CARLOW TOWN BIODIVERSITY STRATEGY & ACTION PLAN

2021 – 2025

A FRAMEWORK FOR PARTNERSHIP BETWEEN CARLOW TOWN DEVELOPMENT FORUM, CARLOW COUNTY COUNCIL, AND THE COMMUNITY OF CARLOW TOWN

Prepared for Carlow Town Development Forum in partnership with Carlow County Council

CARLOW COUNTY COUNCIL
COMHAIRLE CHONTAE CHEATHARLOCHA

CARLOW TOWN DEVELOPMENT FORUM

An Roinn Tithíochta, Rialtas Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

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Foreword

Biodiversity – the variety of living things on the planet - and how we interact to sustain life is as essential for our economy as for our well-being.

In line with the National Biodiversity plan 2017 - 2021 the primary objective of this strategy is to ensure that biodiversity and sustainability are considered in all service areas, bringing it into the mainstream of all policy and decision making processes

Conserving biodiversity is not just about protecting species and habitats for their own sake, it also supports our livelihoods and enriches our lives. In Ireland we are fortunate to be surrounded by an abundance of nature and its importance has been more profoundly observed and acknowledged since the outbreak of the current Covid-19 pandemic, an event which could not have been foreseen when this strategy and action plan was conceived.

The new Carlow Town Biodiversity Strategy & Action Plan provides a strategic plan and specific actions for protecting and enhancing biodiversity in Carlow Town, including tackling invasive non-native species and protecting ecosystem services.

The new strategy fully acknowledges the economic value of ecosystem services and the need to restore them for the benefit of our economy and our wellbeing. Biodiversity loss is one of the main environmental challenges facing the planet. With this new strategy, we are striving to ensure that biodiversity and the various and multiple eco-systems in Carlow Town are identified, preserved and improved for the benefit of future generations.

The success of this plan depends greatly on the endeavours of local authorities, agencies, organisations and the community of Carlow Town. In this respect, I would like to acknowledge the cooperation and support of Carlow County Council and numerous communities throughout the town who play a crucial role in protecting our biodiversity and raising awareness of its importance. I would particularly like to thank Carlow Town Development Forum, Carlow Environmental Network, Greenside Up and the various groups who work in the area of biodiversity and who were part of the consultation process for this plan.

We are also indebted to the Department of Culture, Heritage and the Gaeltacht who in conjunction with Carlow County Council have funded this plan through the National Biodiversity Action Plan 2017-2021 fund.

It is my sincere belief that the implementation of this new Plan will strengthen and support our endeavours and our resolve to protect biodiversity and to bring it into the mainstream of our daily lives. I am optimistic that with the support of a range of stakeholders (existing and potential) who are committed to this valuable work, we can combine to celebrate many success stories and achievements. Biodiversity benefits us all and to continue to enjoy those benefits we must continue to engage with each other, working together to secure our collective future.

Mary Ryan

Chairperson Green Carlow Sub-Group

Carlow Town Development Forum

Executive Summary

Although Carlow town is an urban environment, there are habitats present in the area that are of value to biodiversity, including trees, native scrub and shrubs, dry meadows and grassy verges, hedgerows, pollinator friendly flower beds and climbers (e.g. ivy). Some suitable buildings also provide resources for species such as swifts, swallows and bats. There is great potential in Carlow Town to strengthen the green infrastructure network and promote habitat connectivity to the surrounding landscape through the implementation of a range of biodiversity enhancement measures.

The Carlow Town Development Forum commissioned Scott Cawley Ltd. to prepare this Biodiversity Strategy & Action Plan, in partnership with Carlow County Council, and it has been funded by Carlow County Council and the National Parks & Wildlife Service, Department of Culture, Heritage and the Gaeltacht. In recent years, Carlow County Council have been supporting a range of projects relating to biodiversity, and this is a further step in that journey.

The initiative for preparing the plan came out of the desire to establish a strategy for the long-term greening of Carlow Town Centre in order to simultaneously improve the amenity of the town, the quality of the public realm, and to support and enhance urban biodiversity. The Plan aligns with policies outlined in the *Carlow County Development Plan 2015-2021* and provides a range of recommendations to strengthen the Green Infrastructure network and improve the biodiversity value of Carlow Town. This study is intended to be a starting point from which further work may continue.

Carlow Town Development Forum consists of stakeholders representing the following: Carlow County Council, County Carlow Chamber, Retailers, Vintners, Market traders, Landlords, Arts Community, Entrepreneurs, Tidy Towns, Public Participation Network, Carlow Tourism and An Garda. The Town Forum set up the 'Green Carlow sub-Group' (Green Group) to simultaneously green the centre of Carlow Town and increase biodiversity within the Town. The Green Group, along with Carlow County Council, have been instrumental in driving this process and helping to increase engagement and involvement with the local community.

A meeting was held between Scott Cawley Ltd. and the Green Group prior to survey work commencing where it was agreed that detailed survey data and recommendations would be provided for five Biodiversity Focus Areas, with further recommendations for the wider town area also included in the plan.

A Stakeholder Engagement Evening was held and represented at this meeting were IT Carlow EnviroCore; Carlow College; Carlow Environment Network; Greenside Up; Carlow Fishing Club; An Gairdin Beo Carlow Community Garden; Waters Support; Delta Centre; Tidy Towns; Teagasc; Dragon Boat Club; Carlow Beekeepers Association; VISUAL; and Hollywood Forest. Further consultation will be through the Council's CiviQ Consultation Portal and feedback from this and from Carlow County Council has been incorporated into the Plan.

Carlow Town Development Forum and the Green Group have been mindful of the Sustainable Development Goals in producing this document. Additionally, they have been cognisant of Carlow County Council's role as the local authority sector Sustainable Development Goal Champion.

The Project Area for the Carlow Town Biodiversity Strategy & Action Plan, bordered by the Ring Road and the two rivers, was deemed to be too large an area for a focussed study, so Scott Cawley and the Green Group chose five smaller areas to concentrate on for the focussed studies and area-specific actions. These areas are the Town Centre, Hanover Park, Burren River Linear Walk, Barrow River Section, and The Plots (Hanover Harps).

These focus areas were selected based on a number of criteria including centrality in relation to Carlow Town, amenity value, tourism opportunities and biodiversity value/enhancement prospects. Any relevant specific actions within these areas will be extrapolated to apply generally to the larger Project Area, and the Strategy will be based on the larger Project Area. Indeed, many of the general actions could be used not just in Carlow Town but throughout the whole County of Carlow.

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1 Introduction

1.1 Biodiversity

Biodiversity, or biological diversity, put simply is the variety of life on earth. It forms the web of life, which humans are an integral part of, and on which we fully depend. Biodiversity includes all plants, animals, fungi, microscopic algae and the places in which they live (their habitats) and encompasses organisms as small as microscopic algae to the largest mammal, the blue whale (Figure 1).

