COMHAIRLE CONTAE AN CHLÁIR | CLARE COUNTY COUNCIL

CLARE BIODIVERSITY

ACTION PLAN 2017-2023

2017

CONSERVING THE BIODIVERSITY OF COUNTY CLARE

COMHAIRLE CONTAE AN CHLÁIR
CLARE COUNTY COUNCIL

Clare Biodiversity

An Chomhairle Oidhreachta
The Heritage Council

FOREWORD

Clare County Council has prepared the 3rd Clare County Biodiversity Action Plan 2017–2023, which supersedes the 2nd Clare Biodiversity Action Plan, published in 2014. The 2nd Clare County Biodiversity Action Plan achieved much success under the auspices of Clare County Council and other organisations, community groups and individuals working towards biodiversity conservation in the County. In this regard, we would like to thank the many community groups, schools, farming organisations, biodiversity groups, and individuals for their contribution to the conservation of biodiversity to date.

Our biodiversity provides space for recreation and play. It enhances our homes, our schools and our work places and adds character to our towns and villages. It is something to be proud of, and something worth conserving.

The Clare County Biodiversity Action Plan 2017-2023 identifies and translates the actions of the National Biodiversity Plan 2017-2021 as they relate to County Clare, for their implementation at the local level through this Biodiversity Action Plan. In addition the Biodiversity Plan will run in parallel with the Clare County Development Plan 2017-2023 and builds upon its goals and objectives for biodiversity across County Clare.

Raising awareness of biodiversity within our county is one of the main purposes of this Biodiversity Action Plan, by providing detailed information on the biodiversity found in the different parts of the county Clare as well as identifying the benefits and the threats to biodiversity in Clare.

The Clare County Biodiversity Action Plan 2017-2023 provides comprehensive information on biodiversity in Clare and the importance of why we need to conserve it. Recognising the critical role it plays in relation to food production, water quality, climate change mitigation, health of soil, medical advances, bio-mimicry leading to efficiencies in science, as well as the cultural, educational, recreational and well-being benefits. Our woodlands remove carbon from the atmosphere, providing us with fresh air. Our wetlands remove organic material and pollutants from our lakes and rivers, providing us with clean water. Our species rich grasslands are central to our cattle, sheep and dairy production. Our gardens are improved by earthworms mixing the soil and bees pollinating the flowers. In keeping with the ecosystem services approach, details are given of the many habitats in Clare and how they function, the many threats which exist to biodiversity and a description of the Clare based organisations which contribute to biodiversity conservation in the County are a valuable reference in the plan.

Communities throughout the county are understanding the importance of biodiversity and are engaging in important biodiversity projects in their areas. We invite and encourage all the people and stakeholders of County Clare to become even more actively involved with us as we implement the Clare County Biodiversity Action Plan 2017-2023, as working together, we can continue to conserve our unique and beautiful biodiversity into the future.

In the words of Seamus Heaney, the biodiversity of County Clare can ‘catch the heart off guard and blow it open’. Few destinations across the world offer the visitor such an evocative natural beauty as Clare, whether it’s the Burren, the Loop Head Peninsula or Lough Derg. Even our musical heritage, for which we are renowned, is intrinsically linked to our biodiversity, having inspired countless poets and musicians, from Merriman’s ‘Midnight Court’ at Lough Graney, and Droney’s ‘The Fertile Rock’ in the Burren, to Irvine’s moving ballad, the ’West Coast of Clare’. However, our biodiversity is not just for the benefit of those visiting here, or for those looking to be inspired. It is first, and foremost, for the people of County Clare.

Mr. Tom McNamara
Mayor of Clare

Mr. Pat Dowling
Clare Chief Executive

Contents

1.0 Introduction

Biodiversity refers to the variety of all living things. The following description and drawings comes from the children of a local Clare school, and provides an easy, accurate and enjoyable way of understanding biodiversity.

B is for bumbling bees in the meadow
I is for interesting insects crawling on a leaf.
O is for owls hunting in the dark
D is for dancing daffodils in our schoolyard.
I is for inquisitive hedgehogs looking for food
V is for the very tasty vegetables we grow in the garden
E is for enormous earthworms mixing up the soil
R is for rivers flowing through the hills
S is for spring when baby animals are born
I is for ivy climbing up the wall
T is for the tadpoles that grow into frogs
Y is for yellow, red and brown, the colours of the leaves in autumn




County Clare is bursting at the seams with biodiversity, from the common daisy, found in every back garden, to the beautiful orchids of the Burren. Biodiversity can be full of grace and agility like a damselfly in a meadow, or slow but steady like a garden snail. It can come right up close like the ducks at Lough Derg, or be as elusive as the pine martens in Dromore Woods. It can be cute like a hedgehog, or comical like the puffins at the Cliffs of Moher. It can be big and strong like the Brian Boru Oak, or as fragile as a butterfly on Tullaher Bog. There are plants and animals we encounter every day, and others we may never see, but they are all an important part of our biodiversity.


However, some biodiversity in Clare is in danger of disappearing. Reclamation and changes in land-use have altered the natural processes of our wetland habitats, resulting in the loss of water-dependant plants and animals such as the lapwing. Invasive species, such as Japanese knotweed, have spread across the County, and are out-competing our native wildlife for food, space and light. Animals such as the arctic char, once found in many of our lakes, and plants such as the corn cockle, once found in tillage fields across County Clare, are now thought to be extinct here. Others, such as the freshwater pearl mussel, found in the Cloon and Doonbeg rivers, are getting closer to disappearing from our County forever. Many of these issues are underpinned by a lack of awareness and understanding, and there is an urgent need to address these issues through education and guidance.


It is widely acknowledged, that the most effective way to achieve the conservation of biodiversity at a local level, is through a Local Biodiversity Action Plan. It is a way of ensuring that existing and new initiatives, aimed at conserving and enhancing local biodiversity, are undertaken in the context of an overall framework, and that individual projects contribute towards a common set of objectives and targets. The Clare County Biodiversity Action Plan 2017-2023 will recognise existing initiatives, support new ones, and identify and prioritise areas where more actions are needed. In this way, national and international targets for the conservation of biodiversity can be achieved, while at the same time addressing local priorities.

Aim of the Clare Biodiversity Action Plan:

To conserve the biodiversity of County Clare

2.0 Background to the Clare County Biodiversity Action Plan 2017-2023

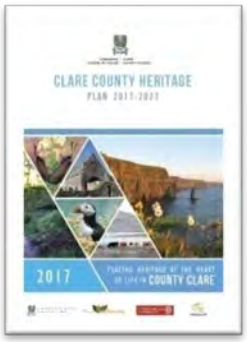
The Clare County Biodiversity Action Plan 2017-2023 supersedes the second Clare Biodiversity Action Plan, which was published in 2014, and achieved much success under the auspices of Clare County Council and many other organisations, community groups and individuals working towards biodiversity conservation in County Clare. Clare County Council employed a full time Biodiversity Officer from 2010 to mid 2014.

Over the course of the last Biodiversity Plan there were annual Biodiversity awareness initiatives, community events and activities: Biodiversity Week and Heritage Week, talks, outings, bog walks, bat outings, practical demonstrations, wildlife surveys, public workshops, articles written for local media, alongside working with local communities to undertake Local Biodiversity Actions and planning.

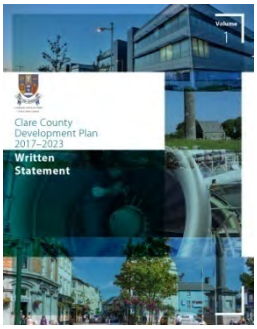
2.1 Policy Framework and Content of the Clare County Biodiversity Action Plan 2017-2023

The Clare County Biodiversity Action Plan 2017-2023 is informed by the seven strategic objectives and associated targets of the third National Biodiversity Action Plan, 2017-2021, Ireland's Vision for Biodiversity. The National Biodiversity Action Plan is consistent with the ecosystem approach (See Section 3.0 below), which is the primary framework for action under the Convention on Biological Diversity. The National Biodiversity Plan is a high-level strategic document, with many of its actions aimed at national level and state regulatory bodies. *Under Objective 1. Mainstream biodiversity into decision-making across all sectors*, the Local Authority plays a key role and is responsible for implementation of best practice in environmental assessment and in policy development to protect and restore biodiversity, and is required to strengthen their ecological expertise, to invest in Blue-Green infrastructure and to update County Biodiversity and Heritage Plans.

The Clare County Biodiversity Action Plan 2017-2023 identifies and translates the actions of the National Biodiversity Plan which relate to County Clare, and ensures that they are implemented at the local level through this Local Biodiversity Action Plan.



The Clare County Biodiversity Action Plan 2017-2023 complements the County Clare Heritage Plan 2017-2023. The Heritage Plan views biodiversity as integral to County Clare's wider heritage resource, and promotes its vital role in green infrastructure, tourism, agriculture, recreation and climate change. The implementation of the County Clare Heritage Plan 2017-2023 is funded by both Clare County Council and the Heritage Council, and managed by the Heritage Officer.



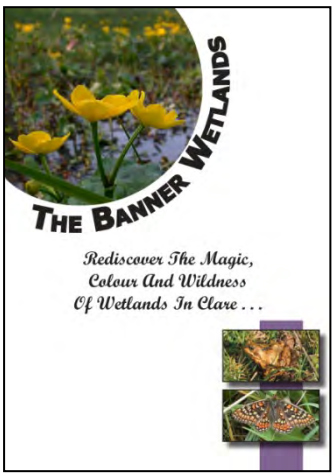
The Clare County Biodiversity Action Plan 2017-2023 is informed by the Clare County Development Plan 2017-2023. The Clare County Development Plan 2017-2023 has the remit to ensure that all planning policy and development applications are in compliance with the relevant environmental legislation, including the Habitats Directive, Codified (Birds) Directive, Strategic Environmental Assessment Directive, Environmental Impact Assessment Directive, Wildlife Act, Water Framework Directive and Shellfish Waters Directive. As such, it is critical that the Clare County Biodiversity Action Plan contributes to the preparation of planning policy within the County, and produces best practice guidelines on biodiversity conservation and management for all sections of Clare County Council. It is also noted that the Development Plan contains a specific objective (CDP14.1) to implement both the Clare County Biodiversity Action Plan and the Clare County Heritage Plan, or any subsequent plans, in partnership with all relevant stakeholders.

The Clare County Biodiversity Action Plan 2017-2023 also complies with the relevant environmental legislation, and in this regard, it has undergone a screening for appropriate assessment and for Strategic Environmental Assessment. It has also been informed by global, national and local environmental issues which are accepted as being critical to biodiversity conservation, including climate change, food security and societal attitudes to our landscape and biodiversity.

