tools.	On selling a new piece of electrical and electronic equipment each retailer has a duty to accept household WEEE on a one-for-one basis from the customer. If a retailer delivers the equipment they have a duty to collect WEEE (on a one-for-one basis) that is available for collection. Alternatively the householder can deposit this waste in the recycling centres at no charge. The Producer Recycling Fund (PRF) levy on each new piece of equipment covers the recycling costs of this returned material. This waste should not be mixed with household waste or put into a wheelie bin for collection.
Wood	Pallets, doors, timber pieces.	Accepted at some of the recycling centres. Otherwise they may be taken to an authorised facility.
Veterinary medicines and materials	Used needles, syringes, medicines, animal remedy containers	Used needles, syringes and certain medicines such as antibiotics should be disposed of at designated hazardous waste collection facilities or by approved hazardous waste collectors (collectors must have a valid Waste Collection Permit). Empty animal remedy containers should be disposed of in line with manufacturer recommendations

Sewage Sludge in Agriculture

Sludge is generated by the following sectors:

- local authority sludges (e.g. water and wastewater treatment plants)
- private septic tanks
- industrial sludges (e.g. agri-industry such as dairying, slaughtering and food processing; and chemical/biological industry)
- agricultural sludges (e.g. cattle, sheep, pig, horse & poultry slurries, spent mushroom compost).

It is important to note that the spreading of sludge on land, including sewage and septic tank sludge, in County Clare is not an acceptable practice. This is because the level of phosphorous in agricultural slurries and industrial sludges coupled with phosphorous levels in soils is greater than crop phosphorous requirements.

Sorting the recycled waste by hand

Air Pollution

While air pollution is not considered a significant problem in Ireland, there are a number of relevant issues, which are discussed in brief below.

Backyard Burning

The burning of waste (or backyard burning) is mistakenly seen as a cheap method of managing waste and is presumed not to be harmful to the environment. Nothing could be further from the truth.

Toxic Pollution

Practically all uncontrolled low temperature burning of waste releases toxic pollutants directly into the air without treatment or filtering. Backyard burning is one of the major sources of pollutants affecting air quality in Ireland today. Current research indicates that when household and farm waste is burned, whether in piles, in the open, in barrels, open pits or in commercially available home incinerators, toxic pollutants are released into the air.

Toxins in Food Chain

Eventually the toxins that are released into the air fall back and settle on land where they are absorbed by the soil and plants. These toxins can then enter the food chain when farm animals eat the contaminated plants. The toxins are absorbed into the body, which can lead to contamination of the beef, lamb, or dairy produce that later becomes available for human consumption.

Backyard burning

List of Pollutants

Below is a list of pollutants that can potentially be generated by uncontrolled low temperature burning;

- Dioxins and furans, some of which are classified as carcinogenic (cancer causing)
- Volatile organic compounds (VOCs), which can aggravate respiratory and heart illnesses and lead to kidney and liver damage. They also contribute to the formation of ground-level ozone (photochemical smog)
- Polycyclic aromatic hydrocarbons (PAHs), which are generated when elements of municipal waste are not completely combusted. PAHs are known carcinogens
- Carbon monoxide (CO), small amounts of which can cause nausea and headaches when inhaled. CO contributes to the formation of harmful low level ozone
- Hexachlorobenzene (HCB), which has similar properties to dioxins as it is persistent and builds up in humans and the environment. At certain levels of exposure it may cause serious health problems such as cancer, kidney and liver damage
- Nitrogen oxides (NOx), which contribute to acid rain and the formation of ground level ozone. Short term exposure to very high concentrations of Nitrogen Dioxide (NO^2) can result in adverse effects on the respiratory system
- Microscopic particles, which can be small enough to get deep into our lungs. They are associated with health problems including bronchitis, asthma and heart attacks. People who already have respiratory or heart problems, the elderly and infants are most at risk when exposed to these particles. These particles are known to transport dioxins in the environment
- Ash, which may contain mercury, lead and arsenic. These are toxic to humans and animals when consumed, causing heart problems, kidney and brain damage. If deposited in the garden, vegetables can accumulate them and they can then be passed onto humans when eaten

1

Garden Waste

Householders should not burn their garden waste (e.g. branches, hedging) but should instead invest in garden shredders and use this valuable material as mulch, or mix with compost. Alternatively green waste (e.g. hedge and grass clippings) can be taken to the composting facility at the Central Waste Management Facility (CWMF) located at Ballyduff Beg in Inagh.

Burning Vegetation

Burning of vegetation by landowners for the purpose of managing grazing lands (e.g. heath) is a long-established practice. However, it is not automatically exempt from the law. It is generally acceptable as long as it is done in a careful manner and observing relevant guidelines. However if it gives rise to pollution, it may be the subject of legal action by the Council. If it breaches wildlife protection laws, it may be the subject of legal action by the National Parks and Wildlife Service.

Where farmers are burning scrub/vegetation, they must in all cases inform the fire service at least one day before burning, giving the location, time and duration of burning. It is illegal to burn any vegetation between 1st March and 31st August (bird nesting season). Where farmers are burning within one mile of a woodland or Nature Reserve, they must inform the Gardaí and woodland owner at least one week in advance. Where burning is to take place within a Special Area of Conservation (SAC) or Natural Heritage Area (NHA), written consent must be obtained in advance from the National Parks and Wildlife Service.

If burning waste creates environmental damage, nuisance or gives rise to pollution, the advice is not to burn. If in doubt, contact the Environment Section of Clare County Council.

The Clare Fire Service has produced guidelines on 'Precautions to be taken when burning gorse, heather and grass', reproduced here.

Precautions to be taken when burning gorse, heather and grass

- Before carrying out any burning, landowners should contact The Fire Brigade Control Centre via 999 system at least one day before it is proposed to burn. The location, time and duration should be given
- Burning should be started early in the day
- A fire break of at least 50 feet (16 metres) metres should be made outside of the area to be burned
- Inform the owner or forester in charge of any woodland nearby
- Inform your neighbours to prevent alarm
- Check the weather forecast and do not burn in exceptionally dry conditions where strengthening or variable winds are likely
- Burn against the direction in which the wind is blowing

2

1. *Garden composter* **2.** *Clare Fire service, Ennis*

Air Pollution

- Do not attempt to carry out the operation alone. Enlist sufficient help to ensure that the burning is carried out efficiently, effectively and safely
- If possible have a mobile water tanker (e.g. slurry tanker) or crop sprayer with a hose attachment
- No burning should be carried out at night
- Remember that strong fire creates its own wind currents so don't allow it to burn too fast
- If the fire gets out of control and threatens buildings or woodlands, call the Fire Brigade immediately by dialling 999/112 and meet the Fire Brigade to show them the best route to the fire
- Keep children away from the area being burned
- Before leaving the area make sure that the fire is completely out. Return later to check, confirm to Fire Brigade Control, via 999 system, that controlled burning has been completed
- Remember, it is an offence to start fires within 50 feet (16 metres) of a public road
- Burning is prohibited between 1st March and 31st August each year
- Landowners have a special responsibility to preserve the countryside, its landscape and its wildlife. They should take reasonable precautions to ensure that uncontrolled fires do not occur on their property
- Clare County Council currently imposes a charge on the owner of the property, or beneficial occupier for the cost of the Fire Brigade being turned out to a fire. However, where Clare County Council is satisfied that the landowner has taken reasonable precaution to guard against an uncontrolled outbreak of fire or where it is shown exceptional hardship exists, it may, at its own discretion, decide to waiver part or all of the charge

The Department of the Environment has drafted new regulations to govern the burning of waste, and these may be passed into law in 2008. They impose an overall prohibition on the burning of waste, but allow certain exemptions for burning of vegetation as part of agricultural practice.

Fighting a Gorse fire

Greenhouse Gases

Greenhouse gas is a term used to describe a gas that contributes to global warming. Global warming is the ongoing increase of temperature in the atmosphere. Though there is a wide range of greenhouse gases the three main ones of most concern are Carbon dioxide (CO_2), Methane (CH_4) and Nitrous oxide (N_2O).

Global Warming

It is generally accepted that greenhouse gases have already raised the temperature of the Earth by between 0.3°C and 0.7°C. By 2020, this is likely to have grown to between 1.5°C and 4.5°C, a rate of increase unprecedented in the history of the Earth. Some scientists believe that Ireland will be about 1°C warmer. This would mean that Ireland could also be wetter because warmer air can hold more moisture.

Consequences for Ireland

On the one hand, the change in temperature would benefit farmers because every 1°C increase in average temperature increases the growing season by about two weeks. Crops like wheat and barley could be grown in more areas. But the potential down side is much more significant. As the sea level rises due to melting Arctic ice, coastal areas could be flooded and coastal erosion could increase. More rainfall could cause flooding along many rivers, having a detrimental effect on agricultural land.

The most disturbing prospect, is that cold water from the melting Arctic ice could disrupt the North Atlantic Drift (Gulf Stream) and Ireland could suffer much colder winters.

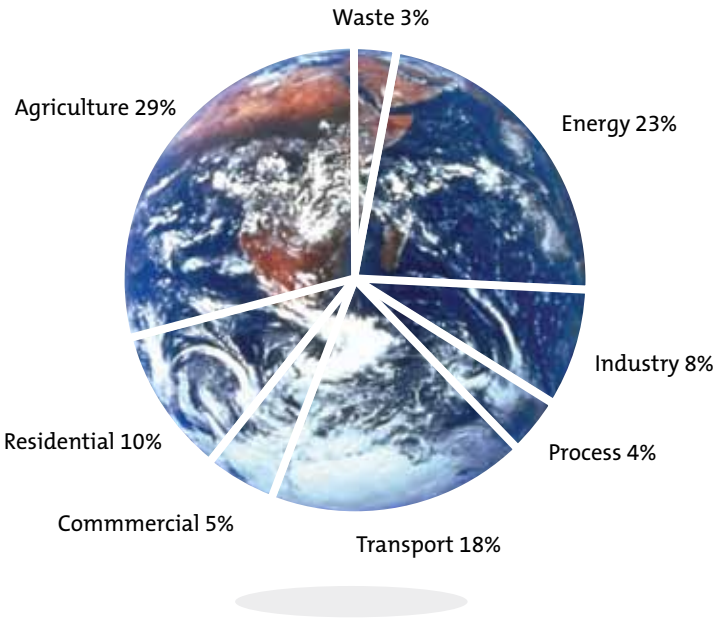
Kyoto Protocol

In December 1997 in Kyoto, Japan, a protocol set targets for developed countries to limit or reduce greenhouse gas emissions in the period 2008 to 2012 . In Ireland's case we promised to limit the increase in emissions to no more than 13% above 1990 levels, by the year 2012.

Ireland's economy has experienced huge growth since the early 1990's. At the moment Ireland is 25% over the 1990 level. If the target of less than 13% over 1990 levels is not achieved, one option is to purchase carbon credits from countries that are below the limit. It is speculated that Ireland will be a minimum of 3.7 million tonnes of carbon dioxide credits per year short of its Kyoto target. The government plans to buy 3.7 million tonnes of carbon dioxide credits each year for the five years of the Kyoto protocol (2008 – 2012) on the international trading markets or 18.5 million tonnes in total.

The current market price for a tonne of carbon dioxide allowances is €10, although this price could rise or fall. At €10/ tonne this would create a bill for Ireland of €185 million.

2004 Greenhouse Gas Emissions in Ireland



Greenhouse Gas Sources

Sources of greenhouse gases include agriculture, transport, industry and general burning of fossil fuels. The figure on the previous page from the EPA shows how various sectors contributed to Ireland's emissions of greenhouse gases in 2004. Surprisingly, emissions from the agricultural sector contribute to nearly one third of national emissions.

Six greenhouse gases are covered by the Kyoto Protocol but carbon dioxide, methane and nitrous oxide are of most concern. The main greenhouse gases generated by agriculture are methane and nitrous oxide. The difficulty with these two gases is that they have high global warming potentials (GWPs). While the GWP for carbon dioxide is 1, it is 21 for methane and 310 for nitrous oxide.

Agricultural Sources

Agriculture generates greenhouse gases through three main sources;

- enteric (intestinal) fermentation by ruminants,
- manure, and
- soils

Ruminants

In ruminant animals (e.g. cattle and sheep), feed ferments in the rumen (one of the animal stomach's) as part of the digestion process. This is known as enteric fermentation. Ruminant methane outputs can be controlled through reduction of stock numbers and reduced emissions per animal.

While controlling livestock populations reduces agricultural greenhouse gas emissions, research into animal feed characteristics, additives and livestock feeding practice is currently being undertaken to establish whether changes may help to reduce methane emissions.

Manure

Livestock manure also produces methane. The amount of methane produced depends on the way the manure is managed. To minimize the amount of methane released, conditions must be such that the manure remains in contact with the air (aerobic). For example manure that remains in fields where the animal grazed or which is dried and spread on land, produces a low level of methane. However manure that is held as slurry in lagoons, pits or tanks produces a higher level of methane since it is held in anaerobic (oxygen free) conditions.

Soil

Agricultural soil management is a source of methane and nitrous oxide emissions. Nitrous oxide is lost to the atmosphere through the soil nitrogen cycle. However, the application of additional nitrogen (manure or chemical fertilizer) to the soil can increase the rate of emissions. The rate of emission increases when the nitrogen applied is in excess of what can be absorbed by plants.

Projected Decrease

Emissions from the agriculture sector are projected to reduce significantly over the period from 2001 to 2012 due to the adoption by the Irish government of Common Agriculture Policy (CAP) reform based on full decoupling from production of direct payments which will encourage reduced livestock numbers in the country. With this reduction in stock numbers less animal manure will be produced and less chemical fertilizer will be applied to farmland.

The implementation of the Nitrates Directive should have a further beneficial effect on GHG emissions from agriculture as this also will lead to stricter management of fertilizer applied to lands.

As the issue of global warming is now of real concern, with instances of extreme weather conditions becoming more frequent, all countries including Ireland must try to reduce emissions of greenhouse gases. This can only be achieved through the use of cleaner fuels, improved industry practice, and reduced intensity of agricultural practices.

Role of Forestry

Carbon neutral plants are plants which do not add to the build up of CO_2 in the atmosphere. There is a natural carbon cycle, in which plants take carbon dioxide from the atmosphere as they grow. When plants are burned or decompose, the carbon dioxide is released to the atmosphere. As new plants grow, they again take carbon dioxide from the atmosphere.

Forestry plantations are benefical in this regard. County Clare had a total area of 43,694 ha under forestry in 2000. This equates to approximately 14% of the land area which is well above the national average of 9.9%. An increased forest coverage will help reduce our net emission of greenhouse gases and contribute towards achieving compliance with our Kyoto commitments.

In the past, forestry policies favoured commercial planting of fast-growing, coniferous species, such as Sitka Spruce. However, uniform, monoculture plantations of coniferous trees can be of limited biological diversity value. Greater benefits in terms of landscape, amenity, heritage and habitats can be realised from forestry plantations that also include native and broadleaf species.

Limerick Clare Energy Agency

The Limerick Clare Energy Agency (LCEA) was established in 2005 with investment from Limerick and Clare County Councils and support from LEADER in Limerick and Clare, and the University of Limerick. The aim of the agency is to provide energy efficient solutions for organisations and businesses seeking to become more sustainable. The agency has a wide remit, promoting energy efficiency and renewable energy solutions, and providing energy services to all economic sectors in the region.

Climate Change Strategy

Through the Energy Agency, Clare and Limerick were the first counties in Ireland to produce an Energy & Emissions Balance (2006) which calculated our energy consumption and CO_2 emissions. From that data, a Climate Change Strategy has been developed for the two counties which sets targets for reducing our CO_2 emissions and adopting renewable sources of energy.

Renewable Energy Opportunities for Farmers

Bio fuels

Biomass is the term used to describe all organic material such as plant materials. The energy produced from these materials is known as bioenergy. Biofuel is the term used when biomass is used to make bioenergy. Biofuel can be either solid (i.e. firewood, energy crops) or liquid (i.e. oil produced from rapeseed oil, used as a vehicle fuel).

Biofuels will be needed in the future to contribute to the security and diversity of fuel supply, to tackle global warming, to comply with EU Directives and to provide alternative land uses for farmers. Biomass now provides 7% of the EU's total energy needs. Approximately 80% (5.6% of the total) of this fuel is wood.

Agriculture has been seen as part of the greenhouse gas problem because of its high methane and nitrous oxide emissions. By using biofuels, agriculture can be seen less as the problem and more as the solution. Imported fuel makes up nearly 90% of the total energy demand in Ireland. The majority of these imports are fossil fuels. As a rough guide, each 1% of farmland devoted to biofuels would provide 1% of our total energy requirements.

2

Forestry Thinnings

Forestry covers almost 15% of the land in County Clare. About 8,000 hectares of this are over ten years old and are ready for thinning. Forestry thinnings can be chipped and used to generate heat. The County Clare Wood Energy Project (managed by Rural Resource Development and Teagasc) is promoting the development of a local wood energy market through the creation of a wood chip supply chain and providing advice on the installation of new commercial scale wood heat systems.

1

3

1. *Rapeseed* **2.** *Forestry thinnings* **3.** *Wood chips*

1

Energy Crops

Energy Crops are grown specifically for energy purposes. Short Rotation Forestry, more commonly known as Short Rotation Coppice (SRC) consists of densely planted, high–yielding varieties, usually willow, harvested on a 2-3 year cycle to provide wood fuel.

2

Willow

Willow has been grown extensively in Scandinavia for fuel, and in Sweden some 16,000 hectares of land are dedicated to its production for renewable energy. In the United Kingdom there are 1,500 hectares under SRC willow. Only 60 hectares are grown on a pilot basis in the Republic of Ireland. The willow used in energy crops grows to 5-7 m in height and has numerous shoots. Willows are planted in the Spring.

The willow will grow rapidly in the first year reaching up to 2m in height. During the winter following planting, the plants are cut back to ground level to encourage the growth of multiple stems. This is known as coppicing. Generally three years after cutback and again during the winter, the crop is harvested and 7-9 harvests may be achieved over a 30 year plantation period. The wood that is harvested is chipped and dried and burned in woodchip stoves and woodchip boilers. Financial grants are available from Sustainable Energy Ireland for the installation of wood chip stoves and boilers.

1. *Willow harvesting* **2.** *Coppiced Willow stool*

Renewable Energy

1

Miscanthus

Miscanthus is a woody, perennial grass originating from South East Asia, commonly called Elephant Grass. The grass can be grown commercially as an energy crop for use in heat and power generation. Miscanthus is planted in spring and the canes produced during summer are harvested in winter. This growth pattern is repeated every year for the lifetime of the crop, which is usually at least 15 years. Miscanthus has been successfully grown in pilot projects on a number of locations in the south of the country, including West Limerick.

2

3

Bio-ethanol/ Bio-diesel

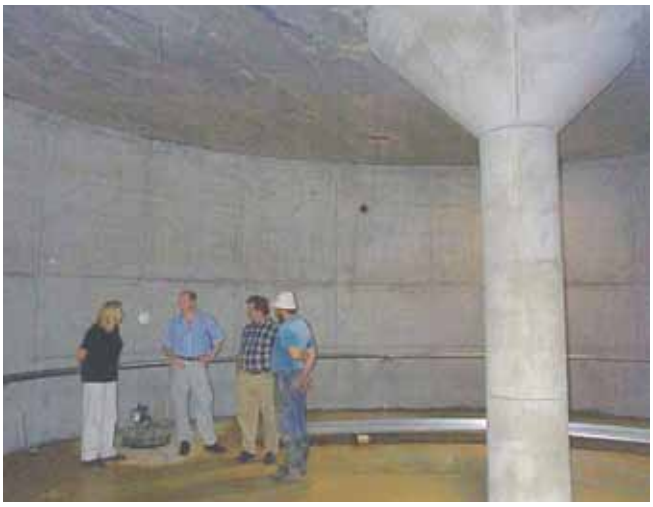
Bio-ethanol produced from wheat or sugarbeet can be used as an additive for petrol engines. Biodiesel from recovered vegetable oils, rapeseed oil and sunflower oil can be used as either 100% plant oil derived bio-diesel or blended with conventional diesel to produce a bio-diesel blend.

These fuels must meet specified industry standards for fuel quality to ensure optimum performance and durability of the engine. In 2005 the Government announced that over €6 million in excise relief would be provided for biofuel projects. The relief was to cover 16 million litres of biofuels over a two year period commencing in 2005. Several bio-fuel projects got underway around the country.

Anaerobic Digestion

Anaerobic Digestion (AD) is a natural process of decomposition and decay that takes place in the absence of oxygen and by which organic matter is broken down to its simpler chemical components. The AD process can be used to turn residues from livestock farming, food processing industries, waste water treatment sludge, water treatment plant sludge and other organic wastes into biogas. The biogas can be used to generate heat and/or electricity.

4



1. *Miscantus Field* **2.** *Miscantus bales* **3.** *Sunflowers* **4.** *Inside an Anaerobic Digestor*

Difficulties arise however with the high initial set up costs and the utilisation of small amounts of a bulky gas at dispersed locations. Some form of financial incentive will be required if any significant development is to take place in anaerobic digestion in agriculture. However, it is a common and proven technology in many parts of Europe.

Wind Energy

The first wind farm project in Ireland was established in 1992 at Bellacorrick, County Mayo. Today wind farms in Ireland supply enough power to support over 146,000 users, equivalent to the domestic electricity needs of County Cork. Clare has three wind energy projects in operation as of the start of 2008, in Kilmihil, Monmore near Doonbeg and Booltiagh near Ben Dash, with two further wind farms sanctioned in Lissycasey and Moneypoint.

Potential for Clare

However, there is still enormous potential for the development of wind power in Ireland. Our country has one of the best wind resources in the world—almost the entire country has either an excellent or very good wind energy resource. By 2010 it is expected that there will be a capacity of 71MW of wind generated power in Clare and this is forecast to increase to 87MW by 2015.

Potential for Farmers

As the economics of wind projects become more favourable, many more areas across the country will be suitable for wind turbines. However the siting of wind energy developments is critical in terms of impacts on landscape, fauna including birds and bats, and people. In many countries on continental Europe a thriving, largely farmer-led, wind industry has developed. In countries such as Denmark it has been successfully used as a supplementary income, with the landowner erecting his/her own wind turbine and selling the excess production to the grid.

Profile
Clare County Council Environment Section

The Environment Section of Clare County Council has a wide range of reponsibilities including the protection of water and air quality, waste management and litter control, energy, environmental education and awareness, and looking after recreation and amenities.

Working With

The Environment Section works closely with many organisations and departments including the Environmental Protection Agency, Health Service Executive, Department of Agriculture and Department of the Environment, as well as all of the other sections within the County Council.

Our section employs about 60 people in a wide range of activities, many of whom work with local communities and landowners. Clare landowners are most likely to meet the Environmental Patrol Wardens, scientists and technicians.

Farm Survey Team Access

Environment Section staff sometimes need to access private land and/or farmyards. By law, they may enter private land for investigation and monitoring purposes (e.g. water pollution incidents, illegal dumping). Although not required by law, Environment Section staff will generally try to contact the landowner when investigating water pollution incidents or undertaking farm surveys.

However, identifying landowners can sometimes prove difficult especially in cases that involve walking along a stream or river to trace the source or extent of pollution. All staff carry an authorisation notice with them, and are happy to show this when requested.

Farm Survey Process

Farm surveys are carried out by a team of scientists and technicians, concentrating on a particular local river or lake catchment where evidence of pollution has been found. One of the major pollutants which farming activities can generate is phosphates.

Farm surveys focus on the level of pollution control on the farm. Our survey team collects information on how much effluent is generated, how it is collected within the farm, and how the landowner manages or disposes of the effluent without damage to the environment.

The survey team work in co-operation with landowners, and if improvements have to be made they will advise on what needs to be done. Only in serious cases, or where there is a refusal to improve pollution control, do they take the legal route – i.e. issue of a notice under Section 12 of the Water Pollution Act of 1977, directing that certain works must be done.

Since the introduction of the Good Agricultural Practice Regulations under the EU Nitrates Directive, the farm surveys look at nitrate as well as phosphate pollution and the same approach is taken in working with farmers.

Environmental Patrol Wardens

Three Environmental Patrol Wardens, each covering a particular part of the county, travel through their areas in marked vans. They investigate complaints of illegal dumping and litter, and where necessary issue litter fines. For more serious cases, they initiate the process of legal proceedings. As illegal dumping has not yet been banished from Clare, landowners play an important role in identifying and reporting dumping sites to the Council.

Other Contact with Farmers

Farmers/landowners may also meet other members of the Environment Section team, for example:

- If making a complaint about illegal dumping, water pollution or other environmental damage. Complaints will be treated in confidence, investigated by the appropriate members of the team, and the farmer will be notified of the outcome.
- If visiting any of the Council's recycling centres, or the landfill at Ballyduff Beg, Inagh.
- Through your children who are very likely to meet the Environmental Education and Awareness staff through activities at school, especially the Green Schools Campaign which is very successful in Clare, and at other education and information events.
- At the beach, through the facilities provided under the Blue Flag Beaches scheme and maintained by the Council Area Offices, the local community or Environment Section staff.
- Through our newest area of activity, the promotion of energy conservation and renewable energy through the Limerick-Clare Energy Agency. This is closely related to the very important topics of climate change and the consumption of fossil fuel, and is likely to become more important for landowners in the coming years.

Waste Management and Litter Control

- Preventing, reducing, recycling, and disposing of waste
- Operating our own landfill and recycling facilities
- Regulating collection of waste by private collectors
- Issuing permits for private waste disposal & recovery sites
- Enforcing waste management law, including investigation of illegal dumping
- Enforcing litter law
- Removing abandoned vehicles
- Enforcement of regulations on packaging waste, plastic bags, waste electrical equipment nd end-of-life vehicles
- Participating in the Clare-Limerick-Kerry Regional Waste Management Plan

Protection of Water and Air Resources

- Monitoring water quality in rivers, lakes and ground
- Monitoring bathing water quality
- Monitoring quality of drinking water produced by water treatment works
- Monitoring effluents produced by sewage treatment works
- Investigating incidents of water pollution
- Issuing licences to discharge waste water
- Issuing air pollution licences
- Surveying catchments to control phosphate pollution
- Operating laboratories
- Advising the Planning Section on water protection measures to be taken by new developments

Environmental Education, Awareness

- Publicising new facilities provided by the Council and Community Initiatives
- Publicising changes in waste management and litter law
- Organising the Green Schools Campaign in Clare
- Participating in national campaigns e.g. Race Against Waste
- Organising home composting clinics
- Holding environmental award schemes and Clare in Bloom
- Community grant schemes, Local Agenda 21 Partnership grants, litter awareness grants
- Organising participation by Clare towns in Pride of Place Competition

Recreation and amenity

- Gardening Section's work
- Maintaining and improving beaches
- Operating the beach byelaws
- Participating in the Blue Flag Beaches scheme

Energy

- Participation in Limerick-Clare Energy Agency
- Education and awareness on energy conservation and use of renewable energy sources

See Useful Contacts in Appendices for contact details, page 214.

Species Profile
Invasive Species—Non-Native Plants

Introduction
Many plant species have been introduced to Ireland for gardens, ponds, or for a variety of other reasons. Most do not spread to the wider environment. Some species, however, find conditions to their liking in Ireland and find also that the natural predators and diseases that control them in their native lands, are not present.

Given these conditions, some non-native species are now causing severe ecological problems by taking over areas of ground and excluding native plants. Among these problem species are Japanese Knotweed, Giant Hogweed, Himalayan Balsam, Dogwood, Cherry Laurel and Rhododendron. Bracken is a native plant which is considered invasive and requires control.

Japanese Knotweed
is of major concern in Ireland. Female plants were imported from Japan as a garden plant. However the species is able to reproduce via its roots and spreads very quickly. For this reason soil that contains Knotweed plants or roots must not be moved or dumped. It grows alongside rivers and streams, in wet fields, on waste ground and on roadsides.

It is up to landowners to control the spread of this species and deal with it if they find it on their land. Knotweed can be controlled using weedkiller, although it is resistant to chemicals and may require several attempts before it is finally wiped out, often taking three years to eradicate. Because Knotweed often grows close to rivers, when using weedkillers, care must be taken to prevent water pollution.

Giant Hogweed
grow in similar places to Japanese Knotweed. In County Clare, areas along the Blackwater at Ardnacrusha have been invaded with Giant Hogweed. It is characterised by its size – growing 3 to 5 metres in height, with fine spines that make it appear furry. Giant Hogweed contains a substance within its sap that can result in severe burns producing swelling and severe, painful blistering.

Spraying with an appropriate herbicide is the most effective treatment option available, although it can take several years to eradicate. A quicker method of removing Giant Hogweed involves the clearing of above ground leaf/stem material and the removal of ground material polluted with roots and seeds.

Due to the risk of contact with sap from this plant, removal by hand should be restricted and not considered once the plant has grown above one metre in height. Protection using full wet weather clothing, with gloves and face visor, should be used when cutting or removing this species.

Rhododendron
is a woodland plant that was introduced here in the eighteenth century, as an attractive garden shrub which provided good cover for pheasants. It is a very invasive species and in a woodland situation, quickly replaces the natural undergrowth vegetation with its dense growth that blocks out light and prevents native plants from growing beneath. It also prevents the natural regeneration of tree species and can eventually cause the demise of the woodland.

Cutting and burning, or removal is one of the best policies for eradicating rhododendron. It regenerates after cutting and generally requires repeated weedkiller application to prevent re-growth.

Cherry laurel is similar in form and requires similar habitats to Rhododendron. Rhododendron is found in County Clare in The Glen, Ennistymon.

Dogwood
Dogwood is another invasive shrub species. This plant has become popular for landscaping along new roads as it has colourful red and yellow stems, even in winter. Although there is a native strain of this plant, it is very uncommon and those used in landscaping are non-native highly invasive varieties, which spread to the wider area. This shrub is not a major problem yet, but has the potential to spread in a manner similar to the other plants listed here.

Section 3

Enhancing the Living Farmland

What will you find in this section?

This section of The Living Farmland is designed to help landowners recognise the wildlife habitats on their farm and show how with little time, effort or money, biodiversity on a farm can be greatly increased through sympathetic management. The text describes a variety of different habitats that are found around County Clare and shows practical ways to maintain and enhance these habitats. The section is divided up into a number of habitat types, each of which includes a profile of a plant or animal species.

1

The section begins with background information about another aspect of our environment—Nature Conservation. It reviews relevant issues for County Clare in terms of policy, sites designated for nature conservation and the organisations whose aim is to conserve nature.

2

3

Some of the practical management techniques described here are concerned with either traditional practices that are no longer widely observed or the refurbishment of damaged habitats. They show how the extra effort goes a long way and how the results can be extremely beneficial to wildlife.

While none of these measures are compulsory, some may correspond with mandatory biodiversity actions in REPS, for example traditional hay meadow and additional stonewall maintenance. Each section also outlines simple best practice guidelines that can be used on any farm.

The highlight of this section is a series of profiles of farmers in Clare who are currently managing their farms with wildlife conservation in mind. These farmers kindly invited us to observe the habitats on their farms and describe what they actively do to benefit wildlife and biodiversity.

4

1. *Hen Harrier* **2.** *Brimstone Butterfly* **3.** *Pine Marten* **4.** *Bluebells in a woodland habitat*

Nature Conservation

There are very few habitats in Ireland, which have not been affected by the activities of man. The country's natural heritage developed its distinctive character hand in hand with the development of traditional farming practices. Although agricultural intensification can cause loss of biodiversity, management of habitats by farmers is often essential for its maintenance. Some people believe that the best way to protect natural heritage is to 'fence it off and let it go wild'. In most cases this is very far from the truth. The need for many wildlife habitats to be managed on a long-term basis has been recognised through supplementary measures in REPS and other agricultural policies.

2

1

1. *Sixmilebridge farmlands* **2.** *Fox*

Sites Designated for Conservation

The EU Habitats Directive is European Legislation that provides for the protection of wild flora and fauna, and also, more importantly, their habitats. Member states were directed to provide lists of sites for designation to be included as a network of protected sites around Europe called 'Natura 2000'. Under domestic Irish legislation, Natural Heritage Areas are also protected once they are formally proposed under the terms of the Wildlife (Amendment) Act 2000.

There are three main conservation designations in Ireland:

- Natural Heritage Areas (NHA),
- Special Protection Areas (SPA) for birds
- Special Areas of Conservation (SAC).

Designations and the Law

Some of the NHAs have not yet been formally designated and are currently awaiting approval from the Minister for the Environment, Heritage and Local Government. Likewise some SACs are awaiting EU approval but they are fully protected from the time of notification. These as yet undesignated sites are temporarily known as proposed NHAs and candidate SACs. Even though their names (proposed and candidate) sound provisional, these sites are protected by law – either the Wildlife (Amendment) Act 2000 in the case of NHAs, or the Habitats Directive in the case of SACs and SPAs. 'Priority habitats' under the Habitats Directive are those in danger of disappearance within Europe and as such are of particular nature conservation importance.

1

NPWS Role

The National Parks and Wildlife Service (NPWS) within the Department of the Environment, Heritage and Local Government are responsible for the selection, designation and protection of these areas in order to promote appropriate management and prevent any damage or loss. Owners of land within these designations are notified of the designation boundaries. Staff from the NPWS work closely with the landowners (mainly farmers), as well as local and national authorities to balance the needs of the landowner with the conservation objectives of all protected conservation sites.

2

Notifiable Actions

It is a requirement that SACs and SPAs are maintained or restored to a favourable conservation status. To achieve this, certain restrictions are placed on land use in these areas. This can have wide ranging implications for the land-owner as the carrying out of certain restricted actions requires the specific permission of the Minister for the Environment. Such actions are called 'Notifiable Actions', and some activities are not permitted under any circumstances.

1. *Common Blue Damselfly* **2.** *Coastline by Quilty*

Designated Sites for Conservation on the Farm

With the introduction of the Single Payment Scheme, farmers are required to respect various Statutory Management Requirements (SMRs) which are set down in EU legislation on the environment, public, animal and plant health and animal welfare, as well as to maintain the land in Good Agricultural and Environmental Condition (GAEC). This is known as Cross Compliance.