In addition to its intrinsic value biodiversity provides us with everything we could possibly need for survival (e.g. food, water, fibre, fuel, medicine). These free services that biodiversity provides us with are often known as 'ecosystem services', and include the maintenance of natural ecological processes such as pollination, water purification, flooding control, climate regulation etc. Biodiversity also provides us with amenity areas such as parks and woodland that we can enjoy, and that enhance our quality of life.

The main threats to biodiversity are habitat loss and fragmentation, over-exploitation, climate change, the introduction of invasive alien species, and pollution. Sadly, human behaviour is the root cause of these threats. *"The loss of biodiversity often reduces the productivity of ecosystems, thereby shrinking nature's basket of goods and services, from which we constantly draw. It destabilizes ecosystems, and weakens their ability to deal with natural disasters such as floods, droughts, and hurricanes, and with human-caused stresses, such as pollution and climate change."* (CBD, 2000).

The good news, however, is that there is still time, to address these threats and reduce the pressure that we as humans are placing on biodiversity. Positive actions taken to prevent further biodiversity loss start at the individual level and can be further reinforced by communities coming together and acting together. It is hoped that this Biodiversity Strategy & Action Plan will provide a starting point for the people of Carlow Town and wider County to further conserve and enhance the biodiversity in their community.

1.2 Conservation of Biodiversity

1.2.1 UN Convention on Biological Diversity (CBD)

Loss of biodiversity worldwide led to the acceptance of the need to coordinate action for biodiversity on a global scale. The Convention on Biological Diversity (CBD) is an international treaty that entered into force on 29 December 1993. It has three main objectives:

1. The conservation of biological diversity;
2. The sustainable use of the components of biological diversity;
3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

Ireland ratified the Convention in 1996. Under the convention, each country agrees to undertake a number of actions to halt the loss of biodiversity, including the development of a National Biodiversity Plan or Strategy for the conservation and sustainable use of biodiversity.

1.2.2 European Law

The Birds Directive (2009/147/EC) and the Habitats Directive (92/43/EEC) are the most important pieces of European legislation underpinning biodiversity and nature conservation. Special Areas of Conservation (SAC) are designated under the Habitats Directive for the protection of habitats listed on Annex I and/or species listed on Annex II of the Directive. Special Protection Areas (SPAs) are designated under the Birds Directive (2009/147/EC) for the protection of bird species listed on Annex I of the Directive, regularly occurring populations of migratory species (such as ducks, geese or waders), and areas of international importance for migratory birds.

1.2.3 National Law

The Wildlife Acts 1976 – 2019 are the principal pieces of legislation at national level for the protection of wildlife and for the control of activities that may harm wildlife. All bird species, 22 other animal species or groups of species, and 86 species of flora are protected under this legislation. Natural Heritage Areas (NHAs) are designated under the Wildlife Acts to protect habitats, species or geology of national importance. In addition to NHAs there are proposed NHAs (referred to as pNHAs), which are also sites of significance for wildlife and habitats and were published on a non-statutory basis in 1995, but have not since been statutorily proposed or designated. Proposed NHAs are offered protection in the interim period under county or city development plans which requires that planning authorities give due regard to their protection in planning policies and decisions.

The *European Communities (EC) (Birds and Natural Habitats) Regulations 2011 to 2015* transposes the Habitats and Birds Directives into Irish law. It also contains regulations (49 and 50) that deal with invasive species (those included within the Third Schedule of the regulations).

The *Flora (Protection) Order, 2015* lists species of plant protected under Section 21 of the Wildlife Acts.

The *Planning and Development Acts 2000 to 2019* is the basis for Irish planning. Under the legislation, development plans (usually implemented at local authority level) must include mandatory objectives for the conservation of natural heritage and for the conservation of European Sites. It also sets out the requirements in relation to environmental assessment with respect to planning matters, including transposition of the Habitats and Birds Directive into Irish law.

1.2.4 National Plans

National Biodiversity Plan

Ireland's third National Biodiversity Action Plan (NBAP) 2017-2021, arising from Irelands commitments under the UN CBD, sets out actions through which a range of government, civil and private sectors will undertake to achieve Ireland's Vision for Biodiversity that "biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally". Thus the NBAP not only contributes to conserving and restoring biodiversity at a national level, but also on a European level. It is an objective of the NBAP that local authorities prepare, review and update their BAPs.

All Ireland Pollinator Plan

The 'All Ireland Pollinator Plan 2021-2025 is an exciting initiative to promote the importance and conservation of native pollinator species and habitats in Ireland. Pollinators are under serious threat globally. Bee populations in particular are in serious decline due to a litany of threats, and some one third of our 97 native Irish bee species are now threatened within extinction on the island (NBDC 2019). This plan has been adopted by many notable organisations in recent years, including Agri-Food and Biosciences Institute (NI), Transport Infrastructure Ireland, Bord Na Móna, Gas Networks Ireland and Iarnród Éireann, as well as a many Irish government departments, non-governmental organisations, charities and local councils.

There are six main objectives of the All Ireland Pollinator Plan, namely:

- Making farmland pollinator friendly
- Making public land pollinator friendly
- Making private land pollinator friendly
- All-Ireland Honeybee Strategy

- Conserving rare pollinators
- Strategic coordination of the plan

1.2.5 Local Plans

Carlow County Council as policy and decision makers has wide-ranging roles and responsibilities, covering many aspects such as land use issues and environmental permitting, which can affect the quality of the natural environment. Functions such as planning, roads, waste, parks services, social housing, can all have an impact on our natural environment.