Finally, it is important that the Clare County Biodiversity Action Plan 2017-2023 itself contributes to raising awareness of biodiversity. As such, it includes detailed information on the biodiversity found in different parts of County Clare (See Section 5.0 below). The Clare County Biodiversity Action Plan 2017-2023 also includes information on the benefits of biodiversity, and the threats to biodiversity in Clare. Again, each section is appended by objectives to ensure that the benefits of biodiversity are fully recognised, appreciated and maintained, and that threats are minimised or eliminated. In this way, the publication and distribution of the Clare County Biodiversity Action Plan 2017-2023 in itself, will contribute to achieving the aims of the National Biodiversity Action Plan, Ireland's Vision for Biodiversity, 2017-2021.

Objectives of the Clare County Biodiversity Action Plan 2017-2023

- To implement the actions of Ireland's National Biodiversity Action Plan 2017-2021 as they relate to County Clare;
- To inform all biodiversity projects undertaken as part of the County Clare Heritage Plan 2017-2023 and support its full implementation;
- To ensure the Clare County Biodiversity Action Plan 2017-2023 fully informs all planning policy within the County, including the biodiversity objectives in the Clare County Development Plan 2017-2023;
- To produce best practice guidelines on biodiversity conservation and management for all sections of Clare County Council;
- To ensure that all projects carried out under the Clare County Biodiversity Action Plan 2017-2023 comply with the requirements of the Habitats Directive, and all other legislation as appropriate.



3.0 What is Biodiversity?

Biodiversity is the shortened name for biological diversity. We use it to refer to the variety of all living things in a particular place. This includes both wild and domesticated plants and animals, as well as fungi, bacteria and other micro-organisms. However, it is important to remember that biodiversity isn't just about the number of different plants or animals. Instead, biodiversity can be broken down and discussed at four separate levels as follows:

1. **Species diversity:** refers to the number of different types of plants, animals, fungi, bacteria and other living organisms, both wild and domesticated;
2. **Genetic diversity:** refers to the unique DNA which an individual plant or animal possesses. Genetic diversity is essential for populations of different species to remain healthy and functional;
3. **Habitat diversity:** refers to the 'home' of different species, and provides its specific requirements in terms of food, shelter and a means of reproduction;
4. **Ecosystems diversity:** refers to the relationships between different species, their habitats and their local non-living environment (geology, hydrology and micro-climate).



Ecosystem diversity is the most important of these, as it recognises that a species, or a habitat, does not exist independently of its surroundings, and that in order to protect an individual species or habitat, we must protect the community in which it exists. As such, in the context of biodiversity conservation, it is vital that ecosystems diversity is understood, promoted and protected. The biodiversity of County Clare is made up of many interlinking ecosystems, such as wetlands, grasslands, woodlands, lakes, rivers, and coastline. A more detailed description is given is Section 5.0 below.

Similar to the objectives of the National Biodiversity Action Plan 2017-2021, the Clare County Biodiversity Action Plan 2017-2023 is consistent with the 'ecosystem approach'. The ecosystem approach ensures that all of the essential processes, functions and interactions between species, their habitats and their local, non-living environment have been taken into account when promoting best practice management and guidelines for biodiversity conservation. The size of different ecosystems varies, but we must ensure that we protect them in their entirety in order to ensure that we do not overlook any critical relationships.



The Clare County Biodiversity Action Plan 2017-2023 will increase awareness and understanding of the County's biodiversity, and particularly our ecosystems diversity. An educational strategy to enhance biodiversity learning among the different sectors of society is required. This strategy will target all ages and all abilities. Events in County Clare will take advantage of international and national initiatives such as International Biodiversity Day and National Heritage Week. In addition, the Clare County Biodiversity Action Plan 2017-2023 will take advantage of all available information channels when raising awareness to ensure it reaches the widest possible audience.

Objectives of the Clare County Biodiversity Action Plan 2017-2023

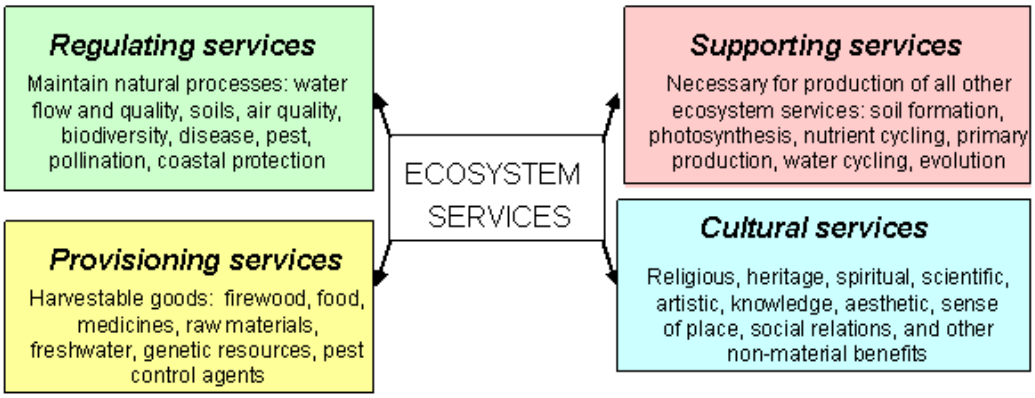
- To deliver an educational strategy to enhance biodiversity learning among the different sectors of society;
- To host events across County Clare to celebrate biodiversity, particularly during International Biodiversity Day and National Heritage Week;
- To publish awareness raising material through a variety of media, including newspapers, radio, publications, websites and social media.



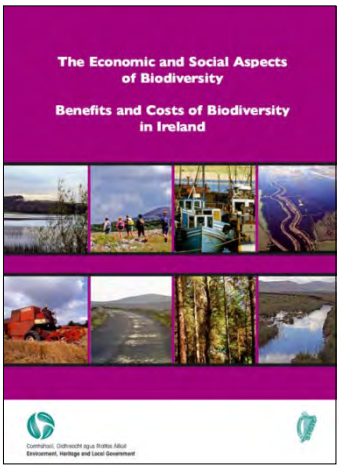
4.0 Why should we conserve Biodiversity

Biodiversity provides many services to our society and economy in County Clare, but these services are not always recognised or appreciated. Many of these services are free and are therefore taken for granted. When breathing in fresh air, for example, we rarely consider the role that plants have played in converting carbon dioxide into oxygen. This is despite many of us learning about photosynthesis in school. Similarly, because many public water supplies are treated before the water is used, we can easily forget the role that wetlands play in purifying it (removing organic matter and pollutants). It should be remembered that water is a finite resource which must be constantly recycled, and by the time water enters the public water supply, biodiversity has already done most of the work for us.

Many of the services provided by biodiversity are provided at an ecosystem level. These 'ecosystem services' can be broken down into regulating services, provisioning services, supporting services, and cultural services as shown below.



The result of these services being overlooked and taken for granted, is that biodiversity is often viewed as a luxury, as an obstacle to progress and development, and that its conservation is an unnecessary expense. This perspective is compounded by the fact that many of the services which biodiversity provides can be very difficult to quantify or place a value on. In 2008, an Irish study called 'The Economic and Social Aspects of Biodiversity – Benefits and Costs of Biodiversity in Ireland' put the value of our national biodiversity at over €2.6 billion per year. It is vital to raise awareness of the services which biodiversity provides, and promote their clear benefits to our economy. Some of these services are detailed in the following sections.



4.1 Food Production

Our agriculture sector is heavily reliant on a healthy biodiversity. Cattle, dairy and sheep production in County Clare is grassland based, with only a very small proportion of grassland reseeded each year. Good grassland management is therefore central to our agriculture sector. Over the last number of years, it has become increasingly evident that species richness in grassland swards results in more productive and cost effective grassland management, and healthier livestock than a rye grass sward.

There has also been a huge increase in weed and pest resistance to herbicides and pesticides in our tillage and horticulture sectors, resulting in a return to more natural forms of pest control. Companion plants are those which are sown alongside our crops in order to attract beneficial insects, repel pests, or provide nutrients, shade or support. In gardens or allotments, for example, when carrots and leeks are planted together, the leeks will repel carrot flies, while the carrots repel onion flies and leek moths. Meanwhile in tillage fields, the creation of beetle banks provides an alternative to pesticides. Beetles are carnivorous, and feed on the pests of cereal crops, however, at harvesting time they are left exposed to predators. Beetle banks provide a refuge for these beneficial insects.

The conservation of genetic resources for native Irish agricultural breeds and varieties is also very important, whether it's the Ballyvaughan seedling apple, Galway sheep or Tipperary turnips. Some of these breeds and varieties have a natural resistance to pests, and therefore may provide a critical resource to future food security measures. Similarly, biodiversity provides us with wild foods such as fish, shellfish, mushrooms, honey, nuts and berries. The sustainable management of these resources will also be critical to future food security.

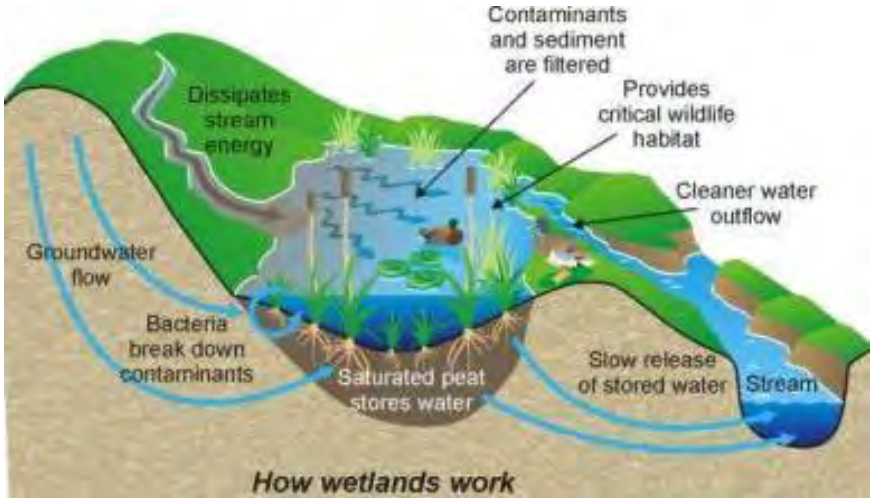
Objectives of the Clare Biodiversity Action Plan

- To raise awareness of the role biodiversity plays in the production of food in County Clare;
- To promote natural forms of pest control and the benefits of companion planting among gardeners and farmers;
- To develop guidance on alternatives to herbicides and promote other effective control for weeds.
- To promote the sustainable management of our wild food resource.