There are particular SMRs, which refer to SPAs and SACs. SMR1 deals with the Conservation of Wild Birds, while SMR5 deals with the Conservation of Natural Habitats and of Wild Flora and Fauna. Special guidelines are given for actions in SACs and SPAs.

SMR1 and SMR5 Guidelines for SPAs and SACs:

Grazing should be kept at a sustainable level to avoid overgrazing, particularly in coastal sandy areas or on peat or thin peaty soils

Supplementary feeding in areas where it has not been customary over the last ten years is allowed only under consultation with the Department of the Environment (DEHLG)

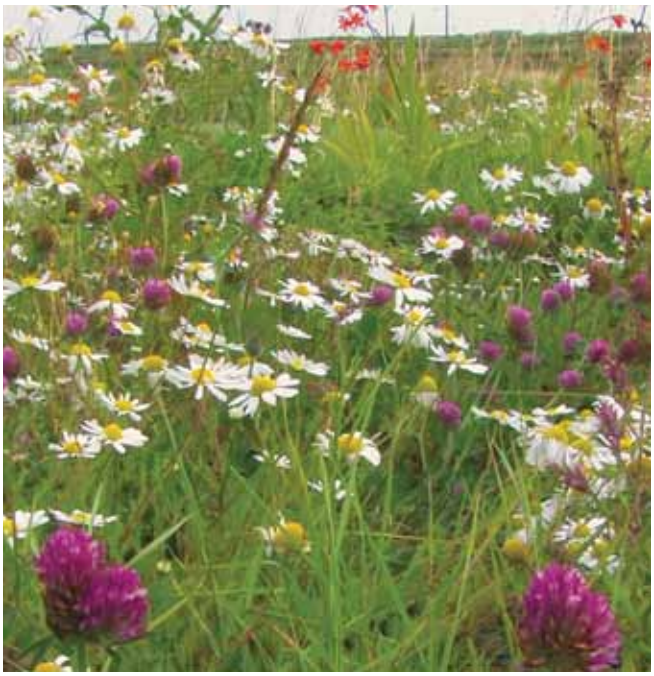
Notifiable Actions, which are outlined in a notice of designation, can only be carried out with the consent of the DEHLG, or any other Statutory Authority, unless that activity has already been outlined in a REPS/DEHLG approved farm plan

Turf should not be extracted mechanically using 'sausage' machinery in bog areas of the SPA/SAC unless consent is obtained from the DEHLG

Other actions which cannot be carried out in an SPA/SAC, unless in a REPS/DEHLG approved farm plan or with written consent from the DEHLG include:

- Altering watercourses
- Reclaiming or re-seeding land
- Dumping any material or burning any vegetation
- Cutting trees or clearing waterside vegetation on a wide scale

1



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Farm Scheme for Designated Areas and Commonage (Target Lands)

This scheme is operated by the NPWS to pay farmers and landowners for losses incurred as a result of restrictions caused by the designation of lands as SAC, SPA or NHA and also to pay for certain actions which will benefit nature, as agreed in a farm plan. Any owner or legal user of lands in a SAC, SPA or NHA or commonage, who is not already in REPS, can join.

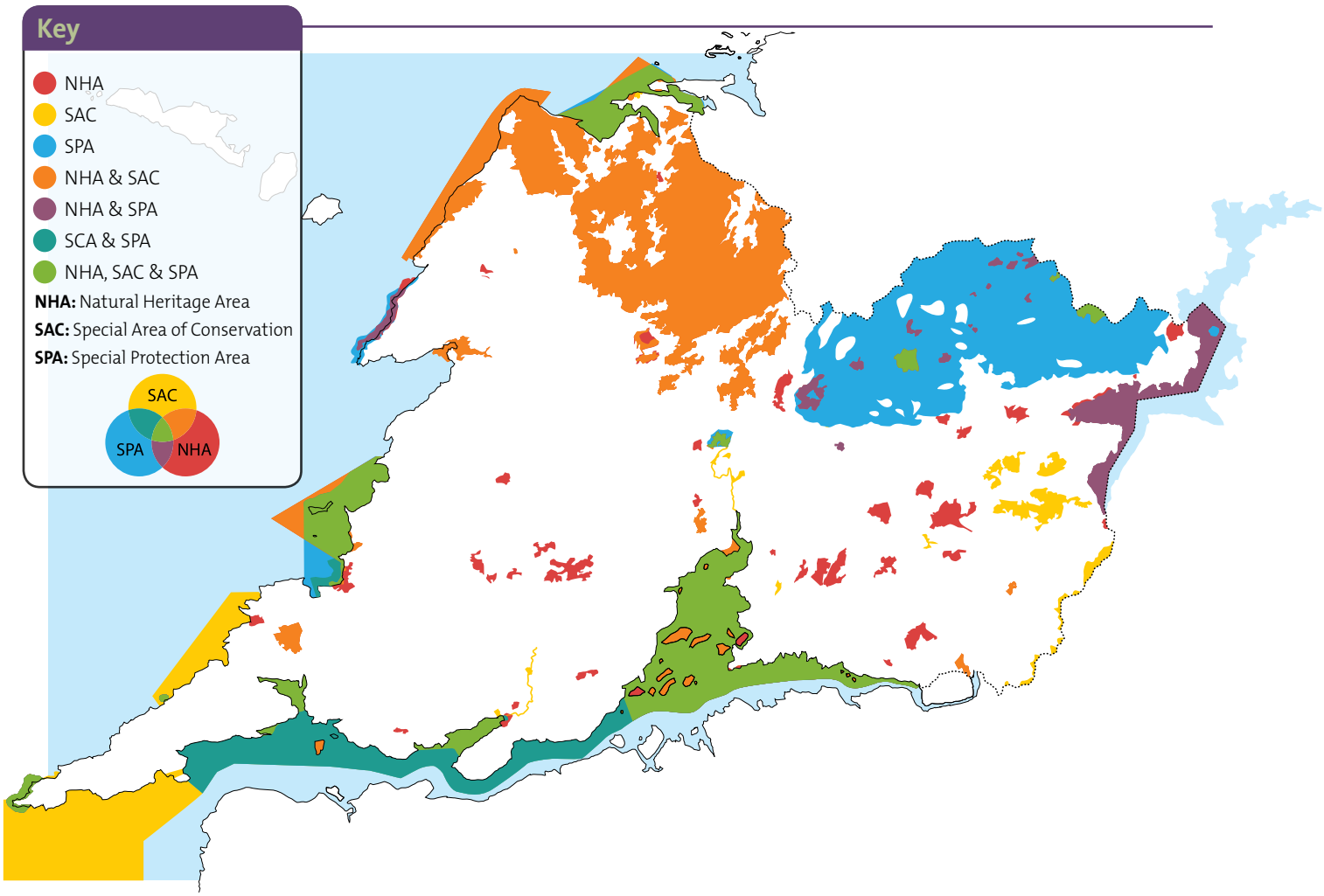
In essence, the farm plan will describe the designated lands or commonage, the current farming activity, habitats and species on the land, prescribed future management and an account of what is to be paid to the landowner by the NPWS. Normally, these plans will operate for 5 years. The difference between this scheme and REPS is that the NPWS scheme deals with lands designated for nature conservation only, while REPS is a whole farm scheme.

The NPWS scheme payment covers costs and losses incurred. The amount paid is specific to each farm, depending on changes required in farm practice and if stocking rates have to be reduced.

For further information on this scheme, contact the NPWS (see page 215 - Useful Contacts).

1. *Dark Red Helleborine* **2.** *Wildflowers*

Sites Designated for Conservation



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2

1. *Cray fish* **2.** *Wet woodland*

Natural Heritage Areas (NHAs)

1

The most basic conservation designation in Ireland is the Natural Heritage Area. These are offered legal protection under the Wildlife Amendment Act 2000. Natural Heritage Areas are designated for the protection of flora and fauna and, more recently, the Geological Survey of Ireland (GSI) have proposed that some areas be designated for their fossil or geological importance.

Sites which have a NHA designation are of national importance and can range in size from small areas, such as individual buildings with significant Bat Roosts, to large areas such as a native Woodland, Blanket Bog, Lakes or complexes containing a number of different habitat types.

Examples of NHAs in County Clare which are not also designated as SPAs or SACs include the following:

- **Loughattorick District Bog NHA** on the southern slopes of the Slieve Aughty mountains is an example of a blanket bog NHA. It is protected for its characteristic blanket bog vegetation and the presence of raised bog in certain deep hollows. Additionally, Red Grouse and Hen Harrier are known to breed and hunt in the area.
- **Ayle Lower Bog NHA** is an example of a lake and raised bog NHA near Tulla. It is one of the most western raised bogs in Ireland.
- **Lough Cullaunyheeda NHA** near Kilkishen, protects a lake system, which is of interest for its waterfowl and its nationally important numbers of diving duck. The lake system hosts a variety of habitats from open water, to wet grassland, marsh, cutover bog and wet woodland.
- **Cahircalla Wood NHA**, below Ennis, is an example of a protected area of native Ash and Hazel woodland. It is noted for its rich herb and moss layers, which are typical of native woodland. It also contains pockets of wet woodland and limestone pavement.

1. *Lough Graney*

Special Areas of Conservation (SACs)

2

Special Areas of Conservation are designated to protect habitats and species that are considered to be of importance not only in Ireland, but also in Europe. The legal basis for Special Areas of Conservation is the EU (Natural Habitats) Regulations or the 'Habitats Directive'. Annex I of these regulations lists a number of habitat types for which protection is legally required. Irish habitats include certain types of woodland, heaths, lakes, rivers and coastal habitats.

Some of the habitats listed in Annex I are considered to be in danger of disappearance and are referred to as Priority Habitats. Examples of these are Blanket and Raised bogs, Fens, some Sand Dunes, Machair, and Turloughs. In addition to these habitats for which SAC protection is required, the regulations list a number of individual plant and animal species that must also be given protection. Annex II of the Regulations is a species list which includes the Lesser Horseshoe Bat, Otter, Salmon and White-clawed Crayfish (see Appendix 1).

Examples of SACs in Co Clare include the following:

- The **Kilkee Reefs** are designated a Marine SAC. This is because it has areas of important reef and shallow bay, both of which are listed as Annex I habitats.
- **Dromore Woods and Loughs** to the northwest of Ennis are protected as an SAC and a Nature Reserve. This area provides a wide diversity of habitats including limestone pavement, woodland and a naturally eutrophic lake. This site is important for wildfowl and mammals, but particularly the Lesser Horseshoe Bat, whose population here is of international importance.
- **Carrowmore Dunes** SAC protects fixed dunes, Marram dunes, embryonic shifting dunes and reefs near Doonbeg in west Clare. The site also protects a population of the rare snail, Vertigo angustior, a species that is listed in Annex II of the Habitats Directive.
- **Tullagher Lough and Bog** SAC is situated near Doonbeg. It is protected because it is a good example of a raised bog in the west of Ireland. It holds four habitats that are protected under EU law and many interesting species of plant, such as Pipewort and Quillwort. The grasslands surrounding the lough provide a habitat for the overwintering Greenland White-fronted Goose.
- **Ballycullinan Lake** near Corofin is an example of a fen habitat that, like many of the other fens in Clare, is linked to a lake system. This site is an SAC due to the presence of a species rich fen type, which is dominated by Great Fen Sedge.
- **Limestone Caves** provide important habitat for some bat and plant species, most notably the Lesser Horseshoe Bat, which is listed in Annex II of the EU Habitats Regulations. County Clare is dotted with these caves and many are protected as SACs.

1

1. *Tullagher Bog* **2.** *Kilkee Reefs*

Special Protection Areas (SPAs)

1

Ireland is required to designate Special Protection Areas for birds under the EU Birds Directive which came into force in 1979. Annex I of this Directive requires that special protection measures be put in place for certain bird species including Peregrine Falcon, Kingfisher, Chough, Greenland White Fronted Goose, Hen Harrier, Corncrake and many others. The conservation of sites for migratory wildfowl species is another requirement of the Birds Directive.

SPA's are often, but not always, associated with areas of water and their shorelines and hinterlands. Many of Ireland's lakes, estuaries and coastal waters, sea cliffs and islands are designated for the protection of birds. Of those sites not associated with water, most cover mountain or bog habitats. These would be protected for bird species such as Peregrine Falcon, Merlin, Greenland White-fronted Goose and Golden Plover.

Through the designation of SPA's under the EU Birds Directive and SACs under the Habitats Directive, it is hoped that a Europe wide network of protected areas entitled 'The Natura 2000 Network' can be established. There is a large degree of overlap between SPA, SAC and NHA designations with many sites being designated as all three.

Examples of SPAs in County Clare include the following:

- The **Cliffs of Moher** are designated as an SPA, and host the largest mainland colony of Puffins in Ireland, as well as colonies of many other seabirds, such as Kittiwakes, Guillemots and an internationally important population of Razorbills.

2

- The whole of **Lough Derg** is designated as an SPA for its importance to breeding and wintering wildfowl. It is also of conservation interest for its fish and freshwater invertebrates. Lamprey have been recorded in the site, as have the endangered fish species – Pollan. Atlantic Salmon also use the lake as a spawning ground.

- Much of the **Shannon and Fergus estuaries** are designated as one large SPA to protect the important populations of waders and wildfowl. It is the most important coastal wetland in the west of Ireland and has vast expanses of intertidal flats.

3

1. *Fulmar gliding by the Cliffs of Moher* **2.** *Full length Lamprey* **3.** *A chough*

Other Designations

There are other categories of protected area in Ireland including National Parks, Nature Reserves (both of which are generally state-owned), Wildfowl Sanctuaries and Refuges for Flora and Fauna. These designations differ from the NHAs, SACs and SPAs in that the designated lands are specifically managed for wildlife above any other land use.

Nature Reserves	A nature reserve is an area which is protected under Ministerial order because of its importance for wildlife. While most nature reserves are State owned, they can be owned by organisations or private landowners. Anyone interested in acquiring statutory protection for their lands should seek advice from the NPWS. Examples of nature reserves in County Clare include Ballyteige Nature Reserve, near Lisdoonvarna, in north Clare. This protects a species rich wet meadow and heath grassland that is formed as a result of the poorly draining soils of the area and is managed in the traditional way for haymaking. Also listed as nature reserves are Dromore Woods to the northwest of Ennis, Cahermurphy Woodland in the Slieve Aughty mountain range and Keelhilla Nature Reserve on Slieve Carron.
Wildfowl Sanctuaries	These are areas, which have been excluded from the 'Open Season Order' so that game birds can rest and feed undisturbed. Shooting of game birds is not allowed in these sanctuaries. Ballyallia Lake, north of Ennis and Islandavanna near Clarecastle, are protected as Wildfowl Sanctuaries, as is part of the Inagh River Estuary.
Refuge for Flora or Fauna	The Minister may designate areas for wild birds, wild animals or flora as refuges by imposing protective measures to conserve both the species and their habitats. Seven such designations exist in Ireland, with one being in County Clare – the Cliffs of Moher.

Mallard Duck

The Burren National Park

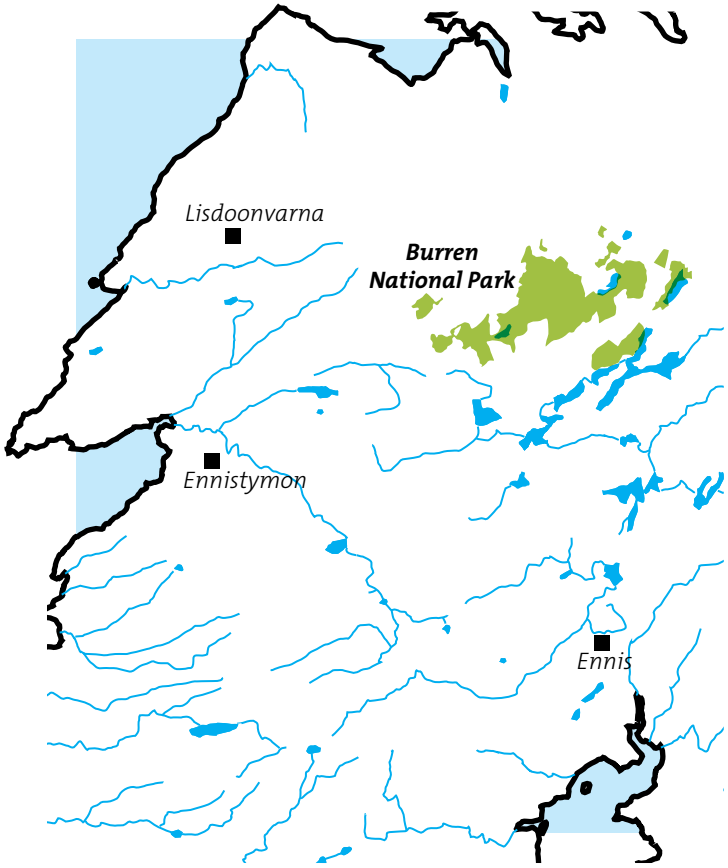
National Parks are unusual in that the land is State owned. Another big difference is the encouragement of visitors to the Parks for educational, cultural or inspirational purposes.

Management

Management of the land within National Parks focuses on the enhancement of their nature conservation or landscape value, but also takes into account public access and appreciation and research, so long as these objectives are compatible with the protection with the natural heritage of the Park. National Parks are protected under the State Property Act 1954 and much of the land area is also designated as NHA, SAC or SPA.

Rare Burren Habitats

The Burren and the region surrounding it contain some of the most unique and important habitats in an Irish, European and global context. The exposed Karstic limestone that is a feature of the region provides an unusual bedrock which, coupled with the Atlantic climate, provides for many rare and interesting habitat types.



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Many of the habitats are, in themselves, worthy of protection under Annex I of the EU Habitats Regulations, but what makes the area so special is the way these separate habitats combine and interact with one another to form a truly unique landform that is host to a similarly unique group of plant and animal species. A wealth of attractions are found within the Burren, in terms of botany, geology, archaeology and history.

Much of the land area in the region is protected through SAC and NHA designations and there is a National Park to preserve the natural heritage of the area and increase public access. The Burren National Park covers an area of over 1,000 hectares and encompasses, within its boundaries, most of the important habitat types found in the Burren. A description of some of these habitats is provided here;

2

1. *Hawthorn Shield Buck* **2.** *Butterwort Flower*

The Burren National Park

Limestone Pavement

Limestone pavement is the bare exposed limestone that typifies the Burren landscape. It is listed in Annex I of the EU Habitats regulations and is also a priority habitat. It is protected by designation not only in the National Park but also in many of the SACs in the Burren region.

Even though soil and vegetation are scarce, very interesting species can be noted, for example the Bee Orchid. This orchid which mimics the physiology of a bee has evolved these features to increase the chances of pollination by attracting other bees to it. The Burnet Rose and Brittle Fern are also plants found in this special habitat.

2

Grasslands

Orchid rich dry calcareous grassland is another internationally important habitat found extensively when shallow soils cover the limestone in the Burren. In addition to orchids, these grasslands support a diverse range plants and animals.

Plants include other classic 'Burren' species such as Spring Gentian, Mountain Avens and Bloody Cranesbill. Butterflies, moths and snails are also found here. This habitat is listed in Annex I of the EU Habitats Directive and is a priority habitat. The orchids of County Clare are described in more detail later in this section.

1

1. *The Burren pavement* **2.** *The Burren Code*

1

Turloughs

Turloughs are seasonal lakes fed by groundwater in Karstic limestone areas that fill and empty with the rising and falling of the water table. They are almost unique to Ireland (Galway and Clare) and support very rare plant and animal communities, where wetland species grade into species more typical of dry land. Turloughs are home to a range of special invertebrates, including our rarest Damselfly – Scarce Emerald Damselfly.

As regards flowers, Shrubby Cinquefoil is a little yellow plant, common in countries of northern Europe but in very few places in Ireland. It occurs however in the Burren National Park in dense populations. Turloughs are listed as an Annex I Priority Habitat type. Many are protected as SACs. Examples include Ballyvaughan and Carran turloughs.

2

Other Habitats

The habitats described often occur in close association with each other and with hazel scrub habitat (which is not protected under Annex I) to form a mosaic of habitats, which is in itself, important to many species. The maintenance of these habitats requires active management in the form of sympathetic agricultural practices. Increased fertilizer use and agricultural reclamation are threats to the ecology of these habitat types.

The Burren region supports many of the other important habitats found in Clare with areas of woodland, peatland and an extensive coastline with a sand dune system at Fanore. There is much overlap of SAC and NHA designations in the region with most of the areas of exposed limestone being designated as both. There are no SPAs within the Burren region, the nearest being The Cliffs of Moher and Ballyallia Lake near Ennis.

3

Burren Research

Research is an ongoing feature of the Burren, because it is such a unique and interesting place. Currently, a project is underway which aims to develop a new model for sustainable agriculture in the Burren in order to conserve the habitats designated under the Habitats Directive. This project is called the BurrenLIFE Project. It is funded by the EU Commission (LIFE Nature Fund), National Parks & Wildlife Service, Teagasc and Burren IFA.

While the majority of the research is on privately owned land, one of the project sites incorporates some of the National Park. The research is focusing on ways to keep farm inputs to a minimum and to optimise farm outputs whilst ensuring the land is managed efficiently and effectively. In essence, this will benefit the habitats of the Burren and the farmers who manage them.

1. *Turlough at Carran* **2.** *Gentian* **4.** *Sand Dunes and limestone pavement*

Clare Heritage Programmes

Clare Biodiversity Action Plan

A Local Biodiversity Action Plan (LBAP) which has been developed for County Clare is being implemented by the Clare Biodiversity Group.

The aim of Clare Biodiversity Action Plan is to conserve the biodiversity of County Clare by:

- Establishing priorities for the conservation of biodiversity of local, national and international importance
- Raising awareness and appreciation of biodiversity in County Clare, through publications, events and working with communities in their own localities
- Managing the local biodiversity resource through collecting and managing data on plants, animals and habitats
- Promoting the conservation of biodiversity in the plans and programmes of other organisations
- Working in partnership with other organisations and people involved in biodiversity in Clare

Many publications have been produced as part of the Clare Biodiversity Action Plan. The following publications are available on the Clare Biodiversity web site www.clarebiodiversity.ie and for free from Clare County Council;

- Spot the 101 Habitats and Species in Clare (booklet)
- Recording the Wildlife of County Clare (booklet)
- Clare Bluebells (leaflet)
- Clare Cuckoo Survey Results 2006 (booklet)
- Japanese Knotweed (leaflet)
  A Hedgehog survey was undertaken in 2007

In addition to this work, the Biodiversity Group has published six Habitat Action Plans for County Clare for;

Limestone Pavement, Salt Marsh, Sand Dunes, Roadside Verges, Fens and Native Woodland

And four Species Action Plans for;

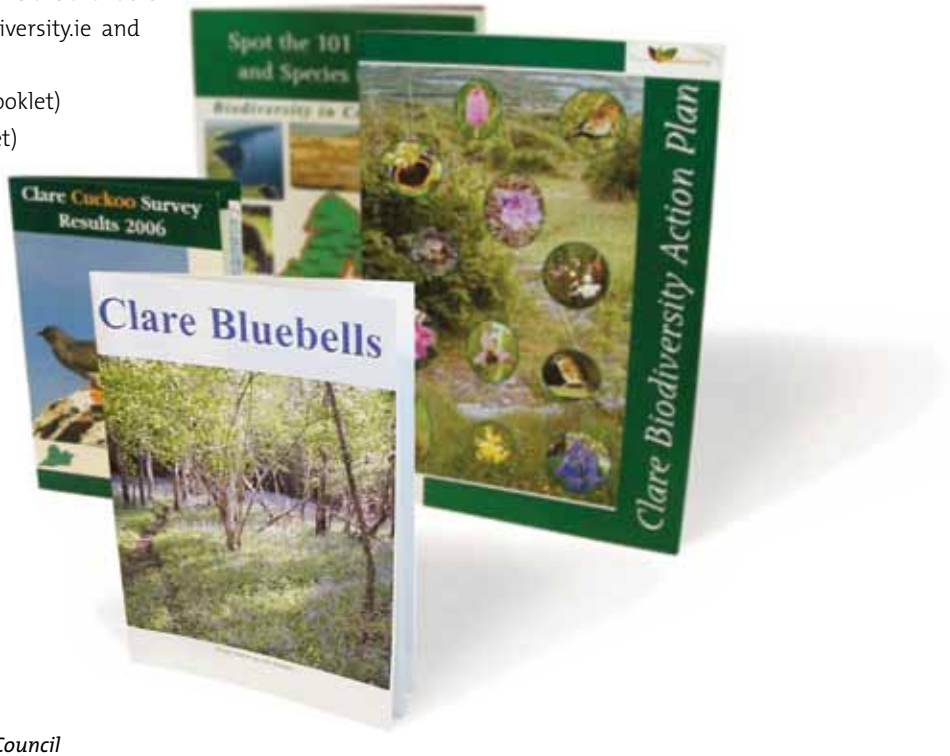
Irish Pollan, Lungwort, Cuckoo and Leisler's Bat

All are available from Clare County Council's Heritage Office.

Clare Biological Records Centre

In order to build a picture of the distribution of plants and animals in Clare, a comprehensive biological data system has been put in place. The data (observations of plants and animals) gathered is being used to raise awareness of wildlife as well as to help prioritise actions.

This information is available on an interactive web site www.clarebiodiversity.ie (follow the link to the Records Centre). Farmers, as custodians of our countryside, are a natural choice to become involved by supplying such records. To submit observations of plants and animals in your area you can submit them online or by e-mail to biodiversity@clarecoco.ie.



A selection of publications produced by Clare County Council

1

Biodiversity Events in Clare

A wide range of biodiversity events including talks, outings and training sessions are available in County Clare, the details of which can be obtained from www.clarebiodiversity.ie. These events are run by various organisations including Clare County Council, Teagasc, BirdWatch Ireland, Irish Seed Savers Association and CELT.

Clare Heritage Plan

The aim of the Clare Heritage Plan is to foster a greater understanding of our heritage and to ensure that the most informed decisions are made concerning its future. It has proven to be of great benefit to local government, national agencies working at local level, NGOs and local communities. In essence, the Plan identifies local heritage needs and helps to address them. It sets out how the Local Authority, in association with other stakeholders, can identify, protect and manage the heritage of County Clare.

The Clare Heritage Forum provides advice on the preparation and implementation of the Plan. The Forum comprises representatives of bodies involved in heritage in the county, typically local government, local development organisations, state agencies, landowners, heritage organisations and the community and voluntary sector.

By harnessing collective effort and goodwill, the aim is to increase awareness, appreciation and enjoyment of our rich heritage resource.

Field Monument Adviser Programme

The Field Monument Adviser Programme is run by Clare County Council, in association with the Heritage Council. It is used to monitor and advise landowners and farmers on the preservation, conservation and management of archaeological sites on their land. The FMA initiative in Clare has been extremely successful in raising awareness of our rich archaeological resource, which continues to be under threat from mismanagement, neglect and destruction from inappropriate developments.

The project provides a support service for farmers and landowners to help ensure the preservation of archaeological monuments in their ownership. It assists with the identification of field monuments and provides information on how best to care for these sites.

2

1. *Clare Biodiversity day* **2.** *Stone Barrow in Fahee North, the Burren*

Profile
National Parks & Wildlife Service

The Clare Team

The National Parks and Wildlife Service (NPWS) is represented in County Clare and the Aran Islands by a team of eight staff consisting of five rangers, a District Conservation Officer, Deputy Regional Manager and Regional Manager. Their work mainly covers monitoring and protecting designated sites, management of State-owned lands and education. State owned properties in Clare include the Burren National Park, Dromore Woods, Ballyteige Nature Reserve, Cahermurphy Woods, Keelhilla Slieve Carron Nature Reserve and the Islandavanna Wildfowl Sanctuary.

Ranger's Work

About 60-70% of rangers' time is divided between monitoring and protecting designated areas, which are generally privately owned, and advising other government departments in relation to matters such as grant-aided forestry, planning permission applications, and assisting in cross-compliance inspections. The remainder is spent on survey work, wildlife protection, education and advice to the public on general wildlife issues.

Designated Sites

County Clare has approximately 102 designated sites. Landowners are entitled to maps of the designated sites in order to check whether their lands are included in these areas. Appeals can be made against or for, the inclusion of a section of land in a SAC, SPA or NHA. A person can only make appeals if they have a legal interest in the site (i.e. landowner or legal user) and the appeal must be made on scientific grounds.

Appeals should be accompanied by a map of the area of concern and be as informative as possible. If an Appeal is unsuccessful a farmer may apply to the Nature Conservation Appeals Board which has an independent chairperson. Maps of the designated sites in County Clare are available for public viewing in the local offices of the Department of the Environment, Heritage and Local Government, the Department of Social and Family Affairs and at Teagasc offices.

Notifiable Actions

Certain activities or operations restricted within designated sites can only be carried out with the permission of the Minister of the Environment, Heritage & Local Government. These are called Notifiable Actions and vary depending on the type of habitat that is present on the site. Landowners are sent copies of the Notifiable Actions that are relevant to their lands. In the case of NHA's, three months written prior notice is required to be given to the Minister before undertaking any notifiable activities.

There is compensation available to landowners and landusers who have lands proposed for designation as a NHA, SAC or SPA. Compensation is targeted through various schemes. These include the Rural Environment Protection Scheme (REPS), and Departmental Farm Plans. Consideration regarding compensation is also given to landowners, who are not farming and are holders of aquaculture/foreshore licences.

Educational Work

Communication through education is the key to promoting awareness of wildlife issues. Local NPWS staff provide a service to the community by visiting schools, giving public talks and assisting community groups and other government departments with heritage projects. These initiatives help people to make the connection between a 'love for the land' and nature conservation.

Living with Nature

A free booklet called 'Living with Nature' is a step by step guide to the types and process of designations in Ireland. Landowners with any queries about designated sites and who want a copy of the booklet can call the Department of the Environment, Heritage & Local Government Free Phone Helpline 1800 405 000. Details of the NPWS can also be found on their web site www.npws.ie. Local contact details are in the *Useful Contacts* section on page 215.

Birds of County Clare

County Clare is home to many nationally and internationally important wetland areas that are favoured by birds. These are distributed throughout the county and include coastal and inland sites.

Coastline and Wetlands

The shore and mudflats of the Shannon Estuary and Galway Bay are the winter home to important populations of geese, swans, ducks, waders and gulls. The rocky Atlantic coastline between these two areas supports lesser numbers of waders, but there are some colonies of breeding seabirds. Inland there are many wetlands, including bogs, fens, turloughs (seasonal lakes) and larger lakes. These types of wetland are most important for numbers of winter waterbirds (including waders like Lapwing, Black-tailed Godwit, Dunlin, Snipe and Golden Plover, as well as Whooper Swan, Wigeon and Teal) that use them for feeding and roosting.

Birdwatchers Paradise

County Clare has a lot to offer the birdwatcher; the sight of an orange-billed Puffin, a flock of hundreds of black and white Lapwing wheeling in flight, or a bright male Yellowhammer singing for a 'little bit of bread and no cheese' from a hedgerow is unforgettable. There are famous breeding colonies of seabirds present in the summer (May-June) at the Cliffs of Moher. Fulmars, Kittiwakes, Guillemots and Razorbills can be seen there, as well as the most easily viewed colony of Puffins in Ireland. Peregrine Falcon, Raven and Chough are also regulars in the area.

1

2

3

Shannon Estuary

The Shannon Estuary, which borders counties Clare, Limerick and Kerry, is more than 50,000 hectares (over 120,000 acres) in area and is by far the largest estuary in Ireland. As a wetland area for birds, the estuary is of international importance and peak numbers of approximately 50,000 wildfowl, waders and gulls winter here. This makes the Shannon Estuary the most important wetland bird area in the west of Ireland.

Just at the side of the estuary, the Shannon Airport Lagoon is very popular with birdwatchers. This was formed when two causeways were built out to an island to give a calm landing area for seaplanes. The coming of jet planes to Shannon has left the lagoon for the birds. Thousands of waders and other waterfowl can be seen at the lagoon (where there is a hide) and nearby areas of the Shannon Estuary in autumn and winter.

1. *Puffin* **2.** *Black-tailed Godwit* **3.** *Golden Plover*

1

Other important sites for birds in Clare are:

Ballyallia is a small lake on the River Fergus close to Ennis. It is a good place to get close views of wildfowl in winter. In particular, a flock of up to 40 Whooper Swans is regularly present there. Lough Atedaun is a shallow lake close to Corofin that has similar bird life to Ballyallia.

Maghera Mountain is in northeast Clare, north of Tulla and west of Feakle. The mountain is 400 metres high and is covered by heather, interspersed with Spruce plantations. There are also two small lakes. This area gives the chance to see upland birds in County Clare: Red Grouse (hard to find anywhere else in the county), Siskin, Crossbill, Merlin, Hen Harrier, Long-eared Owl and Woodcock.

2

3

As its name suggests, the majority of Galway Bay lies in County Galway, but some of the southwestern parts of the bay lie in County Clare. Sheltered inlets like Ballyvaughan Bay, Muckinish Bay and Corranroo Bay provide feeding areas for waders (Dunlin, Ringed Plover, Bar-tailed Godwit, Curlew, Redshank, Greenshank, Turnstone and Oystercatcher) and wildfowl (Teal and Wigeon).

Good numbers of Pale-bellied Brent Goose can be found on the Aughinish peninsula and there are often Scaup and Whooper Swan at Lough Murree. Another avian highlight of the bay is the high number of divers (a type of bird that dives below the water's surface to catch fish) found there in winter. The waters of the southern side of the bay are the best place to see the protected Black-throated Diver in Ireland.

4

1. *Guillemot* **2.** *Peregrine Falcon* **3.** *Merlin* **4.** *Curlew*

Birds of County Clare

2

Special Birds in Clare

The Chough

Although crows are familiar birds in all parts of Ireland, it is not common today to see our rarest crow, the Chough. These birds breed on sea cliffs and in caves, and also sometimes in ruined buildings near to the sea. They are now found thinly scattered along the western and southern coasts of Ireland, from Wexford around to Donegal. The Chough is rare in the west of Europe and changes in farming seem to have contributed to the decline in some areas.

Choughs need well-grazed cliff slopes or hillsides to feed on. Where livestock has been moved away from farmland at cliff edges, the vegetation has become too tall for the birds to feed. Chough feed on insects that they collect from, or just below, the surface of the soil and they like to feed in areas of very short vegetation with bare patches. Good places to see choughs in County Clare are the Cliffs of Moher, nearby at Hags Head and near the lighthouse at Loop Head.