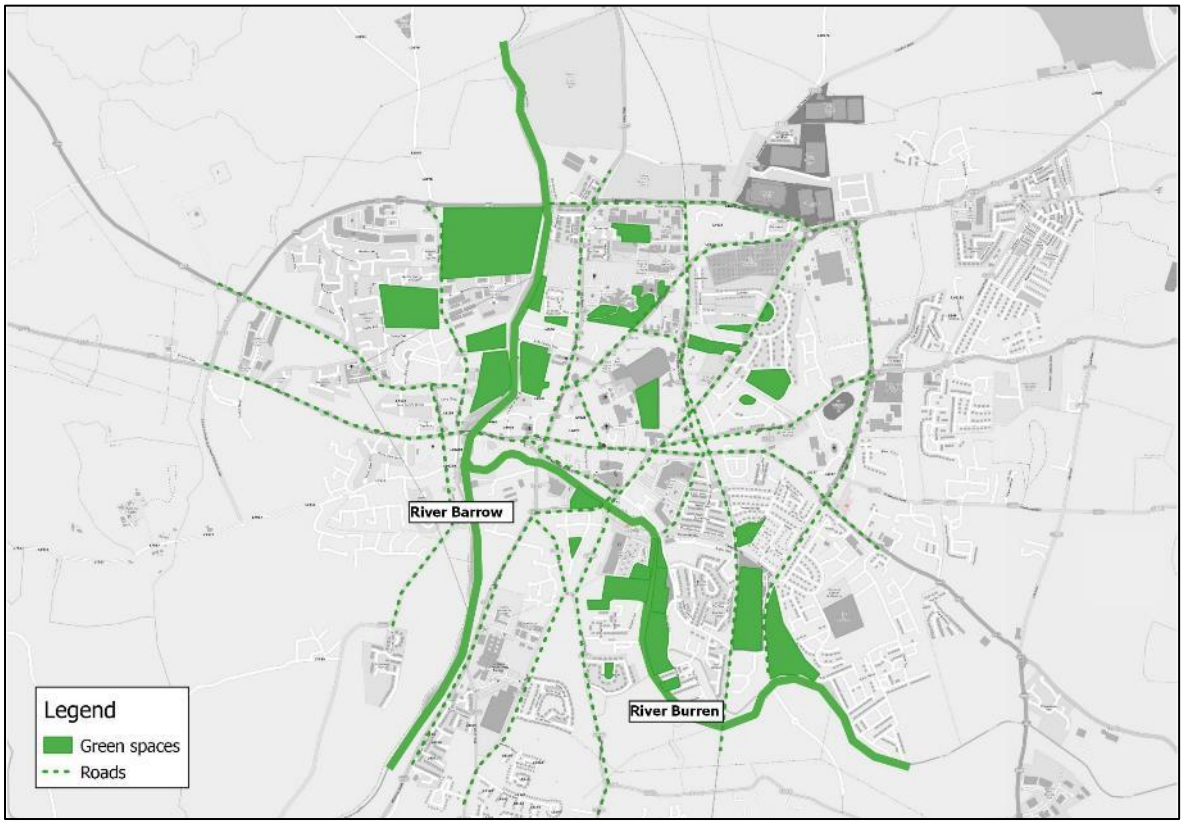
Carlow County Council have the ability to protect and enhance the natural heritage in the county which can be most effectively achieved through the policies and objectives contained in County and Local Development Plans, and through the consideration of natural heritage in the planning process. Chapter 9 of the Carlow County Development Plan 2015-2021 includes several policies and objectives that relate to the conservation of natural heritage. Biodiversity Strategy for Carlow Town

1.2.6 Project Area

Carlow is the county town of County Carlow and is located in the south-east of Ireland, along the River Barrow. The land-use of the surrounding area is largely agricultural. Although Carlow town is an urban environment, there are habitats present in the area that are of value to biodiversity. The River Barrow is a Special Area of Conservation (SAC), meaning that it has gained legal protection for habitats and species of European importance. It is therefore the most important ecological feature of Carlow town. The River Burren is a spawning tributary of the Barrow and is also an important ecological feature which provides habitat for fish, birds and mammals. Other habitats in the town which provide value to biodiversity include trees, native scrub and shrubs, dry meadows and grassy verges, hedgerows, pollinator friendly flower beds and climbers (e.g. ivy). Some suitable buildings also provide resources for species such as swifts, swallows and bats.

The green infrastructure network in Carlow Town provides connectivity of habitat for a range of species. Of particular importance to biodiversity are the rivers and associated riparian habitats. Aside from the rivers, the green infrastructure network in Carlow Town is largely comprised of highly managed areas of parkland, gardens and treelines. There are also some areas of waste-ground, cemeteries and agricultural fields. There is great potential in Carlow Town to strengthen the green infrastructure network and promote habitat connectivity to the surrounding landscape through the implementation of a range of biodiversity enhancement measures, particularly along the banks of the rivers. Figure 1, below outlines some of the existing green spaces within Carlow Town, as identified through orthophotography. The roads and railway within Carlow Town have been highlighted in this map as they represent opportunities to connect green spaces and strengthen existing green infrastructure.

Figure 1 : Existing Green Infrastructure Network in Carlow Town



1.2.7 Purpose of this Biodiversity Strategy & Action Plan

The Carlow Town Development Forum commissioned Scott Cawley Ltd. to prepare this Biodiversity Strategy & Action Plan (herein the plan). The work was commissioned by Carlow County Council and Carlow Town Development Forum and was funded by Carlow County Council and the Department of Culture, Heritage and the Gaeltacht. In recent years, Carlow County Council have been supporting a range of projects relating to biodiversity (See Section 1.3 below for details).

The initiative for preparing the plan came out of the desire to establish a strategy for the long-term greening of Carlow Town Centre in order to simultaneously improve the amenity of the town, the quality of the public realm, and to support and enhance urban biodiversity.

The main objectives of this plan were to:

- Identify the existing and potential biodiversity areas in Carlow Town;
- Carry out biodiversity surveys in five chosen 'focus areas' in Carlow Town;
- Outline biodiversity enhancement actions for these five focus areas in Carlow Town;
- Outline more general biodiversity enhancement actions for the whole Project Area in Carlow Town
- Prepare a long-term Biodiversity Strategy & Action Plan for Carlow Town informed by the above.

This plan aligns with policies outlined in the *Carlow County Development Plan 2015-2021*[1]. The actions outlined in this plan should be taken into account in the preparation of Local Area Plans.

This plan provides a range of recommendations to strengthen the Green Infrastructure network and improve the biodiversity value of Carlow Town. This study is intended to be a starting point from which further work may continue. The Carlow Town Development Forum should be commended for taking the initiative to commission this study, as should the Carlow County Council, the Local Enterprise Office, and the Department of Culture, Heritage and the Gaeltacht for providing the funding.

1.2.8 Involvement of the Local Community in the Production of the Plan

Carlow Town Development Forum was set up in 2018 to provide an opportunity for all stakeholders to work collaboratively towards a shared vision that will enhance the quality of the town environment, strengthen the town centre offering and generate a thriving town centre to maximise visitor footfall, increase spending and ultimately offer customer choice and satisfaction. The Town Forum consists of stakeholders representing the following: Carlow County Council, County Carlow Chamber, Retailers, Vintners, Market traders, Landlords, Arts Community, Entrepreneurs, Tidy Towns, Public Participation Network, Carlow Tourism and An Garda.

The Town Forum set up the 'Green Carlow sub-Group' (Green Group) to simultaneously green the centre of Carlow Town and increase biodiversity within the Town. The Green Group, along with Carlow County Council, have been instrumental in driving this process and helping to increase engagement and involvement with the local community.

A meeting was held between Scott Cawley Ltd. and the Forum prior to survey work commencing where it was agreed that detailed survey data and recommendations would be provided for five Biodiversity Focus Areas. These were chosen based on their potential for biodiversity and locations within the town. Recommendations for the wider town area have also been included in this plan.