4.2 Provision of Clean Water

When discussing water, we generally break it up into surface water (lakes and rivers that we can see) and groundwater (underground aquifers and springs that we can't see). In County Clare, approximately 75% of our water supply comes from surface water (for example Castle Lake and Doo Lough), with the remaining 25% coming from groundwater (for example Drumcliff Springs). Biodiversity plays a significant role in the provision of good quality water in County Clare.

The wetlands (bogs, fens, marshes and swamps) which surround our lakes and rivers slow down the flow of dirty water from both point source and diffuse pollution, including domestic and commercial wastewater treatment, surface water run-off, industry and agriculture. This allows pollutants to be trapped and filtered out before they reach our water bodies, while microorganisms break down the organic matter. Groundwater is particularly vulnerable in County Clare due to the limestone bedrock of much of the County. Unlike shale, the soluble and karst (fractured) nature of limestone provides little or no protection from pollutants. In these areas, soil and vegetation cover may often provide the only barrier from pollutants to groundwater.



Water is a finite resource which is constantly being recycled. Therefore, the 'wastewater' we 'dispose of' will eventually be recycled and reintroduced into our water supply. In the absence of wetlands, this wastewater will be reintroduced much quicker, and without the cleaning process which our wetlands provide.

It should also be recognised that the natural processes of our wetlands are the basis for constructed wetlands such as reed bed wastewater treatment systems and attenuation ponds, and that it is the invertebrates living in water, such as mayflies and stoneflies, which are regularly used to measure water quality.

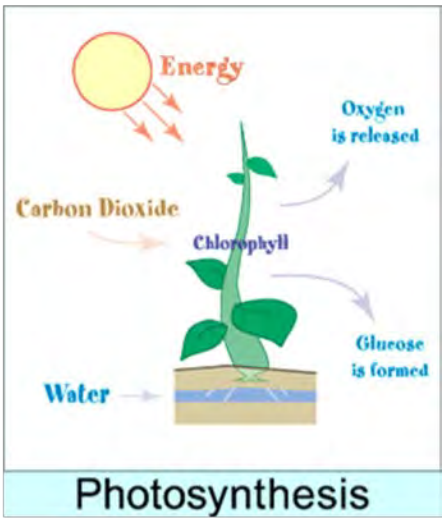
Objectives of the Clare County Biodiversity Action Plan 2017-2023

- To promote the sustainable management of our water resource, and to raise awareness of the links between biodiversity, surface and groundwater, and our water supply and wastewater;
- To continue to raise awareness of the critical role of our wetlands in the provision of clean water and the treatment of wastewater;
- To support the role and function of the Local Authority Waters and Communities Office.

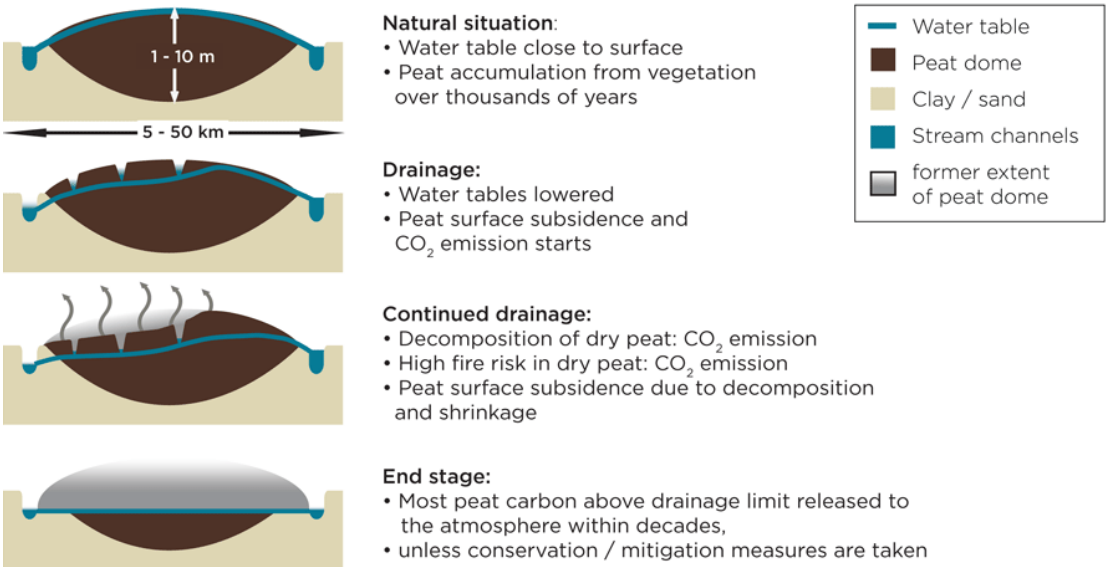
4.3 Climate Change

Climate change is regarded as the biggest environmental issue facing the world today. The release of greenhouse gases, such as carbon dioxide, is regarded as one of the main drivers of climate change. Biodiversity, and particularly plants, play a significant role in removing this carbon dioxide from the atmosphere and storing it through photosynthesis. However, activities such as deforestation prevent this critical service from occurring, while activities such as the drainage of peatlands can actually release more carbon dioxide into the atmosphere. Combined, these activities can speed up the rate of climate change. The rate of biodiversity loss across the world has been inextricably linked to the rate of global climate change. However, there has been an increasing move towards trying to adapt to climate change, rather than trying to stop it, and in this regard, biodiversity has another significant role to play, particularly in relation to flood attenuation.

Carbon sinks and carbon sources have become part of the vernacular among school children. Here in County Clare we have two main carbon sinks and potential sources, namely our bogs and our woodland. Our trees and other green vegetation take in carbon dioxide (a mixture of carbon and oxygen), use up the carbon, and release the oxygen. In this way they act as carbon sinks. County Clare is one of the most forested counties in Ireland with around 14% forestry cover, although some of this is species poor conifer plantation. The loss of woodland, and particularly broadleaved woodland, reduces the size of our carbon sink, as well as a loss of habitat for birds, mammals, insects, fungi and lichens.

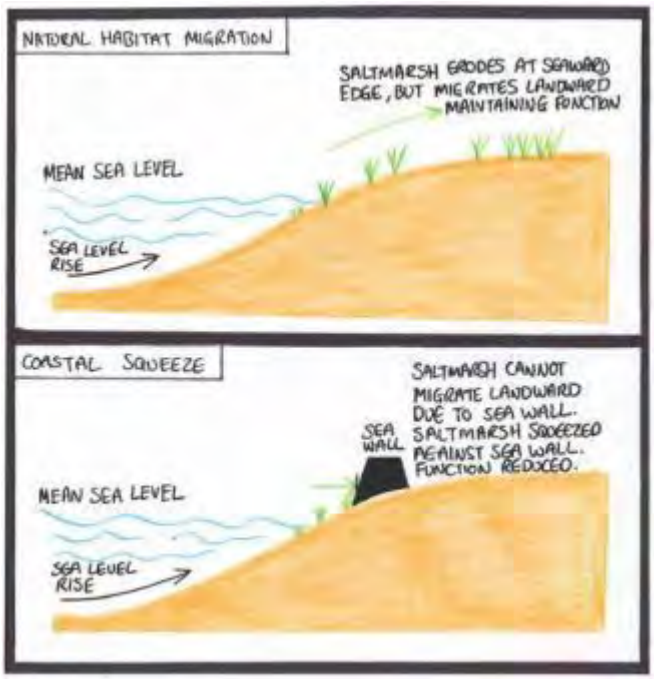


Our bogs, such as Lough Acrow and Tullaher bogs in West Clare, contain and absorb carbon dioxide in the same way as trees and other vegetation, but in much higher quantities. In fact, the world's peatlands contain four times the amount of carbon as all of the world's rainforests, however, peat only retains carbon if it's moist. Therefore when a bog or fen is drained, they become major carbon sources, releasing huge quantities of carbon dioxide into the atmosphere as the peat decays and oxidises.



Wetlands, such as bogs, fens, swamps and marshes, slow down the flow of water, and so help to regulate flooding, however, their loss not only exacerbates the level of flooding, but also its speed, which leads to flash flooding. Wetlands can contain huge volumes of water (for example bogs are made up of over 90% water) and when a wetland is drained, the water must go somewhere, and water will always flow to the lowest lying areas. The protection and retention of river floodplains from infilling, reclamation or development is also vitally important to ameliorate the impacts of flooding.

Climate change and ocean acidification present considerable threats to the marine environment.



Coastal erosion is an on-going process, while sea level rise is generally regarded as a result of climate change. Coastal habitats such as saltmarshes and sand dunes act in a similar way to wetlands in reducing the impact of coastal erosion on soft landscapes. Coastal habitats adapt to erosion by naturally migrating inland, however, hard developments such as a sea wall, prevent this migration, and combined with sea level rise, the habitats become trapped and 'squeezed' between the two forces, resulting in their eventual loss. The damage caused to coastal communities by stormy seas in January 2014 has resulted in the provision of sea defences along our coastline.

Objectives of the Clare County Biodiversity Action Plan 2017-2023

- To raise awareness of the role of biodiversity in climate change, and the importance of wetland management in preventing flooding;

- To raise awareness of the impacts of coastal squeeze and the importance of coastal zone management.

4.4 Soil Fertility

As most gardeners know, the more earthworms in the soil the better, as they help to mix up the soil, aerate it, and improve its structure, however, it's not just earthworms which contribute to soil fertility. Microorganisms such as fungi and bacteria help break down organic matter such as dead vegetation and animal manure into humus, which provides nutrients to plants, holds moisture and improves soil structure. Nutrient cycling by soil organisms is estimated to be worth €1 billion each year to the agricultural sector in Ireland. Plants themselves can contribute to soil fertility. Clover for example is a nitrogenous plant, meaning it increases nitrogen in the soil, a vital nutrient for plant growth, while trees and shrubs bring nutrients from the sub-soil and bedrock (including important trace elements) to be distributed over the top soil via leaf litter. This is of particular value for farms and gardens where crops and animals (and ultimately humans) need such nutrients for good health.

Objectives of the Clare Biodiversity Action Plan

- To raise awareness of the importance of Soil Fertility, and produce best practice management guidelines for maintaining Soil Fertility;
- To raise awareness of the important role earthworms, microorganisms and other biodiversity play in soil fertility.