1

Barnacle Geese

Barnacle Geese migrate from Greenland to spend the winter in County Clare. In the region of 700-750 of these birds use undisturbed places like Mutton Island, Illaunearaun Island and Doonbeg Bay on Clare's coast as refuges. These birds like to feed on coastal and island swards that have been kept short by exposure to salt spray. Their short stocky beaks allow them to feed on close-cropped swards where the grass is too short for sheep or cattle.

In the past, before people understood about bird migration, it was thought that Barnacle Geese developed from the Goose Barnacle that is found in the sea because the geese were never seen to breed in temperate zones. The connection between the goose and the barnacle was perhaps made because the barnacle looks like the head and neck of a goose.

Birds and Farming

Changes in land use and management have had significant effects on the birds of Clare. Since the 1970s the Corncrake, Grey Partridge, Corn Bunting and perhaps also the Twite have become extinct in the county.

The Corncrake's Call

For many years the rasping 'crek crek' call of the Corncrake was intimately linked to the Irish summer. People would complain about being kept awake by the birds as they called, for a few hours after midnight, from May to July. This bird's ability to 'throw its voice' was also legendary; many a time a person would try to get close to a calling bird, only for it to seem to be calling from another part of a field entirely when they thought that they were getting close. The Corncrake arrives in Ireland in late April and returns to its wintering grounds in Africa in September.

3

1. *Chough* **2.** *Barnacle Geese* **3.** *Corncrake*

Impact of Change

The long decline of the Corncrake in Ireland has been linked to changes in the management of meadows and the harvesting of hay. The mechanisation of hay cutting destroyed more nests than the traditional scything method and improved grass strains could be cut earlier, so that more birds and nests were destroyed. More recently, the introduction of silage making, which encourages even earlier cutting, has made the problem even worse. The parents cannot raise their chicks before the modern cutting dates and they are killed during the mowing of the grass.

In some areas hay meadows have been replaced by pasture, where the grass is too short for Corncrakes, and in other areas the abandonment of haymaking has led to the spread of rushes, which grow too closely spaced for Corncrakes to use them.

1

REPS Support

So, even though modern changes in farming are implicated in the decline of the Corncrake, this bird is adapted to life in agricultural areas and finds it difficult to survive where agriculture is discontinued. Payments to farmers in areas with suitable habitats and where Corncrakes are identified as present are made under the REPS scheme. The management measures that are required include cutting hay meadows from the centre outward, rather than cutting from the edge in. This gives the birds the chance to escape into neighbouring areas of vegetation when the hay is cut. Although Corncrake no longer breed in Clare, they are staging a slight recovery in Galway and Mayo and hopefully they will return to breed here also.

2

Tillage Birds

Corn Bunting and Twite, from the Finch family, have disappeared with the decline in tillage and the number of winter stubble fields. The bright, colourful Yellowhammer is still quite commonly found in the northeast of the Burren, but it has declined elsewhere. An eco-tillage option (called LINNET) which has been included in REPS could help to halt the decline in seed-eating farmland birds like the Yellowhammer.

Wetland Birds

Snipe, Dunlin, Redshank and Lapwing, although common in winter when extra birds arrive from continental Europe, have become much more scarce as breeding birds because their breeding habitat has been lost to drainage works. Although the Lapwing will nest in wet low-lying fields and sandy areas, the other three species are most often found nesting in marshes.

It has been found in some parts of Ireland that the abandonment of grazing in marshy areas (and in some cases the division and fencing of areas that were formerly open commonage) has caused a decline in the numbers of breeding waders.

Light livestock grazing is necessary to keep the vegetation short enough to suit the birds and they help to keep pools open and unchoked by plants. It has been found that cattle are best suited to this job, since they are heavy enough to cause the right amount of poaching of the ground. Another possible cause of the decline in the numbers of ground-nesting waders is the spread of the introduced Mink.

3

1. *Redhsank* **2.** *Dunlin* **3.** *Lapwing*

Species Profile
Invasive Species — Mink

What is an invasive species?
The term 'invasive species' refers to species, usually introduced by humans to a new environment, where they interfere with the species that are native there. Often people are surprised to learn that quite common animals such as rabbits, Sika and Fallow Deer, grey squirrels, bank voles and rats have all been introduced to Ireland from different countries around the world. The American Mink is an example of a non-native species of animal that has colonised Ireland.

Widespread
American Mink (Mustela vison) is native to America and was introduced to Ireland for fur-farming in 1951. During the 1950s, the first Mink started to escape or were released from these farms, eventually establishing themselves in the wild. They are now widespread throughout Ireland.

Mink are closely related to our native Stoat and are similar in size and shape, though usually slightly larger and with a bushier tail. Their coat is dark brown to black in colour and white markings are found on the underside of the animal. Because of selective breeding, some Mink observed in the wild have grey or even white coats.

Effect on Other Species
Mink can adapt to a wide range of habitats but prefer those found close to water. Although it has not been proven, it is widely believed that Mink may affect other species such as Stoats and Otters as they compete for the same food and habitat. Mink are well known for killing flocks of domestic fowl and may kill all the birds in a run. Waterfowl such as coots and young swans are also at risk from attack by Mink.

No Natural Predator
Legislation to control the Mink was only passed in 1966, by which stage, the species was well established in the countryside. Control of this species is difficult and involves setting a large number of traps over a long time period in order to eradicate the breeding population.

The way in which Mink have adapted to the Irish countryside shows how invasive species can so easily colonise and demonstrates the negative effect of introducing non-native species which do not have a natural predator.

Habitats

What are they?

A habitat is the natural home of living things, such as trees, flowers, insects, birds and mammals. It provides all the necessary requirements for the plant and animals found within it including food, water, shelter and living space.

Habitats are the basic units of the natural environment and it takes a wide variety of habitats to support a wide variety of wildlife. This is what 'biodiversity' is all about.

Most habitats are home to a number of animals and plants, so if a habitat is damaged or destroyed, the species that live in it may disappear from an area.

County Clare supports a rich diversity of habitats and species, from the rocky landscape of the Burren in North Clare to the deep waters of Lough Derg. Many of these habitats are legally protected because they are rare and also because the species they support are rare in Ireland and Europe.

In addition to these areas, there are many other important sites for wildlife and every landowner has a number of these habitats in their care. For example, hedgerows, ponds, streams and areas of scrub are all very important to wildlife, and are found throughout the county.

The habitat descriptions that follow are broadly based on the Heritage Council's 'A Guide to Habitats in Ireland' 2000 publication.

Waterside habitat

1. *Peacock Butterfly* **2.** *Dragonfly* **3.** *Stoat* **4.** *Six-spotted Burnet moth* **5.** *Ladybird* **6.** *Hare* **7.** *Sloe Worm* **8.** *Common Frog,*

Grassland Habitats

Introduction

Grasslands are one of the most abundant habitats we have in Ireland. Most grasslands are created through the management of the land by grazing, mowing, fertilising and drainage. Grassland would revert to scrub or woodland if this management ceased, so essentially, they are habitats created by farmers.

Grasslands can be important habitats in their own right, for the particular grass and flower species that may be present, but also for the many types of animals, birds and insects they support.

There are many different types of grassland in Ireland. In general, grasslands that receive the least attention and management are the most valuable as the less fertiliser and reseeding a grassland receives, the more valuable it will be to wildlife. This is because fertiliser encourages competitive grasses which limit the growth of other species such as wild flowers.

Many factors influence the quality of grasslands and the diversity of plant life they support, such as soil type, fertility, slope and drainage.

Many different types of grassland can be found around the county and these are split into different habitat types, depending on the range of species present and the management approach taken.

Types of Grassland Found

The following grassland habitats are described in more detail in this section:

- Improved Agricultural Grassland
- Semi-natural Grassland including;
- Dry Calcareous and Neutral Grassland
- Dry Humid Acid Grassland
- Wet Grassland
- Marsh

In practice there will be a mix of some or all of these habitats on your farm. This section will help you to recognise the grassland habitats present on your land, provide some information about the type of plants and animals that use these habitats and outline some of the management options which will enhance wildlife in these areas.

A number of different management options for grassland habitats are provided. Some are legal requirements, others are based on REPS Guidelines and more are Best Practice Guidelines. Some farmers may consider trying out some of the options over the entire farm; others may decide that there is an area of their farm that they are willing to manage solely for wildlife; others again may find that they are already using many of the guidelines and are happy with the existing management of the farm.

Grassland Habitat

Improved Agricultural Grassland

What is it?

Improved agricultural grasslands are the most common habitat on farms in County Clare. They include meadows and pastures which have been managed for high grass yields. They are generally well drained, seeded with a mix of vigorous grasses such as rye grass and fertilized with N, P, K, farmyard manure and slurry.

The seed mixes used often contain clover as a further source of nitrogen. The high level of fertilization and relatively few grass species encourages a very lush, green field, which can be intensively grazed and provides a good crop of silage where conditions are suitable.

These habitats support a very limited range of plant and animal species when compared with the range that may be expected on unimproved agricultural grassland, and therefore hold a much lesser conservation value. The most obvious sign of major improvement is a bright green grassy sward with few wild flowers and herbs. Patches of weeds such as nettles, thistles and docks may also be present.

Playing pitches and garden lawns can also be considered as improved grassland due to the intensive management they receive.

Best Practice Management for Wildlife in Agricultural Grassland Habitats

It is accepted that improved grassland is the main source of fodder for animals on farms in Ireland. Our climate is ideal for grass growing which can be grazed or harvested as hay or silage to provide winter feed. However, there are ways to improve the wildlife value of agricultural grassland;

- Retain or enhance hedgerows and other potential 'wildlife corridors' that connect areas of wildlife value
- Leave wider field margins of 1.5 - 2.5 metres uncut, as a refuge for wildlife
- In unimproved fields, maintain 'pockets' of other habitats which may be present
- Avoid applying herbicides or pesticides close to field boundaries, drains or streams bordering the field

Further steps you could consider include;

- Cutting silage as late as possible if ground nesting birds are present
- Cutting silage from the centre of the field, working out wards so that any nesting birds or mammals have time to escape
- Minimise the use of animal treatments which leave insecticide residues in dung, such as drenching treatment

Improved Grassland

Semi-Natural Grassland

What is it?

Semi-natural Grassland is a broad category, which describes the other types of grassland found on farms, which are not managed as intensively as Improved Agricultural Grassland. These types of grassland vary according to local conditions such as the acidity of the bedrock and soil, drainage and management.

Grasslands that have not been intensively managed provide slightly better conditions for wildlife, with more grass and flower species present including buttercup, red clover, yarrow, knapweed and cuckoo flower in summer. There are also likely to be pockets of other habitat types including patches of wet grassland or marsh in a wet corner, patches of scrub or even rocky outcrops with diverse grassland types.

Semi-natural grassland habitats include Dry Calcareous and Neutral Grassland, Acid Grassland, Wet Grassland, Marsh, Grass Verges and Field Margins. Overall, semi-natural grasslands have a higher wildlife value because they have a more diverse range of plants and animals associated with them.

1

2. *Quaking Grass*

Dry Calcareous and Neutral Grassland (Crag Land)

Dry calcareous and neutral grasslands are semi-natural grasslands on base-rich calcareous (alkaline) or pH neutral soils. Agricultural activities in these areas are generally of a low intensity. The best examples of these grasslands are found mainly on shallow limestone soils such as those in the Burren. However, many areas with limestone bedrock are capable of supporting this habitat, including crag land found on many farms around the county.

Calcareous grasslands support a wide range of grasses and other flowering plants including Ox-eye Daisy, Ladies Bedstraw and Bird's Foot Trefoil. Grasses include Fescues, Meadow Foxtail, Crested Dogstail, Cocksfoot and Quaking Grass.

Dry-Humid Acid Grassland

Dry-Humid Acid Grassland refers to semi-natural grassland on acid soils that commonly occur in the uplands and are often used as hill grazing. There is quite a limited range of species and the vegetation is typically composed of dense low swards of fine-leaved grasses such as Bent grasses, Wavy Hair Grass and Mat-grass. Small sedges and various flowering plants including Ribwort Plantain, Tormentil and Lousewort may also be found.

A small amount of heather may be present and scattered areas of scrub and bracken are common in this habitat. Examples of this habitat are found at Gortglass Lough, near Killadysert, the Slieve Aughties and parts of East Clare.

Best Practice Management for Neutral and Acid Grasslands

- Continue grazing management at traditional stocking rates
- Delay cutting the meadow until mid-July or later if possible
- Avoid supplementary feeding of livestock
- Maintain/ enhance hedgerows and any existing patches of woodland or scrub
- Avoid applying lime, especially on acid grassland, as this will alter the nature of the land
- Avoid applying herbicides on a wide scale. If necessary, spot treat
- Top weeds in late summer
- Land not previously ploughed should not be newly cultivated or ploughed
- On dry calcareous and neutral grasslands, increase species richness by aftermath grazing. Graze at a level that avoids poaching and erosion
- On acid grassland, restrict stocking levels to between 0.4 to 2.5 sheep / ha with the lower rate being applied to wetter and higher sites that are more vulnerable to overgrazing and poaching. Where there was no winter grazing, stocking levels can be increased to double the normally advised rate between May and October
- In undergrazed areas threatened by scrub encroachment higher stocking levels can be used
- Minimise or avoid use of animal treatments that leave long-lasting insecticide residues in dung as these grasslands support a wide diversity of insect life

Dry Calcareous Grassland in the Burren

Wet Grassland (Rushy Fields)

Wet grassland occurs in waterlogged soil or poorly drained land conditions. Alongside the grasses are herb or weed species that are tolerant of wet conditions including various types of rush, sedge and plants such as Meadowsweet, Silverweed and Devils Bit Scabious. Often grasses are less common in wet grasslands than rushes, sedges and other flowering plants.

Best Practice Management for Wet Grassland

- Top rushes once in late summer or autumn, unless the area is well grazed
- If cutting hay, delay until after mid July
- If ground nesting birds are present, restrict livestock during the breeding season
- Graze with cattle at a stocking rate of 0.5 cattle / ha
- Do not graze with sheep
- Maintain existing conditions by not draining, cultivating or planting with forestry
- Avoid use of fertiliser, herbicides or pesticides
- Avoid supplementary feeding of livestock on wet grassland

Example in County Clare: Ballyteige Nature Reserve (State-owned), near Lisdoonvarna

1

2

Marsh

Marshes differ from wet grassland in that they have fewer grasses and more broad-leaved herb vegetation. Marshes do not accumulate peat deposits. Flowers tolerant of waterlogged and wet conditions such as Marsh Marigold, Water Mint and Purple Loosestrife are very common and make up much of the vegetation. Certain types of mosses may also be abundant.

Marshes differ from swamps in several ways - they are not dominated by reeds, support a greater range of species and don't typically have standing water.

Best Practice Management for Marsh

- Graze the marsh with cattle in summer at a maximum stocking rate of 0.5 cattle / ha
- Leave a 50 metre buffer zone around the marsh. Don't fertilise or spread slurry within this buffer
- Don't infill the marsh or use as a dump for waste materials
- Avoid excessive poaching. However some poached ground can increase habitat diversity
- Avoid directly or indirectly draining the marsh
- Don't plough, cultivate or reseed the land
- Avoid the use of herbicides or pesticides on the marsh or buffer areas as pesticide application on surrounding lands can lead to pollution of the marsh
- Within SACs, Ministerial consent should be sought for activities listed as Notifiable Actions.

Example in County Clare: Dromore Nature Reserve (State-owned)

1. *Wet Grassland* **2.** *Marsh Grass*

Management Techniques
Control of Ragwort

Ragwort (Senecio jacobea) is also known as ragweed, buachalán and buachalán buidhe.

It is a common grassland weed which is poisonous at all stages of growth because of the presence of liver damaging chemicals. It retains its poisonous properties in both silage and hay. The symptoms shown by affected animals are loss of condition, jaundice and straining, usually with diarrhoea. Deaths can result in cattle and horses. Poisoning is rare under grazing conditions because stock will avoid eating the plant due to its unpalatable taste. However, precision chop silage distributes ragwort segments throughout the crop, making selection by livestock impossible.

Ragwort is a biennial plant which grows in a rosette (green leaf) stage in its first year of growth. In the second year the plant produces the yellow flowering stems from June onwards. The flowering plant can produce 150,000 seeds per plant and normally dies after flowering. Ragwort is classified by the Department of Agriculture as a noxious weed and farmers are required to control its spread.

Best Practice Management

- Cutting / topping prevents seed production but does not give long term control
- Grazing with sheep helps control the rosette stage of plant growth
- Pulling by hand works where the infestation is not severe. The seedling stage is not usually removed by hand pulling. Pulling needs to be repeated on consecutive years
- Pulled plants need to be removed from the field as the plant can still set seed, which has a 70% germination rate
- Chemical control works best on the rosette stage. Spraying can be carried out in late autumn (Mid September to Mid November) or early spring (February to mid March)
- Use either 2,4-D or MCPA sprays for chemical control
- Infected silage fields need to be sprayed in the autumn
- Repeat spraying may be required to give control because of the biennial nature of the plant
- Keep livestock off sprayed fields until the plant dies back. This should take three weeks. Ragwort plants become more palatable after spraying

Species Profile
Greenland White-Fronted Goose

Latin Name: Anser albifrons flavirostris
Irish Name: Gé Bhánéadanach
Greenland White-fronted Geese breed in the low arctic coastal fringe of west Greenland between Nuuk and Upernavik. They migrate south, through south and west Iceland, during September and October to winter exclusively in the warmer climate of Ireland and islands in the west of Scotland.

Easy to Identify
This is probably the most easily recognised of the grey geese. It has an obvious white forehead "blaze", dark bands on the belly and white under the tail. The Greenland race has orange bills, legs and feet. Black bars are visible across their chest and generally the number of bars on the chest reflect the age of the bird. Both sexes are alike but immature birds lack the barring and white forehead of the adults. Like all geese, they fly in a 'V' formation and are often quite noisy in flight, particularly prior to migration in spring. This species are extremely acrobatic in flight.

'Bog Goose'
During winter, Ireland is home to almost 50% of the Greenland population of white-fronted geese. Two thirds of the Irish population occur at the Wexford Slobs, the remainder winter in smaller flocks over approximately 30 sites throughout the west and north of the country.

Throughout its wintering range it is associated with a landscape characterised by peatlands and low intensity agricultural land. Here in Clare they return to traditional bog sites and grassy fields. Wintering areas are often remote and flocks can be small and difficult to locate.

The White-fronted Goose was once known as the 'Bog Goose' as it was commonly found feeding in upland blanket and lowland raised bogs.

Declining Numbers
The underlying trend of population sizes has been a gradual contraction of range, and reduction in flock size. With the decline of peatlands, White-fronts now feed on freshwater marshes and wet meadow.

They are now under threat in Ireland, as traditional wet grasslands are lost due to changes in farming methods. There are at least five extinctions known to have occurred in Ireland since the early 1980s. Thirteen sites have shown decreases in numbers and these trends are strongly related to the number and size of feeding sites. These birds are also extremely sensitive to disturbance and will take flight at the slightest sign of danger.

Clare Flocks
In Clare, we have seen a similar fall off in numbers. There are only three flocks remaining. These can be found at Tullagher Bog in west Clare with a population of 16 birds. Another small flock frequents Core Bog and the Tuamgraney region of east Clare. The final flock may be seen near Tubber, traversing between this area and Burren Lakes like the Polje in Carran. It is estimated that we have less than 150 individuals left in the county.

Protection
Greenland White-fronted Geese are protected under the Irish Wildlife Acts and are also listed on Annex I of the EU Birds Directive which provides protection under European and National Law to this species and its habitat.

Farmer Profile
Sean Bugler

Sean Bugler, his wife Ann and three children live between Scarriff and Mountshannon, in the house his great-great grandfather built in 1850. He is a full time farmer and is involved primarily in dairy farming with over 125 cows.

Callows

Sean's farm is located in the very scenic Shannon valley on the shores of Lough Derg. The farm has an interesting topography, sweeping up from the lake's edge to the uplands in north East Clare, which gives rise to a variety of habitats including the Shannon Callows, wet grassland, improved agricultural grassland and upland blanket bog. The word Callow is derived from the Irish word caladh, which describes a seasonally flooded grassland. The rivers flood during the spring and winter depositing silt and nutrients on the surrounding fields, which support a variety of wildlife.

Water Quality

The Bow River drains Sean's land, flowing from Cappaghbaun Mountain in the north to Lough Derg in the southeast. The river corridor supports a good diversity of mixed broadleaved trees, lush grasses and tall herb vegetation. In the past 10-15 years, Sean has noticed a distinct improvement in water quality in the area. He believes this may be due to changes in agricultural practices, such as fencing off rivers and drains, restricting livestock access to the river channel, and also in the control of land spreading and fertilizer applications. However, Sean has noticed that by fencing off the river corridors, the river channel requires more management such as cutting trees and scrub away from the stream channel to keep it clear.

Corncrake

Although not in REPS, Sean implements a number of measures that are beneficial to wildlife and biodiversity. The Shannon Callows, traditionally used as hay meadows by farmers, are a very important habitat for the preservation of one of the most endangered species in the country, the Corncrake. Sean remembers hearing the Corncrakes distinctive call 'crek - crek' when he was a child, however the species has since disappeared from the area. Sympathetic management of the callows is necessary for the return of the Corncrake.

When the corncrakes first arrive in Ireland from Africa in late spring they use the tall marsh vegetation around the lake as the grass in the meadows is still too short to give them adequate cover. When the grass grows up over the summer they nest in the fields. Sean cuts the callows for silage, once a year, late in the summer. This practice is of great benefit to the Corncrake as it allows the bird time to hatch two broods. Research has shown that this time is needed for the survival of the Corncrake.

1

1. *Lough Derg Basin*

1

Blanket Bog

On the high ground above Sean's farm is an area of upland blanket bog, which was historically cut by Sean's ancestors. Recently Sean and his neighbours came to an agreement not to reclaim or cut the area in the future but to fence the area off and 'leave the bog to the wildlife'. Unlike hay meadows, bogs can be fenced off and left to regenerate. They require very little management and provide a valuable refuge for wildlife.

Wintering Wildfowl

Lough Derg was designated as a Special Protection Area (SPA) in 1995, as it supports important numbers of wintering wildfowl, Greenland White-fronted Geese, Common Terns and Cormorants. Only in the last 10-15 years has Sean noticed that the geese have come to graze on his and neighbouring land, arriving before Christmas and leaving in mid-March. Sean does not put the cattle to graze on these fields over the winter so the geese do not affect him, however they are very susceptible to disturbance.

2

Visitors

Due to the habitats on Sean's farm a number of organisations are attracted onto his land including fishermen, gun club members, bird watchers, hillwalkers and people from local and government authorities who visit to test water quality. Sean, like many other farmers, does not have any real issue with people coming onto his land as long as they first seek permission and identify themselves. It should be seen as common courtesy and there are also safety and insurance considerations.

3

1. *Lough Derg* **2.** *Common Tern* **3.** *Bow River*

Management Techniques
Creating Wildflower Meadows

Creating Wildflower or Hay Meadows

In the days before silage, hay was the staple feed for overwintering stock. Hay-making was introduced by the Normans in the twelfth century and has been saved by generations of farmers since. While silage requires high nutrient content in the soils and vigorous grasses such as Rye-grass, hay meadows were often grown on poor soils with low fertility. This meant that they consisted of a wider range of naturally occurring grasses and herbs.

Wildlife thrives in hay meadow habitats due to the abundance of species present and the lower nutrient status of the ground. There is less competition with vigorous species and so a greater diversity of plants are present.

If you are interested in creating a wildflower or hay meadow, you will need proper planning to achieve success.

1. Choosing a Site

Poor soils with low fertility levels are best as they promote competition between different plant species, leading to the presence of a wide range of grass and herb species. Fields that are over-run with thistles, nettles etc. are not suitable—although they are not desirable from a farming point of view, they actually indicate that nutrients are present. Vigorous grass species and weeds, which dominate cultivated grassland, will not colonise ground with low nutrient content. Sloping sites are good as they allow the nutrients to drain to the bottom of the slope.

2. Sourcing Seed

Ideally seeds should be sourced locally, where possible. Locally collected seed consists of strains that are better adapted to the soils and conditions of the area. Check with your supplier that the mix uses non-competitive grasses such as Bents, Sweet Vernal Grass and Crested Dogs-tail, so that no vigorous grasses dominate the sward. If you live near a traditional grassland it may be possible to hand collect seeds.

The recommended seed rate varies but 2-5 grams/square metre with a ratio of approximately 80% grasses to 20% wildflowers is recommended for smaller areas. For planting on a larger scale the rate is 6-8 kg per acre of Native Origin Seed. If you need to keep the cost down you can use 6-8 kg per acre of catalogue native grass mix and 1 kg of predominantly wildflower seed.

Note: An alternative option is to allow natural regeneration of a site where the fertility has been reduced. Sites that would be suitable include areas where the topsoil has been removed for use elsewhere. The majority of nutrients are in the top layers of the soil. This type of land will recolonise with seed from deep down in the seedbank and windblown seed. Hay from other meadows can also be used as a seed source.

3. Preparing the Soil

The initial preparation of the soil involves clearing any rank or dead grasses and weeds. This can be carried out by tilling the soil repeatedly or the application of a biodegradable herbicide such as Round Up™.

4. Sowing Seed

Seeds can be sown throughout most of the year though ideal sowing times are between mid-March to late May, or into July if wet, and again in late August to late September. Before sowing ensure that the top 2-3 mm of topsoil is worked over either by rotovator and harrow on large areas or by rake on smaller areas. Any large stones should be picked and removed at this stage. The surface should be firm but crumbly so that seedlings can send out their roots. The seed should be scattered on the prepared seedbed and gently firmed in by rolling.

5. Aftercare Management

The aftercare of the meadow can be divided into two sections.

1. In the first year after sowing the sward should be mown regularly to maintain an even height. Some species can establish themselves much quicker than others and these should not be allowed to become dominant. All cuttings must be removed so that the extra nutrients do not enter the soil.

   From year two onwards, traditional hay making methods can be implemented. According to best practice, this involves two cuttings per year, one cutting in late July when most of the grasses and herbs have set seed and another in October or November to remove the regrowth.

2. As in year one, all cuttings must be removed and fertiliser should not be applied.

   In subsequent years, the meadow will take on a slightly different appearance as different species dominate but with time a natural balance will be struck. Once the wildflower meadow becomes established, it will provide a haven for wildlife of all types, increasing biodiversity and enhancing the local landscape. Alternatively late grazing in Autumn will allow the plants to set seed during the winter.

For more detailed information look up the following website: http://www.allgowild.com/

1.*Heath Orchid*

1. *Lizard* **2.** *Moss* **3.** *Long Eared bat in an inland cave* **4.** *Bloody Cranesbill* **5.** *Abbey Hill* **6.** *Black Head*

Rock Habitats

Bare rock may not be a good home for many species of animal and plant but every living thing has its 'niche' or place where it thrives best. For many species of algae, lichens and mosses, rock is the ideal habitat. Even larger plants such as ferns and trees can grow in rock crevices where soil accumulates.

Exposed rock can be important for various animals, in particular lizards which enjoy basking in the sun, and bats which use inland caves as roosts. Bare rock is uncommon throughout Europe and thus the species it supports are also uncommon. County Clare is famous for the bare rock habitats in the Burren and also has important inland cave systems.

The following rocky habitats will be described in more detail:

- Exposed Rock
- Inland Caves

1

Exposed Rock

This refers to all non-coastal areas of exposed rock and includes all rock types ranging from solid bedrock to pebbles. Of particular interest in Clare are the limestone karst formations in the Burren region. Limestone pavement is a habitat of international importance. It offers a refuge to quite a unique mixture of plants and animals.

The Bee Orchid, Hoary Rock Rose, Spring Gentian and Rustyback fern are all found on the exposed rock of County Clare. The Common Lizard is also found in this habitat, especially the limestone pavement where heat is maximised due to the nature of the rock.

Best Practice Management for Exposed Rock Habitats

- Maintain traditional grazing patterns and stocking rates (c. 0.2 LU / ha). Grazing is essential to maintain this habitat. Don't overgraze or undergraze. Overgrazing will remove some more sensitive species, while undergrazing will allow scrub to encroach, thus shading out certain important species
- Graze with cattle in preference to other livestock
- Where scrub has encroached, physical clearance is the best option, followed by treating stumps with glyphosate to prevent regrowth
- Avoid all fertiliser, herbicide/pesticide, slurry and farmyard application on and adjacent to limestone pavement
- Where possible avoid locating supplementary feeders on limestone pavement. Rotate feeder locations to prevent poaching and enrichment
- Prevent, where possible, tourists and visitors from removing stone/rock for the purposes of building 'mini-dolmens'
- Avoid removing stone from limestone pavement for dry stone walls or rockeries
- Don't infill grikes (crevices between the pavements) or 'clints' (pavements) with stone to prevent injury to livestock

Inland Caves

Inland caves can be above ground or underground. They can be dry or contain water. Caves are especially important in the Burren, where fissures in the rock form underground tunnels or rivers.

Inland caves are a very important habitat for bats as they provide a winter roost. Bats need winter roost sites that maintain a constant temperature and climate. Other mammals also use caves for shelter at various times of the year.

Best Practice Management for Inland Caves

- Restrict access to caves by stock to prevent disturbance of bats
- Don't disturb roosting bats
- Don't lock up cave entrances completely

Example in County Clare is Edenvale Cave near Ennis.

2

1. *Limestone Pavement* **2.** *Stalactites in a cave*

Species Profile
Orchids

Latin Name: Orchidaceae
Irish Name: Magairlín
Orchids are a distinctive group of wild flowers that have captured people's imagination for many years. In the past, due to their popularity with gardeners, their numbers were reduced by private and commercial collectors.

Flowering
Some orchids are very slow growing and may not flower until they are five to eight years old. In some species the individual plants can flower for many years, while in others they flower only once and then die. Very often, orchids only grow where a certain type of fungus is present in the soil. The flowers of orchids are often beautiful and complex in shape. Some have adapted so that their flowers mimic insects, in order to attract them so that they transfer pollen from flower to flower. The Bee Orchid is adapted to mimic a bumblebee while, confusingly, the Fly Orchid is pollinated by a small species of wasps.

1

Decline
Many orchid species are in a serious decline in numbers and without protection and appropriate management will find it very hard to survive. One of the main threats to native orchids is the destruction of their habitat. Many species require unimproved grassland with little or no fertilizer applied. The application of fertiliser increases the growth of grass, which competes with the flowers, preventing them from growing.

2

Orchid sites are also threatened by rapid scrub or bracken growth, which blocks them from the sunlight. In many cases, the continuation of traditional management techniques such as hay cutting, grazing or coppicing are ideal ways to encourage orchid growth. Orchids are difficult to detect when they are not in flower and flowering can be random, with hundreds of flowers produced in one year and few or none the next. As well as grassland, orchids grow in woodland, scrub, marshes, fens, bogs, sand dunes and in the cracks in limestone pavement.

Orchid Grasslands in Clare
Orchid rich grassland is a protected habitat and County Clare has many such sites. In all 25 species of orchid grow in Clare and three of these are protected under the Irish Flora Protection Order. County Clare boasts fine orchid grasslands in the Burren where traditional farming methods are employed and little improvement has been made to the land. People from all over the world visit the Burren to see the orchids and other wildflowers. Some orchid species are shown here:

The Early Purple Orchid (Orchis mascula) is one of our commoner orchid species found in grassland areas and in woodland clearings. It is the earliest of our orchids, being in flower from April to June.

The Heath Spotted Orchid (Dactylorhiza maculata) is less common in Clare and is found in heaths, bogs and acid grasslands. A good place to see it is by the Cliffs of Moher, where it grows over shale.

The Dense Flowered Orchid (Neotinea maculata), often called the 'Burren Orchid', was once found on the Isle of Man and is absent from Britain. It is found in a few Irish counties, but is much the commonest in County Clare, where it is found in good numbers in the rocky limestone grasslands of the Burren. Elsewhere in Europe this orchid is common in the Mediterranean region.

1. *Fly Orchid* **2.** *Common Spotted Orchid*

Farmer Profile
Shane Casey

Three generations of the Casey Family are involved in the running of the family farm at Fanore, northwest Clare, including Jack, his son Joseph, his wife Maureen and their five children including Shane who is currently a student of Agricultural and Environmental Science in University College Dublin.

Rare Breeds

The Casey farm has a tradition of suckler cows and sheep, including rare breeds, such as Galway Sheep. This is a traditional Irish long wool sheep breed, which they have been rearing for over 40 years. The rearing of rare breeds has been encouraged by a supplementary measure of REPS 'Rearing animals of local breeds in danger of extinction'. To be eligible, a farmer must be a participant in REPS and must be a member of a relevant breed society or conservation organisation.

Diverse Farm Habitats

The Casey farm is nestled between two very different landscapes; the vast limestone hills of the Burren and the rolling sand dunes of Fanore, all of which are designated for conservation under the Burren SAC. This provides for a vast range of habitats on the farm including dry calcareous grasslands, limestone heath, scrub, sand dune and exposed rock (limestone pavement).

An indication of the importance of this region is that, while the Burren comprises just over 1% of the total land area of Ireland, 75% of Ireland's floral species can be found growing here. The Caher River, the only river found in the high Burren, runs adjacent to the farm. The diversity in habitats is also reflected in the management of the farm. The dune system is not grazed, but adjacent meadows are grazed by sheep during the spring and hay is saved during the summer.

Fertilising the Farm

Due to the designation, the use of fertiliser is not allowed on most of the farmland, with the exception of those meadows where garden crops used to be produced. These receive 10:10:20 annually. However, Shane points out that fertiliser would not have been used on other parts of the land anyway due to the thinness of the soil, which is only half an inch in places. Cattle dung provides the required nutrients on grazed areas. As on many farms in the Burren, silage is not cut on the farm, but bought in to supplement the hay. The sheep are housed in a byre during the lambing season. Lambing can take approximately four months with over 200 sheep of various breeds. The straw bedding is used as manure on the hay meadow, which is spread before May each year.