Two public events were held as part of this study, with the aim of encouraging the community to appreciate their local biodiversity and learn more about the fascinating plants and animals that they share their locale with. The first event was a bat walk and talk on the evening of 5th September 2019 which was attended by approximately 15 people. It was held in Hanover Park. The event was publicised via carlowlive.ie, Carlow Public Participation Network (PPN), LinkedIn, and Eventbrite. The local community was also notified by word of mouth by Carlow County Council, Carlow Town Development Forum 'Green Group' and Scott Cawley Ltd.

[1] Carlow County Council (2015). *Carlow County Development Plan 2015-2021.*

Photos from Stakeholder Engagement Evening

The second event was a Stakeholder Engagement Evening held on the 12th of November in the Woodford Dolmen Hotel, Carlow Town. Represented at this meeting were IT Carlow EnviroCore; Carlow College; Carlow Environment Network; Greenside Up; Carlow Fishing Club; An Gairdin Beo Carlow Community Garden; Waters Support; Delta Centre; Tidy Towns; Teagasc; Dragon Boat Club; Carlow Beekeepers Association; VISUAL; and Hollywood Forest. The findings of the ecological site surveys were presented to the attendees. The attendees were then split into groups and asked to review the study areas and based on their local knowledge as well as the information presented, suggest biodiversity actions for the study areas, as well as any other areas they felt there was potential for biodiversity enhancement. This information is incorporated into the plan.

Some of the actions or suggestions arising from this consultation session included:

- Creation of a Biodiversity loop walk through the town to showcase local biodiversity features and also create ecological connectivity along the walk
- Contact private landowners to investigate the possibility of extending public access or a possible walkway from Burren Street Bridge to the weir on the River Barrow

- Install signage in the town centre and adjacent to the train station to raise awareness of this river walkway
- Empower and equip residents association to clean up the River Burren area and connect to nature e.g. organise some information exchange events and regular litter picks
- Set up a project team to tackle anti-social behaviour along the River Burren. Engage addiction services to help/advise with this
- Explore ways in which car parks can be put to better use for biodiversity and reduce concrete cover, reduce lighting, increase biodiversity friendly planting and introduce permeable paving

Further consultation will be through the Council's CiviQ Consultation Portal and feedback from this and from Carlow County Council has been incorporated into the Plan.

1.2.9 Implementation of the Biodiversity Strategy & Action Plan

This plan proposes a number of ambitious projects/ actions to be carried out in Carlow town. For these actions to be successful, the plan needs the backing of the local community, and for the local community to become 'biodiversity champions'. The actions in this plan were drawn up in consultation with representatives from the local community. It is proposed to establish a local community plan implementation group facilitated by Carlow County Council. Carlow County Council will support and advise local project partners in how to apply for funding to implement biodiversity actions/projects. Carlow County Council, as Sustainable Goals Champion for 2020, will spearhead the process through a number of its departments, such as the Environment Department, Community Department, Local Enterprise Office, and the Carlow Municipal District Area Office, among others. Funding has been secured from the National Parks & Wildlife Service through the National Biodiversity Action Plan fund, and match funding from Carlow County Council is also available. This funding will be used to implement the actions outlined in this Plan. Carlow County Council will work with the local community and environmental groups to complete these actions and groups can apply to avail of this funding by contacting the Local Enterprise office at enterprise@carlowcoco.ie.

1.3 Existing Biodiversity Projects in Carlow Town

Carlow County Council have used LA21 funding to implement a range of biodiversity projects across the town in recent years including the introduction of beehives to the Town Park and some biodiversity friendly planting schemes. A section of the Town Park, along the River Barrow has been allowed to grow wild to enhance the biodiversity of the area.

Visual Centre for Contemporary Art, Carlow are supported by Carlow County Council and have ran a range of biodiversity programmes. These include 'The Bees Needs' and 'Imagining Futures' projects.

Carlow County Council also work with Pride of Place and Tidy Towns committees across the county. Tidy Towns have specific awards for communities that are actively improving their area for biodiversity. Pride of Place recognises general improvements to local communities. These communities have been engaging in a range of biodiversity projects in recent years, with support from the Council.

1.3.1 Carlow County Council Climate Change Adaption Strategy 2019-2024

Carlow County Council is located within the Eastern and Midlands Climate Action Region (CARO) and is actively engaged in reducing the negative impacts of climate change. The Carlow County Council Climate

Change Adaptation Strategy 2019-2024[2] was adopted by the members in 2019 as a collaborative response to the impact that climate change is having, and will continue to have, on the County of Carlow and its citizens. The Strategy features a range of actions across nine key thematic areas. The Carlow Town Biodiversity Strategy and Action Plan 2021-2025 has been mindful of the Climate Change Adaptation Strategy and in particular the thematic area of Natural Resources & Cultural infrastructure and the objectives of this theme, which include:

- To provide for the enhancement of natural environment to work positively towards climate action;
- To promote effective biodiversity management and enhance protection of natural habitats and landscapes;
- To protect Heritage and Cultural Infrastructure;
- Promote awareness about the importance of protecting natural resources at present and for the future;
- Explore opportunities to maximise environmental co-benefits within the areas of Natural Resources and Cultural Infrastructure.

1.3.2 Sustainable Development Goals

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations (UN) Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. Carlow County Council is a Sustainable Development Goals (SDG) Champion. This is an initiative established by the Department of Communication, Climate Action and Environment to raise awareness of the UN's Sustainable Development Goals.

[2] Carlow County Council (2019). *Climate Change Adaptation Strategy 2019-2024.*

Carlow Town Development Forum and the Green Group have been mindful of the Sustainable Development Goals in producing this document. Additionally they have been cognisant of Carlow County Council's role as the local authority sector Sustainable Development Goal Champion. The Sustainable Development Goals the actions in this strategy help us achieve are:

2 Flagship Projects

A number of potential 'Flagship Projects' have been identified which incorporate a range of the actions identified in Section 6 below. These projects would raise awareness of local biodiversity and hopefully spark interest within the local community.

2.1 Flagship Project 1- Biodiversity Education and Awareness

Education and outreach is key to encouraging people to get actively involved in nature conservation and biodiversity enhancement. This flagship project should focus on targeting a range of different groups within the community as outlined below.

- Outreach to schools and community groups (As detailed in Section 6.1.12)
- Carlow County Council staff, contractors, community groups and other organisations involved in the hands-on management of parks and green spaces should be trained in how to manage these areas in a biodiversity friendly way (As detailed in Section 6.1.12)
- Installation of signage informing people of the biodiversity features in different parts of the town
- Installation of signage informing people of the actions that have been taken in particular areas of the town for example, where a grassy verge has been left uncut
- Commissioning of artwork inspired by local biodiversity (As detailed in Section 6.1.11)
- Encouraging locals to get involved in monitoring and citizen science programmes (See Section 6.1.13)

2.2 Flagship Project 2- Become a town partner of the All-Ireland Pollinator Plan

County Councils have an important role to play in conserving pollinators on public land. By becoming a partner of the All-Ireland Pollinator Plan, Carlow would be committing to implementing at least one pollinator-friendly action in the first year of signing up and at least three more within the following five years. Many of the actions are low-cost or cost neutral and are available to view on the All-Ireland Pollinator Plan website.