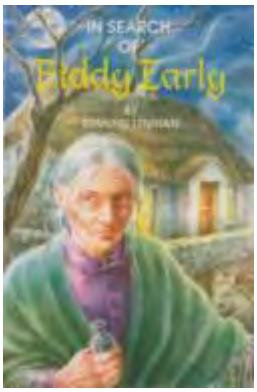
4.5 Crop Pollination

Most people appreciate the beauty wildflowers bring to our landscape, they want the option to grow their own fruits and vegetables and they want to buy affordable Irish apples or strawberries in our shops. This can only happen in a landscape that supports pollinators and provides them with nesting areas and a diverse diet from spring to autumn. The annual value of pollinators for human food crops has been estimated at €153 billion world-wide, and at least €53 million in the Republic of Ireland. We know that 78% of our wild plants also benefit by being pollinated by insects. Without these wildflowers, the Irish landscape, cherished by us and crucial to our tourism sector, would be a less beautiful and colourful place. While bees are the most notable pollinators, there are many other insects which help pollinate, including hoverflies, butterflies and moths. County Clare and particularly the Burren, is a stronghold for pollinators and particularly bee species, however, pollinators are in decline in County Clare and across the world for a number of reasons; including diseases, parasites, fragmentation of their habitats, intensification of agriculture, the use of pesticides and chemicals and climate change. More than half of Ireland's 97 native bee species have significantly declined in numbers since 1980, with one third now threatened with extinction.

Objectives of the Clare Biodiversity Action Plan

- To assist in the implementation of the All-Ireland Pollinator Plan 2015-2020, including Councils: actions to help pollinators;
- To promote County Clare, and particularly the Burren region as an important refuge for native pollinators.

4.6 Medicine



While the medicinal benefits of herbs have been known since the time of County Clare's most famous herbalist, Biddy Early, it is among bacteria, algae and fungi that the most recent medical advances have been made. In the last decade, there have been several outbreaks of new life-threatening, and potentially epidemic diseases, as well as many diseases where there is no known cure available. As there is estimated to be at least 7,000 species of algae and fungi yet to be discovered in Ireland, there is significant potential for identifying new cures to diseases. It is important, therefore, to continually record the biodiversity of County Clare, and submit records to the National Biodiversity Data Centre. Initiatives such as habitat mapping, bio-blitz events and school or college projects will be supported through the Clare County Biodiversity Action Plan 2017-2023 .

Objectives of the Clare Biodiversity Action Plan

- To support the recording of biodiversity across County Clare and the submission of all biodiversity records to the National Biodiversity Database Centre.

4.7 Bio-mimicry

Bio-mimicry is how science and technology copy nature's design in order to increase efficiency. For example, the eye of a moth has shown scientists how to create an anti-reflective coating for solar panels, the wings of a dragonfly inspired panels on a boat called 'Solar Sailor', which harnesses both solar and wind energy, super adhesive bandages have been modelled on the structure of a gecko's foot, and trains have been modelled on the head profile of a kingfisher. Bio-mimicry encourages us to look afresh at nature for ideas and models of sustainable design, and there are ever increasing opportunities to bring together ecology, biology, design and technology.

Objectives of the Clare Biodiversity Action Plan

- To support research projects which explore opportunities for bio-mimicry based on the biodiversity of County Clare.

4.8 Education

Biodiversity has always played a role in education, particularly within the curriculum of primary schools, and it is well recognised that outdoor activities add enormously to the relevance and effectiveness of children's learning. In County Clare, there are a number of programmes and initiatives in schools which aim to increase children's awareness of our local biodiversity, such as the Heritage Council Heritage in Schools Scheme. In the Burren, the 'Ecobeo' programme has paved the way for a deeper understanding of the Burren among school children, while An Taisce's national 'Green Schools' initiative has a specific biodiversity 'flag'.

However, curriculums and consequently schools, have tended to use national, or even international case-studies to teach, thereby overlooking the wealth of case-studies available on the school's own doorstep. Increasingly, there is a focus on place-based education. Place-based education immerses the students into their local landscape and local biodiversity and offers opportunities to enhance multi-dimensional learning opportunities than classroom-based education alone.

It is important however, that the educational objectives of the Clare County Biodiversity Action Plan are not restricted to children, young people, schools and other educational institutes. Awareness and understanding of biodiversity is critical through all life stages and abilities, particularly given that those with the most influence on biodiversity today, are adults who have finished formal education. There is a need to promote life-long learning in relation to our biodiversity to ensure that policies and decisions are fully informed and evidence based.

Objectives of the Clare Biodiversity Action Plan

- To deliver an educational programme to a wide variety of sectors and produce educational material which introduces local biodiversity;
- To promote the Heritage Council Heritage in Schools Scheme;
- To utilize the findings of research projects at all levels in educational material;
- To raise awareness and understanding of biodiversity through all life stages, and promote life-long learning in relation to our biodiversity;
- To support the ongoing rollout of An Taisce's Green School initiative, and support the Biodiversity theme where possible;
- To support the rollout of Burrenbeo's Ecobeo and Áitbeo's programmes;
- To further develop the concept of Place-based education in Clare, and particularly in the Burren.

4.9 Recreation, Amenity and Well-being

There is an increasing appreciation of the recreational and amenity benefits of biodiversity as evidenced in the development of a Green Infrastructure Plan for Shannon and an emerging Green Infrastructure Plan for Ennis, in neighbourwood schemes such as Lees Road and Ballybeg Woods and in the popularity of walking trails throughout the County, such as the Cliffs of Moher Coastal Walk from Liscannor to Doolin. However, it is important to understand that many of the health benefits and particularly the mental health benefits, arising from these areas are inextricably linked to the biodiversity available. In healthcare, and particularly the field of naturopathy, the healing effects of nature and biodiversity are becoming increasingly recognised. It is well known, for example, that hospital patients recover more quickly when they can see trees and other aspects of biodiversity from their windows, while sensory gardens can provide stimulating environments for all. Biodiversity can even benefit business, with a window view of nature, or even a cluster of plants near their desks reducing worker fatigue and increasing attention and memory. Simply surrounding ourselves with the sounds of nature is proven to reduce blood pressure and stress.

Objectives of the Clare County Biodiversity Action Plan 2017-2023

- To raise awareness of the role of biodiversity in the health and wellbeing of our society in County Clare.

4.10 Inspiration and Culture

'Great art picks up where nature ends'. This quote from Marc Chagall is particularly apt in the context of the rich and radiant biodiversity of County Clare. Countless artists have tried to convey the vibrancy of the spring gentian against the Burren's grey limestone, or to capture the serenity surrounding Lough Graney. Others have been encouraged by the rugged Atlantic coastline, or the seemingly endless number of wading birds in the Fergus Estuary. However, it's not just artists who come to County Clare to be inspired, as evidenced from the huge volume of songs, stories and poems which describe our local biodiversity in vivid detail. Indeed many parishes and townlands throughout County Clare have names associated with biodiversity, or local songs describing their landscape.

Biodiversity is also central to many aspects of our cultural heritage. The Latoon Fairy Tree near Clarecastle is where the Munster fairies are said to have rested on their way to war. The Herbalist, Biddy Early, was convicted of witchcraft due to her knowledge of herbal medicine, while the Brian Boru Oak in Tuamgraney is one of the oldest and most famous oak trees in Ireland. School visits and competitions carried out under the first and second Clare County Biodiversity Action Plan have revealed some exceptional raw talent which has been inspired by our local biodiversity. It is important that these activities are continued so that there is a greater recognition of the importance of our local biodiversity to the arts.

Objectives of the Clare County Biodiversity Action Plan 2017-2023

- To encourage the appreciation and understanding of our biodiversity through art, music, and folklore

5.0 Finding the Biodiversity of County Clare

County Clare is home to many rare species, unique habitats, however, biodiversity does not just occur in 'wild places' such as bogs, woodlands, or the seashore. It can occur on our doorsteps, in our gardens, schoolyards and farms. As a result, those who manage our landscape, such as farmers, gardeners and landowners, are the custodians of our biodiversity.

The rich biodiversity which County Clare boasts is reflected in the high number of Nature Reserves, Wildfowl Sanctuaries, Special Areas of Conservation, Special Protection Areas, and Natural Heritage Areas that have been designated across the County. The designation and subsequent management of these areas are governed by the EU Habitats Directive, EU Birds Directive and Irish Wildlife Acts. While the Clare County Biodiversity Action Plan 2017-2023 does not have any control in this, it is considered that the future protection of County Clare's biodiversity is as equally reliant on awareness, education and the provision of best practice guidelines. It is important to remember that County Clare's biodiversity is not just about rare or threatened habitats and species, or designated sites. Very often, it is a common plant or animal which is vital to the survival of other species. The rare and protected marsh fritillary butterfly, for example, is only found near its food plant and requires high densities of the devil's-bit scabious plant. There are also a number of species which could be regarded as 'favourites' in County Clare, for example, cuckoos, hedgehogs, cowslips, ash trees, blue tits, frogs and many more. These are important species for education and awareness as they spark an immediate interest among audiences.

However, in order to conserve the biodiversity of County Clare, we need to know what biodiversity we have here. To date a considerable proportion of County Clare has been mapped for its habitats, and it is an objective of the Clare County Biodiversity Action Plan 2017-2023 to continue this habitat mapping.

Objectives of the Clare County Biodiversity Action Plan 2017-2023

- To continue the habitat mapping of County Clare, and use it to raise awareness of County Clare's biodiversity.



In keeping with the ecosystem approach, the ecosystems of County Clare are detailed in Sections 5.1 to 5.8 below. However, to demonstrate the complexity of ecosystems, an example of a garden ecosystem is set out below.

In a typical back garden, there will be a grass lawn surrounded by a hedge. The types of trees in the hedge will vary depending on the type and depth of soil available, and exposure to the elements. There may be shade-loving flowers like violets or primroses growing underneath the hedge, while sun-loving flowers such as daisies or dandelions may be scattered around the lawn. In shady or unmanaged corners, there may be other plants like ivy, nettles or mosses.





Micro-organisms, such as fungi and bacteria, will live on the ground, and help to break down fallen leaf litter, while earthworms improve the soil by mixing it up and aerating it. This in turn will improve the growing conditions for plants. The flowers and plants will attract insects. Caterpillars, slugs and aphids (tiny flies) will feed on the flowers themselves, while butterflies and bees will fly from flower to flower searching for pollen or nectar. Some plants will attract certain types of insect only. For example, brimstone butterflies are only found where there are buckthorn trees; cabbage white butterflies rely on plants from the cabbage family; and nettles attract red admiral, small tortoiseshell, peacock, and comma butterflies.