Winterage

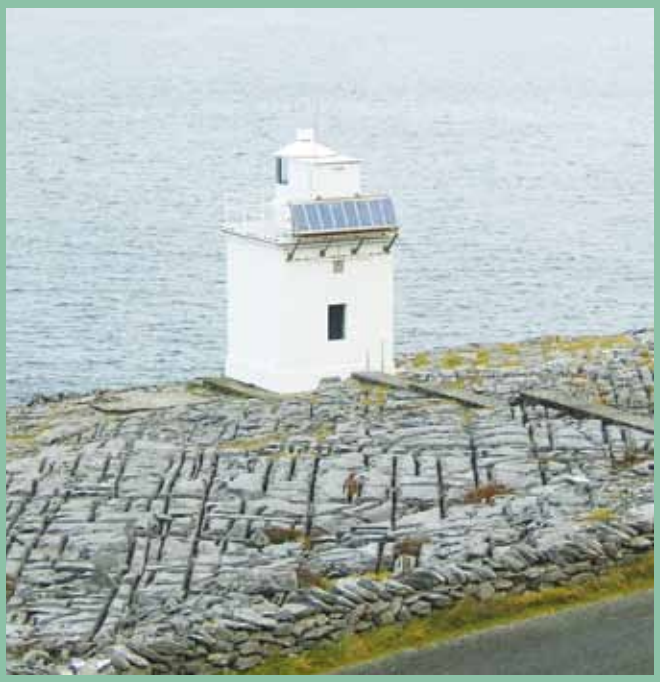
A pattern of grazing known as 'winterage' is practiced extensively in some parts of the Burren including the Casey farm. This involves moving the cattle onto limestone pavement in November, keeping them there until May when the animals are brought down onto the lowland and 'improved' pastures during the summer months. This practice greatly benefits the livestock and the flora of the Burren alike.

The often misquoted General Edmund Ludlow (1651), a follower of Oliver Cromwell, explains this in his memoirs, *"We entered into the Barony of Burren of which it is said that it is a country where there is not water enough to drown a man, wood enough to hang one, nor earth enough to bury him, which last is so scarce that the inhabitants steal it from each other, and yet their cattle are very fat, for the grass growing in turfs of earth of two or three foot square, that lie between the rocks, which are of limestone, is very sweet and nourishing".*

The unique flora of the limestone grassland can flower and set seed freely during the summer months and the winter grazing controls the spread of grass and the invasion of hazel scrub, preserving the open landscape of the Burren. Under REPS, grazing is prohibited from May to September in areas identified as winterage on the REPS map. Farmers in the Burren felt that this 'one size fits all' blanket prescription reduced the flexibility of farmers to react to weather conditions and rates of grass growth on summer pastures. As a result, one week of summer grazing, in June or July, is now permitted under the scheme.

Visitor Problems

Fanore, Fan Oir, the golden slope, is one of Clare's most popular destinations for tourists and environmentalists alike, with one of the best dune systems in the county. However, Shane outlines some of the added difficulties faced with farming in areas such as the Burren: "Due to the picturesque views of Galway Bay and the Burren there are always people coming and going. They often park on the bends of roads, which is very dangerous and the worst thing they can do is leave a gate open. Generally



people don't worry stock, but there are some problems with people knocking stonewalls, ignoring purpose built styles that have been provided. It happens every year".

The Casey's REPS plan requires that all stonewalls on their farm are kept stockproof at all times. Traditionally, walls were maintained when stock were in the fields but would be left untouched when no stock were around, which was far more cost effective than constantly repairing walls.

Wildlife Value of Habitats

As a young farmer in the Burren, Shane feels that some people 'don't recognise valuable habitats such as acid grassland, moorland and their value to wildlife and protected species. All people see is the Burren and the rare plants associated with it, whilst not appreciating those in their own locality.'

The sense of pride in their locality is evident in the Casey family who maintain the local lighthouse and were also involved in its construction. In the past, Jack would go each night to the lighthouse to light a gas cylinder; in Joseph's time it was necessary to check that cans of propane were not running out, whereas renewable energy via the use of solar panels is now being used to operate the lighthouse – definitely a sign of the times.

Farming for Conservation

Shane Identifies the development pressure for holiday homes and plantation forestry on marginal land as the main threats to his locality and the broader environment. 'Farmers are of the attitude that good agricultural land also has good nature value, whereas really the opposite applies. So they plant on bad land which is usually of high ecological value.' He believes that farming for conservation is the only way forward and that we need to learn from our mistakes and those of other nations.

Management Techniques
Grazing Rocky Pastures

The exposed rock of the Burren does not look as though it would offer good grazing for any animals. These limestone hills, however, provide good grazing with herb rich grasslands growing amongst the rocks.

Winter Grazing

Unusually many of these upland areas were traditionally used as wintering grounds for cattle. This is at odds with normal farming practice where livestock are generally removed from the high pastures to overwinter in the lowlands. This practice is possible in the limestone areas of the Burren because grass continues to grow throughout the winter months. This is due to the mild winters in the area and because the limestone absorbs and retains heat from the sun during the summer and acts as a radiator in the winter.

Because the land is free draining and the soils are thin, excessive poaching of the ground is rarely a problem in these areas. During the summer, many of these upland rocky pastures are devoid of water and as such cannot be used for grazing at this time. This kind of management has led to the development of an unusual range of grassland species the composition of which is unique to these areas. There is also the advantage to wildlife that winter grazing provides a 'clean sheet' for summer growth, where otherwise old growth would stunt new plants.

2

Changing Practices

In recent times, farming practices have changed and there has been a reduction in the traditional grazing pattern of the Burren uplands. Traditional systems are labour intensive and do not provide as competitive a return for the farmer as modern systems. The abandonment of upland areas in favour of highly fertilized lowland fields and indoor feeding results in less of the upland vegetation being eaten. This has had a knock-on effect on the unique plant composition in these areas, and will ultimately lead to encroachment by hazel scrub.

Not only is this the loss of an important type of grassland habitat but it also significantly changes the landscape from being open, exposed and rocky to a more enclosed, scrub covered landscape that is not so unique to the Burren.

Traditional is Best

Where possible, traditional methods should be used to maintain the upland Burren flora, with full use of the uplands during the winter, ideally without relying heavily on supplementary feeding. Where feeding is necessary it should be of concentrated feedstuffs as opposed to silage.

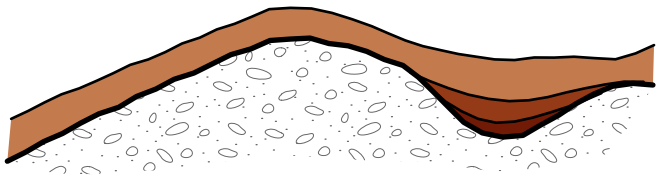
1

1. *Cattle grazing* **2.** *Rock Rose*

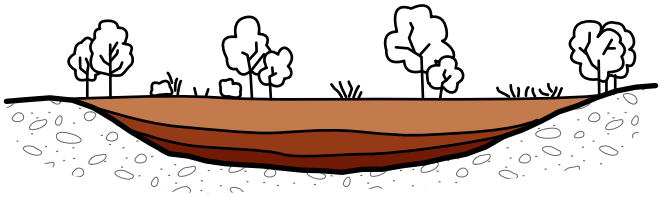
Peatland & Heath Habitats

Introduction

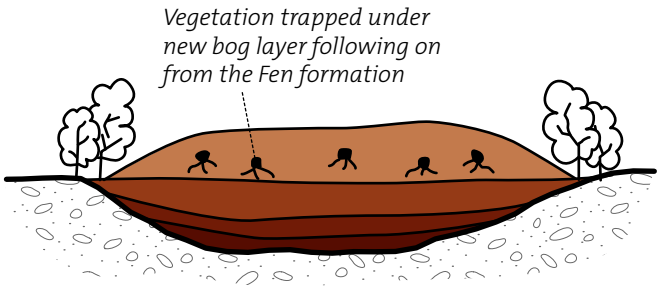
Peatlands cover almost one-sixth of the total land area of Ireland, which is a higher proportion than any other European country, except Finland. Although we have been Involved in peat cutting in Ireland for centuries, it has been on a smaller scale than in other countries, which means that Irish bogs have a high international value. This has clearly been recognised by Europe, as almost 120 peatland sites have been designated as SACs in Ireland. While we may just consider bogs as a source of turf or energy, they have a local value in purifying water and preventing flooding as well as providing a habitat for a diverse range of birds, insects and plants. They also form an important part of our scenic landscape.



Blanket Bog follows the contours or slopes of upland areas



Fen forms in lake basins and is groundwater fed



Raised Bog forms over lake basin peat and is rain fed

Types of Peatland Found

Peat forms from dead plant matter in waterlogged conditions. Due to the lack of oxygen, dead plant matter cannot break down fully, eventually leading to the formation of peat. The two main types of peatland are fens and bogs. In Ireland we have two types of bogs: raised bogs and blanket bogs. The majority of bogs in County Clare are blanket bogs. It is estimated that more than 80% of Irish bogs have been severely damaged through peat removal, turbary, afforestation, overgrazing and drainage schemes. Hydrology is the most important issue in relation to bogs. For this reason, draining or infilling of any peatland or local water catchment area should be avoided.

Conservation of Peatlands

Similarly, reseeding, application of fertilisers, planting of crops, woodlands or conifers should be avoided in peatlands, as this seriously alters the typical bogland vegetation. In bogs, existing paths and tracks should be used for access, to avoid creating new tracks, which can cause erosion. For far too long, peatlands have been considered and used as mere wasteland.

The following peatland habitats will be described in more detail:

- Fen – rich and poor fens
- Raised Bog
- Blanket Bog – upland and lowland
- Cutover and Eroding Bog

Sphagnum moss

Fen

What is it?

Fens occur in damp or waterlogged conditions and generally develop in natural depressions or hollows in the landscape, such as lake edges, flood plains or river valleys which have an available source of ground or surface water. They do not depend on rainwater like raised and blanket bogs.

Fens can occur in mosaics with grassland, or grade into wetland areas such as bogs or open water. Sometimes fens contain bodies of open water and small areas of scrub or wet woodland. Essentially, a fen is a 'bog in the making'. They often go on to form raised bogs, with the vegetation changing as they become more acidic. This process occurs extremely slowly.

1

Fen vegetation is composed chiefly of sedges, which have a grassy appearance, and brown mosses. A wide variety of species are associated with fen as they provide pools and damp ground for many birds and insects. Among the common species are Snipe, Sedgewarbler, Curlew and Woodcock as well as abundant damselflies and dragonflies.

Fen areas benefit from grazing, which opens up the sward. This helps to maintain diversity and keeps invasive rushes under control.

There are two main categories of fen: rich fen and poor fen. Rich fens are fed by calcareous or alkaline waters and are generally situated on limestone bedrock, while poor fens are fed by acid waters and are usually on an acid peat substrate. There is a concentration of fens around the lakeshores of the eastern Burren, near Mullaghmore (State owned) and Ballycullinan Lake near Corofin.

2

Best Practice Management for Fens

- Avoid reseeding, planting of crops, woodland or conifer in and around fen peatland
- Do not feed livestock during the winter in fen areas
- Continue traditional summer grazing between July and October with a maximum stocking density of 0.5 cattle/ha
- Remove stock before October if the fen becomes waterlogged
- Prevent overgrazing or severe poaching
- Retain a buffer of 50 metres around the fen where no fertiliser or lime should be spread
- Ploughing or other cultivation should also be avoided within this buffer area
- Control rushes by cutting in autumn
- Within SACs, Ministerial consent should be sought for activities listed as Notifibale Actions

A few extra measures...

You could also consider the following;

- Graze or mow on a three or four year rotation, leaving 10% ungrazed and unmown, particularly around the margins to encourage scrub growth
- Maintain water levels in the fen by keeping water bodies open and removing excess reeds during the winter
- Avoid draining or infilling the fen

3

1. *Fen in the Burren* **2.** *Snipe* **3.** *Fen*

Raised Bog

What is it?

Raised bogs started to develop at the end of the last Ice Age, when fen peat began to build up, eventually losing contact with the groundwater that fed it initially. Once the connection to groundwater is lost, a raised bog starts to form and the only source of water is from rain.

Raised bogs are mainly found in lowland areas in river valleys, lake basins and other natural hollows and derive their name from their raised dome shape. Most raised bogs in Ireland are found in the midlands and this type of peatland is usually very deep (3 to 12 metres) compared with blanket bog, which is why they have been under more pressure from peat cutting and harvesting on a large scale.

The surface of a good raised bog is characterised by a combination of open pools, raised moss hummocks and flatter areas called 'lawns'. The acidic and nutrient-poor conditions in raised bogs are favoured by heathers, cottongrasses and Sphagnum or 'bog mosses'. Sphagnum moss acts like a sponge, soaking up water and further acidifies the bog by releasing hydrogen ions. These plants die back to eventually form peat, but this process takes place over centuries.

Because bogs have been growing for so long, scientists use them to gather information about climate and vegetation in Ireland thousands of years ago, by looking at items such as pollen at various depths in the peat. There are very few intact raised bogs left in Ireland as the great majority of this habitat type has been destroyed by peat extraction, burning and drainage.

Examples of raised bogs in County Clare include Cloonloum More Bog, southwest of Tulla, and Tullagher Bog, near Kilkee which is one of the most southerly raised bogs in Ireland.

Best Practice Management for Raised Bogs

- As hydrology is the most important issue for bogs, avoid draining the bog or local water catchment area. Retain water in the bog by blocking drains on the bog and at bank faces. It is best to seek advice from the NPWS before undertaking these measures
- Where possible, restrict turf cutting to hand cutting on isolated areas away from the main dome, and avoid cutting turf from intact areas
- Remove rubbish or waste dumped on the bog and don't use the bog to dump or store any materials
- Restrict access to the bog by livestock and avoid using the bog for grazing
- As there is no need to burn bog vegetation, this activity should be avoided
- Fertiliser should not be applied to the high bog and cultivation of any type, including planting trees and crops, should be avoided

Tullagher Bog

2

Blanket Bog

What is it?

The spread of blanket bog began about 5,000 years ago. Blanket bog is found mainly in coastal and upland areas where low temperatures and wet conditions prevail. There are two types of blanket bog in Ireland – upland and lowland blanket bog. The cut-off point is generally considered to be 150 metres above sea level.

Upland blanket bog is widely found in upland areas throughout the country and is generally one to two metres deep, with pockets of deeper peat. However lowland blanket bog or Atlantic blanket bog as it is sometimes known, is restricted to the wetter areas along the western seaboard with annual rainfall of over 1,250mm. Peat depths vary between 1.5 and 7 metres.

The vegetation found in blanket bogs has a more grassy appearance than raised bogs as it is dominated by Black Bog Rush, Purple Moor Grass and sedges. Wet areas of intact blanket bogs may have drainage features such as scattered pools, channels and streams. Fauna associated with these types of bog include the Irish hare, pygmy shrew, and birds including Hen Harrier, Merlin and Snipe.

Most of the bogs in County Clare are blanket bogs and examples include Lough Atorick Bog in the Slieve Aughty Mountains, Slieve Elva and Lough na Minna, near Lissycasey. The main threats to blanket bog in Ireland and County Clare are unsuitable afforestation projects and overgrazing by livestock.

Best Practice Management for Blanket Bogs

- Avoid grazing in winter when the bog is especially wet and vulnerable, and vegetation has died back
- Do not use bog or wet areas as a location for supplementary feeding for livestock
- Avoid overgrazing of blanket bogs by reducing stocking levels to between 0.15 and 0.4 sheep per hectare, depending on the level of damage evident on the bog
- Allow overgrazed areas to recover by excluding or reducing stocking and allow bare ground to re-vegetate by fencing off these areas to livestock
- Control bracken by cattle grazing and trampling in early summer and control any rhododendron or other invasive exotic species.
- Avoid burning large tracts of bog and set aside 20% of the bog never to be burnt. Restrict burning to no more than once every 15-20 years. It is illegal to burn between the 1st March and the 31st August, as this is the bird-nesting season
- Avoid cutting turf on intact (uncut) areas of bog as this will affect the drainage of the bog
- Maintain or recreate the hydrology of the bog by blocking drainage channels where possible.
- When trying to regenerate areas of bare ground, avoid draining, reseeding or applying fertiliser or lime to bog areas. Planting of conifers and crops should be avoided. Use existing paths and tracks for access and avoid creating new tracks, which can cause erosion.

1

1. *Lough Atorick Bog in the Slieve Aughty Mountains* **2.** *Merlin*

Cutover and Eroding Bog

What is it?

Cutover and eroding bog is where the original mass of peat has been reduced through turf cutting or erosion. Cutover bogs include those that have been cut by hand or machine for domestic use and those that have been harvested mechanically for commercial purposes such as peat moss production. The process of removing peat from bogs results in a mixture of habitat types including bare peat and areas of recolonising vegetation.

Many factors influence the type of vegetation that grows on cutover bog including the level of disturbance of the ground, local hydrology or water conditions, the depth of the remaining peat, and the type of peat and underlying rock. Woodland, scrub, heath, fen and grassland habitats are all potential colonisers of cutover bog. Standing water is generally a common feature of cutover bogs too, where excavation has taken place. Many cutover areas may present good conditions for the redevelopment of wetlands and eventually bogs as well.

Eroding blanket bog is characterised by vast tracts of bare peat, most commonly in upland areas. Although erosion may be due to natural factors, overgrazing has also played a significant role in this process. Often networks of channels and gullies form, which cut through the peat sod to below the rooting level of plants, leaving bare peat exposed, which may eventually be stripped away to reveal the rocky layer below. 'Peat hags', which are small remnant blocks of peat, may persist. Even if damaging activities cease, recovery is at best slow and often is impossible to achieve at all.

An example of cutaway blanket bog can be found at Aughiska More, Lisdoonvarna which lies to the east and west of the main Ennistymon-Lisdoonvarna road.

Best Practice Management for Cutover and Eroding Bog

- Avoid draining the bog
- Don't burn in an uncontrolled manner and avoid burning during the bird nesting season (1st March to 31st August)
- Don't reclaim, reseed, cultivate or plant conifers on the bog
- Avoid the use of fertiliser, lime or herbicides on the bog
- Don't use the bog as a dump for waste
- Prevent nutrient rich run-off from neighbouring high ground from entering the bog
- Limit turf cutting to hand-cutting of previously cut areas only
- Allow birch scrub to spread, if already present
- Control invasive species such as rhododendron and other exotic weed species
- Permit some traditional rough grazing by cattle on cutover bog

Heath

What is it?

Heath is a habitat, which is often associated with peatlands. It includes areas of open vegetation dominated by heathers, dwarf shrubs, lichens and mosses. Heaths were created as a result of thousands of years of human clearance of natural forest vegetation and by grazing and burning on generally infertile acidic soils.

Heath can be distinguished from other peatlands by its depth. It is generally shallower than blanket bog or raised bog and because of this, supports different communities of plants. Heath habitats often occur interspersed with bog.

The three main types of heath are dry, montane and wet heath. Some of the best examples of montane heath in Ireland are to be found in the Burren, for example on Moneen Mountain. The differences between dry and wet heath are described below.

Dry Heath

Dry heaths can be found on acid (dry siliceous heath) or calcareous (dry calcareous heath) soils.

- Dry siliceous heaths are located on free-draining, relatively dry soils, which are quite poor in nutrients. Heathers and dwarf shrubs such as Bilberry and Western Gorse are found in this type of habitat.
- Dry calcareous heath is found in limestone areas on well-drained, shallow soils, where the nutrients have been leached out of the surface. Unusually, these soil conditions encourage the growth of plants that would normally prefer acid soils such as heathers and dwarf shrubs. This habitat type often grades into scrub and grassland vegetation. Dry calcareous heath is generally more species-rich than dry siliceous heath and also features plants associated with limestone habitats.

1

2

Example in County Clare: Slieve Bernagh Bog, west of Lough Derg

Wet Heath

Wet heath is found on peat with an average depth of between 15 and 50 centimetres, where the ground cover is at least 25% dwarf shrubs such as Ling, other heathers and Crowberry.

In general, wet heath occurs on the slopes of hills and mountains, where it is too steep or too dry for bog to develop and it often blends into blanket bog. Other bog species such as Purple Moor-grass and sedges and mosses are also a common feature of wet heaths. This habitat is very fragile and is therefore easily damaged.

Examples in County Clare: Ballyteige Nature Reserve (State owned), West of the public road at Cooleabeg on the slopes of Slieve Elva, Slieve Bernagh Bog

Best Practice Management for Heaths

- Do not burn between the 1st March and the 31st August (bird breeding season)
- Avoid grazing eroded or overgrazed sites until they have recovered
- Avoid giving supplementary feed to livestock on heath
- Use grazing cattle to trample bracken in early summer, as this helps to control growth
- Alternatively, combine grazing with cutting or use cutting alone to control bracken
- On dry heath, control gorse if necessary by cutting or burning outside of the bird nesting season
- Restrict burning to small areas at any particular time and do not re-burn any area of heath more than once in any fifteen year period
- Designate 20% of the area 'never to be burnt' to act as a reservoir/refuge for insect and plant species
- Limit sheep stocking rates to 0.6 sheep / ha on dry heath and 0.2 sheep / ha on wet heath
- Trees should not be planted on heath
- Avoid draining, reseeding, ploughing, cultivation and fertilising

1. *Heather* **2.** *Wet Heath*

Management Techniques
Control of Bracken

Dense Bracken refers to areas which are dominated by bracken (Pteridium aquilinum). Bracken is a natural feature of the landscape. However, originally it was a woodland plant, which was kept under control by the shade provided by the woodland canopy.

Due to the large-scale loss of woodland cover in Ireland, this natural control has been lost and bracken has become dominant in many areas of the countryside. It tends to form dense carpets or grow in large patches, often replacing important habitats such as heath and species-rich grassland. So while it is native, it can be considered an invasive species.

The dense canopy provided by bracken prevents much plant growth underneath and reduces both the grazing potential and the wildlife value of the land as a result. In certain situations it can be beneficial for wildlife by providing shelter for small birds and animals, supporting various butterflies and on occasion woodland flora, which require shaded conditions.

Best Practice Management for Dense Bracken

- Allow cattle to trample stands of bracken
- Combine grazing control of young shoots with cutting, or alternatively, use cutting as the sole control measure where stands of bracken are sparse
- Carry out control measures when the plant has reached its maximum growth for the year
- Where bracken growth is dense, cut or roll the bracken stands two or three times per summer for two years in June, July and Mid-August. Spray in the third year with Asulam™ when the fronds are fully open
- Check for ground nesting birds before carrying out these control measures
- Spot spray in subsequent seasons as necessary
- Prevent livestock from eating large amounts as it can be toxic if they are exposed to it over a long period of time
- Control is more effective in summer
- Avoid spraying in very hot still conditions as the chemical may evaporate
- If rain is expected, avoid treatment
- Be aware that bracken can re-occur

Farmer Profile
Andrew Killeen

Andrew Killeen is a young farmer from Doonbeg, in southwest Clare. Over five generations of the Killeen family have farmed in Doonbeg and 14 years ago Andrew took over the running of the family dairy farm from his father. In 2001, Andrew was awarded the FBD Macra 'Young Farmer of the Future'. He milks approximately 70 cows and keeps some horses on the land. Andrew is a full time farmer, however during the summer months the family supplement their income by running a B&B from their farmhouse.

REPS

Having been involved in REPS for over eight years, Andrew is currently in REPS 2, aiming towards REPS 4. Under the scheme, he completed a number of requirements including; pollution control measures, development of a nutrient management plan and stockproofing. On REPS, he says

"REPS has benefited the farm financially, particularly in relation to pollution control as it allowed me to extend the slurry storage capacity and improve the general tidiness of the farm".

He finds his REPS planner very helpful and approachable. However, he feels that the REPS training courses could be better tailored to the specific needs of the various types of farmer in the county.

SAC Designation

Almost half of the Killeen farm is a designated Special Area of Conservation (SAC). Prior to that the land was a designated Natural Heritage Area (NHA), but in 2002 the site was also given SAC status due to the international importance of the habitats on the land.

The site is designated due to the presence of an active raised bog habitat known locally as the Tullaher Bog Complex and also for the numbers of wintering birds such as Greenland White-fronted Geese and Whooper Swan that visit his land. When a site is designated an SAC, the landowner is obliged to manage the site in an environmentally friendly manner. Andrew was advised by the National Parks and Wildlife Service (NPWS) that he should carry on farming within the SAC as he did before.

The main restrictions placed upon him were that he could not create any new roads or drains within the SAC, however maintenance of existing features is permitted. Andrew says, in relation to the wildfowl that "Contrary to what people might think, the birds are more of a help than a hindrance".

The birds graze up to 20 acres of Andrew's land undisturbed, as this area is otherwise unsuitable for winter grazing. They fertilise the land and leave the grass sward thick and healthy and therefore of benefit to livestock.

1

1. *Loop Head peninsula*

1

Turf Cutting

Traditionally the Killeen Family cut the bog on their land, however the SAC designation has placed some restrictions on cutting in the raised bog, in that no commercial turf cutting machinery can be used; so turf can be saved by hand only. In recent times the Killeen family have adopted alternative sources of fuel but with increasing oil prices they may look to the bog again. As part of REPS Andrew decided that some areas of bog that were previously reclaimed for pasture will be set aside for hay meadow habitat.

Farm Wildlife

Under REPS Andrew has not seen any dramatic changes in wildlife around the farm. He believes that this is because the bog was always there and provides local wildlife with an important refuge. In farms where marginal land is not available, he believes that biodiversity measures under REPS could be of real benefit.

Andrew is positive about the future of farming in West Clare and is proactive in several research projects undertaken by local and national groups.

1. *Whooper Swan*

Species Profile
Lichens

Lichens are common organisms that are often overlooked due to their small size. On closer inspection, many species have beautiful and complex shapes, are brightly coloured and are often amongst the first species to colonise bare rock.

Lichens are unique in that each one is not simply one organism but is two species living in extremely close association with one another. One species is a fungus and the other an alga. Many different combinations of fungi and algae form a variety of types of lichen.

Clean Air

Many lichens show extreme sensitivity to air pollution. In the west of Ireland the air is relatively pure, having no large industrial centres to cause pollution and having the expanse of the Atlantic Ocean immediately to the west. This provides ideal conditions for the growth of a diverse range of lichens. For example, many lichens grow on the hazel trees of the Burren. A particularly noteworthy lichen is the Tree Lungwort (Lobaria pulmonaria), which is quite rare in Ireland. It occurs in a few small woodlands in the Burren. This lichen is very sensitive to air pollution and will only grow where the air quality is good.

Soil Formation

Lichens are very important in that they re-establish life on rock and barren disturbed places. They play an important role in soil formation over much of the earth because as the lichens colonise rocks, they trap dust, silt, and water.

Peatland Lichens

In peatlands, various Cladonia lichens can be found, including Matchstick Lichen, Cup Lichen and Antler-horn Lichen. Bearded lichen is one of the commonest found in peatlands and it often forms cushions over the peatland surface. Lichens are one of the first colonizers after the burning of peatland, firstly Matchstick Lichen, then Cup Lichen and finally Bearded Lichen, which reaches its maximum development after ten years. For this reason it is often used to estimate how long ago a bog was burnt.

Management Techniques
Peatland Conservation

The wildlife communities of any peatland site are constantly changing and require management to maintain their conservation value. This involves understanding the site and identifying what can be achieved by management. Every fen, raised bog and blanket bog in Ireland has been modified by man.

In the case of raised bogs the damage is done by turf cutting on the edges, burning and drainage. For blanket bogs the damage includes drainage, turf cutting, burning and overgrazing. Fen damage includes land reclamation, nutrient enrichment, drainage and in-filling.

It is still possible to protect what remains of our peatland heritage and under the right conditions peat can form again on a harvested bog. Sphagnum moss, which is one of the bog plants that forms peat, can re-establish, however this process can take up to 20 years.

Grazing

In areas where overgrazing is a problem a reduction in the number of stock may be enough to restore damaged peatland.

Areas that are very badly damaged often require a total removal of stock to allow the vegetation to recover. This is best achieved by fencing off overgrazed areas.

1

Drainage

Where bogs have been drained, it may be possible to raise the water table up to its former level by blocking the drainage channels.

Once this is achieved the process of peat formation may begin again. It is possible to speed up this process by introducing live sphagnum moss plants to the degraded bog, however they would need to be from a local source.

2

1. *Bog Cotton* **2.** *Sphagnum moss*

Afforestation

Where bogs have been planted with coniferous trees, their felling and removal is the first step to restoring peatland conditions.

Any regeneration of tree species that seed from the planted trees must also be removed. Naturally occurring native bog woodland should never be removed as this is a valuable and rare habitat in itself. Such trees include Birch, Alder and Willow.

Restoration

Restoration requires a minimum of one metre of peat. Rewetting of the bog is necessary, if it has been drained in the past. This is achieved by filling in drains. The bog can be allowed to regenerate by itself or the process can be accelerated if live sphagnum plants are transplanted on to the bog. This process can return harvested bogs back to functioning wetlands.

Currently a project called 'Restoring Active Blanket Bog in Ireland' is being undertaken. It is jointly funded by the EU and Coillte. The project aims to restore bogland in partially or wholly planted sites within SACs and is concentrating on 14 sites at present, one being in Co. Clare at Pollogoona Bog in the Slieve Aughty uplands. This bog was chosen because of its high ecological value, being soft, wet and quaking over most of its surface. Works here involve the felling of poorly-developed areas of conifer plantation around the margins of intact bog.

Freshwater Habitats

Freshwater habitats include lakes, ponds, rivers, streams, springs, swamps and turloughs. These habitats are all described in detail in the following pages. Fresh, clean water is essential for life on earth. However, in recent times, the condition of these habitats has been declining due to the intensification of industry and agriculture.

Fortunately, County Clare has many freshwater habitats, which remain unspoilt and free from serious pollution. Many of these natural features are of national and international importance for their scientific and wildlife interest.

Important Habitats in Clare

Much of the bedrock in County Clare is limestone. In most of the county, phenomena such as disappearing rivers like the Caher River and turloughs are relatively common. They are, however, very rare internationally. The wetlands of east Clare and the rivers of west Clare all contribute to the vast number of valuable freshwater habitats of the county.

Turloughs are unique to Ireland and the greatest concentration of these 'disappearing' lakes is located in the counties of Clare and Galway. Many renowned lakes and fens are also found in County Clare, such as those in the East Burren, where an internationally important complex of freshwater habitats is to be found.

Key Management Issues

There are three main factors to be considered when managing watercourses.

The first is the protection of water quality. Pollution through direct or indirect sources will impact on wildlife using the watercourse. Water quality can be protected through providing buffer zones when spreading fertiliser and slurry, and ensuring that sheds and feeding points are a sufficient distance from the water body. Ideally, access to watercourses by animals should be restricted, at a minimum, preventing them from standing in the water.

The next consideration is to maintain sufficient levels of water to ensure that wildlife using the watercourse can survive. This includes fish, birds, plants and even microscopic creatures, which use the sediments in the bed of the lake or river.

Finally, variety of habitats is essential. As variety in light and shade, substrate (river or lake bed) type, trees and open spaces, all add to the wildlife value of a watercourse, management practices should try to enhance this variety where possible.

Lakes & Ponds

What are they?

Lakes and ponds include all bodies of open or standing water. They may be natural, modified or entirely artificial. Clare lakes can be very important for recreation and fishing, for example Lough Derg, Doolough and Lickeen. In general, lakes are a species-rich habitat, supporting birds such as the Little Grebe, Shoveler, Pochard and Whooper Swan.

Plant communities include plants which grow beneath and above the surface, including Pondweeds, Bogbean, Mosses, Quillworts, Reeds, Rushes and Sedges, and also the trees and shrubs which surround lakes and adjacent wetlands.

Nutrient Status

However, the 'richness' of an individual lake is also based on many factors such as water chemistry, local geology and altitude. Lakes are classified according to their 'trophic' or nutrient status. The trophic status is determined by investigating the levels of phosphorous and phytoplankton, the microscopic plants that inhabit water bodies. Excessive levels of these 'nutrients' lead to algal growth (algal bloom) which gives the lake a murky green colour and is harmful to aquatic life. There are three main categories of lake, based on their trophic status:

Oligotrophic:	Low nutrient status and low plant growth e.g. Lough Bunny
Mesotrophic:	Moderate or intermediate nutrient status and moderate plant growth e.g. Lough Derg
Eutrophic:	High nutrient status and high plant growth e.g. Ballybeg Lake

Best Practice Management for Lakes & Ponds

- Graze about 50% of the shoreline
- Preserve traditional water levels
- Consult the NPWS before cleaning out a pond
- Leave a 20 metre buffer for farm activities such as ploughing and the spreading of fertiliser, slurry or farmyard manure
- Don't drain or extract excessive amounts of water
- Don't dump waste materials into lakes or ponds
- Non-native fish or animal species should not be introduced, e.g. the Zebra Mussel
- Avoid the use of herbicides to control aquatic plants
- Prevent trees from overshadowing the entire water surface

1

1. *Mute Swan* **2.** *Reeds and Lillies*

Rivers & Streams

What are they?

Rivers are natural watercourses that form channels through the countryside, draining the land as they flow and transporting water over the land surface.

1

Types of Rivers

Rivers can be divided into two broad categories: Upland Eroding Rivers and Lowland Depositing Rivers.

- Upland Eroding rivers are characterised by steep gradients, rapid water flow, and rocky or pebbly beds with little vegetation. It is during this stage in the river's life that it cuts its channel. Example in County Clare: Caher River.
- Lowland Depositing rivers are those that flow along more shallow gradients in the lowlands at a slower pace. As this type of river has less energy, it cannot carry as much material and therefore fine sediments are deposited on the riverbed as it flows. Generally lowland depositing rivers are larger and deeper than upland eroding rivers. They may contain a number of features at different stages in their course such as pools, fringing reedbeds, banks, sand and gravel bars, small islands and backwaters. Examples in County Clare: River Fergus and River Shannon.

The types of plant and animal species that inhabit a particular river is dependent on a variety of factors including the force of water flow, type of river bed, nutrient status, water quality, channel size and depth, human influence and amounts of light and shade. Both floating and standing vegetation may be present in such rivers. The most common species include reeds, rushes and yellow flags, along with floating plants such as water lilies and pondweeds.