2.3 Flagship Project 3- Save our Swifts

Swifts are Amber-listed birds that breed in Ireland every summer and there is known to be an active population of swifts nesting in buildings within Carlow Town (Webb, 2018). This flagship project has great potential to benefit the local breeding population of swifts and could include the following actions:

- Commission a swift survey of Carlow Town to identify all known nesting sites and protect them from inappropriate development which would result in the loss of a nesting site
- Organise a swift awareness event to observe swifts in the town and educate locals on this fascinating species and the threats they face
- Build swift towers or install nest boxes onto suitable buildings to provide new nesting sites for Carlow's swifts (lures will also need to be installed)
- Install cameras in new swift towers or nest boxes and stream them online to encourage public interest

2.4 Flagship Project 4- Bat-Friendly Town

Following on from the success of the bat walk carried out by Scott Cawley Ltd. in 2019, this flagship project would incorporate a range of enhancement measures with the aim to improve the suitability of Carlow Town for the local bat population.

- Consider removing lighting from key areas for bats to create dark corridors i.e. along hedgerows, treelines and rivers
- Where the above is not possible, install 'bat friendly' lighting in key areas (See Section 6.1.8)
- Include night-scented flowers and climbers within planting schedules in areas which are considered suitable for bats i.e. hedgerows, treelines and rivers
- Consider planting hedgerows in suitable locations within parks and green spaces (See Appendix E)
- Engage community groups to install bat boxes on suitable trees, buildings or bridges (See Section 6.1.6

2.5 Flagship Project 5- River Clean-Up

The rivers in Carlow Town are hugely important for a wide range of biodiversity. The aim of this flagship project would be to improve water quality and enhance the rivers and surrounding habitat for wildlife.

- Create an action group to pick up litter along the rivers
- Where possible, avoid the use of chemicals near watercourses
- Where possible, zone a 10m 'riparian edge' within which no development will take place
- Where no invasive species are present, banksides should be kept in a 'wild' state

2.6 Flagship Project 6- Biodiversity Loop Walk

A loop walk could be created through the town which would showcase local biodiversity features and the actions that Carlow County Council are taking to improve biodiversity. If implementing this flagship project, Carlow County Council would be encouraged to implement as many 'biodiversity actions' as possible along the walking route. This would create connectivity of habitat for different species and strengthen the green infrastructure network in Carlow Town. This could include hedgerow planting, biodiversity-friendly management of roadside verges and grassland, bee hotels etc. Sections of the River Barrow and River Burren should be included within the biodiversity loop walk as they are the most important ecological features of the town. A map could be created and installed along the route which labels 'features of

interest' such as the rivers, hedgerows and new projects that have been implemented to promote biodiversity.

3 Local Study Area

3.1 Selection of the Focus Areas

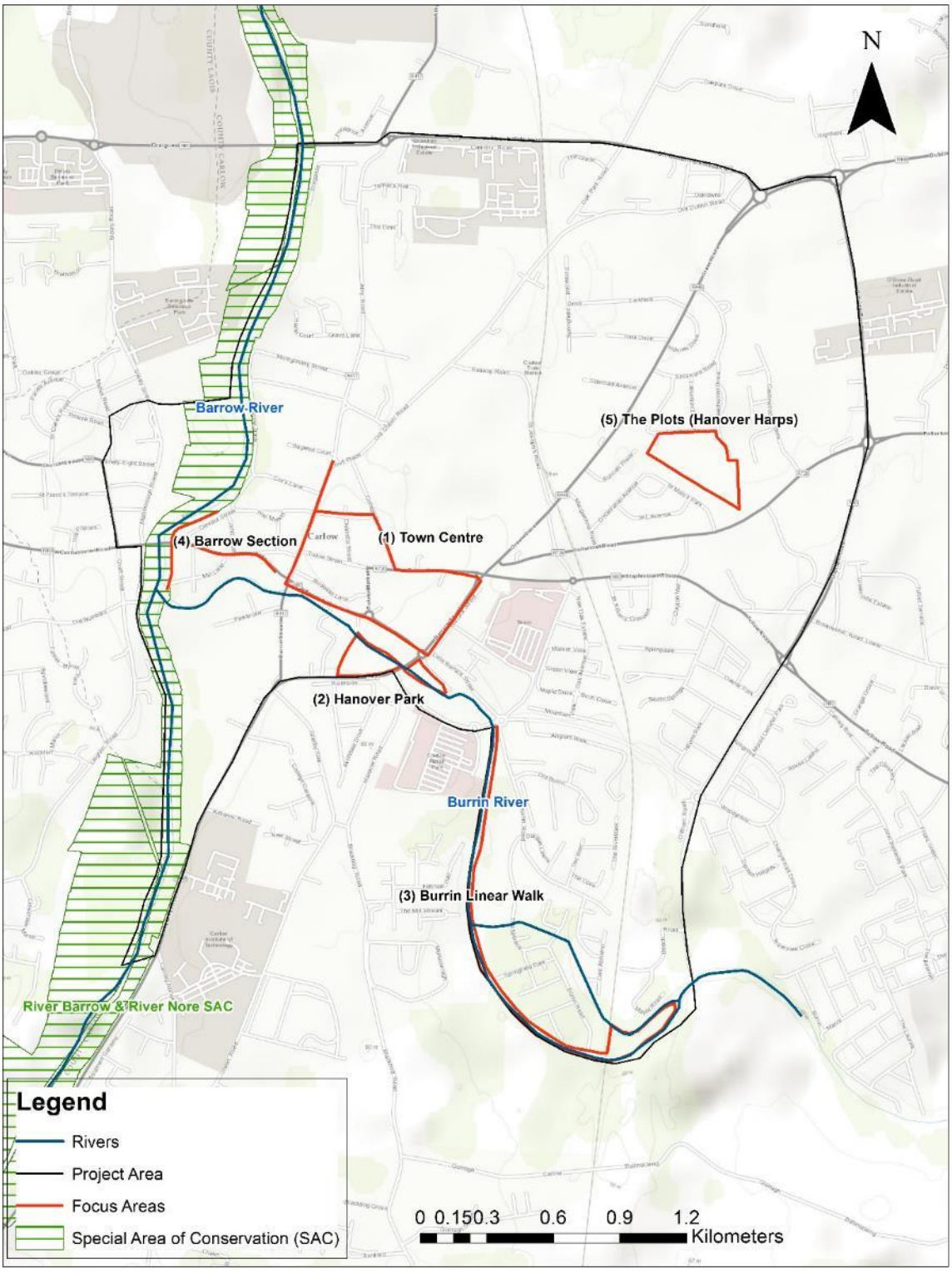
The Project Area for the Carlow Town Biodiversity Strategy & Action Plan, bordered by the Ring Road and the two rivers, was deemed to be too large an area for a focussed study, so Scott Cawley and the Green Group chose five smaller areas to concentrate on for the focussed studies and area-specific actions. These are illustrated in Figure 2 and are as follows:

1. Town Centre;
2. Hanover Park;
3. Burren River Linear Walk;
4. Barrow River Section; and
5. The Plots (Hanover Harps).

These focus areas were selected based on a number of criteria including centrality in relation to Carlow Town, amenity value, tourism opportunities and biodiversity value/enhancement prospects.