All of these insects will in turn become prey for someone higher up the food chain. Spiders and beetles will feed on flies and aphids, while pygmy shrews, hedgehogs and birds feed on anything they can catch. An important thing to remember is that different levels of the food chain are interdependent. For example, while a beetle relies on flowers to attract aphids, flowers rely on beetles to keep the aphids under control.



However, interdependence is not restricted to food chains. Birds, for example, need materials to build their nests. A blackbird's nest is an untidy cup in the lower branches of the hedge, made from grass and twigs, and bounded together with mud or finer grasses. Blue-tits, on the other hand, will find a hole in a tree or wall, and make their nest from moss, wool, dead leaves and spiders' webs.

The interdependence between different plants, animals and their environment has developed over many years, and led to unique communities with their own processes, functions and interactions. This is what we refer to as ecosystems. The description above is only a fraction of what a real garden ecosystem would include, and should be viewed only as a learning tool. Examples of other ecosystems in County Clare, including the rare and threatened species they support, are detailed below.

5.1 Limestone Ecosystems

Limestone is the bedrock for most of north and mid-Clare and was formed around 360 million years ago at the bottom of warm shallow sea by the compaction of marine fossils. The soluble and base-rich nature of limestone provides unique habitats, such as pavements, calcareous (or orchid-rich) grasslands, turloughs, petrifying springs and caves. While these can be found throughout mid-Clare, some of the best examples in Ireland occur in the Burren.

The limestone landscape of the Burren is unmistakable, with its annual display of arctic-alpine and Mediterranean flowers. However, it's not just the individual species of flowers found in the Burren which make it unique, but rather the fact that these flowers grow side-by-side here, and in such high numbers. Spring gentians, hoary rock roses, bloody cranesbills and mountain avens flourish in the north Burren around Fanore and Blackhead. Meanwhile, twenty-two of Ireland's twenty-seven species of orchids are best found around Carron and Kilnaboy, including the bee orchid, fly orchid and early purple orchid.

The colours which these flowers bring to the landscape are intensified against the backdrop of grey limestone. For the keener botanist, the Burren can also be found hiding such gems as the dark-red helleborine, autumn lady's tresses, Irish orchid and Irish saxifrage.

This abundant display of flowers supports a vast array of insects, which can be seen busily moving from flower to flower. For example, twenty-six of Ireland's thirty-three butterflies have been recorded at Mullaghmore, and it is widely considered to be the richest butterfly site in Ireland. However, other insects can be more difficult to find. The Burren Green moth is found nowhere else in Ireland or Britain, and like many moths, only comes out at night.

The hydrology of the Burren is particularly special, and it is widely claimed that water, rather than rock, is what defines the Burren. Most of the central Burren (40% of the overall area) drains south into the Fergus, via the Elmvale springs north of Corofin. The northern Burren, consisting of the catchments of Ballyvaughan and Bell Harbour (12% and 14% of the Burren respectively) drains mainly through submarine outlets into the sea at Galway Bay, while the western Burren, consisting of the catchments of Poulsallagh, Deereen, Caher and Fisherstreet (16% of the area) drains largely into the Atlantic Ocean.

The wetlands of the east Burren support many distinctive habitats and features, with turloughs being among the most unique. Turloughs are temporary, shallow, groundwater-fed lakes surrounded by a rocky rim and lined with boulder clay, which fill and empty through swallow holes connected to the water table. In the Burren, turloughs generally have very low

nutrient levels, which make them very interesting. At the bottom of the turlough, the vegetation consists of a mixture of aquatic plants, such as stoneworts and pondweeds, while at the top of the turlough there are plants which are tolerant of being submerged in water, such as shrubby cinquefoil and turlough moss. The Carron turlough is the largest in Europe, while Lough Bunny has one of the lowest nutrient levels of any lake in Europe, and supports Ireland's rarest damselfly, the scarce emerald.

The protection of limestone ecosystems in the Burren is largely linked with the systems of farming here. In this regard, on-going support for the Burren Farming for Conservation Programme is vital. The hydrology of the Burren, its complex groundwater network and extreme vulnerability from pollution sources, its influence on the Burren's wetland habitats, and its role as the source water of the River Fergus is not widely recognised or understood. In the absence of such an understanding, there are many potential threats. The Burren is one of County Clare's largest tourism attractions, however, this poses additional threats. The provision of parking and wastewater disposal in the Burren have been on-going concerns for a number of years, however, the construction of damaging 'mini-dolmens' is also a problem. In many cases, these have resulted in extensive damage to the limestone pavement. The Burren and Cliffs of Moher UNESCO Global Geopark aims to address these issues, and it is vital that the Clare County Biodiversity Action Plan informs, and supports this programme.

Objectives of the Clare Biodiversity Action Plan

- To raise awareness of the effects of damage to limestone pavement, particularly its removal and the construction of 'mini-dolmens';
- To raise awareness of and threats to, the complex groundwater network in the Burren and its influence on the Burren's wetland habitats;
- To encourage and support the work of the Burren Farming for Conservation Programme and the Burren and Cliffs of Moher UNESCO Global Geopark in the conservation of the limestone ecosystems in the area.

5.2 Freshwater Aquatic and Wetland Ecosystems

County Clare is rich in aquatic habitats, such as lakes, rivers and streams. Our largest lake, Lough Derg is one of only five lakes to support the Irish Pollan, Ireland's most unique fish species. These fish are thought to be glacial relicts of an Alaskan-Siberian whitefish species, but there are strong scientific arguments that the Irish Pollan should be recognised as a unique and separate species.

In 2012, the high numbers and variety of fish in Lough Derg, including a landlocked population of sea lamprey, attracted white-tailed eagles (also known as sea eagles), in addition to its resident cormorant population.

Our main river, the Fergus, almost splits the County in half. The Fergus rises in the Burren, and flows through Inchiquin Lake, the angling village of Corofin, Dromore Woods Nature Reserve, Ballyalla Lake Wildfowl Sanctuary, Ennis Town, and Clarecastle village, until the incoming tide at the Fergus Estuary creates one of the most important areas for wildfowl and waders in Ireland

In west Clare, the extensive springs of Mount Callan provide the source water for the Inagh, Annageeragh and Annagh Rivers, while its peak overlooks several lakes including Doo Lough, Cloonmacken Lough, Drumcullaun Lough and Lough Keagh.

South-east Clare is equally full of lakes, including Fin Lough, Rosroe Lough, Lough Cullaunyheeda and Doon Lough. Their waters are home to several species of fish, including pike, perch, bream and roach.

Wetlands, as the name suggests, are areas that have been wet for long enough to allow specially adapted plants and animals to establish. They regularly occur as mosaics, and it can often be difficult to see where one wetland type ends and another begins. County Clare is home to several different wetland types, due to our wet climate, topography, geology, hydrology and soil types. Many of these are regarded as being internationally important.

Some wetlands, such as swamps and marshes, are linked to lakes and rivers. They are, in effect, the border between the open water and dry land. Reeds, Sedges, water forget-me-not, marsh marigold and purple loosestrife provide cover for ducks and waders such as snipe.

Other wetlands, such as bogs, wet heath and fens, occur where the water table is close to the surface, or where the bedrock is impenetrable. Shale, for example, is the bedrock for much of West Clare, and this has had a dramatic effect on the landscape. At Cragnashingaun Bog and Lough Acrow Bogs you can find the carnivorous sundew plant, bog-building sphagnum moss, hares, frogs and red grouse.



Objectives of the Clare Biodiversity Action Plan

- To work with landowners, local communities and other relevant groups to protect and manage inland waters, river corridors and their floodplains, turloughs, lakes and other water bodies from degradation and damage and to recognise and promote them as natural assets of the urban and rural environment;
- To support the full implementation of the 2nd cycle of the River Basin Management Plan for Ireland including measures to protect high status sites in Co Clare, provision of community wetlands, integrated constructed wetlands, natural flood areas with a particular focus on the River Fergus catchment involving community action;
- To raise awareness of Irish Pollan and White-tailed Sea Eagles at Lough Derg and their conservation requirements amongst the general public, anglers and authorities;
- To raise awareness of the heritage and environmental value of bogs and to support and encourage landowners and local communities to protect their valuable bog resource;
- To raise awareness of the importance of water quality for nature conservation


5.3 Woodland and Hedgerow Ecosystems

With 14% woodland cover, County Clare, and East Clare in particular, contains many fine woodlands. While Raheen Wood boasts the Brian Boru tree, the woodlands on the lower slopes of Slieve Bearnagh are carpeted with bluebells, ramsons and wood anemones. In West Clare, the Vandeleur Woods echo to the calls of blackbirds, finches and goldcrests, while the hazel woodland in the Eagles Rock Nature Reserve in North Clare is noted for its rare lichens.

In mid-Clare, from Corofin down towards Ennis, the landscape has been eroded and smoothed by the River Fergus and its tributaries into natural parklands. Pine martens, stoats, and red squirrels inhabit the woodlands of Dromore, Lees Road and Ballybeg.

Our woodland and scrub echoes in Spring to the calls of chiffchaff, willow warbler and whitethroat. County Clare is also an important stronghold for the cuckoo. The cuckoo itself relies on a plentiful population of meadow pipits and dunnocks, to utilize their nests, and trick them into raising its own young.

There are two woodland types of particular importance in Clare. Native woodlands consist predominantly of native trees, and support a rich ground flora including flowering plants, ferns and mosses. A huge variety of lichens and fungi can be found in native woodlands, particularly those which contain a lot of dead wood.

Native woodlands are of high importance because they have developed over time along with all other species of native flora and fauna in a symbiotic relationship beneficial to each other. Native trees such as oak and willow support hundreds of different species of insect compared to the mere handful that are associated with non-natives trees.

Wet woodlands, as the name suggests, are found growing in wet areas or bogs, and can be categorized depending on the types of trees, or the location. For example, riparian woodland is one which grows along river banks, and can be found along the banks of the Shannon in South East Clare. The most common type of wet woodland in County Clare is wet willow-alder-ash woodland, and is often referred to as ‘Carr’. Examples of this can be seen at Dromore Woods Nature Reserve, while Loughanilloon bog supports bog

woodland.

Hawthorn is by far the most common tree species in County Clare's hedgerows, closely followed by blackthorn, however, ash, elder, gorse, holly, willow and hazel are also quite prevalent. Older hedgerows in Clare are generally more species-rich as they have had the opportunity for species to arrive and establish, for vegetation to develop, and for complex ecosystems to evolve. Hedgerows in County Clare with holly, guelder rose or crab apple, or those linked with woodland, generally support a richer diversity of species, with flowers such as enchanter's nightshade, lords and ladies and wood woundwort. However, it is the shape and structure of our hedgerows, rather than the tree species, which tend to influence the species diversity in the ground layer (flowers). Hedges that are tall and wide, or have abundant trees, tend to have a more species-rich ground layer, whereas those that have been cut hard, or are open and scraggly and with a high bramble cover tend to be species poor. Those hedgerows containing willow tend to be linked to wet grassland or a water body such as a stream or drain. These hedgerows often support wetland species such as meadowsweet, soft rush, horsetail, and purple loosestrife.