Best Practice Management for Rivers and Streams

- Permit natural patterns of erosion, deposition and flooding to occur
- Avoid diverting the river/stream channel
- Maintain features such as bays, shallows, and riffles that provide a variety of habitats for fish
- Maintain at least a 10 metre buffer zone to protect the river or stream from slurry, fertiliser and herbicide application
- Materials or waste substances should never be dumped in or beside a watercourse
- Trees should be preserved on the riverbank. Fallen trees should be removed with care.
- Plant native tree species such as alder and willow near river banks – combine light and shade areas
- Control alien and invasive species such as Giant Hogweed, Japanese Knotweed and Himalayan Balsam
- Do not introduce any plants to watercourses such as aquatic plants from garden centres as they can become invasive and take over the waterbody

1. *Salmon*

Springs

What are they?

Springs are small features, where groundwater reaches the surface. They provide a continuous supply of groundwater to the surface from a single point source or a seepage zone spread over a wider area. Springs can occur in both upland and lowland locations. They can be found within a variety of habitat types such as woodlands, grasslands, exposed rock or heathlands. Mosses are usually quite plentiful around them and they often support a range of invertebrates.

Tufa Formation

Springs occur throughout the Burren in areas where there is an upwelling of calcium rich groundwater or seepage from the limestone. Tufa (too-fa) formation and marl deposition occur in a relatively small number of the Burren springs and these are said to be 'petrifying' or stone-forming. These pertrifying springs are rare and are listed as a priority habitat under Annex I of the EU Habitats Directive.

Good examples of tufa springs can be found on the cliffs above the southern section of Spanish Point beach. Tufa is essentially common limestone. What is uncommon about this limestone is the way it forms. Calcium-carbonate (limestone) rich water emerges from the spring under pressure. When it hits the air, the calcium carbonate precipitates (settles out of solution as a solid like limescale in a kettle) and forms deposits around the spring which are known as 'tufa'.

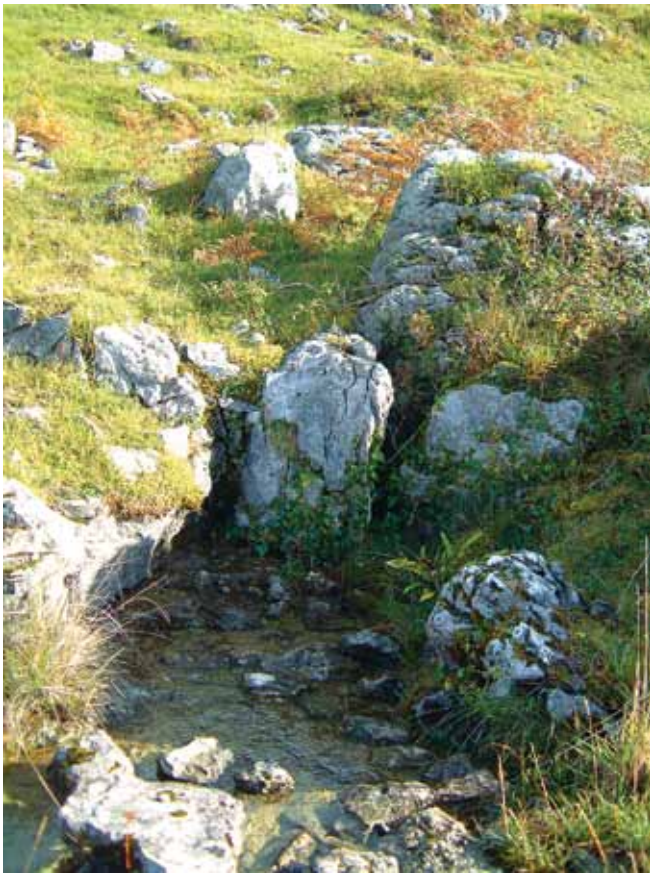
Pollution Prevention

Best practice for the protection of springs is necessary to protect groundwater quality. Springs are essentially discharge points for groundwater. If they become contaminated by chemicals, synthetic fertilisers or, manure or slurry from livestock, the body of water underground can become unusable.

Limestone areas where the rock is deeply fissured and cracked are particularly sensitive. Water can move easily through 'pipes' in the rock and travel great distances in a short space of time. Spring water is vital as drinking water for humans and livestock and therefore it is crucial that springs are carefully managed.

Best Practice Management for Springs

- Prevent disturbance by livestock
- Create a buffer zone within which no agricultural practices such as the spreading of fertiliser, herbicide, slurry or farmyard manure is permitted
- Position watering troughs or feeding stations away from springs. This will help prevent point source pollution.
- Don't dispose of waste materials near to springs



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Swamps

What are they?

Swamps are usually located between areas of open water and dry land, and are found in standing water for a large part of the year. They can be found along the margins of rivers, lakes, canals, lagoons and estuaries and therefore can be part of freshwater or brackish saline systems. The most commonly found plant types are various types of reeds, tall sedges and herbs. These habitats can be quite important for birdlife, especially for reed-nesting birds, such as Warblers.

Types of Swamps Found

There are two main types of swamp: Reed and Large Sedge Swamps and Tall Herb Swamps.

- Reed and Large Sedge Swamp are dominated by large sedges and grasses such as Common Reed, Common Clubrush, Reed Canary grass and Bulrush. These swamps are relatively species poor, meaning there is a limited range of species living in it. Example in County Clare: Banks of the River Fergus
- Tall Herb Swamps is more species rich and is composed mainly of tall flowering plants such as Lesser Water-parsnip, Water Forget-me-not, Yellow Flag and Hemp-Agrimony. Example in County Clare: Ballycullinan Lake, 2km south of Corofin

1

Best Practice Management for Swamps

- Agricultural activities such as ploughing, spreading fertiliser, slurry or farmyard manure should be avoided within a 20 metre radius of the swamp
- Prevent herbicides or pesticides from entering the swamp
- Avoid draining or infilling the swamp
- Maintain traditional grazing regimes, where damage is not evident. Cattle and horses are the recommended grazers outside of the peak bird-breeding season (March-June). Stocking rates should not exceed 0.5 cattle/ ha
- Collect dead reed material during the winter season to prevent accumulation of litter and drying out of the swamp
- Cut up to a maximum of one third of the reedbed per year. This can be done during the winter if necessary
- If reedbeds are being grazed, exclude stock from approximately one quarter of the area
- Control the spread of scrub in swamps
- Reedbeds and swamps should not be burnt

1. *Bulrush* **2.** *Sedge Warbler*

Turloughs

What are they?

Turloughs are found in limestone areas, where weathering of the rock below the ground has created vast underground caves and passages, which act like natural pipe-work. These allow the rapid movement of water underground. As the water table (the surface of groundwater) rises, the water makes its exit to the earth's surface through holes called 'swallow holes'.

Although some turloughs have inflowing rivers and streams, most fill up by means of swallow holes and flooded underground passages. As a result, turloughs are often described as seasonal or temporary lakes as their water levels fluctuate depending on the time of year.

Turlough Plants & Wildlife

The plants that can be found growing in turloughs are very unique, as they are tolerant of seasonal flooding and drought. Bands of vegetation form in rings around the margins of turloughs, depending on how tolerant the plant species are of flooding. Trees grow as shrubby specimens near the upper edge, while the presence of Black Turlough Moss marks the highest water level. Grasses and sedges with species such as Shrubby Cinquefoil, Dog Violet and Turlough Violet occur further down. Silverweed is often dominant near the bottom of the basin.

The shallow flooding of large areas of vegetation provides ideal feeding for wintering wildfowl, including Wigeon, Teal, Shoveler, Whooper Swan and waders in the summer, including Snipe, Dunlin and Lapwing. Other fauna include beetles and damselflies, such as the Scarce Emerald Damselfly. This is the rarest damselfly in Ireland but is common in some parts of Clare, in turloughs or other fluctuating wetlands.

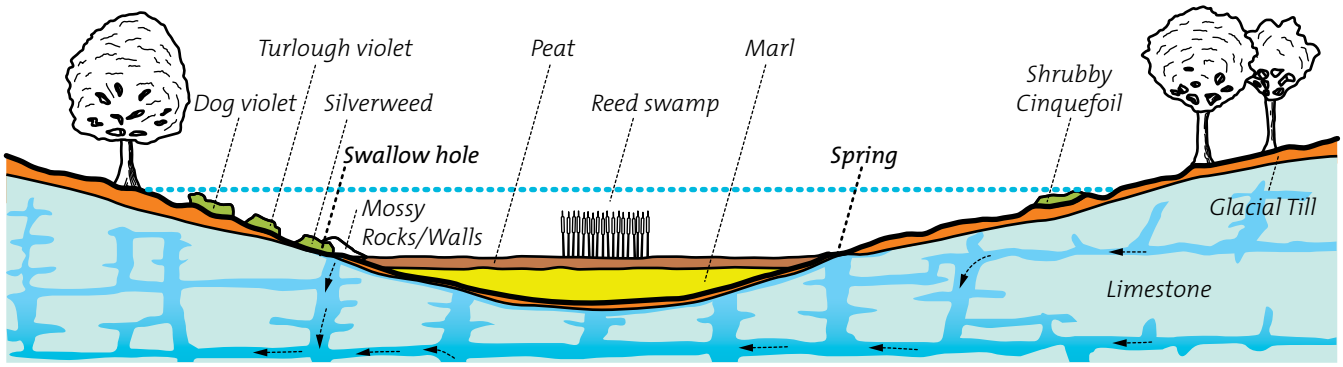
1

Turloughs are more or less unique to Ireland and the main concentration of this habitat type is in the Clare, Galway, Roscommon region. It is a priority habitat under the EU Habitats Directive.

Examples in County Clare: Burren National Park, Mullaghmore, Dromore Nature Reserve, Carron, Lough Gash

Best Practice Management for Turloughs

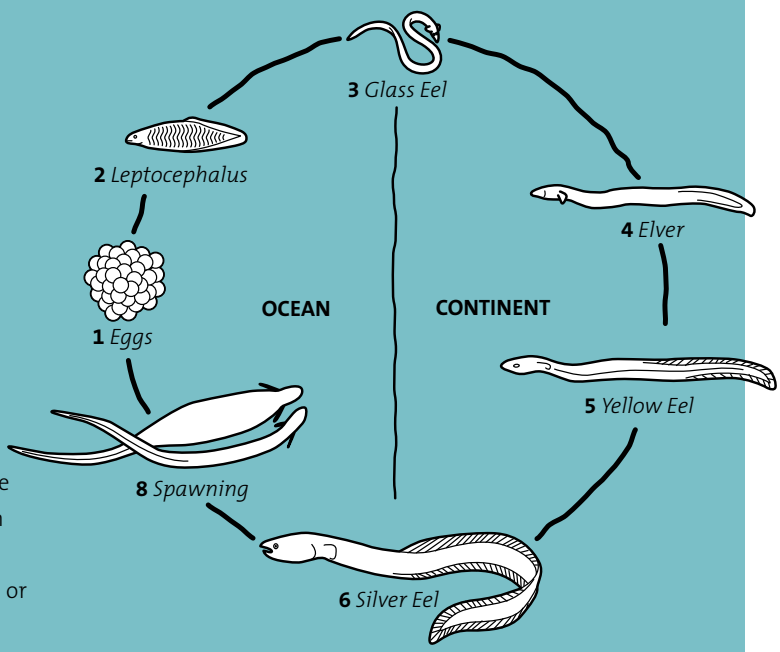
- Don't plough, drain or reseed turloughs as the plants and soils are very sensitive
- Continue traditional grazing regimes, where there is no evidence of damage. Grazing prevents the encroachment of scrub Maintain a stocking rate of 10 sheep or 2.5 cattle / ha for the 4-5 month season. If the turlough is very wet adjust this rate downwards and graze for a shorter period
- If drainage is affecting the turlough, allow the ditches and channels to silt up naturally. Flooding is necessary to maintain the fertility of the soils
- Avoid excavating new drains (existing ditches may be retained where they do not affect the turlough adversely)
- Be aware of wildfowl overwintering on the turlough
- Avoid the disposal of chemicals, wastes or run-off from herbicides and fertilisers in the turlough, by maintaining a buffer of at least 20 metres from the swallow hole



1. *Turlough at Mullaghmore*

Species Profile
Eel

Latin Name Anguilla anguilla
Irish Name Eascann



Eels are found in almost all waterways in Ireland. They have an unusual lifecycle in that they spend part of their life in freshwater and part in the sea. Eels migrate all the way to the Sargasso Sea (northeast of the Caribbean) to spawn. The larvae then drift back to Europe in the Gulf Stream. When they reach Europe the young eels migrate up freshwater streams and rivers. They then mature in the freshwater and become brown or yellow in colour.

Caribbean Spawning Grounds

Eels can remain in freshwater for up to 60 years. Towards the end of this stage the eels turn silver in colour. They then migrate back down the rivers on dark moonless nights and return to the Sargasso Sea to spawn. They are also unusual in that they can survive outside water for a period of several hours and so can travel over land on dark, wet nights.

Declining Numbers

Eels are declining in numbers and juvenile stocks of Eel throughout Europe have declined by 99%, although the picture is much better in Ireland where stocks are still relatively strong. The cause of this decline is unclear but pollution, overfishing, habitat degradation, parasite infection and climate change have all been identified as potential factors.

1

Farmer Profile
Christy O'Grady

Christy O'Grady and his family have farmed in Larchill, northwest of Ennis, since 1927. Although, Christy's son Seamus has taken over the full time running of the farm, Christy is still actively involved. Up until spring of 1987, dairying was the main activity on the farm. Today however, a suckling herd and the fattening of cattle are the principal enterprises along with rearing sheep and horses.

Changing Times

Christy has seen a marked change in the dependency on agriculture and its products;

"In the 1950's there was a high dependency on agriculture due to high unemployment. Farmyard enterprises were a lot more profitable than farming itself and you produced your own garden vegetables, pigs and milk. Now people can work a five-day week and earn a good living – because there are alternatives, you don't have to stay farming".

Christy acknowledges that farming can be labour intensive, for relatively little profit, which discourages many people. He also points out that –

"Spring is a hard time with lambing, but summer is easier now than it was in the past because of contractors who come in and cut hay. Winter can be more difficult with larger stock numbers and environmental restrictions".

Farm Habitats

The O'Grady farm contains a diverse range of habitats, as the farm fringes the outermost reaches of the limestone pavement of the Burren, alongside drumlins and lakes to the north of Ennis. Christy's land contains five lakes, with six acres of reed bed and some exposed limestone rock, where the soil remains thin. The underlying soil on Christy's land is marl, which is a clay type soil. Due to the very shallow topsoil over the limestone, similar to that of the Burren, the pasture would revert to scrub if it is not regularly grazed or cleared.

A lot of investment has gone into the provision of a modern farmyard. Housing cattle indoors over winter helps to protect the lakes and the quality of groundwater. Poaching of fields and lakeshores in the winter season is avoided, preventing pollution of local watercourses and groundwater resources.

1

1. *Ennis Drumlin Farmland*

Reedbeds

On Christy's land, reedbeds fringe the shores of many of the lakes. Reedbeds are amongst the most important habitats for birds in Ireland. They offer cover and breeding habitat to a range of wildfowl such as Coot, Moorhen and Water Rail. In addition to birds, reedbeds also provide spawning habitat for many species of coarse fish. Apart from their ecological value the reedbeds are also very important when it comes to water quality. Christy tells of the way the reeds 'keep the lake water clean' and has considered using reed bed technology to treat the dirty water from his farm.

1

Farm Wildlife

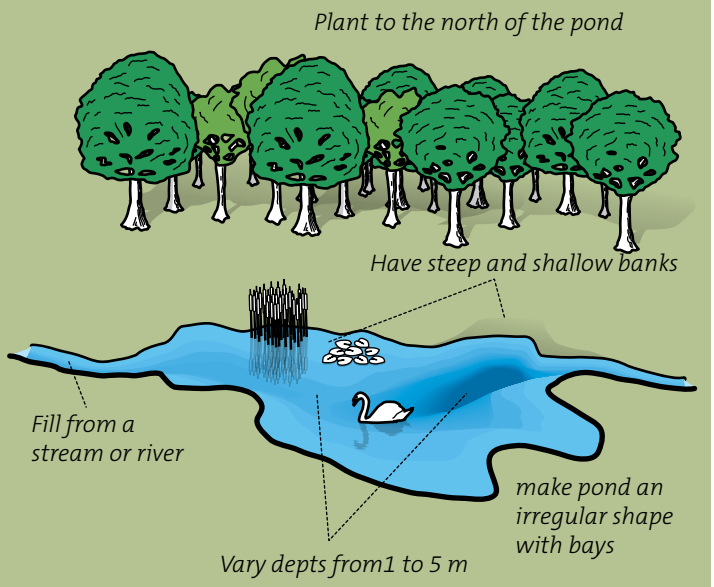
During the shooting season, hunters are a regular feature on Christy's land, hunting duck and pheasant. Hares are plentiful in the area, however Christy has noticed a decline in the number of rabbits in recent years. Corncrake has not been seen or heard in the area since he was a child. Whooper Swans and ducks inhabit the lakes along with Perch, Roach and Pike which are fished for occasionally.

2

1. *Coot* **2.** *Hare*

Management Techniques
Pond Creation

The creation of a pond is one of the most reliable ways of introducing wildlife and habitat diversity to a farm. In addition, ponds provide an attractive feature in the landscape. Where safety allows, they can be a good feature in public or community areas. The wildlife and amenity value of ponds can be greatly enhanced if the following considerations are made at the planning stage.



Site Selection

When choosing a site for a pond:

- Seek professional advice. It is important that existing watercourses and water bodies are left intact and not interfered with
- Avoid areas of high nature conservation value such as woodland, marsh, or reedswamp
- Site the pond where there are suitable ground conditions to avoid problems with siltation etc
- Consider how the pond is to be filled—by stream, river; spring or groundwater. The water level in ponds that are fed by a stream or river can be easily controlled, whereas with springs and groundwater there may be some seasonal fluctuation. Water levels that rise and fall, and even ponds that dry out can be good for nature conservation but may not be acceptable where the pond is of amenity value

Reeds and lillies in pond

Creating Your Pond

- When excavating a pond, dig to a range of depths (1 – 5 m) to suit the requirements of many different plants and animals, from those that live in deep water to those which prefer shallow areas. The banks should also offer steep and shallow slopes, again to support the different requirements of a wide range of species. The pond should be irregular in shape to create bays and sheltered areas
- Trees or tall vegetation should be planted to the north of the pond and far enough back that the pond does not become clogged with leaves. This provides a south facing aspect to the pond and also provides shelter
- Be careful with the disposal of material excavated from the pond area. It should not be used to infill other wetlands
- Ponds will naturally colonise with plant species but it is important to leave a soil base for plant attachment whatever kind of liner has been used. To speed up the process, native plants may be introduced from other ponds. Do not import plants from a garden centre as they are likely to be non-native and potentially invasive to the pond and watercourses in the wider area.

Coastal Habitats

Because Clare has an extensive coastline taking in Galway Bay, the Atlantic Ocean and the Shannon Estuary, the county boasts a wide variety of coastal and marine habitats, many of which are of national and international significance. Some of the more important sites include the Cliffs of Moher, the Kilkee reefs and the Shannon estuary, which is the largest estuary in Ireland and is regarded as the best site in the west for birdlife.

The following coastal habitats will be described in more detail:

- Sea Cliffs, Islets and Caves
- Brackish Water
- Saltmarsh
- Shingle & Gravel Shore
- Sand Dunes
- Rocky Shore
- Sand Shores
- Mud Shores

Harbour at Ballyvaughan

Sea Cliffs, Islets & Caves

What are they?

Sea cliffs, islets (small islands) and sea caves are all natural coastal features. All three are composed mainly of rock, although sedimentary cliffs are common too. They support mainly lichens and salt tolerant plant species such as Thrift, Sea Aster, Sea Plantain and Roseroot.

Pockets of grassland or heath may occur where soil has accumulated. These are important features for birdlife and offer ideal nesting sites for many species such as the Peregrine Falcon, Puffin, Chough, Razorbill, Terns, Guillemots and Gulls. Sand martins make their nests in sedimentary cliffs.

Examples in County Clare: The Bridges of Ross, Loop Head, Cliffs of Moher

Best Practice Management for Sea Cliffs, Islets & Caves

- Keep livestock at least 10 metres away from the cliff edge
- Prevent erosion of the cliff edge by restricting access to the cliff margin
- Avoid parking machinery on the cliff edge
- Don't tip waste material over the cliff edge
- Continue any traditional grazing practices, where applicable
- Sea Buckthorn should not be planted as it is an invasive non-native species
- Don't develop any leisure facilities close to the cliffs
- Don't extract any materials from the cliffs

2

3

1

1. *Cliffs of Moher* **2.** *Bridges of Ross* **3.** *Sandwich Terns*

Brackish Water

What is it?

Brackish waters include lagoons, saline lakes and tidal rivers. Lagoons and saline lakes are bodies of brackish or saline water, which are either completely or partially separated from the sea by barriers of sand, shingle or rock. As a result the salinity can vary considerably. Typical vegetation of such habitat types include combinations of green seaweeds and plants found in submerged aquatic habitats, namely Spiked Water-milfoil, Water Crow-foot and Fennel Pondweed.

The term tidal river refers to stretches of river that are affected to some extent by the tide. All river estuaries are brackish. The River Shannon and River Fergus estuaries are among the most famous coastal wetland habitats in Ireland. Over 50,000 wintering wildfowl are regularly to be found in this area of international importance. It is important globally for its Dunlin, Black-tailed Godwit and Redshank populations, and nationally for many species, including Cormorant, Whooper Swan, Greylag Goose, Lapwing, Curlew and Greenshank. Brackish water also contains many fish species, including Flounder, Bass, Mullet, Smelt and Atlantic Salmon.

Examples in County Clare: Shannon estuary, Fergus estuary and all other river estuaries

2

Best Practice Management for Brackish Water

- Herbicides, pesticides, slurry, fertiliser or farmyard manure should not be applied close to the water's edge
- Avoid cattle grazing and disturbance in the area
- Remove any rubbish or dumped material

3

1

1. *Lower Shannon* **2.** *Greenshank 3. Curlew*

Saltmarsh

What is it?

Saltmarsh is an area of land that is covered by the sea during very high tides. The vegetation found in such places is tolerant of saline soils and periodic flooding. Examples of such vegetation include Saltmarsh grass, Sea Aster, Common Scurvy grass, Thrift and Sea Plantain. The underlying soil is generally composed of silt, mud or peat and is therefore vulnerable to erosion, especially where heavy grazing occurs.

Water features such as pools known as 'pans' and tidal creeks are also common on salt marshes, especially on larger examples of this habitat type. Breeding waders are often found here. Sixteen saltmarshes were recorded in County Clare in a nationwide inventory but they are becoming increasingly rare.

Examples in County Clare: Inagh River Estuary, Carrigaholt, along the Shannon and Fergus estuaries

Best Practice Management for Saltmarshes

- Stock with animals traditionally used to graze the saltmarsh and do not give supplementary feed to the livestock
- The saltmarsh should not be reclaimed, infilled, fertilised, ploughed or reseeded
- Vegetation on the saltmarsh should not be burned
- Seek advice on blocking heavily eroding creeks or water channels, especially in SACs, as permission from the NPWS is required
- Control the spread of scrub and invasive species
- Maintain traditional grazing regimes or stock levels of 1 dairy cattle/ ha or 4 sheep / ha
- Avoid blocking freshwater streams that flow into the marsh

Sand Dunes

What are they?

Coastal sand dunes are formed by windblown sand from sandy beaches. Ridges of sand develop over time parallel to the direction of the prevailing wind. There are three main stages in dune development, as follows:

Embryonic Dunes

The initial stages of sand dune formation take place on the upper section of the seashore and these so-called 'embryonic dunes' are rarely over one metre in height. They generally have no plant cover but form where various grasses tolerant of sandy conditions trap the windblown sand from the beach.

Yellow and White Dunes

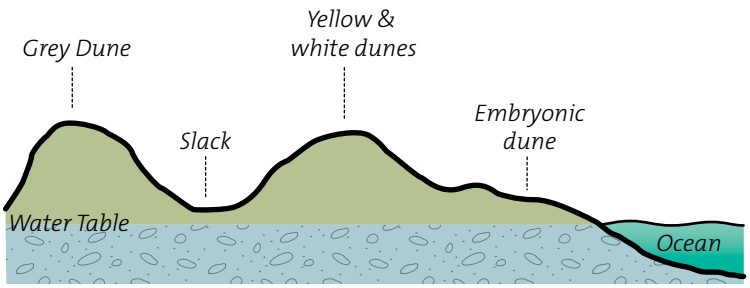
Eventually as the dune stabilises, it develops into a sand hill and a system of dunes and hollows called 'slacks' occur where the water table is close to the surface. The first stage in the stabilisation of dunes depends on the ability of Marram grass to trap sand and grow upwards through new sand deposits.

Vegetation cover is patchy and consists mainly of Marram grass and plants like Sea holly, which are tolerant of the salty conditions. Marram dunes composed of siliceous or acid sand are referred to as Yellow Dunes, while those composed of calcareous or lime-rich sand are referred to as White Dunes.

Fixed (Grey) Dunes

Fixed dunes are stable sand hills with a more complete cover of vegetation, typical of grass and heath habitats. Certain types of orchids are often found on these dunes. Moss and lichen cover is also abundant. The grey colour of some lichens typical of fixed dunes has resulted in the alternative name 'grey dune'. Where vegetation is left to grow unchecked on fixed dunes, scrub and woodland can sometimes develop. The most typical species found are brambles, gorse, hawthorn and blackthorn.

Scrub and woodland development on dunes is rare in Ireland due mainly to grazing and recreation. Sea buckthorn is often planted in order to stabilise dune systems but as it is a non-native species, this practice is not encouraged. The main distribution of sand dune systems in Ireland is along the west coast between the counties of Galway and Donegal.



Sand Dunes

Threats Past and Present

Sand dunes are a very vulnerable and fragile habitat. Many threats exist today that can upset the delicate balance which this habitat requires. Sand extraction was a major problem in the past, where lorry loads of sand were removed for constructing roads and houses. This practice is now illegal. In the past, this problem was added to by an increase in the cutting of the Marram grass, for thatch, during World War I.

More recently, in the late 1970's and 1980's, when agriculture became more intensive and higher stocking rates were encouraged, dunes throughout the country were damaged by overgrazing. Tourism has also compounded erosion problems, with increasing pressure on the sensitive vegetation.

1

Sand Dune Wildlife

Dunes support an interesting array of wildlife. Birdlife includes the Meadow Pipit, Skylark, Stonechat and the Chough is known to feed on the tight turf of dunes, as the intermittent bare patches are good for feeding on ants. Hares and rabbits will be found within the dunes, while butterflies such as Meadow Brown, Ringlet and Common Blue are often found.

The Narrow-mouthed Whorl Snail (Vertigo angustior), listed as declining in Ireland, occurs in relatively high numbers in some of the dunes of County Clare, for example in Doonbeg and Carrowmore dunes. Generally it is found in the wetter slack areas of the dunes and it depends on the maintenance of existing local hydrological conditions. The species is protected by European legislation because of its rarity.

2

As regards the flora of sand dunes, a few interesting species are found in County Clare. The Common Dodder for example can be found in the dunes at Fanore. This is a parasitic thread-like plant found growing on Wild Thyme. Various orchids can be found throughout the dunes; Pyramidal, Bee and Fragrant Orchid in the drier parts and Common Spotted and Marsh Orchid in the wetter areas. Fanore dunes also offer a home to the rare liverwort - Petalwort, which is a protected species, under the Habitats Directive.

Clearly, sand dunes are more than just an accumulation of sand, they are complex living systems. For this reason, they are protected under Annex I of the EU Habitats Directive, with some dune types being a priority habitat, for example Grey Dunes.

3

1. *Common Blue Butterfly* **2.** *Skylark* **3.** *Dunes by Fanore*

Best Practice Management for Sand Dunes

Many sand dunes have traditionally been used as grazing land for livestock. This is often a necessary part of their management and is important in preventing the build up of scrubby vegetation on otherwise grassy dunes. The use of these areas for agriculture, however, can also lead to erosion, nutrient enrichment and damage the delicate flora of the dunes. In many areas, public access also poses an additional erosion threat to the dunes. If a few management guidelines are followed, these threats to dunes can be minimised.

- Winter graze with cattle or horses from September to March only, to allow dune species to flower and set seed. Avoid using sheep, as their feet cut the sod resulting in erosion of the dune
- Continue traditional low density grazing patterns where no damage is evident to the dunes. In eroding areas, avoid exceeding the recommended stocking rate of 0.5 to 1 LU/ ha
- Don't give supplementary feed to livestock, to prevent nutrient enrichment from introduced feed
- Control the rabbit population, where necessary
- Cut and remove invasive plant species such as Sea buckthorn
- Don't apply fertiliser or herbicides to the dunes
- Waste or materials should not be stored on the dunes
- Prevent erosion by limiting recreational and other activities which may damage the dune system. This includes the use of motor vehicles and horses
- In sensitive areas public access should be restricted to prevent erosion. It may be necessary to fence off areas and provide boarded paths
- In areas where damage has occurred and the sand has 'blown out', repairs may be made by fencing off the downwind end of the hole to trap sand that is blowing away. Fences can be made out of chestnut paling, synthetic mesh, pieces of brushwood or anything with the ability to prevent sand from blowing away
- Sand should not be removed from the dune system

Examples in County Clare: Doonbeg, Fanore, Lahinch

1. *Pyramidal Orchid*

Shores

Shingle & Gravel Shores and Rocky Shores

What are they?

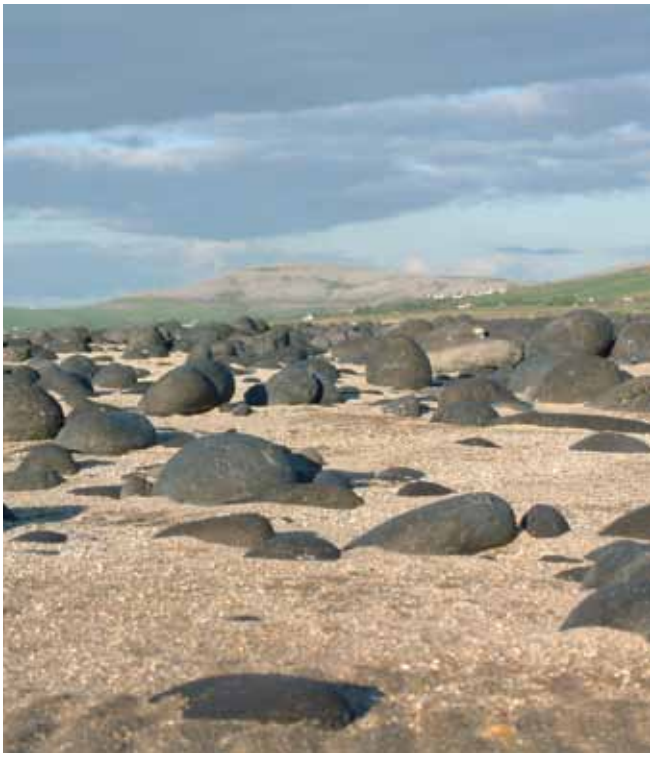
Shingle and gravel shores are found at exposed or semi-exposed coastal locations and consist of loose rocky material in the form of shingle or gravel. The particle sizes of these materials are somewhere between coarse sand and boulders. Various plants tolerant of this type of coastline grow along the upper edge of the shore. Rocky shores are composed of rock outcrops.

The amount of wave action determines the type of wildlife present on rocky shores. On the extreme upper shore, the rocks are usually dominated by lichens, with grey lichens occurring above the yellow lichens. Black lichens form a band at the base of the lichen zone. Exposed rocky shores often support dispersed plants typical of dry land such as Thrift.

Rock Pools and Wildlife

Rock pools are an important feature of rocky shores as they support a variety of plant and animal life, depending on their position in relation to the tide. Wildlife within rock pools and on rocky shores includes crabs, anemones, starfish and sea-urchins. On the upper shore, pools are less saline and support a range of green seaweeds. In the mid-shore area, crust-like coralline algae are more common.

2



Brown seaweeds such as bladder wracks and kelps are more typical of deeper pools on the lower shore. These seaweeds were often used as precious fertiliser by local farmers. Birdlife along these shores can be quite interesting with species such as Rock Pipit, Oyster Catcher and Turnstone present. Purple Sandpiper is a winter visitor to our shores and headlands. They acquire a purple sheen on their grey feathers in spring, which can only be seen at close range. Quilty is particularly well-known for the Purple Sandpiper.

Examples in County Clare: Between Carrowmore and Spanish Point, The Flaggy Shore, Burren, Quilty and Kilkee

1

1. *Rinnville Bay near Kilcredaun at the Mouth of the Shannon* **2.** *Shore rocks in the Burren*

Sand Shores and Mud Shores

1

What are they?

Sand shores are formed primarily of coarse, medium or fine-grained sand with some scattered shell and stones on the surface. Some vegetation may grow along the strandline, on the upper shore area where seaweed is deposited by the tide. However, any mobile sand will not be capable of supporting plant life. The lower shore is dominated by animal life such as crabs, bristle worms and some shellfish such as Thin tellins. The lower shore may have some cover of Eelgrass. The shoreline is owned by the State.

Mud shores are composed of fine sediments and are most common on sheltered sections of the coastline and estuaries. They often take the form of raised mudflats criss-crossed by a network of shallow watercourses. Bristle worms, bivalves and mud snails are commonly found in this habitat.

Vegetation on mud shores is often similar to that of salt marshes but is more open and dispersed in character. The Brent Geese which visit Ireland during the winter after breeding in the Arctic, and the Barnacle Geese who also overwinter here, generally feed on coastal grasslands, primarily Eel Grass and roost in mudflats.