Any relevant specific actions within these areas will be extrapolated to apply generally to the larger Project Area, and the Strategy will be for the larger Project Area also. Indeed, many of the general actions could be used not just in Carlow Town but throughout the whole County of Carlow.

Figure 2:Focus Areas in relation to Carlow Town



3.2 The Focus Areas

3.2.1 Focus Area 1: Town Centre

The Town Centre focus area includes the following streets: Dublin Street; Brown Street; Charlotte Street; Tullow Street; College Street; Kennedy Avenue; Potato Market; and Barrack Street. See Figure 2. (Central grid reference: S 72216 76598).

3.2.2 Focus Area 2: Hanover Park

Hanover Park focus area includes Hanover Park itself and a small strip of land to the east of the park. See Figure 2 (Central grid reference: S 72262 76379).

3.2.3 Focus Area 3: Burren River Linear Walk

The Burren River Linear Walk focus area encompasses the riverside walkway from the roundabout at the Inner Relief Road, south along the river, under the railway bridge and includes the grassland area as far as the weir. See Figure 2. (Runs from grid references S 72555 76213 to S 73035 75467).

3.2.4 Focus Area 4: Barrow River Section

The Barrow River Section focus area covers a small section of the Barrow river-side running from Wellington Bridge down to the confluence with the Burren River, and up along the Burren River as far as the bridge at Burrin Street in the Town Centre. See Figure 2. (Grid references S 71644 76441 (south) S 71785 76790 (north) and S 71785 76790 (west) S 71958 76624).

3.2.5 Focus Area 5: The Plots (Hanover Harps)

The Plots focus area encompasses Hanover Harps playing pitches and a community allotment near Elm Park Drive. See Figure 2 (Central grid reference: S 73088 76953).

4 Ecological Survey Methods

4.1 Habitat Survey

Site surveys were undertaken on 22nd, 23rd, 28th, 29th August and 3rd and 4th September 2019 by Aoife O'Rourke of Scott Cawley Ltd. Habitats within the focus areas were surveyed using methodology outlined in *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011) and habitats were identified and classified according to *A Guide to Habitats in Ireland* (Fossitt, 2000). Flora species identifiable at the time of year have been provided, alongside a DAFOR (Dominant, Abundant, Frequent, Occasional, Rare) score indicating their relative abundance. Plant nomenclature follows that of the *Checklist of the Flora of Britain &* Ireland (BSBI, 2007).

The aim of the field survey work was to identify areas of biodiversity interest in the focus areas and characterise the habitats within these areas. Brief descriptions of the habitats have been provided in this report.

4.2 Invasive Species Survey

All invasive species listed on Third Schedule of the *European Communities (Birds and Natural Habitats) Regulations 2011* as amended (herein the Birds and Habitats Regulations) were identified and recorded. Maps showing indicative locations of Third Schedule invasive species are included below in Section 5. Other invasive species not listed in these Regulations are discussed in Section 5 below.

4.3 Bat Survey

Four bat activity transects were carried out from dusk over four survey dates covering; Town Centre, Hanover Park, Burren River Linear Walk, The Plots (Hanover Harps) and Hanover Park. Survey dates and locations are included in Table 1.

Bat surveys were conducted using two different handheld ultrasound bat detectors (Pettersson D240x, and Elekon BatLogger M). The surveys were carried out from 15 minutes prior to sunset to c. 1.5 hours after sunset. Dates, timings, weather and other details of the 2019 dusk surveys are outlined in Table 1 below. Overall, the weather conditions were considered to be optimal for bat activity surveys. Data generated from the surveys were analysed using Kaleidoscope Pro Analysis software and Elekon Bat Explorer software.

Table 1 Bat Activity Survey Information

Date	Survey Type	Focus Area	Detector Used	Sunset/ Sunrise	Survey time	Weather and Temperature
28/09/19	Dusk	Town Centre and Hanover Park	Pettersson D240x	20:30	20:15-22:21	Dry and calm, except for short heavy downpour at 20:40, temperatures between 17°C - 20°C
03/09/19	Dusk	Burren Linear Walk	Elekon BatLogger M	20:12	19:55-21:45	Cloudy with occasional light drizzle. Light wind with temperatures between 16°C - 18°C
04/09/19	Dusk	The Plots (Hanover Harps)	Elekon BatLogger M	20:10	20:39-21:53 (survey delayed due to aborted Barrow Section transect-lack of access)	Dry, light-moderate wind, temperatures between 11°C - 13°C
05/09/19	Dusk	Hanover Park	Pettersson D240x	20:08	19:45-21:38	Dry, light wind, temperatures between 16°C -18°C

4.4 Bird Survey

Bird species were recorded throughout the focus areas based on incidental visual observation and aural observation (bird song).

4.5 Other Fauna

The presence of other mammal species (excluding bats) was substantiated through the detection of field signs such as tracks, markings, feeding signs, droppings, and direct observation.

Butterfly and bumblebee species were recorded from each focus area, where observed.

4.6 Limitations

It was not possible to carry out habitat and species surveys of Focus Area 4 (Barrow River Section) due to a lack of safe access to the area.

The field surveys took place outside of the breeding bird and bumblebee activity seasons. Ad hoc records of breeding birds and bumblebees were recorded where observed, however further surveys in the future will likely reveal further species of these taxonomic groups.

The field survey work did not include specialised flora (e.g. bryophyte surveys) or fauna survey (e.g. otter) work and the lack of sightings or evidence of many species does not necessarily mean they do not occur in the area.

The field survey work was considered adequate for the purpose of identifying and assessing areas of biodiversity interest to inform the plan. However, additional specialist surveys (*e.g.* for otter, badger, bryophyte, lichen) would most likely reveal the presence of other flora and fauna species in the area.

5 Existing Biodiversity

5.1 Focus Area 1: Town Centre

5.1.1 Habitats

Carlow Town Centre predominantly contains buildings and artificial surfaces (BL3) habitat. This habitat type includes roads, houses, buildings, and other artificial built and hard surfaces. There are trees planted under pavements throughout the town, particularly along Kennedy Avenue, Barrack Street and new trees planted along Green Lane. It is typically of low botanic value, however, may be of value for fauna species, in particular bats, swallows and swifts.