However, a poor species diversity of a hedgerow does not diminish the vital function it plays in supporting our local biodiversity. Migration between habitats is critical to healthy functioning populations, and hedgerows offer protection to migrating species. Flying insects, for example, take advantage of the sheltered side of hedgerows as they travel across the countryside, while the dense undergrowth of many of our hedgerows provides a safe passage for invertebrates and small mammals. In Clare, and particularly mid Clare, hedgerows are vital to the survival of lesser horseshoe bats. The echolocation system of these bats is not very successful in open spaces, and so they are heavily reliant on intact hedgerows for commuting.

Many hedgerows in County Clare are overgrown and 'gappy', which results in a loss of structure. In addition, many hedgerows lack young trees, and this poses a potential threat to their future. Good management of a hedgerow, which includes practices such as laying and coppicing, can rejuvenate a hedgerow, and extend its lifetime almost indefinitely. The hedgerow resource in County Clare could be greatly improved with higher levels of management that follow best practice.

Objectives of the Clare Biodiversity Action Plan

- To work with landowners, local communities and other relevant groups to promote the retention and conservation of existing trees and hedgerows, and to prevent the disruption of connectivity between woodlands, hedgerows and other valuable habitats;
- To encourage proposals that enhances the landscape through positive management and additional planting of native tree species;
- To raise awareness of the importance of native woodlands and trees;
- To provide guidance and encourage best practice management of hedgerows and to continue recording the hedgerows of County Clare.

5.4 Grassland Ecosystems

Grasslands are easily the most common and recognisable habitats in County Clare, but there are many different types. Agricultural fields, which are grazed by livestock or closed-off for silage, generally contain a perennial rye-grass sward. The perennial rye-grass dominates and so these fields tend to have a lower diversity of species than those fields which are less intensively managed. Fields managed as hay meadows are particularly important as they are generally mown in mid or late summer after the vegetation has flowered. In some species rich grasslands in south-east Clare, the rare blue eyed grass can be found.

Wet Grasslands are those which occur on waterlogged or poorly drained soils, and contain a rich variety of plants that are more tolerant of the wet conditions. Flowers such as meadowsweet, cuckoo flower, silverweed and devils-bit scabious are abundant. These flowers support high numbers of flying insects, as well as providing cover for ground nesting birds, such as the skylark and meadow pipit.

Molinia Meadows are a particularly special type of wet grassland, that are dominated by purple moor-grass from which they get their name (molinia is the Latin name for this species). Ballyteige Nature Reserve, near Lisdoonvarna, is a fine example, and supports marsh orchids, hare, snipe, frogs and orange-tip butterflies.

While the Burren supports the best examples of calcareous grasslands, these also occur throughout mid Clare, where there is a thin layer of nutrient poor soil over limestone. Orchids such as the pyramidal orchid, common spotted orchid and fragrant orchid are typically found, as well as mountain everlasting, kidney vetch, and lady's bedstraw.

Objectives of the Clare Biodiversity Action Plan

- To raise awareness of the different types of grasslands in County Clare, and best practice in relation to their management;
- To continue the recording of grasslands in County Clare.

5.5 Marine Ecosystems

The Atlantic Ocean borders West Clare, from Loop Head to Blackhead, while Galway Bay covers much of our northern coastline.

There is an up-welling in Galway Bay, which makes it particularly important for marine life. An up-welling occurs where the wind and currents mix deep water, which is rich in nutrients, but very cold, with surface water, which is warm, but nutrient poor. This produces conditions ideal for plankton to grow. Plankton is at the bottom of the marine food chain, and so, where there is an abundance of plankton, there will be an abundance of fish, birds and other marine mammals. One of the largest colonies of common seals in Ireland occurs in Galway bay, but ironically, despite their name, they aren't very common at all.

Around New Quay and the Flaggy Shore, the waters are rich in shellfish. There are spider crabs, velvet crabs, lobsters and oysters. The shoreline is equally rich in marine species, and is carpeted with many different types of seaweeds, including kelp, carrageen, and bladderwrack. The rock pools are alive with shore crabs that walk sideways, limpets that seem to be stuck fast to the rocks, and sticklebacks that move through the water like tiny rockets.

Sponges, corals, sea-fans, jewel anemones, purple sea urchins, and starfish are quite at home on the reefs around Kilkee. However, our exposed Atlantic seaboard offers fewer opportunities for this kind of wildlife, and instead is renowned for its beaches and cliffs.



The ‘twisted rocks’ of Blackhead, immortalized in the Luke Kelly song, are home to peregrine falcons and kestrels, while further south, razorbills, choughs and puffins can be seen from the famous Cliffs of Moher. The choughs found in County Clare are part of what is believed to be a distinct race, known colloquially as the ‘Celtic Chough’, as they only occur in Ireland, Brittany, Wales, the Isle of Man, Cornwall, and some Scottish Islands. The mudflats and sandflats which stretch south from Quilty towards Lurga Point support waders such as purple sandpipers, dunlins and turnstones. In contrast, the sandstone strata of the cliffs provide excellent breeding platforms for guillemot, kittiwake and fulmar. The Bridges of Ross is regarded as one of the best sites in the West of Ireland to watch migrating birds as they fly to warmer climes.

Sand dunes are interesting and fragile ecosystems supporting a range of specialist seaside plants such as marram grass, sand couch, and scurvy-grass, as well as a diversity of insects and mammals. The sandy beaches and dune systems of Lahinch, the White Strand, Spanish Point and Quilty draw thousands of holidaymakers each year. The dunes closest to the shore are often called yellow dunes. They are dynamic because they have a high exposure of sand and are only partly vegetated. The dunes furthest away from the shore are more stable and have more vegetation. These are often called grey dunes.

Objectives of the Clare Biodiversity Action Plan

- Raise awareness of sand dune habitats and their importance. Update ecological information on beach notice boards;
- To work with the Cliffs of Moher Visitor Centre and Loophead Lighthouse to further increase awareness of County Clare's sea bird colonies;
- Encourage best practice at popular fishing points, particularly in relation to the prevention of littering.

5.6 Estuarine Ecosystems

Estuaries occur where a river enters the sea. The fresh water flowing from the river mixes with the salt water of the incoming tide. There are a number of smaller estuaries along County Clare's west coast, such as the Inagh River Estuary, however, the Shannon Estuary is Ireland's largest.

Between them, the Shannon and Fergus Estuaries create the most important site in Ireland for overwintering wildfowl and waders, with peak numbers of around 70,000 birds holidaying here each year. The nutrients that are carried downstream with the river are mixed by the incoming tide, and as the tide retreats, the nutrients are deposited on the vast expanses of mudflats and sandflats. This creates rich feeding grounds for birds, which are attracted by the huge densities of worms and crustaceans living in the mud. Rare birds such as whooper swans, golden plovers, and bar-tailed godwits are regular visitors, while dunlins, black-tailed godwits, and redshanks often reach internationally important numbers.

Salt marshes are found along much of the Shannon Estuary, and provide roosting areas for many birds, as well as a nursery for some fish species. Salt marshes act as a transitional zone between the marine environment and the terrestrial environment, and help to buffer the effects of tides and waves on our coastline. Their vegetation varies depending on the salinity (quantity of salt in the water), with plants such as glassworts and common cord-grass on the seaward edge where salinity is high, and plants such as sea-pink, sea-plantain and sea-aster on the landward side where salinity is lower.

The Shannon Estuary is also home to smelt, one of our few truly estuarine fish species. Nicknamed the 'cucumber fish' by pike anglers, the smelt is actually a distant relative of the salmon. The anglers use the smelt as bait fish, due to their ability to attract pike with their pleasant smell.

Ireland's only resident population of bottle-nosed dolphins can regularly be seen breaching in the lower reaches of the Shannon Estuary, which provides the area with a unique tourism opportunity. Furthermore, the estuary is an important dolphin calving area, with the young calves being fully dependant on their mother for the first year of life.

Objectives of the Clare Biodiversity Action Plan

- To raise awareness of the unique nature of estuaries, their habitats and wildlife;
- To promote the Shannon Estuary as an area to watch, learn about and enjoy wildlife;
- To raise awareness of salt marshes and their importance in County Clare.

5.7 Farmland Ecosystems

In County Clare, farmland binds all other habitats together. It is a patchwork of irregular shaped fields, bordered by hedgerows and stone-walls, and managed in a multitude of ways. In fact, our entire landscape is very much a farmed landscape, with only a small handful of areas, such as town and village centres and green spaces, open water and a handful of bogs and woodlands, which have not been shaped in some way by farming.

The Burren, for example, with its limestone pavements, turloughs and orchid-rich grassland is a completely farmed landscape, and relies of farming for its continued existence. The vast areas of wet grasslands in Clare are farmed, with the weather dictating when they are grazed. Agro-forestry, which had almost died out as a practice, is slowly returning to popularity. Even the highest slopes of the Slieve Aughty Mountains and the sand dunes of the West coast are all farmed.

However, there are many habitats and species which are considered to be almost uniquely 'agricultural'. In fields which have been tilled for grain, agricultural 'weeds' add 'unwanted' colour to the landscape.

Corn marigold, corn spurrey, corn cockle and cornflower all take their name from farming, however, they are quickly disappearing as tillage farming has all but vanished in County Clare. The latter two species in particular are now thought to be extinct in Clare. The loss of tillage farming has also led to huge declines in bird numbers such as yellowhammers, greenfinches and the winter visiting bramblings who rely on the field's stubble to see them through the winter.

Over the last half century, farming in Clare has changed, and subsequently farmland habitats have changed. Mixed farming has given way to specialist farm enterprises, and 'land improvements' have had a significant impact. Birds such as lapwings and curlew have suffered a huge decline following the drainage of lands, and subsequent loss of habitat, while

numbers of flying insects, attracted by flowering plants, have fallen since the switch from hay to silage.

It is also important to recognise our native Irish agricultural breeds and varieties. Animals such as Galway sheep and Kerry cattle have become increasingly rare, while crops such as Galway landrace wheat and land leaguer potatoes only survive as a result of dedicated conservationist farmers and gardeners.