Examples in County Clare: Fanore, Lahinch, White Strand and Clonderalaw Bay on the Shannon Estuary

Best Practice Management for Shores

- Beach material (i.e. gravel, stone or sand) should not be removed from the foreshore or above the high tide mark
- Materials should not be dumped or stored on the shore
- Remove washed up or dumped waste
- Avoid driving over the beach

2

1. *White Strand* **2.** *Mud Shore at the Fergus Estuary*

Farmer Profile
John O'Connell

John O'Connell was born on Inishmore or Deer Island as it is more commonly known locally, one of the largest islands near the west shore of the River Fergus estuary. The Fergus Estuary is a branch of the Shannon Estuary that juts north towards Ennis. There are many islands in the estuary and at low tide vast areas of mudflats are exposed - a heedless moment on a falling tide can carry a heavy penalty. John O'Connell is probably among the very few Irish farmers that need to carry tide tables on their person at all times.

John was eight when he moved from the island to the mainland near the village of Ballynacally but his family continued to rear beef cattle on the 65 acres between the 'out farm' on Deer island and the mainland farm, 7km to the north in Drumquin. He worked full time in Shannon until 1998, but continued to manage the farm on a part time basis. He is now retired but continues to farm the island with six other farmers.

Island Farmer

Farming enterprises on the island today are mainly cattle with some sheep and a few horses and goats. There is no tillage on any of the islands in the estuary. John has a herd of 37 dry cattle, 12 of which are grazed on the island at any one time. They are brought over to the island in the spring to fatten up and taken off in the winter when they are sold at the mart or sent to the factory. A ramp and holding pen are located on the pier at Rosscliff, Ballynacally, so livestock can be held before they are loaded on to a flat-bottomed boat for transportation to the island. John has completed REPS 2.

Past and Present

The islands of the Fergus estuary have a solid limestone base and the land is therefore very rich and fertile. It is no surprise then that the farmers of south Clare have braved the reckless currents of the estuary and farmed these islands for centuries. Records of the island from Clare County Library, dating back to 1837 describe farming on the island as '493 statute acres, which are nearly equally divided between pasture and tillage'.

The only inhabitants of Deer Island today are the livestock and the large numbers of wintering wildfowl the estuary attracts each year. Like John, the farmers of Deer Island all live on the mainland. The last full-time resident of Deer Island was Bridget-Ann Tuohy who died in August 2004.

1

1. *Fergus Estuary*

1

2

Designations

Deer Island is included in the Fergus Estuary and Inner Shannon, North Shore SAC, NHA and SPA designation. Due to the large numbers of nesting birds on the Island, the NPWS have excluded an area of John's pasture land for nesting birds.

Diverse Farm Habitats

The remainder of John's farm on the mainland is covered by a diverse array of habitats including Hedgerows, Wet Marsh, Reedbed, Swamps and Intertidal Mudflats. An area of wetland, which floods in the wintertime due to the proximity of the estuary, is a valuable habitat for local wildfowl populations. This area has been fenced off to prevent cattle access under his REPS plan. As well as wildfowl, other wildlife which are found on John's land include the Fox and Pine Marten. There is a well-established Badger sett on the farm in Drumquin. Two derelict buildings on the farm also provide potentially valuable nesting habitats for Barn Owls and Bat species.

1. *Fox* **2.** *Badger*

Species Profile
Otter

Latin Name: Lutra lutra
Irish Name: Madra uisce or Dobharchú

Otters are one of the largest mammals in Ireland. They are found in a variety of aquatic habitats, both freshwater and marine. Although mainly fish eaters, Otters also prey on small mammals, shellfish and waterbirds. They are territorial animals who live alone, with linear territories that often follow stretches of water.

Marking their Territory

Territories of male Otters tend to be larger than those of the females with the size of territory often depending on the availability of food. Although Otters are rarely seen, their presence can be detected as they mark their territories by depositing scented droppings, or spraints, in prominent locations.

These spraints can be found on rocks, small islands and ledges under bridges, and have a musky smell, which is not unpleasant. Spraints can also be recognised because they contain fish scales, shell and bones. Other signs of Otters presence include flattened riverside vegetation where otters slide down the bank into the river.

Nocturnal Creatures

Otters burrow into riverbanks to form holts, which are often situated in natural crevices in the riverbank formed by tree roots. They are generally nocturnal and are most active just after dark and just before dawn. If a group of Otters are seen together it is most likely to be a mother with a young litter, as young Otters stay with their mothers for about six months before making new territories of their own.

Threats

The major threats to Otters in Ireland are road kill, pollution of waterways and destruction of habitats by clearing bankside vegetation and canalising riverbeds as part of arterial drainage schemes.

Protected Species

Otters are protected under Irish law by the Wildlife Act and are also listed in the EU Habitats Directive as a species of European significance requiring protection. Ireland has a higher population of Otters than many other European countries because more of their habitats have been maintained here, whereas in other countries industry and drainage have led to the destruction of Otter habitat. This gives us a greater responsibility to maintain our Otter population, learning from the mistakes of other countries.

Woodland Habitats

Woodland & Scrub

Woodlands are habitats dominated by mature trees. Throughout history woodlands have been an important resource, providing humans with raw materials for tools, food and shelter. Nowadays the environmental and ecological significance of our woodlands has gained more and more attention. With increases in pollution and greenhouse gas emissions, the importance of woodlands in oxygen production and carbon storage is also being recognised.

In terms of biodiversity, woodlands support a huge range of wildlife including mammals, birds, insects and other smaller plants. Large woods can contain up to 5,000 species of plants and animals. Much of the Irish countryside was covered in deciduous woodland until the 18th century.

However the area under trees declined sharply as land was reclaimed for agriculture and the timber was removed for industrial purposes. By the beginning of the 20th century it is estimated that less than 1% of the national land area was covered by woodland or forest. In recent times, there has been a major effort to encourage tree-planting in Ireland and to maintain any existing woodlands.

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Types of Woodland Found

There are various types of woodland in County Clare including semi-natural woodland, wet and bog woodland, modified/non-native woodland and scrub. County Clare is home to some important remnants of native woodland such as at Cahermurphy Nature Reserve, with some of the best woodland found at Mullaghmore in the Burren National Park.

Hazel scrub is becoming increasingly common in the Burren as farming declines in marginal areas. This has serious conservation implications as it conceals important limestone pavement and species-rich grassland habitat. The management of woodlands to maintain and enhance biodiversity is of great importance, given the scarcity of this habitat type in the Irish countryside.

The following woodland types will be described in more detail:

- Semi-natural Woodland
- Wet and Bog Woodland
- Modified/Non-native Woodland
- Scrub

1. *Oak tree* **2.** *Woodland*

Semi Natural Woodland

What is it?

Fully natural native woodland is not thought to exist any longer in Ireland. It is presumed that all stands of native trees have come under human influence at some stage or another. At the end of the last Ice Age, trees began to spread gradually across Ireland, eventually giving rise to natural, native woodland that covered much of the island. This native woodland, comprised of species such as Oak, Ash, Elm, Yew and Holly, has now more or less disappeared, chopped down for fuel and for land clearance in preparation for agriculture.

Clearance of the woods began a long time ago with the arrival of the first farmers to Ireland some 6,000 years ago. The arrival of later immigrants with more sophisticated tools resulted in the loss of almost all of the natural woodland in Ireland by 1700. Semi-natural woodland generally originated later and its development has been influenced by varying degrees of management.

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Semi-natural woodland is woodland, which does not obviously originate from planting. The spacing and mixture of tree species and ages of trees indicate that the woodland has developed in a more or less natural pattern over a long time period, with some human intervention along the way.

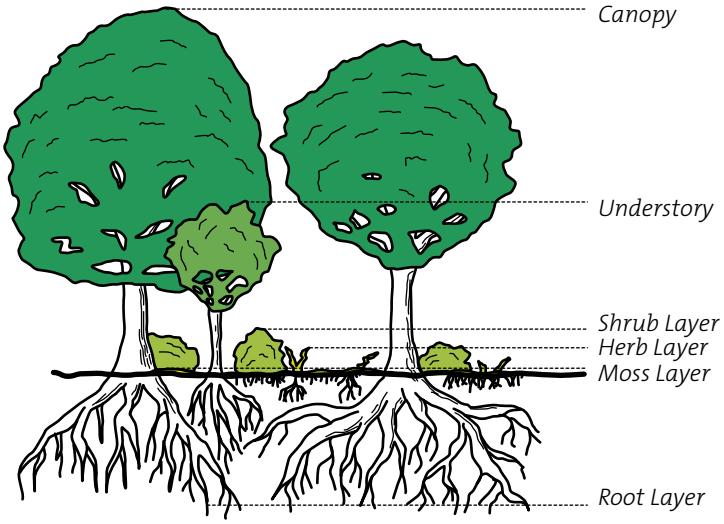
These woodlands are composed of native species of trees and shrubs such as Oak, Ash, Rowan, Hazel and Holly. They are also home to a diverse collection of specialised smaller plants, flowers and mosses, which are tolerant of the shade provided by the woodland canopy. Here you will find Wood Anemone, Bluebell, Lords and Ladies, Pignut and a variety of ferns. A healthy natural or semi-natural woodland consists of various layers, as shown in the diagram below.

Bog and Wet Woodland

Woodland growing in wet places or bogs is often called carr. It is a type of semi natural woodland as it typically seeds itself without planting. It is composed mainly of alder and willow. Birch can also appear at a later stage of the woodland's development. Wet woodland often forms on old cut-over bogs or where natural springs occur.

Examples in County Clare: Spring-fed Woodland at Killaloe, Alder carr on the wetland edges of the Shannon

These woodlands provide a good habitat for many birds, for example the Irish Jay, Goldcrests, Treecreepers, Tits, Warblers and Finches. They offer important feeding sites for many animals also, including bats, Pine Marten, Red Squirrel and Pygmy Shrew.



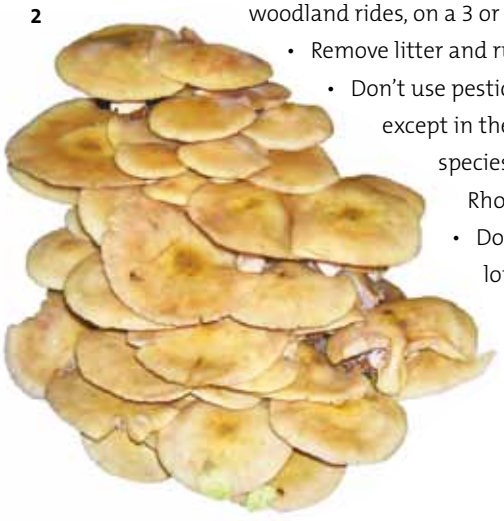
1. *Bluebell Woodland* **2.** *Red Squirrel*

1

Best Practice Management for Semi Natural Woodland

- Allow dead wood to remain. This material provides good habitat for small organisms that in turn are consumed by birds and other animals
- Allow natural regeneration of trees. Protect seedlings by fencing them off
- Control wild animals such as deer and goats by legal methods
- Selectively remove non-native / invasive species such as Laurel, Rhododendron, Beech and Sycamore. These species will shade out native woodland species resulting in less diversity
- When felling trees, do so in winter and fell smaller groups or stands to minimise the effect on the woodland
- Maintain a range of tree heights and areas of open vegetation to encourage wildlife with different habitat requirements
- Maintain clearings and ponds and cut back vegetation along woodland rides, on a 3 or 5 year rotation
- Remove litter and rubbish
- Don't use pesticides or herbicides except in the case of invasive species such as Rhododendron and Laurel
- Don't burn brashings or lop and top in the wood

2



Best Practice Management for Wet Woodland

- Prevent livestock from poaching the woodland floor excessively
- Don't drain the area or alter the water levels

New Planting

New planting, especially in areas adjoining woodland, is a good way to promote wildlife. Use the following guidelines and refer to the management techniques later in the Chapter.

- Plant local strains of native species
- Exclude livestock and use tree guards
- Create a 'scalloped' or uneven woodland edge to create sunny sheltered bays for wildlife to flourish

1. *Wet Woodland* **2.** *Woodland Fungus*

Non Native Woodland

What is it?

Native tree species are those that were present before the last Ice Age. Non-native woodland in Ireland is dominated by conifer plantations. However some non-native broadleaved plantations containing species such as Sycamore and Beech can also be found. Large areas of land, especially marginal farmland, have been planted with introduced conifers including Lodgepole Pine, Norway Spruce and Sitka Spruce.

Often these woodlands are 'monocultures', meaning that they are composed of a single species, whereas a semi-natural woodland will have many different species of trees, shrubs and other plants. This lack of variety means that conifer plantations have a much lower wildlife value in comparison with semi-natural woodlands.

Conifer plantations also lack variety in size and age, as they are planted and felled in large areas. For economic reasons they are usually so densely planted that nothing will grow beneath the canopy. Because they are evergreen, they retain their needles all year round. This makes it even harder for light to get through the canopy to other plant layers.

Unlike our native trees, the leaves or 'needles' produced by conifers do not break down easily and they make the ground acidic. As a result, worms and other animals cannot break down litter easily, meaning that nutrients are not returned as effectively to the soil.

Conifer plantations cover 0.5 million hectares of the Irish countryside and approximately 2,000 hectares in County Clare. They have some minor importance for wildlife as refuges for Pine Martens and as lookout posts for birds. Increasingly, Hen Harriers have been nesting in young conifer plantations. However, in general this modified or non-native woodland does not provide good habitat for the majority of woodland plant and animal species.

Best Practice Management for Non Native Woodlands

- Maintain areas of permanent open space such as glades (or clearings) and rides (or tracks). These areas support other habitats such as grassland or heath, providing diversity for organisms living in the forest
- Allow some dead wood to remain. This material provides good habitat for a range of organisms that in turn are consumed by birds and other animals
- Manage the woodland edge for wildlife by planting or allowing scrub to develop around the forest. This provides a variety of habitat for birds and other animals
- Create a 'scalloped' or uneven woodland edge to create sunny sheltered bays for wildlife to flourish
- Implement the Continuous Cover Management (CCM) approach where possible (i.e. do not clear fell large areas)
- Leave a generous buffer zone between conifer plantations and streams and rivers. Conifer 'needles' release acids as they decompose which can increase the acidity of watercourses and water bodies downstream, seriously impacting on aquatic life. For this reason, no more planting near Doolough is permitted.
- Replace with native trees
- The Forest Service has published Forest Biodiversity Guidelines, which should be incorporated into new forest plantations.

Scrub

What is it?

Scrub is dominated by shrubs or small trees, which are native to the local area. Typical examples are Blackthorn, Whitethorn, Hazel and Gorse. All the vegetation is generally less than five metres in height. Different categories of scrub grow on different types of soil and rock substrate. Gorse scrub grows well on more acidic soils as in the west of Clare, while Hazel scrub prefers limestone or alkaline soils such as those found in the Burren.

1

The importance of scrub and hedgerows should not be underestimated as in many cases they act as an alternative to semi-natural woodland, which is scarce in most parts of the countryside.

Areas of scrub are used by a variety of birds, such as Tits, Stonechat, Finches, Wren, Robin, and Dunnock, and similarly by the Pine Marten. However in certain situations scrub encroaches on other more valuable habitats such as limestone pavement in the Burren. This conservation dilemma is not easy to solve but in general it is recommended that scrub be controlled where it is encroaching on a Priority or Annex I habitat under the EU Habitats Directive. It is wise to seek advice before undertaking any scrub clearance.

Examples in County Clare: Burren National Park, Mullaghmore (State-owned), Keelhilla, Slieve Carron Nature Reserve (State-owned), West Clare - Gorse

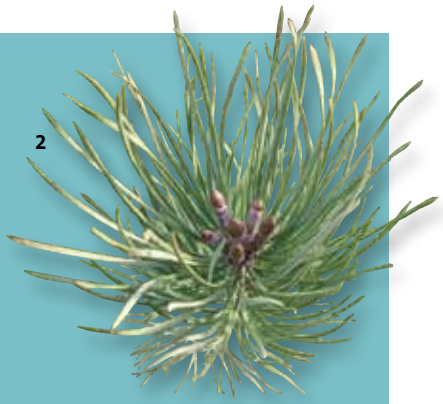
2

Best Practice Management for Scrub

- Maintain scrub by controlled grazing by goats, horses or cattle
- Remove Rhododendron, laurel and other invasive species. These species shade out native woodland species resulting in a reduction in diversity
- Allow small patches of scrub to develop on calcareous (limestone) soils
- Don't remove scrub by bulldozing or other methods
- Retain scrub close to rivers, woodland or forestry
- Don't reclaim land covered by scrub, with the exception of the Burren where scrub should be controlled
- Avoid the bird nesting season when removing scrub (1st March – 31st August)
- Retain all juniper scrub as this habitat type is quite rare
- Only use herbicides to eradicate invasive, non-native species such as Rhododendron or Laurel

3

1. *Stonechat* **2.** *Gorse* **3.** *Bracken*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Species Profile
Native Trees

Species that were present in Ireland before the last Ice Age are generally considered to be native. Analysis of ancient pollen grains preserved in deep peat deposits can tell us what species were found in this country thousands of years ago. It is important to differentiate between native trees, which arrived in Ireland naturally, and non-native or alien trees which have been introduced by humans for their ornamental or timber value.

Biodiversity Value

Many commonly found trees of the modern countryside, such as Beech, Horse Chestnut, Sycamore and all coniferous trees except Yew, Juniper and possibly Scots Pine, have been deliberately introduced to Ireland. Native species are generally more beneficial to wildlife than non-native or introduced species, since fauna have adapted to live with native plants over time (e.g. there is a greater diversity of insects found on native species). These insects in turn provide a food source for birds and mammals.

Sourcing Natives

When sourcing trees and shrubs, it is advisable to consult local nurseries and to purchase local strains of native species. Cultivated varieties of native trees, such as 'corkscrew' hazel are not recommended as they can cross pollinate and dilute wild strains. Coillte have a nursery in County Carlow, which sells native trees.

For more information on native trees, see the publication Buds of the Banner - A Guide to growing Native Trees and Shrubs in County Clare produced by Rural Resource Development and Clare County Council (2007). A list of suppliers of native trees can be found in the appendices.

Irish Seed Savers Association

The Irish Seed Savers Association (ISSA) based in Scariff, County Clare specialises in the propagation of native strains of fruit trees according to organic standards. Since its establishment in 1991 it has developed a seed bank containing more than 400 rare and endangered vegetable varieties and a native Irish apple collection containing over 200 varieties.

Native Woodland Scheme

Under the Native Woodland Scheme, substantial grant aid is available for the establishment and conservation of native woodlands. Contact the County Clare Teagasc Forestry Advisor for further information.

'Buds of the Banner - A Guide to Growing Native Trees and Shrubs in Clare' is a locally available publication which gives plenty of practical advice on sourcing and planting native trees. Produced by Rural Resource Development and Clare County Council, it is available from both organisations, as well as local garden centres and bookshops.

3


1

1. *Guelder Rose* **2.** *Scots Pine detail* **3.** *Buds of the Banner*

1. *Young Oak* **2.** *Hawthorn Berries* **3.** *Honeysuckle* **4.** *Rowan* **5.** *Elm* **6.** *Blackthorn / Sloe* **7.** *Scot's Pine* **8.** *Holly* **9.** *Ash*

Farmer Profile
Brendan Considine

Brendan Considine is a part-time farmer who works as an auctioneer for the local marts and also does valuations of livestock for the Department of Agriculture. Brendan, originally from Ennis, moved to Kilmurry, near Sixmilebridge, in 1991. His farm is located one mile from the village of Kilmurry, where he rears yearling cattle, fattens them and sells them at the mart. The animals are kept in over winter and fed baled silage. Similar to many smaller and part-time farmers, Brendan contracts out work on the farm including silage cutting once a year. Slurry from his slatted shed is also spread by local contractors as required.

Farm Habitats

As a part-time farmer, Brendan has been able to devote some time to managing the habitats on his farm. The previous owner did not manage the land intensively which has meant that although there was a lot of work to be done to get the farm up and running again, it also meant that there are many wildlife features remaining. These include lakes, reedbed, marsh, scrub, parkland trees and hedgerows.

Lakes

There are three medium sized lakes on Brendan's land. As part of his REPS plan, Brendan was required to fence off water courses to prevent access by animals. There are areas of marsh and reedbed habitat surrounding two of the lakes, which were not drained or grazed in the past. Brendan has retained these areas as wildlife habitats and these are included within the fenced off areas. They provide excellent habitat for wetland birds such as Snipe, Reed Bunting and Sedge Warbler. This buffer is also retained when spreading slurry on the land, which serves to protect the water quality of the lakes.

1. *Reed Bunting*

Tree Planting

Brendan and his wife Bernadette have a keen interest in woodland management and wildlife, and have adopted a number of conservation measures on the farm. They have planted a variety of conifers and hard wood trees around the farm, including native species such as birch, ash, oak and willow and non-native species such as beech, sycamore, and japanese larch. In total 2.7 hectares have been planted in two blocks with 0.8 hectares dominated by conifers and 1.9 hectares under broadleaved plantation since 1993.

In 2001 a beech hedge was planted along the driveway and on the occasion of the birth of their son, Séan, in 2005, Brendan and Bernadette planted a special cluster of oak at the front lake. Brendan has had some difficulty, however, with the young oak trees, which he planted on various ditches around the farm over the years as they are a particular favourite of the local hare population. Tree guards have provided some protection to the young trees but some determined hares have managed to overcome this obstacle.

Farmyard Features

Vernacular farmyard features such as gates and gateposts are not protected under law but make the countryside unique. Brendan has retained a number of these traditional architectural features on his farm, including some double and single original iron gates and gate posts, which have a distinct heritage value. Maintenance of these older structures also helps to create diversity in the local landscape.

Farmer Profile
Martin Murphy

Over four generations of the Murphy family have farmed in Cahermurphy, Kilmihil, in southwest Clare. Martin Murphy who now runs the farm has a keen interest in forestry, although historically, turf cutting and dairying were the main agricultural enterprises on this farm. While he continues to keep livestock, half of the farm is now under plantation forestry.

Conifers

The plantation in Cahermurphy is dominated by Sitka Spruce, as is much of the forestry in Ireland. It is relatively easily established and will grow well under a wide range of conditions. It is tolerant of exposure and can grow in a wide range of site types, from very fertile mineral soils to poor peaty soils, like those on Martin's land. Martin has planted the better-drained soils with Noble Fir, which are sold for Christmas trees to the local community.

Broadleaf Planting

Plantations of coniferous trees can be of limited biological diversity value, whereas the inclusion of native and broadleaf species in plantations has benefits in terms of landscape, amenity, heritage and habitats. The introduction of the Forest Service grants in 1997 encouraged the planting of a diversity of species and included a 10 per cent broadleaf planting requirement (site permitting) on all sites. Under this scheme Martin has planted a variety of broadleaved species including Alder, Silver Birch, Ash and Sycamore. These mixtures increase crop biodiversity and also enhance the visual appearance of Sitka Spruce woodlands in the landscape.

Hen Harriers

When Martin first started planting in 1982, he planted on his own, with a tractor and plough. Every year he removes and replants one hectare of trees and supplies locals with timber fuel. This type of planting regime can be of great benefit to wildlife as it leads to a continuous series of age classes thus creating a series of different habitats for many species including pine martins, squirrels and Hen Harriers.

2

1

1. *Kilmihil Farmland* **2.** *Hen Harrier*

1

Hen Harriers are one of Ireland's most rare birds of prey and are protected under European and Irish law. They prefer to nest in young conifer plantations and are known to forage in a mix of upland open and plantation habitats including plantations of various ages, rough grassland, heath/blanket bog, and improved grassland habitats, all of which are represented on Martin's farm.

REPS Restriction

Martin is currently in REPS 3, undertaking a number of environmental and landscape measures including Hedgerow Rejuvenation and Management of an Archaeological site. He is currently replanting the hedgerows on his farm with Hawthorn and Ash. This increases the biodiversity of the farm and also maintains wildlife corridors. Martin has an old slate quarry on his land, which he used for road and path maintenance around the farm. Under his new REPS plan they discovered an archaeological feature adjacent to the quarry and he is therefore prohibited from extracting stone in the future. Martin has found this restriction to be an inconvenience as well as a financial loss. Unfortunately there are no grants available to farmers with archaeological sites.

Self Sufficiency

Martin believes in using the resources available to him on his farm. He makes good use of the gradient of his land by providing a gravity fed water trough for his cattle. This provides a consistent clean water supply for the cattle and allows him to restrict cattle access to trenches and drains, which helps prevent bank poaching and water contamination. He also makes use of felled trees on his land, using the better trunks to make pole gates that are robust and easily maintained.

Martin's farm has been used in Teagasc training events, including an occasion where children from a local school visited the farm and planted an Oak tree on the land to mark the occasion.

Buffer Zones

The most significant change that Martin has seen in forestry over recent years is in relation to buffer zones. When he first started planting he could plant up to the edge of drains and streams, whereas now he has to maintain a much larger buffer zone. He realises that this is necessary to protect water quality, which is essential to all farms for both humans and animals.

1. *Gravity-fed water trough*

Management Techniques
Tree Planting

What Trees to Plant?

Consider the conditions of your site. Note the local soil type, drainage, exposure, the space available and whether the site is inland or coastal. Look around at what is growing locally in hedgerows and treelines and use them to guide your decision. It is best to plant local strains of native species as they are better for wildlife and are also better suited to your locality. The table on the following page gives some tips on choosing the best tree species for your site.

Where to Source Trees?

If possible plant seeds or cuttings that come from semi-natural woodlands in the local area. Collecting local seeds and growing seedlings is inexpensive but time-consuming. Local nurseries or Coillte supply local strains of native species from throughout the country. When ordering, check the Latin name to make sure you are getting native trees.

When and Where to Plant Trees?

Broadleaved trees are dormant from November to March, so this is the best time to plant. Don't plant when the soil is frozen or waterlogged. Trees grown in containers can be planted all year round so long as they are well watered afterwards. Trees can be planted to renew existing woodlands or to create new woodland habitats. Shelterbelts help to shield gardens, farm buildings and houses from the wind. Trees can be planted anywhere - on unused land, to supplement hedgerows, on steep slopes, along roadways or in field corners. Look around your farm.

How to Look after Young Trees?

For the first four years after planting out, young trees need to be tended. It is important to remove weeds and rubbish from around the base and any broken or diseased branches or shoots. Stake and ties should be maintained where they are still required. Plastic tree shelters are a good idea to prevent damage by rabbits, hares and perhaps even deer. Where larger areas are to be planted rabbit-proof fencing may be required.

1

2

3

1. *Dig a hole larger than the root area of the tree* **2.** *Ensure there is enough room to spread out the roots* **3.** *Firm with your foot and water well*

1

How to Plant Trees?

The most convenient size of young tree to plant is the bare-rooted 'whip', which is roughly 1 metre in height. Whips are cheaper, easier to transport and they do not require staking. Before planting out, keep the roots covered by plastic or soil in a trench to prevent drying out. There are two methods of planting young trees: notch planting for bare-rooted whips and pit planting for small nursery standards.

Notch planting

Involves making two cuts into the ground with the full length of the spade to create an 'L' shape. A triangular piece of sod is levered up so that the roots of the whip can be inserted into the cut. The soil is then firmed down around the cut and the base of the young whip.

Pit planting

Involves digging a hole large enough to contain the whole root system. A short stake is inserted into the pit and the top sod is placed back grass side down. The tree is placed in the hole to the same depth as it was previously planted. Return the soil to the hole, refilling the best soil first. Shake the tree to settle the soil around the roots. Firm down the soil firmly. Mulching around the base of the tree will help prevent excessive weed growth.

Grants

The Forest Service is responsible for the allocation of grants for tree planting. Contact your Teagasc Forestry Advisor for information on your entitlements if you are planning to plant areas greater than 0.1 hectares. Under the Native Woodland Scheme, substantial grant aid is available for the establishment and conservation of native woodlands.

FEPS (Forestry Environment Protection Scheme) is a new grant scheme which offers REPS farmers the opportunity to plant forestry for environmental benefits. More information is available from the county's Teagasc Forestry Advisor.

2

1. *Mulching with grass clippings helps keep weeds down* **2.** *Vigorous grass growth will compete with young trees for nutrients and water*

The following table provides information regarding native tree species in Ireland and their suitability for planting in various soil and site types. Use this as a guide when choosing trees to plant on your farm.

Tree species	Irish Name	Suitable Conditions	Environmental Value	Timber Value
Alder *Alnus glutinosa*	Fearnóg	Wide variety of soils, Tolerates wet/damp soils, smoke or pollution and shade	Supports many insects. Seeds eaten by small birds	Poor
Ash *Fraxinus excelsior*	Fuinseóg	Wide variety of soils, Tolerates wet/damp soils, smoke or pollution and shade. Suitable as individual tree	Rich undergrowth. Seeds eaten by birds and small mammals	High. Hurleys
Aspen *Populus tremula*	Crann creathach	Tolerates wet/damp soils, smoke or pollution and shade. Invasive. Not near service buildings	Rich in insects	Matchwood and pulp
Blackthorn *Prunus spinosa*	Draighean	Wide variety of soils, Suitable for hedging – good for stock-proofing, Tolerates smoke or pollution, exposed and coastal sites, Invasive	Good nesting cover. Rich in insects including bees	Hard. Ornamental purposes
Crab Apple *Malus sylvestris*	Crann fia-úll	Wide variety of soils, Suitable for hedging and as individual tree, tolerates smoke and pollution	Provides food for insects and birds	Small. Used for carving
Birch: Downy & Silver *Betula pubescens & Betula pendula*	Beith chlúmhach & Beith gheal	Wide variety of soils, Tolerates wet conditions and smoke or pollution, Suitable as individual tree	Foliage rich in insects, seeds consumed by birds, rich ground vegetation	Hard. Not commonly used
Hawthorn (Whitethorn) *Crataegus mongyna*	Sceach gheal	Wide variety of soils, Suitable for hedging and as individual tree, tolerates smoke and pollution and shade	Excellent. Flowers attract bees. Insects abundant on foliage. Berries attract mammals and birds	Hard. Ornamental use only
Hazel *Corylus avellana*	Coll	Wide variety of soils. Suitable for hedging, tolerates smoke and pollution	Rich in insects. Nuts attract small mammals	Pliable
Oak: Sessile & Pedunculate *Quercus petraea & Quercus robur*	Dair ghaelach & Dair ghallda	Wide variety of soils. Suitable as an individual tree only on large sites	Richest tree for insects in Ireland. Acorns attract birds and mammals	Good. Hard, white wood. Valuable for inlays, veneer
Rowan *Sorbus aucuparia*	Caorthan	Wide variety of soils. Tolerates wet or damp conditions. Suitable for hedging and as an individual tree, tolerates smoke and pollution and shade	Good. Flowers and berries attract insects and birds	Poor
Scots Pine *Pinus sylvatica*	Péine albanach	Wide variety of soils. Suitable as an individual tree	Attracts insects. Seeds consumed by birds and squirrels. Owls use them to breed and roost	Known as 'Red deal'. Furniture and Building
Whitebeam *Sorbus aria*	Fionncholl	Suitable as an individual tree. Tolerant of smoke, pollution, shade, coastal locations and thin soils. Prefers dry soils but tolerates damp conditions.	Good. Flowers attract insects and berries consumed by birds	Not commonly used
Wild Cherry *Prunus padus*	Crann silín fiáin	Wide variety of soils. Suitable for hedging and as an individual tree.	Good. Blossoms attract bees and fruit consumed by birds.	High quality. Used for furniture.
Willow species *Salix sp.*	Saileach	Invasive. Not suitable near buildings or services.	Early flowers valuable for insects and bees. Good nesting cover on wet sites	Pliable light timber. Used for basket-making
Wych Elm *Ulmus glabra*	Leamhán sléibhe	Tolerates smoke, pollution and shade.	Rich in insects and nectar attracts bees. Insects and seeds consumed by birds.	Furniture, coffins
Yew *Taxus baccata*	Iúr	Wide variety of soils. Suitable as an individual trees. Tolerates smoke or pollution and shade.	Fruit attract birds such as thrushes	Hard

Cultivated Land and Built Habitats

Cultivated and built land has been stripped of its natural and semi-natural vegetation for the purposes of providing shelter, food or infrastructure for humans. These man made habitats generally have a lower ecological value than semi-natural habitats.

However buildings can provide 'niches' for species such as bats which roost in older buildings, and nesting sites for birds. Arable and tilled land provides valuable food sources for birds such as Yellowhammer and Finches.

The following cultivated and built habitats will be described in more detail:

- Buildings
- Horticultural Land
- Arable Crops
- Tilled Lands

1

1. *Bullfinch*

Buildings

Manmade structures such as dwelling houses and farm outhouses offer important links to the past. Generally, they are not renowned for their wildlife value. However, some buildings can provide suitable habitats for bats and birds such as owls, swallows, swifts and housemartins.

All birds and bat species are protected under Irish or EU legislation. In general, the wildlife value of a building increases with age and proximity to other habitats. Important features in buildings for bird nests and bat roosts include eaves, access holes and roof spaces.

Clare's architecture reflects its predominantly rural and agricultural economy. Most farm buildings are vernacular in style. Vernacular architecture is generally seen as architecture built by ordinary people to suit their own needs, using local materials to hand. As such, vernacular housing expresses variations from region to region and locality to locality, depending on the different needs and location of the inhabitants.

Thatch would be most well known type of vernacular roof covering but other types include the stone slate roofs of West Clare known as Liscannor or Moher slate which are quarried from the local thin-bedded sandstone. It is the policy of Clare County Council to protect vernacular architecture.

Examples in County Clare: Widespread

2

Best Management Practice for Buildings

Ecological Advice

- Maintain old stone buildings and disused buildings
- If you are thinking of renovating an old stone building, ask NPWS or the Conservation Officer, Clare County Council for advice
- Don't use preservative chemicals to which bats are sensitive. The NPWS can provide a list of approved preservatives
- Don't disturb bats if they are present in disused buildings, contact the NPWS

1

3

1. *Thatch, a common vernacular roofing material* **2.** *Swallow* **3.** *Maintain stone and disused buildings*

1

3

Built Heritage Advice

- Seek advice from the Conservation Officer before renovating old buildings
- The Conservation Officer will have information on traditional methods of repair which are more suited to the long term maintenance and survival of old buildings
- The Conservation Office may be able to grant aid the repair and restoration of old buildings. There are a number of grant schemes such as the County Conservation Grant Schemes, the Department of Environment, Heritage and Local Government grant scheme for thatch roofs and the Heritage Council Buildings at Risk Grant Scheme
- Good Sources of information include: the Conservation Office, Clare County Council and their website www.clarecoco.ie/Planning/conservation.html; Irish Stone Buildings by Patrick McAfee; Department of Environment, Heritage & Local Government website www.environ.ie; and the Heritage Council, Kilkenny www.heritagecouncil.ie.