Flower beds and borders habitat (BC4) and trees also occur within the Town Centre, mainly within planters and hanging baskets. As these planters and baskets are widespread and relatively small in area they have not been mapped. This habitat contains a high proportion of ornamental non-native plant species that are regularly maintained and managed and includes areas of scattered trees and shrubs. Ornamental planting around the bases of trees was also observed. It is of low botanic value due to the lack of native plant species present, and the highly managed nature of the planting.

A number of different flower bed and planter types were recorded throughout the Town Centre (see examples of each in plates 1-6). Most of the plant species recorded are of poor-value for pollinators and other wildlife, as they have been over-bred to produce showy-flowers to be visually attractive, meaning the plant has little energy left to produce nectar and pollen. For example flowers such as begonias, petunias, geraniums, and lobelias would typically be included in hanging basket and planters in urban areas.

The current planting programme in Carlow Town open spaces is as follows:

- Winter/ spring bedding plants, planted in October: polyanthuses, pansies, tulips (golden, appledoorn, red)
- Summer Bedding, planted in May: begonias (trailing and ordinary), geraniums, petunias, and pansies

Locations of this planting programme include opposite the County Council buildings, the post office, potato market, barrack street, roundabouts and 50 planter boxes in the summer.

A more biodiversity-friendly flower bed planted in the Town Centre by the Green Group in May 2019 is shown in Plate 7. It contained pollinator-friendly ornamental plants such as: thyme *Thymus* sp.; yarrow *Achillea* sp.; heath *Erica* sp., cone flower *Echinacea* sp. and michaelmas daisies *Aster amellus*.

Figure 3: Habitat map of Carlow Town Centre (Focus Area 1)

Figure 4: Third Schedule invasive species recorded in Carlow Town Centre (Focus Area 1)

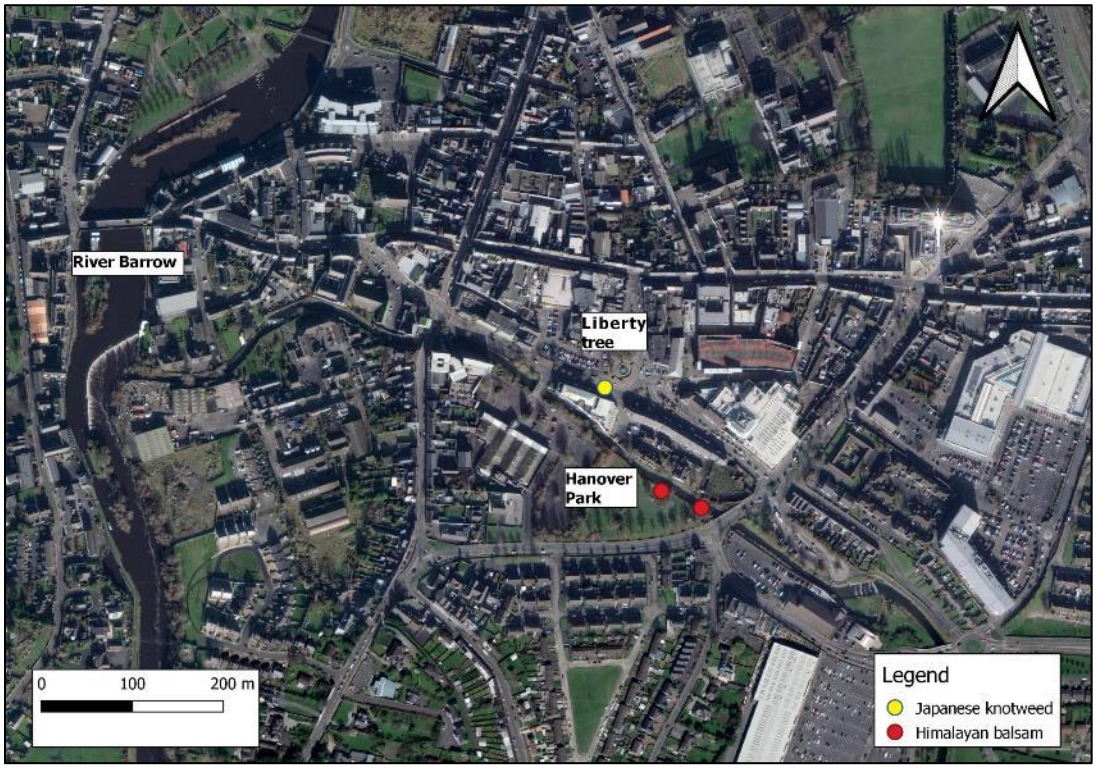


Plate 1. Planter containing begonias and petunias

Plate 2. Mixed flower bed containing primroses, begonias, ornamental grass, ornamental daisy, Darwin's barberry (*Berberis darwinii*) and forest flame (*Pieris* sp.)

Plate 3. Planter containing begonias and a dwarf palm

Plate 4. Typical hanging baskets containing petunias, ornamental pansies, and lobelias

Plate 5. Bed of geraniums

Plate 6. Planter containing begonias and a rose (*Rosa* sp.)

(a) Perennial flower bed

(b) Honey bee visiting *Echinacea* sp.

(c) Hoverfly visiting *Aster amellas*

Plate 7. (a-c) Example of the most biodiversity-friendly perennial flower bed found in Carlow Town Centre currently, planted by the Green Group in May 2019

5.1.2 Invasive Species

A stand of Japanese knotweed *Fallopia japonica* was recorded on the southern bank of the Burren River on Kennedy Avenue, near Lemongrass Restaurant (See Figure 4). Japanese knotweed is listed on the Third Schedule of the Birds and Habitats Regulations. Japanese knotweed originates from Japan, Korea, Taiwan and China, where male and female plants are present. In Europe only female plants have been recorded to date. Japanese knotweed is a particularly invasive plant species. It rapidly forms dense stands of vegetation and outcompetes native flora. Once it becomes established it is extremely difficult to remove. It is particularly prevalent near water sources, as is the case in Carlow town. It can also undermine the stability of buildings and pavements, as it has the ability to grow through concrete and tarmacadam.[3]

5.1.3 Bats

A minimum of two bat species were recorded within Carlow Town Centre: Leisler's bat *Nyctalus leisleri* and pipistrelle bat(s) *Pipistrellus spp.* The bat call analysis software could not differentiate between the *Pipistrellus* species- common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, and Nathusius's pipistrelle *Pipistrellus nathusii*. The Leisler's bat was recorded on College Street and the pipistrelle species were recorded commuting and foraging over the water at the bridge adjacent to the entrance to the old Penney's site on Kennedy Avenue.