High Nature Value Farming, such as that being promoted by the Burren Farming for Conservation Programme, is becoming increasingly important. Many of our farms in County Clare support a wealth of habitats and species, which are reliant on farming practices for their ongoing management and conservation. In addition, there is an increasing move towards agroforestry, which effectively means utilizing the ground layer of forestry for grazing, tillage or horticulture.

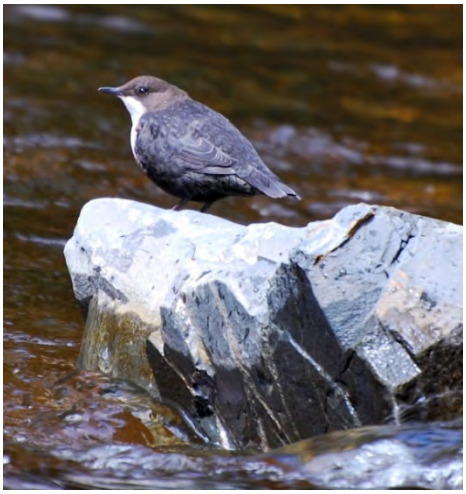
Objectives of the Clare Biodiversity Action Plan

- To encourage and promote the principles of High Nature Value Farming and Agroforestry in order to support the conservation of our important habitats;
- To encourage and promote the active growing and conservation of native agricultural varieties, particularly among community groups and schools.

5.8 Gardens, Buildings and Urban Ecosystems

In gardens, hedgerows and green roads all across the County, there is ample opportunity to encounter our many colourful birds such as goldcrests, blue-tits and chaffinches. Garden bird tables in wintertime are particularly important, with many of our smaller birds depending on them for winter food.

Depending on the types of shrubs and plants growing, our gardens can be full of butterflies such as the orange-tip, common blue and peacock, as well as many other insects from ladybirds and spiders to bees and snails. Larger animals, like pygmy shrews, frogs and hedgehogs are also common visitors, particularly at night. There are many ways of encouraging wildlife to visit our gardens through simple planting and management.



Walls also support an array of animals and plants, whether it's the dry stone walls which border many farms and roads or the lime mortar walls of our old buildings and archaeology. Wall rue is one of a number of small ferns found growing in the crevices of un-pointed walls, while spiders take advantage of the many hunting opportunities they provide. These walls even provide small birds, such as stonechats, with spaces for breeding.

Houses and haysheds across the County support breeding swifts, swallows and house martins. These birds migrate thousands of miles from their wintering grounds in Africa and use our long summer days to catch enough insects to raise their young here. Barn owls are a particularly welcome sight in many farm buildings as they help control rodents. These birds prefer open farmland, where they can hunt over rough grassland and along hedgerows.



Older buildings, as well as caves, are also vitally important for bats. Often bats will use buildings as their summer roosts, and return to the more stable conditions of caves for their winter hibernation. The town of Ennis and the surrounding area are hugely important for bats and particularly for the rare lesser-horseshoe bat. Others such as the Daubenton's bats, can regularly be seen skimming over the surface of the River Fergus in the town centre. Bats rarely fly over open space, and so depend on wildlife corridors such as hedgerows and tree lines to hunt and migrate.

While many agricultural fields now contain only a rye grass sward, our road-side verges still support wild flowers, bees and butterflies. These species once flourished here in great abundance, but are becoming much less common in County Clare and in Ireland as a whole. In many cases, our roadside verges are their last refuge. Equally graveyards have become the last refuge for lichens. The white, green and yellow colours you see on headstones are in fact lichens. These unique life-forms are made up of an algae and a fungus, combined into a single organism for mutual benefit.

Objectives of the Clare Biodiversity Action Plan

- To promote and encourage the management of gardens and community spaces for wildlife;
- To raise awareness of lichens and their habitats in County Clare, particularly in graveyards and guidance for their care and protection;
- Continue to raise awareness of bats in County Clare and the importance of hedgerows as wildlife corridors;
- Promote and encourage best practice in roadside verge management, particularly among tidy town groups;
- To promote the conservation and maintenance of stone walls in County Clare as refuges for ferns, mosses, lichens and invertebrates.

6.0 Threats to Biodiversity

There are many threats to biodiversity in County Clare. Regardless of the threat or its cause, however, it is critical that we first understand it, and the impacts it has on our biodiversity. Only then can we identify solutions, and produce best practice guidance. The following sections identify some of the main threats to biodiversity.

6.1 Lack of Awareness, Knowledge and Understanding

Biodiversity is a relatively new term which has not yet become part of the vernacular in many sectors. Its use only became prevalent following the Convention on Biological Diversity in 1992, while its definition is often scientific and complex, making it difficult for many people to comprehend. In addition, biodiversity is often viewed at a species and habitat level, therefore overlooking the critical relationships, interactions and processes which make up an ecosystem. A lack of understanding can create difficulties when promoting best practice guidance for the management and conservation of biodiversity.

Only 10% of the 31,000 species which occur in Ireland are considered 'familiar', with the majority of these species being plants, birds and mammals. More than 60% of our biodiversity are invertebrates, but there is a general lack of knowledge about these, and about the important role they play in a healthy and functioning ecosystem. As these creatures are generally low down on the food chain, an impact to their populations can have serious ramifications further up the food chain. For example, a small change in the pollution level of a lake may not directly affect a fish species, but is likely to significantly alter the number and species of invertebrates, and therefore dramatically affect the main food source of the fish.

Biodiversity is also regularly associated with the designation of lands for conservation, or with the requirements of appropriate assessment (both of which come under the remit of the Habitats Directive and Wildlife Acts). Given the history of land ownership in Ireland, these are understandably contentious issues, but can deflect attention from the important services that biodiversity provides us, and can undermine efforts to raise awareness and other conservation initiatives.

6.2 Fragmentation of Habitats and Loss of Wildlife Corridors

In County Clare, we have many valuable habitats which support a wide variety of species. However, habitats cannot be sustained in isolation, as the species they support need to migrate in search of food, shelter and a mate. Migration is also critical to ensure genetic diversity within a population. For this reason, linear linkages between habitats, such as hedgerows, stone walls, roadside verges and the riparian zones of streams and rivers, known collectively as wildlife/green corridors, are a vital part of a healthy biodiversity.

The wild flowers along our County's hedgerows encourage the migration of bees and other pollinators. With each flower these pollinators visit, they help to ensure that the genetic diversity is maintained. This is critical, given that nearly three quarters of Ireland's flowering plants are found in hedgerows. Many species will avoid migrating through open spaces as

they offer little protection from predators, and opt instead for the cover of hedgerows. The dense undergrowth of many of our hedgerows not only allows safe passage for invertebrates and small mammals, but is also a source of food along their way. Even flying insects take advantage of the sheltered side of hedgerows as they travel across the countryside. The echolocation system of lesser horseshoe bats is not very successful in open spaces, and so they are heavily reliant on intact hedgerows for commuting.


Where part of a wildlife corridor, such as a hedgerow, is removed or fragmented, this can significantly impact the migration, and subsequent survival of species. Certain species, such as bats, are particularly sensitive to the loss of hedgerows, and entire roosts may be lost as a result. In addition, there are certain hedgerows in County Clare which are well established and support species which are not found in younger hedgerows. The demise of these hedgerows can result in the removal of certain species from an area. Fish species, such as salmon, are born in shallow gravelly river beds and then migrate to the sea for several years, before returning to the same river bed to breed. Where in-water developments, such as weirs, mills or bridges, are being built, these have the potential to obstruct the migration of migratory fish species, thereby leading to their permanent loss from our rivers.

6.3 Inappropriate Developments

Developments which are inappropriately located or designed have the potential to have a negative impact on our biodiversity. Some examples of this includes roads which break a habitat in half, a wastewater treatment plant too close to a watercourse, floodlights in areas where owls hunt, or clearance of hedgerows where bats commute. Potential impacts from developments can be minimised, or even avoided, when the local biodiversity is taken into account at the earliest stages of project planning. It is critical however, that biodiversity is viewed for its potential to enhance a developments setting, rather than as an obstacle to the development.

6.4 Water Pollution and Changes to Hydrology

Deterioration of water quality, as a result of both point source pollution and diffuse pollution, is a significant threat to our biodiversity and particularly our aquatic ecosystems. Phytoplankton and macro-invertebrates (such as mayflies, stone-flies and caddis-flies) are extremely sensitive to water pollution and the loss of these species will result in impacts further up the food chain, from fish and amphibians, to otters and birds. Soil disturbance or excavation adjacent to flowing water can also lead to soil loss and siltation of gravel river beds. This prevents these areas from being used as fish spawning beds and fresh-water pearl mussel beds.

Historically in Ireland, there was an overreliance on solely using engineering solutions to mitigate flooding issues. For example, many wetlands throughout the country were in-filled,

which not only led to a loss of habitat, but also resulted in excess water being diverted elsewhere and new areas being flooded. Land ownership boundaries can often hinder engineering solutions from taking account of the wider effects on the hydrology of adjacent properties and wetlands.

6.5 Spread of Invasive Species

Invasive species are non-native species which pose a threat to our local biodiversity as they out-compete native species for space and food. The spread of invasive species is regarded as one of the most significant threats to biodiversity throughout the world. In County Clare, knotweeds and zebra mussels are invasive species with the highest profile, however, there are at least twenty-five other invasive species found here, from plants to invertebrates to mammals.

Aquatic invasive species, both aquatic plants and animals, are often spread when recreational and pleasure crafts are moved around inland waterways without proper washing and care. This is easily avoided by monitoring the crafts to ensure that they are not transporting invasive species.


Many of our plant invasive species, including japanese knotweed, were deliberately introduced as ornamental garden plants. Dumping of garden cuttings in wild areas can introduce such plants into wild ecosystems. Some ornamental garden species such as certain pondweeds have escaped into wild aquatic ecosystems, and these are particularly difficult to monitor and manage. Inappropriate management of certain invasive species, such as japanese knotweed, can exacerbate their rate of dispersal, and subsequent impact.

6.6 Disturbance to Species

Disturbance to wildlife, and particularly birds and bats, can occur as a result of excessive lighting and increased recreational pressure. The use of jet-ski's and power boats in areas where high numbers of birds regularly feed can result in significant disturbance, while dogs which are not kept on leads also disturb wildlife.

Many species, such as owls, moths and bats are nocturnal, and rely on the veil of darkness to hunt, or avoid being hunted. Flood lighting or high-beam lighting associated with houses and agricultural buildings is becoming increasingly popular, which results in otherwise suitable habitats, becoming unsuitable. In this regard, there is an increasing move towards 'dark skies' as a tourism

attraction and County Clare is ideally located for such an initiative. This in turn would benefit nocturnal wildlife.