2

1. *Roofs are common nesting sites* **2.** *Seek advice when renovating a building* **3.** *Maintain vernacular elements*

Horticultural Land

Horticultural land is used for growing vegetables, fruit, ornamental flowers and other plants. It includes orchards, market gardens and structures used for growing produce. Weeds such as charlock and chickweed are typical of such cultivated land.

The Farmers Market is making a revival in County Clare. Four markets occur weekly throughout the county, in Ballyvaughan, Ennis, Killaloe and Kilrush. Here, local produce is made available to the public. As organic produce is increasingly sought after, Clare's potential to meet this market demand is being developed.

Example in County Clare: Irish Seed Savers Association (ISSA), Scariff;

1

2

Best Management Practice for Horticultural Land

- Use pesticides only when pest threshold levels are reached
- Use insecticides early or late in the day to minimise the effect on bees and non-target insects
- Take care to avoid spray drift by applying in calm, dry weather conditions and using only quantities specified by manufacturer
- Consider alternative, environmentally friendly means of pest control
- Set aside field margins for wildlife or widen existing margins by a metre or two
- Don't allow fertiliser applications to affect field margins and adjacent habitats
- Avoid exceeding the required amount of pesticide

3

1. *Apple tree* **2.** *Farmers market* **3.** *Irish Seed Savers Association*

Arable Crops and Tilled Land

1

Arable Crops & Tillage

County Clare has a total tillage area of about 700 hectares. Arable crops are grown mainly in south central areas of the county and northern parts on the Clare/Galway border.

Arable crops include cereals, root, leaf and energy or fibre crops such as sugar beet, turnips, rape and flax. Weed species typical of land cultivated for arable crops are Common Poppy and Knotgrass. Tilled land is land that has been prepared for the cultivation of crops, but where the crop type is not yet identifiable.

Example in County Clare: Common in north Clare, Bellharbour, New Quay

2

Best Management Practice for Arable Land

- Use pesticides only as a last resort, when pest threshold levels are reached
- Consider alternative means of pest control
- Take care to avoid spray drift. Don't spray on windy days
- Set aside field margins for wildlife or establish wider strips of grass as 'Beetle banks'. Avoid use of herbicide or pesticide in these areas and don't plough here
- Retain stubbles over winter and avoiding burning
- Plant spring rather than winter cereals
- Apply fertiliser only to the crop area – avoiding field margins and adjacent habitats
- Retain or include some arable land on your farm as it provides a diversity of habitat and seeds for a number of bird species, including Yellowhammer and Lapwing
- Scatter seed where you see land is poached and bare

1. *Tilling the land* **2.***Yellowhammer*

Farmer Profile
Liam Walsh

Liam Walsh and his family live in Rylane, five kilometres northwest of Tulla in East Clare. Liam was formerly a dairy farmer but sold his quota in 1979 and has continued full time farming with a suckling herd. There are two slatted sheds on the farm providing sufficient capacity for his cattle, which are generally housed from mid November to mid April. Their winter fodder is pit silage, saved once a year with no need for a second cut.

REPS Demonstration Farm

Liam has been in REPS from the beginning and his farm is used as a REPS approved demonstration farm by the Department of Agriculture and Food, which participants visit as part of their 20 hour training course. The farm contains various examples of how common farmland habitats such as watercourses, scrub, field boundaries and old buildings should be managed and maintained.

River Habitat

A tributary of the River Rine flows through Liam's farm in a south westerly direction, through the village of Quin and the grounds of Dromoland Castle, before entering the estuary of the River Fergus at Latoon. One of the requirements under his current plan is to fence 1.2m out from the bank on both sides of the river. In doing so he has noticed that the bank and channel tend to become overgrown with vegetation, which then requires removal. Liam has, over the past number of years, noticed that fish have returned to the river, which he believes is due to REPS and improvements in pollution control.

Stonewalls

A good example on the farm of where Liam has gone above and beyond the call of duty, are the stonewalls found throughout the farm. He has a keen interest in stone masonry and has invested a lot of time and effort in restoring the walls and old buildings on his land, using local styles.

Bat Breeding Site

Looking across the fields, Liam Walsh's 'home house' seems like a well-renovated old stone cottage, perhaps let over the summer as a holiday home. This is partly true, however the 'tourists' are not your typical family of four but a large population of Lesser Horseshoe Bats, which use the house as a breeding site. Their

1

1. *Tulla Drumlin farmland*

'rent' is paid by the Vincent Wildlife Trust, an independent charitable body engaged in wildlife research and conservation, over a 20 year lease.

Lesser Horseshoe Bat

This bat is now almost extinct in many parts of central Europe and the Irish population of approximately 10,000 individuals which is confined to the west, is considered of international importance. The Lesser Horseshoe bat has very specific roosting requirements and is very sensitive to disturbance, requiring an opening in the building through which it can exit and enter without having to land. This is because of their inability to crawl, unlike other bat species which can squeeze in through a crack or gap in a wall.

The window at the back of Liam's house is the bats' point of entry, and he has had to modify it slightly by installing a flap to prevent the local cats from getting in. Liam has also boarded up the windows so that inside the house is dark and suitable for these nocturnal creatures.

Hedgerows

The habitats on Liam's farm are also very important for the survival of this species, including linear features such as hedgerows, stonewalls and river corridors, which bats use to commute and feed. Very few bats fly over open land, preferring instead the protection of hedgerows against aerial predators like barn owls and sparrowhawks. Research has shown that bats will fly three or four times greater distances to foraging sites along linear landscape features with continuous cover, rather than following a direct path over unprotected open land.

The Vincent Wildlife Trust provides Liam with help and advice on how best to manage the habitats on his land for the bats, however some of these management practices, including the frequency of cutting his hedgerows, contradict his REPS plan. As the species is of high international importance and Liam is managing his land to protect them, these issues have been resolved between the NPWS, the Vincent Wildlife Trust and the Department of Agriculture and Food.

1

1. *Bat house*

Species Profile
Lesser Horseshoe Bat

Latin Name: Rhinolophus hipposideros
Irish Name: Ialtóg crúshrónach; Crú-ialtóg beag

The Lesser Horseshoe Bat is so-called because it has a number of flaps or folds of skin around its nostrils. These folds, known as a 'nose-leaf', form a horseshoe shape and give this bat both its English and Irish names. All Irish bats use echolocation calls (like radar) to navigate. These calls are too high-pitched to be heard by humans. The Lesser Horseshoe Bat emits its echolocation calls through its nose and the nose-leaf is used to control them. All other bats in Ireland make their echolocation calls through their mouths.

Hanging Around

The Horseshoe bat is also the only Irish species to hang freely by its feet and wrap its wings around its body. This feature makes them more vulnerable as they are much more visible than other bats that can hide in crevices etc. Again unlike other Irish bats, the Horseshoe cannot crawl. This is because its legs point backwards from the hips and they cannot be brought forward far enough for the feet to be placed on the ground. This means that it has to fly directly into its roost site and turn upside down to land. In Ireland its distribution is limited to the West and it is found only in counties Clare, Cork, Galway, Kerry, Limerick and Mayo.

Roosting Sites

In summer, it roosts mainly in roofs of old houses or in outhouses, stables, abandoned houses or old cottages. In winter, the bats hibernate in caves, disused cellars, mines and other underground areas. In Ireland, Lesser Horseshoe Bats appear to prefer sheltered valleys in limestone areas.

Disturbance

They are particularly sensitive to disturbance as they slow their body's metabolic rate down even when sleeping during the day in summer. Disturbance raises their metabolic rate and means they must feed almost immediately. If a winter roost is disturbed, a bat may use up a months supply of stored energy as its metabolic rate rises. This is a very dangerous occurrence and could lead to the death of bats because insect food is scarce in winter. A study carried out in County Clare showed that the main foods of the Horseshoe bat are Craneflies (daddy-longlegs), other flies, moths, Caddisflies and Lacewings.

Threats

These bats are also very sensitive to changes in building use or treatment of roof timbers. Maintenance of roof spaces must be carried out to prevent deterioration of roosting sites but disturbance to the bats should be minimised by carrying out work in winter and taking care not to use toxic chemicals as preservatives. Lindane, DDT, Dieldrin pentachlorophenol and tributyl tin oxide are lethal to bats and should not be used. More modern treatments like permethrin or borax based treatments are safer, but still should not be applied when bats are actually present.

Protection

The population of this bat species is decreasing throughout Europe. This is probably due to changes in agricultural and forestry practices and a lack of suitable roosting sites. Ireland has the largest European population making us an internationally important area for the protection of this valuable member of our natural world.

There are up to 20 roost sites in County Clare designated for the protection of Lesser Horseshoe Bats. One of the best known of these is Edenvale Cave near Ennis.

Species Profile
Barn Owl

Latin Name: Tyto alba
Irish Name: Scréachóg reilige

Barn Owls have been found in fossils dating back around two million years, which means that they have been on earth around 40 times longer than modern man. They can be found throughout the globe and were thought to be a supernatural creature by the American Native Indians.

Farmland Birds

Of the five species of Owl in Ireland, most people are familiar with Barn Owls. They are mainly white in colour with a heart shaped face and square tail and would be familiar to most people as the symbol for RTE's 'Late Late Show'. Barn Owls are not birds of woodlands as they prefer more open farmland habitats. Because of this they were once a common feature on many farms. Unfortunately now their screeching call is much less common due to lack of suitable roosts and loss of hunting habitats.

Hunting

Barn Owls generally hunt by flying slowly backwards and forwards over areas of rough grassland, hedgerows and woodland edge. Their main periods of activity are dawn and dusk. They use their sharp senses of sight and hearing to locate their prey, which mainly include the Brown Rat, Field Mouse and Pygmy Shrew. These are often eaten whole and the indigestible fur and bones are regurgitated in the form of pellets. When examined these pellets can reveal exactly which small mammal species have been eaten.

Nesting Sites

As their name suggests, Barn Owls nest in old buildings and agricultural buildings but also use large cavities in trees. The main threats to Barn Owl populations are the lack of these breeding and roosting habitats due to the modernisation of farm buildings. In the past farmers realised the value of barn owls in controlling rats and mice. They provided the birds with nest boxes and left owl holes at the apex of barn roofs.

Hedgerow Removal

The removal of hedgerows and scrub also impacts on Barn Owls by the loss of hunting habitat as these areas provide a habitat for their prey. Road verges now offer some of the best hunting grounds for Barn Owls, though this can lead to increased numbers of birds being hit by cars. Laying poison to kill off vermin is also having an adverse effect on Barn Owl populations. The poisoning of rats and mice has a knock on effect on owls and other birds of prey.

Threatened Species

The Barn Owl is now a designated scarce and threatened species. It shows considerable decline, its population having reduced by more than 50% in the last 25 years. It is defined as a Red-listed species in the Birds of Conservation Concern in Ireland (BoCCI) list. The total breeding population for County Clare is in the region of only 50-60 pairs.

The provision of specially constructed Barn Owl boxes in modern agricultural buildings and the maintenance of areas of rough grassland on the farm can help this species to survive.

Management Techniques
Bat and Owl Boxes

Provision of Barn Owl and Bat Roosting Boxes

One of the main factors that limits the abundance of Barn Owls and Bat species is the lack of suitable breeding and roosting sites. In many cases there are good feeding areas in a locality but little in the way of the shelter that is so important to these species.

Barn Owls and Bats can be encouraged to inhabit an area where there are suitable feeding habitats by providing artificial nesting and roosting sites.

- Barn owls need rough grassland, which is the favoured habitat of its main food, mice. They traditionally nest and roost in large holes in trees or nooks among the rafters and walls inside stone barns. But with so few big old trees around farms, and modern barns with fewer places to nest, the Owls need help to find suitable roosting and nesting sites. Boxes of about the size of an old tea chest can be made and placed high in the rafters of modern barns or outside in trees on woodland edges or hedgerows. These need to be located high in the tree, ideally with branches around to provide cover and shelter.

2

- Many Bat species use holes in trees and roofspaces of buildings as roosting sites. But, with fewer old trees around and roofspaces treated with poisonous woodworm treatment, bats too need help in finding places to roost. Artificial roosting sites can be made and attached to trees out of the reach of predators. Boxes should be around twelve inches high by six inches wide with a sloping roof and entrance slit at the bottom.

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3

1. *Owl box* **2.** *Hibernating bat* **3.** *Bat box*

Wildlife Corridors

Most of the boundary habitats described in this Chapter are linear features, which can connect one place with another. Often the field boundaries or drainage ditches crossing the countryside contain more wildlife value than the fields and roads they border.

These boundaries are often termed 'wildlife corridors' as they provide good habitat for birds, animals and insects. They offer a safer route by which to travel through the countryside with food and shelter along the way. They also link areas together, thereby preventing populations from becoming isolated. It is therefore important to retain and manage these boundaries to maximise their conservation value.

The following man-made habitats will be described in more detail:

- Hedgerows
- Treelines
- Drainage Ditches
- Grassy Verges
- Stonewalls

2

1

1. *Mature hedgerow* **2.** *Wildlife Corridors provide continuous cover*

Hedgerows

Hedgerows are a very common feature in the Irish countryside. In the past they had many functions including defining ownership boundaries, providing stockproof boundaries and also providing shelter for stock in the field.

These functions are no longer necessary on many farms as the advent of barbed wire and electric fences has replaced the labour intensive management of hedgerows as a means of containing animals. Field systems too small for modern agricultural machinery have also meant the loss of hedgerows as fields are enlarged.

1

While the era of electric and barbed wire fences means that agriculture may not demand a need for hedgerows, their wildlife value should not be underestimated. The network of hedgerows surrounding fields is a very important resource for wildlife throughout the countryside. It provides food and shelter and a safe passage through the otherwise open countryside.

Hedgerows are even more significant when there are few wooded areas in a locality as they act as 'mini-woodland' habitats. Put together, they would cover a land area bigger than all the broadleaf woodlands in Ireland. The more plant species present in a hedgerow, the greater the range of food and habitats present and therefore the greater the range of animal species it can support. Adjoining or continuous hedgerows are particularly valuable to wildlife as they give greater protection from predators. In general the greater the variety, in terms of height, width, shape and species mix, the more valuable the hedgerow is to wildlife.

2

Hedgerows are often associated with drainage ditches and raised banks constructed from the spoil from excavation of the ditches. The most common species in Irish hedgerows include shrubs and small trees such as Hawthorn, Blackthorn, Gorse, Holly, Elder, Dog Rose and Bramble; and larger trees such as Ash, Birch, Hazel, Willow and Alder.

There are three main hedgerow types found on farms;

- Escaped hedgerows
- Mature untended hedgerows
- Mature managed hedgerows

Escaped Hedgerows

Also known as 'relict' hedgerows, these have essentially grown into treelines and should be left alone. Planting of gaps between the trees is an option but would need to be fenced off.

Mature Hedgerows

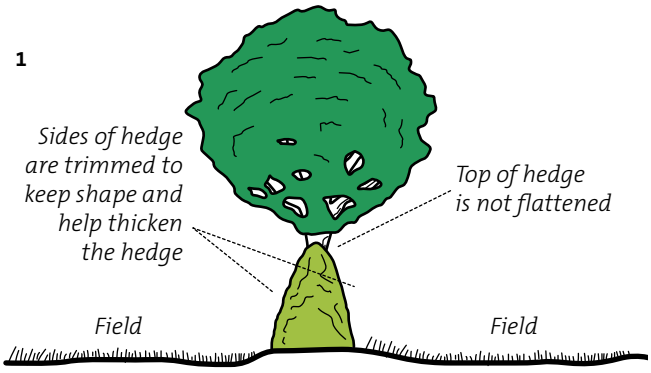
These can be divided into two types. The first is the mature untended hedgerow found along disused farm roads, old embankments or field corners, and which are in generally good condition but have some gaps. These can be improved by planting quicks of young native species to fill gaps (infilling) or by laying or coppicing the existing plants to produce sideshoots at the base of the hedgerow. Blackthorn or holly are good shade resistant native species suitable for infilling.

The second type is the mature managed hedgerow. Here the hedgerow is growing vigorously with plenty of lower growth at the base. Light trimming of the sides on a three year cycle should be sufficient. Otherwise, they should be allowed to grow freely.

3

1. *Hazel hedgerow* **2.** *Managed Hedgerow* **3.** *Escaped Hedgerow*

1



Over Managed Hedgerows

These are hedgerows which have been cut too often and have an unsightly shaved appearance. They should be allowed to grow unchecked to recover height and vigour.

Best Practice Management for Hedgerows

Hedgerows are man-made habitats, which require management to keep them stockproof and to maintain their wildlife value. If they are not managed, they become gappy and overgrown, which is of less value to both the farmer and to wildlife. Try to use the best practice outlined below when managing hedgerows on your farm:

Trimming

- Side trim the hedgerow to give a triangular 'A' shaped profile with a wide base sloping upwards to a peak on top. This prevents shading out of the base of the hedgerow
- Cut to a minimum height of 1.5m. The greater the height and bulk at the base, the better for wildlife
- Where hedgerows have a high proportion of smooth wood species (ash, sycamore, hazel, alder) they should only be side trimmed, as topping will reduce sideshoot growth and lead to top heavy growth (the 'toilet brush' effect)
- Ensure that clean cuts are used so that branches are not left with frayed ends, which can rot. A flail should only be used for light or fresh growth
- Use trained operators when appointing contractors to cut hedgerows on your farm
- Trim in late winter (January/ February) if possible (but no later) so that food sources such as berries, nuts and fruits remain available to animals throughout the autumn and winter seasons. Alternatively, cut in autumn, trimming no more than 20% of farm hedgerows in any one year, as the remaining habitat will provide food and shelter for the displaced wildlife
- Try not to expose bare soil at the base of the hedgerow when trimming. Roots can be damaged and aggressive weeds can dominate under the hedgerow
- Don't cut hedges more than once in a three year cycle (except at points on roadsides where safety issues take precedence)
- A 'tidy' hedgerow is not good for wildlife – don't over manicure
- Where a hedge has 'escaped' (has become leggy) or 'relict' (with mature trees) – do not cut. Consider other management options such as hedge laying (for escaped) or fencing off and replanting the gaps

General Guidelines

- Avoid cutting or burning during the bird nesting season (1st March – 31st August)
- Leave a minimum margin of 1.5 metres beside hedges in tilled areas
- Retain occasional mature trees. These trees provide food, song posts and nesting and roosting sites for birds and other animals
- Reinstate gappy hedgerows by planting native species that are local to the area
- Consider laying old or gappy hedgerows – see 'management techniques' for more information
- When planting new hedgerows such as for REPS, use species similar to those in old local hedgerows rather than non-natives such as beech
- Where possible, leave a 1.5 metre field margin between the pasture/ crop and the hedgerow base. Don't allow spray drift and fertiliser to reach hedgerows

2

1. *'A' shaped hedgerows are best for wildlife* **2.** *Hedgehog*

Treelines and Drainage Ditches

Treelines

Treelines are narrow lines of trees planted generally to act as field boundaries. They differ from hedgerows in that they are composed of mature trees rather than shrubs and smaller trees. They often develop from hedgerows, which have been left unmanaged. They are useful as wildlife corridors, although not as valuable as hedgerows. However all native trees in the countryside have a high wildlife value.

Best Practice Management for Treelines

- In tilled areas, leave a minimum margin of 1.5 metres beside treelines
- Avoid allowing spray drift and fertiliser reaching treelines
- Where feasible, leave a 1.5 m field margin between pasture and the base of the treeline

Drainage Ditches

Drainage ditches around fields are often the 'last resort' for wetland species which have lost suitable habitat due to land drainage. They are valuable breeding and spawning grounds for frogs, which are reasonably common in Ireland but becoming rare in Europe. They also often lead towards streams and watercourses but their water quality is not usually afforded similar protection. They are an important local feature and play a role in the filtration of water, holding it and helping to remove any pollutants and silt before reaching streams and rivers.

Examples in County Clare: Widespread

Best Practice Management for Drainage Ditches

- Don't apply fertiliser, slurry or farmyard manure within 10 metres of the ditch
- Establish native plants along the bank of the ditch channel
- Clear any overgrown bramble or scrub growing in the ditch
- Don't dump or dispose of waste materials in water courses
- Avoid use of aquatic herbicides

Grassy Verges

Grassy verges and field margins are similar habitats to dry meadows that used to be cut once a year for hay and generally managed without the application of fertiliser or grazing of livestock. This habitat is characterised by tall tussocky grasses such as Cock's-foot and Yorkshire Fog, tall flowering plants such as buttercup, Hogweed and Ox-eye Daisy and climbing plants like Vetch and Cleavers. They are very common throughout the countryside and are important refuges for wildlife as they act as wildlife corridors linking habitats.

Best Practice Management for Grassy Verges

- Cut once a year after the grasses and flowers have set seed in late summer
- Trim adjacent hedgerows to allow light to reach the grassy strip below
- Remove any rubbish or waste deposited on the verge
- Prevent direct or accidental application of fertiliser, slurry or manure
- Avoid use of herbicides or pesticides

Stonewalls

Although stonewalls are man-made features, they can over time, become refuges for plants and animals. Generally the older the wall the more valuable it is as a habitat for wildlife. Mosses, lichens and ferns are among the most important forms of wildlife to be found on stonewalls.

Bird and mammal species such as Wheatear, Wren, Stoat and Bats use stonewalls for cover and roosting sites. Walls and banks, like hedgerows also provide protected 'corridors' for small animals to move between areas of favourable habitat.

Similar to hedgerows, stonewalls are under threat from the new machinery associated with agricultural intensification. Existing entrances into fields are not wide enough and need to be widened, often with the loss of traditional stone gate pillars. Enlargement of fields and the building of new houses also often means that stonewalls are demolished. Again, this is the loss of wildlife corridors. While not as rich in wildlife as hedgerows, they provide niche habitats for many species and are especially important for invertebrates.

Best Practice Management for Stonewalls

- Maintain dry stone walls according to the local style of the area
- Build in or retain old features such as sheep passes or 'puickets'
- Don't remove stone walls or replace with styles of dry stone walling which are not representative of local techniques and styles
- Avoid removal of vegetation – lichens or mosses - from stonewalls. Only remove ivy if the structure of the wall is being damaged

Farmer Profile
Mark Donnellan

The Donnellan farm is located near the village of Kilmurry, 6km north of Sixmilebridge in East Clare. Mark Donnellan, took over the full-time running of the family farm in 2000. Like his father before him, Mark is also an accomplished musician and has played with the Tulla Ceili Band for a number of years.

Mixed Farming

Mark runs a mixed farm, rearing a suckler herd to maturity, with replacements to maintain a herd of forty suckler cows. He also keeps a herd of eighty ewes at any one time and the lambing season was in full swing at the time of the interview. As an intensive beef farmer, Mark is aware of the pressures that are placed on his land and the surrounding environment. In order to manage his farm in harmony with the environment, the Donnellan farm has been in REPS since 1994 and he hopes to continue this practice.

REPS

Mark is currently in REPS 3 and has a variety of habitats on his land including lakes, wetland, hedgerows and woodland. Since joining REPS he has had to make key adjustments to the existing farming system. These include reducing stocking levels, adjusting the permitted levels of chemical and organic fertiliser, as well as retaining habitats and protecting watercourses and wells.

Natural Heritage Area

His farm also borders Castle Lake Natural Heritage Area (NHA), which has been designated due to the lakeside deciduous woodland, species rich wet grassland and marsh. Approximately 0.16 hectares of Mark's land is under this designation. He has chosen to manage this plot under Measure A for the Conservation of Natural Heritage. The conservation objective for the maintenance of this habitat is to preserve the water quality of the lake. To ensure compliance with REPS, he has agreed not to drain the wet land, not to plough or spread fertiliser within 50 metres of the lake and not to spread herbicide beside the lake.

Managing Effluent

Mark houses his stock in two slatted sheds which were built in 1993. These were designed specifically for Marks farm, with advice from Teagasc in relation to siting, sizing and construction. The sheds have the capacity to house just over a hundred cattle including suckler cows and calves. His silage slab is also located beside the shed in the new farmyard, so all run-off is contained in the underground tanks.

1

1. *East Clare Loughlands*

The soiled water tank is of sufficient size to hold the silage effluent from the silage base. This is because the silage is cut in two equal cuts, both of which amount to approximately 200 tons. The effluent tank is emptied before the second cut is harvested to provide storage space for the effluent from the silage base. He has provided for 20 weeks winter storage and has facilities to divert rainwater from roofs. Run-off from yards is guided through specially constructed channels.

Hedgerows

There are over 8.5 kilometres of field boundaries on Marks farm. These include hedgerows, stonewalls and tree-lines. The hedgerows on the farm are trimmed regularly according to his REPS plan, which advises a rotation approach to maintenance. The plan also recommends allowing saplings to emerge at intervals along the hedgerow and to maintain existing mature native trees. Mark does not trim hedgerows during the bird nesting season (March to the end of August) and his plan prohibits the crushing of hedgerows by excavators. Mark has planted new hedgerows on his farm to create new habitats in line with REPS 3.

Stone Troughs

Another interesting feature on Marks farm is stone water troughs which are built into the walls around the farm. These allow animal access from adjoining fields and minimise the level of poaching at the lake on the farm.

Heritage Feature

An additional heritage feature on Marks farm is the remains of a stone 'Cashel' which is a recorded archaeological monument. Under Measure 7 of his REPS plan, Mark is required to maintain this in its current condition. This involves avoiding the use of heavy machinery in the vicinity of the monument and controlling stock movements nearby.

Species Profile
Lapwing & Yellowhammer

Latin Name: Vanellus vanellus
Irish Name: Pilibín

The Lapwing, or Green Plover as it was called in the past, is a distinctive dark and white wading bird (it can look black, but the wings and back are actually a dark green), often found on farmland.

Poulation Decline

In winter, thousands of visiting Lapwing can be found throughout fields and wetlands in Clare. Many of these wintering waders come from continental and eastern parts of Europe. The population of breeding Lapwing in Ireland has declined by more than 50%• in the last 25 years and it is Red Listed as a species of high conservation concern.

Nesting Sites

Irish Lapwings breed from late March to early July. Nests are either solitary, or are found in small groups. They favour sites in areas of bare ground or short vegetation including machair, wet grassland, heath, bog and ploughed arable land. This species has been affected by changes in agriculture and by drainage.

How can the Lapwing be helped?

There are some management practices that can help Lapwing to continue to breed in Ireland. These include:

- Retaining areas of unimproved pasture and maintaining pools and wet areas
- Creating mosaics of cereals and grassland.
- Considering weed control measures other than pesticides especially avoiding broad-spectrum insecticides on crops. Insects are an important part of the diet of both adult birds and chicks.

Latin Name: Emberiza citrinella
Irish Name: Buíóg

The yellowhammer is a bird of open country that is slightly larger than a chaffinch. It is certainly one of our more colourful small birds in Ireland.

Farmland Breeding

The male has a striking yellow head and underparts, with a brown back and wings. The plumage of the female is more muted.

Yellowhammers breed mainly on farmland with hedgerows and often winter around stubble and tillage fields. It's song is often described as sounding like the following sentence "A little bit of bread and no cheeeese".

Population Decline

The decline of Yellowhammer populations on farmland began in the mid 1980s and has continued ever since. The population has dropped by more than 50% in the last 25 years and the bird is listed as being a species of high conservation concern in Ireland. Reductions in winter food availability as a result of changes in agriculture such as the sowing of winter crops instead of leaving stubble fields are widely believed to have contributed to the population decline.

Populations in Clare still survive but with the reduction in tillage farming in the county, Yellowhammer populations have declined. However we estimate a population of between 50-60 pairs holding on in parts of the east Burren complex.

Protecting the Yellowhammer

LINNET stands for Land Invested in Nature Natural Eco-Tillage. It was included as Supplementary Measure 5 in REPS 3 to help halt the decline of seed-eating farmland birds due to a reduction in tillage farming in the west. The measure involves sowing a mixed crop of cereal (e.g. oats, barley) with a second crop type (e.g. linseed, rape or kale) that will hold the cereal up over the winter. Grazing is not allowed and the crop is left unharvested so that the cereal grains are available to birds like Yellowhammers, Greenfinches, Chaffinches and Bramblings as winter food.

Management Techniques
Hedge Laying

1

4

Hedge laying is a method of long term management for hedgerows to prevent them becoming overgrown, gappy and neglected.

2

Stockproof Boundary

It involves cutting part way through the stem of woody species, bending them over and weaving them around stakes that have been driven into the ground along the hedgeline. The stems bent over will form a stockproof boundary and new shoots grow up from the base that has been cut to ensure the hedge continues to grow. This method can also be used to rejuvenate hedges that have become overgrown.

Wildlife Habitat

Not only does hedge laying create a good stockproof hedge, it also provides a range of wildlife habitats. These include the very open habitat created just after the hedge has been laid, the bushy, overgrown hedge with young trees prior to laying, and all the growth stages in between.

Some species are more suitable for hedgelaying, such as hawthorn (whitethorn), which is the most common hedgerow species in Co. Clare. The work is labour intensive, but areas of hedge on a farm can be laid in rotation over a number of years, which reduces the workload and also provides a range of different hedgerow types within the field boundaries of one farm.

3

Laying Rotation

Standard hedgerow trees, such as ash, alder, hazel, birch and willow should be left to grow at intervals along the hedge. The length of rotation between layings depends on the species within the hedge, the growing conditions and a number of other factors, though a typical rotation length is around eight years, and so this practice is a long-term maintenance technique.

5

REPS 3 Measure

REPS 3 has a number of biodiversity options. Participating farmers must select two activities which are designed to maintain and enhance the biodiversity on their farms. In terms of hedgerows these include (1) rejuvenation (coppice or lay) 2 metres / hectare / year of old or degraded hedge over the five years of the plan or (2) planting 3 metre / hectare / year of new native hedging over the five years of the plan.

Under REPS 4, support for hedgerow rejuvenation and new planting will be continued. Hedge laying, coppicing and planting of new hedgerows are all retained in the Optional Measures.

6

1. *Alder seeds and leaf* **2.** *Hazel leaf and catkins* **3.** *Laying a hedge* **4.** *Birch leaf* **5.** *Hedge suitable for laying* **6.** *Willow Catkins*

Appendices

Protected Species

Species in Ireland protected by the Birds Directive:

Red-throated Diver
Black-throated Diver
Great Northern Diver
Slavorian Grebe
Storm Petrel
Leach's Petrel
Little Egret
Bewick's Swan
Whooper Swan
Greenland White-fronted Goose
Barnacle Goose
Marsh Harrier
Hen Harrier
Buzzard
Golden Eagle
Osprey
Merlin
Peregrine
Corncrake
Golden Plover
Ruff
Bar-tailed Godwit
Red-necked Phalarope
Mediterranean Gull
Sandwich Tern
Roseate Tern
Common Tern
Arctic Tern
Short-eared Owl
Nightjar
Kingfisher
Chough

Species in Ireland protected under Annex II of the Habitats Directive

(whose conservation requires designation of SACs):

Bottle-nosed Dolphin
Porpoise
Common Seal
Grey Seal
Otter
Lesser Horseshoe Bat
Brook Lamprey
River Lamprey
Sea Lamprey
Salmon
Twaite Shad
White-clawed Crayfish
Marsh Fritillary Butterfly
Kerry Slug
Freshwater Pearl Mussel
3 Whorl Snails:
Vertigo angustior
Vertigo geveri
Vertigo moulinsiana
Yellow Marsh Saxifrage
Slender Naiad
Killarney Fern
Shining Sickle Moss
Petalwort (liverwort)

Legislation

EU Water Quality Directives

No	Official Ref No.	Short title	Full title of Directive/Description
1	75/440/EEC*	Surface water	Council Directive of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the member states (only water for human consumption)
2	76/160/EEC*	Bathing water	Council Directive of 8 December 1975 concerning the quality of bathing water (all fresh and sea water used for bathing to be monitored)
3	76/464/EEC*	Dangerous Substances	Council Directive of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the community (substances are listed)
4	78/659/EEC*	Freshwater Fish	Council Directive of 18 July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life.
5	79/923/EEC*	Shellfish	Council Directive of 30 October 1979 on the quality required of shellfish waters
6	80/68/EEC*	Ground Water	Council Directive of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances
7	80/778/EEC*	Drinking Water	Council Directive of 15 July 1980 relating to the quality of water intended for human consumption
8	98/83/EC	Drinking Water	Council Directive of 3 November 1998 relating to the quality of water intended for human consumption

Air Pollution

No	Official Ref No.	Full title of Directive	Description
1	6/1987	Air Pollution Act 1987	"Air pollution" in this Act means a condition of the atmosphere in which a pollutant is present in such a quantity as to be liable to be injurious to public health, have deleterious effect on flora or fauna or damage property or impair or interfere with amenities or with the environment.
2	Section iv	EPA Act 1992	Ambient air quality assessment and management
3	96/62/EC	Air Quality Framework Directive	The framework Directive sets out the principles of the approach and the Daughter Directives below set the limit values for specific pollutants.
4	1999/30/EC	First Daughter Directive	Deals with sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead.
5	2000/69/EC	Second Daughter Directive	Deals with carbon monoxide and benzene
6	2002/3/EC	Third Daughter Directive	Dealing with ozone
7	Published Jan 07	Fourth Daughter Directive	Will deal with Polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air

Legislation

Waste Legislation

No	Short title	Full title of Directive/Description
1	Waste Management Act 1996	Prohibits waste disposal which is likely to cause environmental pollution and requires any person who carries out agricultural, commercial or industrial activities to prevent or minimise waste etc.
2	Regulation under European Communities Act 1972	Deals with planning, authorisation and supervision of waste activities including toxic waste, PCTs and PCBs, asbestos, waste oils and batteries.
3	The Litter Pollution Act 1997	provides powers for local authorities to tackle the widespread problem of litter pollution

EU Legislation Governing Agriculture

No	Official Ref No.	Full title of Directive	Description
1	77/537/EEC	Council Directive 28/06/1977	Dealing with the emission of pollutants from diesel engines for use in tractors
2	91/676/EEC	Council Directive 12/12/1991	Concerning the protection of waters against pollution caused by nitrates from agricultural sources.
3	2078/92/EEC	Council Directive 30/06/1992	On agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside.
4	85/337/EEC & 97/11/EC	EC Directive Council Directive	States that an Environmental Impact Statement (EIS) must be submitted for all proposed large scale pig and poultry units.
5	95/38/EC	Commission Directive17/07/1995	On fixing maximum levels for pesticide residues on certain products of plant origin, including fruit and vegetables
6	95/39/EC & 86/362/EEC & 86/363/EEC	Commission Directive17/071995 & Annexes to Directives	On fixing maximum levels for pesticide residues in and on cereals and foodstuffs of animal origin
7	1870/95/EC	Commission Regulation 26/07/95	Laying down detailed implementing rules for the use of land set aside for the provision of materials for the manufacture within the community of products not primarily intended for human consumption
9	2930/95/EC	Commission Regulation 18/12/95	Laying down detailed rules for the application of Council Regulation (EEC) No. 1765/92 with regard to set aside scheme.
11	96/12/EC	Commission Regulation 08/03/96	Concerning the placing of plant protection products on the market
12	97/6/EC	Directive	Banning the use of antimicrobial antibiotic, Avoparcin, in pig, cattle and poultry feed. Requires that member states implement the ban from 1st April 1997.
13	727/97/EC	Commission Regulation 24/04/97	To establish a list of products excluded from the application of Council Regulation (EEC) No 737/90 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station.
14		Noxious Weeds Act 1936	Deals with the control of noxious weeds (which are listed under this Act). Any person responsible for land on which these weeds are growing is liable, on conviction to be fined.