6.7 Changes in Land Management

The aim of drainage is to alter the hydrology of land, however, it also changes the ecology of these lands. Plants which would not normally survive in wet conditions will replace the specialist wetland flora. This has ramifications for the rest of the food chain, as there is a subsequent loss of feeding and breeding grounds for many birds and animals. The burning of peatlands for grazing also leads to a loss of feeding and breeding grounds.

The majority of forestry plantations in Ireland tend to be conifer, and contain only one or two species. The compact layout of these plantations means that light is blocked out and subsequently prevents a ground layer from developing. More importantly however, many of these plantations are located on 'poor agricultural' land, which is often high in biodiversity. It should be recognised however, that forestry, when sited, planted and managed correctly, can significantly contribute to local biodiversity.

6.8 Illegal Dumping and Littering

While illegal dumping and littering have wider social, economic, health and aesthetic implications, they also affect wildlife, with many specific examples. Discarded fishing line along our coasts can entangle birds and other wildlife leading to amputation, or even death. Illegal dumping at caves can render them unsuitable for wildlife such as bats, and shade tolerant species that regularly occur at cave entrances, such as ferns and mosses. Washing vehicles or other machinery at lakes can reduce their water quality, particularly where lakes are naturally low in nutrients. Similarly, dumping at bogs or other wetlands can result in pollution to water. This is particularly dangerous where the illegal dumping contains heavy metals or toxic substances.

Objectives of the Clare Biodiversity Action Plan

- To raise awareness of the threats to biodiversity, and promote best practice to avoid or minimise these threats;
- To raise awareness of Invasive Alien Species and promote best practice management for invasive species in County Clare;
- To raise awareness of the importance of water quality for biodiversity conservation;
- To raise awareness of the importance of hedgerows and roadside verges, and promote best practice in their management

7.0 Biodiversity Conservation in Clare

There are a number of notable conservation initiatives across County Clare which have been and continue to be hugely successful. The work carried out as part of these initiatives have contributed to the achievement of the first and second Clare Biodiversity Action Plans, County Clare Heritage Plan 2017-2023 , Clare County Development Plan 2017-2023, and the 3rd National Biodiversity Action Plan 2017: Ireland's Vision for Biodiversity. It is considered important therefore, that their achievements to date are reflected in this Plan, and that an objective of the Clare Biodiversity Action Plan 2017-2023 is to support their on-going progress. A brief introduction to the Clare-based organisations is set out below, however, it should be noted that there are many national organisations which have also made considerable contributions to biodiversity conservation in County Clare.

Based on the findings of the BurrenLIFE Project 2005-2010, the Burren Farming for Conservation Programme is a unique agri-environmental programme designed to conserve and support the heritage, environment and communities of the Burren.

The Burrenbeo Trust operates throughout the North Clare region of the Burren. The work of Burrenbeo has included the development and delivery of the successful EcoBeo education programme, the publication of the Burren Insight magazine, the co-ordination of the Burren Conservation Volunteers, the co-ordination of the successful Learning Landscape symposiums, the creation of information and educational resources, including an award winning website, multilingual fact sheets, and on-line educational modules. In addition, the Burrenbeo Trust co-ordinates the annual 'Burren in Bloom' festival, Burren Winterage School and hosts monthly walks and talks throughout the Burren.

The Shannon Dolphin Research Project was established to develop and provide educational research and awareness for the conservation of the Shannon dolphins, and other wildlife in the Shannon Estuary. The project is managed by the Irish whale and Dolphin Group who have their registered office at the Shannon Dolphin Centre in Kilrush. Research on the bottlenose dolphins in the Shannon Estuary has been ongoing since 1993, resulting in over 20 years of photo-identification and habitat use data. Since 2007 there has been extensive use of static acoustic monitoring using C-PODs including determining the importance of deep-water berths and potentially renewable energy sites. The IWDG take on voluntary research assistants each year from all over the world to carry out the long term dolphin and tour-boat monitoring, as well as facilitating MSc and PhD students. The current research priorities are to explore how often Shannon dolphins use sites outside the boundary of the SAC and a study of the female reproductive biology and social structure using photo identification data.

Based in Tuamgraney, the Centre for Environmental Learning and Training (CELT) focuses on 'promoting conservation through education'. Since its establishment, CELT has worked to increase environmental awareness through an active schools programme and training courses for adults, keep traditional skills and crafts alive through their popular 'weekend in the woods' and other events, demonstrations and workshops, and promote healthy food production through education and training in organics, permaculture, agroforestry, and companion planting. CELT has produced a Local Biodiversity Action Plan for Tuamgraney and help to manage the Tuamgraney Community Woodland Wildlife Park. A native tree nursery has also been established along with a small forest garden area producing fruit, nuts, vegetables and herbs to demonstrate the practicalities and benefits of agroforestry.

The Irish Seedsavers Association was established following the discovery of the North Clare apple variety, the Ballyvaughan Seedling, and has been based in East Clare since 1996, where it has created a Native Apple Collection containing over 140 distinct varieties, a Native Irish Grain Collection with 48 varieties, a Seed Bank containing more than 600 rare and endangered vegetable varieties, a Native Broadleaf Woodland and Wildlife Sanctuary, a colony of hives of Native Black Bee, and a unique orchard of over 33 self rooting varieties of apple trees that require no grafting for propagation, which is probably the largest collection of this type of apple tree in the world. In addition to the orchards being open to the public, the Irish Seedsavers Association regularly hosts conservation gardening workshops and related demonstrations.

The Clare Bat Group was established in 2006 as a response to the County's growing status as one of Europe's most important locations for bats, with nine of the ten Irish species of bats found breeding in Clare. The group are involved in educating and liaising with public bodies, roost owners, and the general public, organising talks, walks, slideshows, school visits and other events throughout the County, including the annual Mid-Summers Bat Count with Bat Conservation Ireland, and contributing articles and interviews about the threats to bats to local and national media. More practical conservation activities have included the Clare Bat Box Project, Clare Leisler's Bat Survey, the repair of bat roosts, and the collection of data on bat distribution throughout Clare on an on-going basis.

Bunakippaun wood in Attyslaney, Tubber, was part of Coillte's Woodland Restoration in Ireland Project involved the removal of non-native trees and shrubs allowing rare native woodland to regenerate, and also included the planting of young native Irish yew trees among the existing yew, as this type of woodland has become quite rare in Ireland. The removal of conifers has allowed light to reach the ground level, and as a result orchids, wood sedge, honeysuckle, pignut and broad-leaved helleborine have begun to flourish, while birdsong has increased and mammals like bats and stoats have also been spotted. In addition, some beech trees were retained for the benefit of the rare bird's nest orchid.

Since the publication of the first and second Clare Biodiversity Action Plan, the biodiversity and heritage section of Clare County Council, in co-operation with various community groups throughout the County have carried out a number of conservation initiatives, including the co-ordination of public events annually to celebrate International Biodiversity Day and Heritage Week, wildlife surveys have been undertaken, projects undertaken with communities and interested individuals, several publications have been produced, articles and interviews are continually submitted to the local media, while competitions, fieldtrips and visits to schools have been undertaken.

Objectives of the Clare Biodiversity Action Plan

- To encourage and support the on-going work of all biodiversity groups working in County Clare;
- To assist and facilitate all biodiversity groups where possible;
- To request funding bodies to continue their support for the biodiversity groups set out above.

8.0 The Biodiversity Plan making Process

Public participation at the early stage of the plan-making process was important to ensure that the Biodiversity Plan both reflects and responds to public concerns and aspirations, as well as addressing National and Regional strategies and guidelines.

8.1 Public Consultation

Elected members were notified of the intention to commence the preparation of the 3rd Clare Clare Biodiversity Action Plan 2017–2023 at the Planning and Housing Strategic Policy Committee and at the Clare County Council meeting in September 2016. Submissions were invited from the 13th October to the 10th of November 2016 from education and wildlife groups, Chamber of Commerce, Tidy Towns, the Public Participation Network and government departments. Notices were placed in all public libraries and at Clare County Council and Municipal District Offices.

Following the preparation of the Draft Clare Biodiversity Action Plan 2017-2023 a period of 6 weeks public consultation commenced between 21st July and 28th August 2017, during which submissions and observations from members of the public were invited. Copies of the Draft Plan were available for public inspection at all public libraries and Clare County Council Offices, on the Clare County Council website and a copy of the Draft Plan was circulated to all elected members.

Six submissions were received at the draft stage in the process, all of which were positive and strategic, and which were taken into consideration in the making of this Biodiversity Plan. Submissions were received from the following:

- Kilkee Tourism
- An Taisce,
- FH Wetlands Systems Ltd, Ennis
- Whitegate Resident
- Local Authority Water Community Officer
- Ennis Tidy Towns

8.2 Environmental Assessment

The preparation of the Clare Biodiversity Action Plan 2017-2023 was informed by a screening for Strategic Environmental Assessment (Environment Report). On the basis of the assessment and consideration of the criteria as set out in Article 9 of the Regulations 2004 (as amended) it was concluded that the Clare Biodiversity Action Plan 2017-2023 and the actions contained therein were unlikely to give rise to significant environmental effects and did not require full SEA.

In addition Screening for Appropriate Assessment was also undertaken. Following the screening, in accordance with *Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (2010);* as significant impacts were ruled out no further assessment was required.

ACKNOWLEDGEMENTS:

Photography supplied by Ruairí Ó Conchúir, John Murphy and Clare County Council.

COMHAIRLE CONTAE AN CHLÁIR
CLARE COUNTY COUNCIL

Clare Biodiversity

An Chomhairle Oidhreachta
The Heritage Council

THIS IS YOUR PLAN AND WE HOPE THAT YOU WILL HELP US TO IMPLEMENT IT BY GETTING INVOLVED.

For more information contact:

Heritage Officer,
Planning Department,
Clare County Council,
Áras Contae an Chláir,
New Road,Ennis,
Co. Clare
Telephone: (065) 6821616

The Clare County Biodiversity Action Plan 2017-2023 will run parallel with the Clare County Development Plan 2017-2023 and the Clare County Heritage plan 2017-2023. The Clare County Biodiversity Action Plan will have regard to these County Plans and build upon their goals and objectives for Biodiversity across County Clare.

The Clare Biodiversity Action Plan 2017-2023 is available from the Heritage Officer, Planning Department, Clare County Council, Áras Contae an Chláir, New Road, Ennis, Co. Clare or by email to forwardplan@clarecoco.ie.