Habitats and Wildlife

No	Official Ref No.	Full title of Directive	Description
1		Wildlife Act 1976	"To provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims" (NPWS)
2		Wildlife Amendment Act 2000	Deals with for example the protection of SACs and NHAs, the control of hunting, international trade in endangered species and hedge cutting during the nesting season.
3		Flora Protection order 1999	This is a list of plant species that are protected by section 21 of the wildlife act 1976. It is illegal to cut, uproot or damage the listed species is any way.
4	92/43/EEC	EU Habitat Directive	Deals with the protection of rare and endangered species of flora and fauna, and also, more importantly, their habitats.
5	79/409/EU	EU Birds Directive	Requires EU member states must identify sites of importance to birds which are contenders for EU designation as Special Protection Areas SPAs. The species considered rare in Europe are also listed here under annex I.
6		The Planning and Development Act 2000	Deals with the control of Development, (with certain exceptions), whereby the local authorities grant or refuse planning permission for development, including ones within protected areas.
7	85/337/EEC	EIA Directive	The environmental impact assessment Directive requires EU members to carry out a detailed study of the environmental impact of certain types of development prior to that development being authorised
8	2000/60/EC	EU Water Framework Directive	The aim of this new European Water Policy will get polluted waters clean again, and ensure clean waters are kept clean
9		EPA Act 1992	Deals with EPA establishment and business, functions of the agency, pollution control, environment information, offences and penalties etc.

Monuments and Heritage

No	Official Ref No.	Full title of Directive	Description
1		National Monument Act	Makes provision for the protection of national monuments and for the preservation of archaeological objects.
2		The Heritage Act 1995	Deals with establishment and business of the heritage council

Fisheries

No	Official Ref No.	Description	Description
1		Fisheries Consolidation Act 1959	Some of the things that the act deals with are rates on fisheries, licences, restrictions, net Regulations, engines, fishing times, fish sales, protection of waters and penalties for offence.
2		Fisheries Act 1980	Deals with fisheries regions and regional boards, penalties, legal proceedings, aquaculture and acquisition and transfer of fisheries, etc.

Legislation

Good Agricultural Practice for Protection of Waters

European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2006 (S.I. No. 378 of 2006) as issued by the Department of Environment, Heritage and Local Government.

No		Full title of Directive/Description
1		The amount of livestock manure to be applied on land, inclusive of that deposited to land by livestock, shall not exceed 170 kg Nitrogen per hectare per annum.
2		The spreading of chemical fertiliser on grassland or on other land is prohibited between 15th September and 15th January inclusive.*
3		The spreading of organic fertiliser on land is prohibited between 15th October and 15th January inclusive. *
4		The spreading of farmyard manure on land is prohibited between 1st November and 15th January inclusive. *
5		No organic fertiliser application during the months November and December. exemption for:-
	a	Soiled water
	b	Chemical fertilisers to meet crop requirements of Autumn-planted cabbage or crops grown under permanent cover.
6		No spreading of chemical fertiliser shall be applied to land within 1.5m of a surface watercourse.
7		No spreading of organic fertiliser shall be applied to land within –
	a	200 metres of an abstraction point used for human consumption, and supplying 100m^3 or more of water or serving 500 or more persons.
	b	100 metres of an abstraction point used for human consumption, and supplying 10m^3 or more of water or serving 50 or more persons.
	c	25 metres of an abstraction point used for human consumption, not specified above.
	d	5 metres of a surface watercourse – this figure is reduced to 3 metres if • the watercourse is an open drain or • the area of land adjacent to the watercourse is a narrow parcel of land not exceeding 1 ha and not more than 50m in width.
	e	15 metres of exposed cavernous limestone or karst limestone features such as swallow holes and collapse features.
	f	10 metres of a surface watercourse if the average incline towards the watercourse is greater than 10%. (This limit supersedes the above 5m and 3m limits)
8		It is permissible to store FYM in a heap where land application will take place on condition that it is located:
	a	250 metres from any waterbody used for the abstraction of water for human consumption, and supplying 10m^3 or more of water or serving
	b	50 or more persons.
	c	50 metres from any other waterbody used for the abstraction of water for human consumption, and not included above.
	d	20 metres from a lake shoreline.
	e	50 metres of exposed cavernous limestone or karst limestone features such as swallow holes and collapse features.
	f	10 metres of a surface watercourse.
9		No FYM shall be held in a field between 1st November and 15th January inclusive.
10		Organic fertilisers should be applied in an accurate and uniform manner.

No		Full title of Directive/Description
11		Fertilisers or soiled water should not be applied to land in any of the following circumstances:
	a	On wet or waterlogged land.
	b	On land that is flooded or likely to flood.
	c	On land that is frozen or snow covered.
	d	Heavy rain is forecast within 48 hours
	e	On land sloping steeply towards rivers, streams, lakes and taking account of soil condition, ground cover and rainfall, there is a significant risk of causing water pollution.
12		Regard should be taken of the weather forecast issued by Met Éireann.
13		Organic fertilisers or soiled water shall not be applied to land
	a	by use of an umbilical system with an upward-facing spashplate,
	b	by use of a tanker with an upward-facing spashplate,
	c	by use of a sludge irrigator mounted on a tanker, or
	d	from a road or passageway adjacent to land irrespective of whether the road or passageway is within of outside the curtilage of the holding.
14		The maximum hydraulic loading per single application of soiled water should not exceed 50m^3 per hectare with a minimum period of 42 days left between applications. The irrigation rate shall not exceed 5 mm per hour. In areas identified by the GSI as extreme vulnerability, on Karst Limestone Aquifers, the maximum hydraulic loading per single application of soiled water should not exceed 25m^3 per hectare with a minimum period of 42 days left between applications. The irrigation rate shall not exceed 3 mm per hour. It is recommended that at least half the slurry produced during the winter housing period is spread on land before 1st July, the remainder before 30th September. In any event local circumstances must be taken into consideration when applying slurry on lands.

*Requirements for Co. Clare

Useful Contacts

Organisation	Address	Phone / Email	Web site	Enquiries regarding
Bat Conservation Ireland	Deerpark House, Tierworker, Co. Meath	(046) 924 2886	www.batconservationireland.org	Bats
Birdwatch Ireland	Rockingham House, Newcastle, Co. Wicklow	(01) 281 9878	www.birdwatchireland.ie	Birds
Clare County Council	Áras Contae an Chláir, New Road, Ennis, Co. Clare	(065) 682 1616	www.clarecoco.ie	Transportation & Infrastructure, Environment and Emergency Services, Economic Development and Planning, Housing and Social Services, Community & Enterprise, The Library Service.
Biodiversity Officer		(065) 684 6499	www.clarecoco.ie www.clarebiodiversity.ie	Biodiversity issues. Biodiversity Action Plans.
Conservation Officer		(065) 684 6407	www.clarecoco.ie	Built Heritage and Architectural Heritage issues.
Environment Section		(065) 684 6331	www.clarecoco.ie/ Environment/Environment.html	Waste Management and Litter Control, Protection of Water and Air Resources, Environmental Education & Awareness, Recreation and Amenity
Environmental Awareness Officer		(065) 684 6205	www.clarecoco.ie/ Environment/Environment.html	Environmental Education & Awareness Programme, Waste Prevention & Minimisation.
Heritage officer		(065) 684 6408	www.clarecoco.ie/ Heritage/Heritage.html	Heritage in Clare and Co. Clare Heritage Plan.
Coillte Nurseries	Ballintemple, Ardrattin, Co. Carlow	(0503) 55621	www.coilltenurseries.ie	Native trees and shrubs and REPs planting
Conservation Volunteers Ireland (CVI)	Stewards House, Rathfarnham Castle, Rathfarnham, Dublin 14	(01) 495 2878	www.cvi.ie	CVI activities
Crann	Crank House, Main Street, Banagher, Co. Offaly.	(0509) 51718	www.crann.ie	Conservation of trees
Design by Nature	Monavea Cross, Crettyard, Co. Laois	(056) 442526	www.allgowild.com	Wildflower meadows, saving seeds, native seeds and sowing roadsides.
Department of Agriculture Teagasc	Teagasc, Station road, Ennis, Co. Clare	(065) 682 8301	www.teagasc.ie/ contacts/index.htm www.teagasc.ie/ advisory/environment/reps.htm	Agricultural training, advice and research REPS
Department of Environment, Heritage and Local Government	Custom House, Dublin 1	(01) 888 2000 1890 202 021	www.environ.ie	General enquiries
Dragonfly Ireland	8 Weaver's Court, Banbridge, Co. Down, BT32 4RP	rst1@bann8. fsnet.co.uk	www.habitas.org.uk/ dragonflyireland	Species and habitats
ENFO – The Environmental Information Service	17 Andrew Street, Dublin 2	1890 200 191	www.enfo.ie	Sustainable development, environmental info for schools etc.

Organisation	Address	Phone / Email	Web site	Enquiries regarding
Environmental Protection Agency (EPA)	PO Box 3000, Johnstown Castle Estate, Wexford	(053) 916 0600	www.epa.ie	General enquiries e.g. licensing technical guidance, water quality
Green Schools	An Taisce, Tailor's Hall, Back Lane, Dublin 8	(01) 454 1819	www.antaisce.org	Making schools more environmentally friendly
Inland Waterways Association of Ireland	c/o Rondavel, Owning, Piltown, Co. Kilkenny	1890 924991	www.iwai.ie	Inland waterways, (Freq asked questions available on website)
Irish Peatland Conservation Council	Bog of Allen Nature Centre, Lullymore, Rathangan, Co. Kildare	(045) 860133	www.ipcc.ie	Bogland areas
Irish Seed Savers	Capparoe, Scarriff, Co. Clare.	(061) 921 866	www.irishseedsavers.ie	Seed banks, rare and endangered vegetables, orchards and nurseries
Irish Wildlife Trust	Garden Level, 21 Northumberland Road, Dublin 4	(01) 6604530	www.iwt.ie	Events and fieldtrips. Primary school education program
Limerick Clare Energy Agency	Foundation Building, University of Limerick, Limerick.	(061) 23 42 96 info@lcea.ie	www.lcea.ie	Energy efficiency, conservation and awareness, Energy Performance Labelling of Buildings, Renewable Energy projects, Climate Change Strategy.
The Heritage Council	Rothe House, Kilkenny.	(056) 888 0888	www.heritagecouncil.ie	e.g. Archaeological objects, wildlife habitats
Native Woodland Trust	Stoneybrook, Kilteel, Co. Kildare		www.nativewoodtrust.ie	Planting and conserving trees
National Parks and Wildlife Service (NPWS)	7 Ely Place, Dublin 2, Ireland	(01) 888 2000	www.npws.ie	Permits and licences, Conservation sites, Farm plan schemes
District Conservation Officer	Séamus Hassett	(065) 682 2711	NPWS, NEPS Building, Francis Street, Ennis	
Burren National Park	Ranger: Emma Glanville	(065) 682 2694		Conservation issues affecting land in their areas
North East Clare	Ranger: Sinéad Biggane	(065) 682 3125		
North West Clare	Ranger: Penny Bartlett	(065) 682 2642		
South East Clare	Ranger: David Lyons	(065) 682 2662		
South West Clare	Ranger: Barry O'Donoghue	(065) 905 1640	NPWS, Merchants Qy, Kilrush	
Shannon Regional Fisheries Board.	Ashbourne Business Park, Dock Road, Limerick	(061) 300 238	www.shannon-fishery-board.ie	Angling, Shannon river catchment.
Shannon River Basin District Project	Mulkear House, Units 2/3 Newtown Centre, Annacotty, Co. Limerick	(061) 337 914 info@shannonrbd.com	www.shannonrbd.com	
Tree Council of Ireland	Cabinteely House, Cabinteely, Co. Dublin	(01) 2849211	www.treecouncil.ie	Planting and conserving trees
Western Regional Fisheries Board	The Weir Lodge, Nuns Island, Galway	(091) 563 110	www.wrfb.ie	Inland fisheries and sea angling in the west
Western River Basin District Project	Unit 2, Block 17, Lios Bán Industrial Estate, Tuam Road, Galway	(091) 746804 info@westernrbd.ie	www.westernrbd.ie	

Web Addresses

Note: All links correct and live at time of going to press, however, as web sites undergo regular maintenance, links may have been moved, retitled, superseeded or deleted and thus may not always work.

Archaeology Sites and Monuments

www.clarelibrary.ie — *(follow heritage and archaeology links)*
www.clarecoco.ie/Heritage/Heritage_Built.html
www.nra.ie/Archaeology/
www.islandireland.com/Pages/archy.html

Soils

www.teagasc.ie
www.ucd.ie
www.wesleyjohnston.com/users/ireland/geography/bogs.html

A guide to REPS

www.teagasc.ie/advisory/environment/reps.htm
www.agriculture.gov.ie/home.jsp — *(follow schemes, reps)*
www.citizensinformation.ie — *(follow employment, income support, REP)*
www.heritagecouncil.ie/publications/agriherit/rec.html — *(study on impact of farm schemes)*

Organic Farming

www.teagasc.ie/advisory/alternatives/organicfarming.htm
www.agriculture.gov.ie
www.organic-europe.net/default.asp — *(follow county reports Ireland)*
www.sustainable.ie
www.planorganic.com/products.htm

Surface Water

www.enfo.ie/leaflets/bs11.htm

River and Lake Quality Monitoring

www.clarelibrary.ie/eolas/coclare/profile/ccdb/physical_environment/water_quality.htm

Geology

www.clarelibrary.ie/eolas/coclare/places/the_burren/burren_geology.htm
www.clarelibrary.ie/eolas/claremuseum/projects/geology2_collection.htm
www.gsi.ie

Landscape Character Areas

www.heritagecouncil.ie/landscape/index.html
www.clarelibrary.ie

Landscape and Development

www.heritagecouncil.ie/publications/landscape_heritage/ch4.html

www.clare.ie

Species Profile – Noxious Weeds

www.teagasc.ie/advisory/factsheets/noxious-weeds.htm — *(Law)*

www.teagasc.ie/advisory/environment/pressarticles/2002/20020914.htm

http://acts.oireachtas.ie/zza38y1936.1.html — *(Law)*

www.teagasc.ie/advisory/factsheets/ragwort.htm

Water and Waste

www.wfdireland.ie

www.epa.ie/downloads/pubs/water/

www.antaisce.org

www.clarecoco.ie/news/Blue_Flags.html

www.clarecoco.ie/Environment/Monitoring_Programmes.html

www.westernrbd.ie

www.shannonrbd.com

Current Water Status in County Clare

www.clarecoco.ie/Environment/Monitoring_Programmes.html

Groundwater Our Hidden Asset

www.epa.ie/NewsCentre/ReportsPublications/EnvironmentalIndicators/ environment in focus

www.gsi.ie

Farming the Living Farmland

www.teagasc.ie

www.ndp.ie/Viewprnt.asp?fn=/documents/EU_Structural_Funds/operational_prog/PCAnnex1AgriRuralDev.doc — *(good farming practice)*

Waste – It's Everyone's Responsibility

www.citizensinformation.ie/categories/environment/waste-management-and-recycling/domestic_recycling_services

www.irelandrecycling.ie

www.raceagainstwaste.com

Agricultural Wastes

www.seregassembly.ie — *(Follow guide to funding, farm waste, management)*

Greenhouse Gases

www.antaisce.org

Web Addresses

Renewable Energy

www.solarenergyireland.com
www.ul.ie/~childsp/Elements/Issue3/HomePage.html — *(Renewable elements)*
www.lit.ie
www.sei.ie/index.asp?locID=105&docID=179
www.sei.ie
www.energyireland.ie
www.ccwep.ie
www.lcea.ie — *Limerick Clare Energy Agency*
www.gega.ie — *Green Energy Growers Association*
www.usewoodfuel.co.uk — *Wood Energy Scotland*
www.renewableenergy.ie —*Renewable Energy Skills*
www.algore.com
www.climateprotect.org

Nature Conservation

www.heritagecouncil.ie/outlook/contents2/5.html

NHAs, SACs, SPAs

www.npws.ie/en/ConservationSites — *(follow links for SPA NHA SAC)*
www.heritagecouncil.ie
www.tcd.ie/Botany/turloughs/SAC.html — *(proposed SAC candidates)*
www.clarelibrary.ie/eolas/coclare/heritage/natural/help.htm

Biodiversity

www.clarebiodiversity.ie

Greenland White Fronted Goose

www.ipcc.ie/infoboggoose.html
www.birdwatchireland.ie

Forestry

www.coillte.ie
www.agriculture.gov.ie/index.jsp?file=forestry/pages/forest_service.xml
www.coford.ie
www.teagasc.ie/advisory/forestry/index.htm
www.agriculture.gov.ie/forestry/publications/biodiversity.pdf

Species Profile – Zebra Mussel

www.wrfb.ie/inforesorces/zebramussel.php

Air Pollution

www.citizensinformation.ie/categories/environment/environmental-protection/air_pollution
www.epa.ie/OurEnvironment/Air/

Waste Policy

www.forfas.ie/news.asp?page_id=370

www.ricoh.co.uk/environment/wrapper.cfm?ricpage=enews37 — *(UK site businesses making money from waste reduction)*

Species Profile – Non Native Plants

www.quercus.ac.uk/pages/invasive.htm

www.netregs.gov.uk/netregs/processes/367839/?lang=_e hogweed

www.slaneyrivertrust.ie/Invasive%20Plants.htm

Designated Sites for Conservation

www.clarelibrary.ie/eolas/coclare/profile/ccdb/index.htm — *(follow physical environmental designations)*

www.heritagecouncil.ie/about/index.html

The Burren National Park

http://homepage.eircom.net/~knp/burren/

www.burrennationalpark.ie

www.burrenbeo.com

Rock Habitats

www.burrenperfumery.com

www.theburrencentre.ie

www.burrenforts.ie — *Caherconnell stone fort and visitor centre*

www.cliffsofmoher.ie

www.burrenlife.com

Management Techniques – Wildflower Meadow

www.allgowild.com

Habitats

www.heritagecouncil.ie/outlook/contents2/7.html — *a guide to habitats Ireland*

www.teagasc.ie/news/2006/200606-21b.htm — *farmers protect the environment*

www.heritagecouncil.ie/publications/habitats/5.html

www.aughty.org

www.iol.ie/%7Eburrenag — *Burren action group*

www.burrenbeo.com — *interactive interpretive centre for the burren*

http://celtnet.tripod.com/celt/ — *centre for environmental living and training clare*

www.clarebiodiversity.ie

www.clarebirdwatching.com

www.clarecoco.ie/Environment/environment.html

www.irishseedsavers.ie — *preservation of traditional varieties of fruit and veg*

www.shannondolphins.ie

www.shannon-fishery-board.ie

www.rpii.ie/radon/maps/clare.html

www.clarelibrary.ie

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Acknowledgements

Content

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Every effort has been made to identify all photographers, however, there are some photographers we were unable to identify.

Pages where more than one photographers images appear are credited clockwise from top left as 'a', 'b' etc.

Glossary of Terms

Algae: simple aquatic plants that may be attached or free floating and occur as single cells, colonies, branched and unbranched filaments.

Algal Bloom: Dense growth of planktonic algae, or most commonly Cyanobacteria (blue green bacteria formerly classified as algae) in nutrient enriched lakes causing discolouration of the water.

Anaerobic Digestion: A natural process of decomposition and decay that occurs in the absence of oxygen, by which organic matter is broken down into its simpler organic components to produce a biogas composed of methane, carbon dioxide and digested matter.

Aquatic: Of, in, or pertaining to water.

Aquifer: A rock unit that will yield water in a usable quantity to a well or spring. A geological formation through which water can percolate, sometimes very slowly for long distances.

Archaeology: The study of historic or prehistoric peoples and their cultures by analysis of their artefacts, inscriptions, monuments, and other remains.

Biochemical Oxygen Demand (BOD): A simple measure of the oxygen consuming capacity of a water sample resulting from the biochemical oxidation of organic matter in the water. BOD is normally measured by incubating a standard volume of water or waste water for five days at 20oC in the absence of sunlight and measuring the amount of oxygen consumed.

Biocidal: any chemical that destroys life by poisoning such as a pesticide, herbicide, or fungicide.

Biodegradable: Capable of decaying through the action of living organisms.

Biodiversity: Biodiversity, or Biological Diversity, is the term given to the variety of life on earth. Biodiversity is everywhere from window boxes to roadside hedges to lake shores and includes everything from the tiny garden ant to the 300 year old Oak Tree. Biodiversity includes diversity of individuals within a species (genetic diversity), diversity of species within an ecosystem or habitat (species diversity) and the diversity of ecosystems or habitats (habitat diversity).

Biodiversity (Biological Diversity): A word that describes all aspects of biological diversity but especially species richness, the complexity of ecosystems and genetic variation.

Biofuel: Fuel, such as wood or ethanol, derived from biomass.

Biomass: Organic matter especially plant matter that can be converted to fuel and is therefore regarded as a potential energy source.

Bivalve: Species consisting of two valves or shells, e.g. cockles and mussels

Blanket Bog: An area, often very extensive, of acid peatland, found in constantly wet climates, characteristic of broad flat upland areas, which develops where drainage has been impeded and the soil is acid.

Brackish Water: Water which contains 0.5 –30 parts per thousand of salinity.

Buffer Zone: Any area serving to mitigate or neutralize potential impacts on another area, providing protection from potentially damaging actions.

Bryophyte: A non-woody plant of small size that reproduces by spores, e.g., mosses or liverworts.

Calcareous: Containing, or like calcium carbonate chalky.

Callows: River-side meadows which flood seasonally.

Canopy: The cover formed by the leafy upper branches of the trees in a woodland.

Carbon Dioxide (CO_2): A colourless, odourless, incombustible gas present in the atmosphere.

Catchment Area: the area from which a major river system or lake derives its water (i.e., the area drained by a river system).

Chlorophyll: The green pigment found in algae and higher plants which is involved in photosynthesis.

Compost: A mixture of decaying organic substances, such as dead leaves or manure, used for fertilising the soil.

Conglomerate: A rock consisting of pebbles embedded in a finer cementing material or consolidated gravel.

Conifer: Chiefly evergreen trees or shrubs including the pine, fir, spruce, and other cone-bearing trees and shrubs, and also yew

Conservation: The wise use of natural resources (nutrients, minerals, water, plants, animals, etc.). Planned action or non-action to safeguard or preserve our natural resources.

Coppicing: Cutting back as young timber to produce shoots from stools or roots.

Cutaway Bog: The peatland area left after peat extraction.

Deciduous: Shedding the leaves annually, as certain trees and shrubs do.

Deoxygenation: The reduction of dissolved oxygen in water.

Dioxins: A collective name given to a group of 75 closely related chemical compounds known as polychlorinated dibenzodioxins (PCDDs). Dioxins can form during combustion by-products during chemical manufacture and bleaching operations.

Dissolved Oxygen (DO): A measure of the concentration of oxygen in a liquid, such as water or waste water, usually expressed in mg/l or per cent saturation.

Drumlin: A low hill of glacial boulder clay, considered to have been fashioned beneath an ice-sheet.

Ecology: The study of the relationships among organisms and between those organisms and their non-living environment.

Ecosystem: A community of interdependent organisms together with the environment they inhabit and with which they interact, and which is distinct from adjacent communities and environments.

Effluent: Liquid wastes

Erosion: The process by which the surface of the earth is worn away by the action of water, glaciers, winds, waves, etc.

Esker: A long, sinuous ridge of sand and gravel, formed by a sub-glacial stream but which, after the melting of the ice-sheet, was left unrelated to the surrounding topography.

Estuary: The part of the mouth or lower course of a river where the river meets the sea.

Eutrophication: The changes associated with enrichment of a waterbody with inorganic plant nutrients particularly nitrogen and phosphorus.

Fauna: Animals

Fen: An area of waterlogged peat, which, unlike bog, is alkaline or only slightly acid.

Fertiliser: Any substance that is applied to land as a source of nutrients for plant growth.

Flora: Plants

Fossil: Any remains, impression, or trace of a living thing of a former geological age, as a skeleton, footprint, leaf print.

Fungus: A diverse group of organisms that live by decomposing and absorbing the organic material in which they grow, such as mushrooms, moulds, mildews, smuts, rusts, and yeasts.

Geology: The study of the Earth, its composition, structure, physical properties, history, and the processes that shape it.

Geographical Information System (GIS): A set of integrated techniques for storing, retrieving, transforming and displaying spatially referenced thematic data in map form.

Greenhouse Effect: Warming of the atmosphere due to the reduction in outgoing solar radiation; resulting from concentrations of gases such as CO_2.

Green Waste: Waste composed chiefly of plant matter.

Groundwater: Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material (see aquifer).

Habitat: The dwelling place of a species of community, providing a particular set of environmental conditions (e.g., forest floor, sea shore).

Habitat: A habitat is a place or site where an organism, creature or plant, is naturally found, i.e. the 'home' of an organism. A habitat contains the right combination of factors to satisfy the needs of the organism, including food, shelter, water, light or shade. Habitats are the buildings blocks of the natural environment and thus a wide diversity of habitats ensures greater diversity of all types of wildlife.

Herb: A flowering plant whose stem above ground does not become woody.

Heritage: what is, or may be, inherited, natural, man-made or cultural.

Horticulture: The science of cultivating plants.

Glossary of Terms

Hydrology: The science dealing with the occurrence, circulation, distribution, and properties of the waters of the earth and its atmosphere.

Hydrogeology: The science dealing with the occurrence and distribution of underground water.

Invasive Species: Non-native species of plants or animals that out-compete native species there natural habitat.

Invertebrates: animals which do not possess a backbone

Karst: An area of limestone terrain characterised by fissures, caves and underground watercourses, which have been created as a result of erosion.

Lagoon: An area of shallow water usually separated from the sea by low sandy dunes or an artificial pool for storage and treatment of sewage or industrial waste.

Lichen: A 'plant' without stems or leaves, usually greyish in colour, growing, for example, on rocks or tree bark, and formed by an association between a fungus and algae.

Liverwort: Moss-like plant growing chiefly on damp ground, rocks, or on tree trunks and helping the decay of logs and the disintegration of rocks.

Littoral: The area between the low and high spring tide levels (marine) or the shoreline (Lakes).

Mammals: Animals with hair- covered bodies that feed their young with milk from the mammary glands, and generally give birth to live young.

Machair: Herb-rich calcareous (i.e., containing calcium carbonate) grassland that grows on shell sand.

Macroinvertebrates: Invertebrates that can be seen with the naked eye.

Macrophytes: Rooted and floating aquatic plants.

Marl: An earthy deposit consisting of clay and calcium carbonate often found at the bottom of lakes.

Migration: The periodic passage of groups of animals (especially birds or fishes) from one region to another for feeding or breeding.

Monoculture: The use of land for growing only one type of crop.

Mosaic: In ecological terms a patchwork of habitats.

Mulch: A covering of straw, compost, or plastic sheeting, spread on the ground around plants to prevent excessive enrich the soil and inhibit weed growth.

Natural Heritage: Natural heritage describes the natural rather than man-made features of the countryside, such as plants, animals, habitats and rock formations in the landscape.

Natural Regeneration: The growth of new seedlings without the intervention of humans.

Natura 2000: A coherent European ecological network of sites comprising SACs designated under the Habitats Directive and SPAs designated under the Birds Directive.

Niche: The particular area within a habitat occupied by an organism.

Nitrate (NO_3): A salt of nitric acid (HNO_3)

Nutrient: Element or chemical essential for growth, e.g., phosphorus, nitrogen, silica, oxygen and carbon.

Organic farming: Farming conducted without the use of drugs, hormones, or synthetic chemicals.

Organism: An individual form of life, such as a plant, animal, bacterium, fungus. A body made up of organs or other parts that work together to carry on the various processes of life.

Ozone (O_3): A secondary pollutant in which the molecule of oxygen consists of three atoms rather than two.

Ozone Layer: A layer of the atmosphere, over 20km above the earth's surface, in which the concentration of ozone is higher than it is elsewhere in the atmosphere owing to its accumulation through vertical air movements from a higher altitude, where it forms by the dissociation and reformation of oxygen molecules exposed to high frequency ultraviolet radiation.

Parasite: An organism that lives on or in an organism of another species, known as the host.

Pesticide: A general term for any chemical agent which is used in order to kill unwanted plants ('weeds'), animal pests, or disease causing fungi.

pH: The measure of the acidity or alkalinity of a substance.

Plankton: Microscopic organisms found floating or drifting in waterbodies.

Pollen: The fertilising element of flowering plants, consisting of fine, powdery, yellowish grains or spores, sometimes in large numbers.

Pollution: The direct or indirect alteration of the physical, chemical, thermal, biological, or radioactive properties of any part of the environment in such a way as to create a hazard or potential hazard to the health, safety, or welfare of living species.

PVC (Polyvinylchloride): One of the most common plastics, used in the manufacture of clothing, furniture and containers.

Precipitation: the manner by which water and other matter in the atmosphere reach the earth's surface. Wet precipitation includes rainfall, snow, hail, mist and fog. Dry precipitation describes the deposition of gases, aerosols and particles not dissolved in atmospheric borne water.

Raised Bog: An area of ombrogenous (i.e., originating as a result of wet climates) acid peatland with a convex profile.

Renewable Resource: A resource that can be exploited without depletion because it is constantly replenished e.g., solar radiation and wind.

Riffle: A stretch of choppy water or a rapid in a river caused by a sand or gravel bar.

Ruminant: Animals that chew the cud such as cattle.

Salmonid Waters: High quality waters suitable for the maintenance of viable self-sustaining populations of wild salmon and trout.

Sedimentary: Formed by the deposition of sediment.

Sewage: Liquid wastes from communities, conveyed in sewers. Sewage may be a mixture of domestic sewage effluents from residential areas and industrial liquid waste.

Sewage Sludge: Semi-solid and solid waste matter removed from sewage at sewage treatment plants.

Sewerage: A network of pipes and associated equipment for the collection and transportation of sewage.

Seedbank: The store of seeds stored naturally in the soil.

Silage: A farm livestock feed made from mown grass or other suitable herbage, which is compressed and partly fermented anaerobically.

Sludge: The suspended matter removed from industrial effluent or sewage.

Slurry: The animal waste generated in animal housing units that have slatted floors and in which there is no use made of bedding material.

Species: The basic category of biological classification, composed of related individuals that resemble one another, are able to breed among themselves, but are not able to breed with members of another species.

Substratum: A surface on which an organism grows or is attached.

Surface Water: Water above the surface of the land, including lakes, rivers, streams, ponds, floodwater, and runoff.

Turlough: A temporary shallow lake in limestone country which fills and empties through cracks, in response to the local water table.

Waste Arisings: A measure of the amount of waste generated by a specified sector or activity.

Watercourse: A natural channel conveying water such as a stream or river.

Weathering: The mechanical and chemical processes that cause exposed rock to decompose.

Wetland: An area covered permanently, occasionally, or periodically by fresh or salt water (e.g., flooded pasture land, marshland, inland lakes, rivers and their estuaries); also includes bogs.

Wildfowl Sanctuaries: Areas of importance for bird life where the shooting of traditional game bird species is prohibited under the Wildlife Act 1976.

Wildlife Corridor: A linear feature facilitating the movement of wildlife from one habitat to another.

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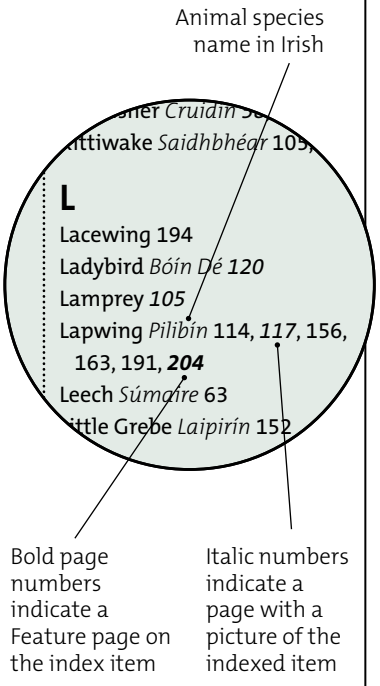
Using the index



Key Terms

Animal Species Index

Plant Species Index (see page 186 for Native Tree Species)

Also see the Native Tree Selection Guide on p 186

"This book for farmers is a valuable reference work providing simple advice on nature conservation and the protection of important habitats in the context of practical farming. IFA is very pleased to have a collaborative role in the publication and I would recommend it to all our members."
Padraig Walshe, President, The Irish Farmers' Association

"This user friendly book sets out best practices for sustainable farming, recognising the farmer's role as food producer and guardian of the environment. The guide is factual and can be referred to time and again for helpful information on environmental practices at farm level, helping to secure the future of agriculture in Clare for generations to come."
Seamus Murphy, Chairman, Clare IFA 2004 - 2007

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