[3] Invasive Species Ireland. Available: https://invasivespeciesireland.com/species-accounts/established/terrestrial/japanese-knotweed, Accessed: 01/11/2019

Buildings and trees in the Town Centre present opportunities for roosting bats if relevant roost features are present. Green corridors formed by treelines, hedgerows and rivers in the Town Centre are suitable commuting and foraging habitat for bats, this is especially the case along the Burren River on Kennedy Avenue. However, artificial lighting within the Town Centre reduces the suitability of the area for commuting, roosting and foraging bats.

5.1.4 Birds

Bird species encountered either within or flying over the focus area included one green-listed species- Jackdaw *Corvus monedula* and two amber-listed species- swallow *Hirundo rustica* and mute swan *Cygnus olor.*

Swallow were observed flying on College Street and Charlotte Street. Mute swan were observed in the Burren River on the western end of Kennedy Avenue. Buildings, trees and some shrubs in the Town Centre area present suitable nesting habitat for birds.

5.1.5 Other Fauna Records

Incidental records of other fauna species observed throughout the ecological surveys of the Focus Area:

Butterfly: A Small tortoiseshell *Aglais urticae* was observed in the area.

5.2 Focus Area 2: Hanover Park

5.2.1 Habitats

Hanover Park is a public park that contains a variety of different habitat types, including amenity grassland (GA2) that makes up the majority of the park area, scattered trees and parkland (WD5), ornamental/ non-native shrub (WS3) along part of the bank of the Burren River and depositing/ lowland rivers (FW2) i.e. the Burren River that forms a boundary to the north of the park.

A small area of land to the east of the park was also included within the survey area. Buildings and artificial surfaces habitat (BL3) is found in this area in the form of a pathway, carpark and bus station. There is some scattered trees and parkland habitat (WD5) and amenity grassland (GA2) in this area. The Burren River forms a boundary to this area of land to the south.

To note: some of these habitats merge together in sections to form mosaic habitats.

Figure 5: Habitat map of Hanover Park (Focus Area 2).

5.2.1.1 Amenity Grassland (GA2)

Plate 8. Hanover Park amenity grassland (GA2)

Hanover Park contains typical amenity grassland habitat, albeit well established and with a high proportion of herbaceous plants. Dominant species in this habitat include common grasses such as red fescue *Festuca rubra* and perennial ryegrass *Lolium perenne* and common wildflower species including yarrow *Achillea millefolium* and dandelion *Taraxacum officinale agg*. Other wildflowers present in this habitat include red clover *Trifolium pratense*, speedwell species *Veronica spp.* and dove's foot cranesbill *Geranium molle.* For a full species list see Appendix A.

5.2.1.2 Scattered Trees and Parkland (WD5)

Hanover Park contains a variety of native and non-native tree species interspersed among the amenity grassland (GA2). Most of the species that have been planted here are native to Ireland including willow species *Salix spp.*, Alder *Alnus glutinosa,* hawthorn *Crataegus monogyna* and Scott's pine *Pinus sylvestris.*

Non-native tree species in this area include sycamore *Acer pseudoplatanus*, horse chestnut *Aesculus hippocastanum* and osier willow *Salix viminalis.* For a full species list see Appendix A.

5.2.1.3 Ornamental /Non-Native Shrub (WS3)

Plate 9. Hanover park ornamental and non-native shrubs in foreground with scattered trees and parkland in background

The edges of Hanover park consist of mostly ornamental/non-native shrubs mixed with native shrubs and an understory of herbs (plate 10). This habitat had been intensively cut-back with generally only the current year's growth displayed. Non-native shrub species present in this habitat include hardy fuschia *Fuschia magellanica*, Chinese bramble *Rubus tricolor* and cotoneaster species *Cotoneaster spp.* Native shrub species include ivy *Hedera helix*, bramble *Rubus fruticosus* and holly *Ilex aquifolium.* The understorey of herbs was comprised entirely of common native species including cleavers *Galium aparine*, herb-Robert *Geranium robertianum*, nettles, *Urtica dioica*, yarrow *Achillea millefolium,* and dandelion *Taraxacum* agg. For a full species list see Appendix A.

5.2.1.4 Depositing/Lowland Rivers (FW2)

Plate 10. Burren river running through Hanover Park

The River Burren runs along the northern boundary of Hanover Park. It flows in a north-westerly direction for c. 750m until it meets the River Barrow. The in-stream and lower bank vegetation (plate 11) was relatively species poor and included the following species: Common duckweed *Lemna minor*, branched

bur-reed *Sparganium erectum*, buttercup sp. *Ranunculus* sp. and common reed *Phragmites australis.* The non-native invasive species Himalayan balsam *Impatiens glandulifera* was also recorded within this habitat. For a full species list see Appendix A.

5.2.1.5 Treelines (WL2)

Plate 11. Treeline in bus station along eastern strip adjacent to Hanover Park

This habitat consists of a mixed overstorey of trees with a grassy ruderal bank as its understorey. Trees in this habitat include native species such as alder *Alnus glutinosa* and hawthorn *Crataegus monogyna* as well as non-native species such as large-leaved lime *Tilia x platyphyllos* and sycamore *Acer pseudoplatanus*. The herbaceous understorey is comprised of a range of grasses, wildflowers and shrubs. Species encountered in this area include ivy *Hedera helix,* false oat-grass *Arrhenatherum elatius,* bentgrass sp. *Agrostis* sp., bramble *Rubus fruiticosus* agg., pignut *Conopodium majus*, cow parsley *Anthriscus sylvestris* and redshank *Persicaria maculosa*. For a full species list see Appendix A.

5.2.2 Invasive Species

Two stands of Himalayan balsam *Impatiens glandulifera* were recorded along the Burren River in Hanover Park (See Figure 4 above). Himalayan balsam is listed on the Third Schedule of the Birds and Habitats Regulations. It forms thick stands of vegetation which shades out native flora. It can leave soil susceptible to erosion, as it dies back in October leaving no native vegetation cover to protect the soil. It also competes with native flora for pollination services, the bumblebees feeding on it are then less likely to feed on, and consequentially pollinate native flowers.[4]

[4]Invasive Species Ireland. Available: https://invasivespeciesireland.com/species-accounts/established/terrestrial/himalayan-balsam, Accessed: 01/11/2019

Plate 12: Himalayan balsam recorded along the Burren River in 2019.

5.2.3 Bats

Three bat species were recorded in the Hanover Park area; these included Leisler's bat *Nyctalus leisleri,* the common pipistrelle *Pipistrellus pipistrellus*, and the soprano pipistrelle *Pipistrellus pygmaeus*. Most bat calls were recorded around the trees to the west of the site, and along the river. Soprano pipistrelles were recorded feeding over the river. A number of these were observed flying under the bridge, where there was little to no lighting. It was concluded that the bridge may represent potential roosting habitat. Some areas of the park were moderately lit. There was no bat activity in the eastern section of this focus area near the bus station. The trees in the park did not have any potential bat roost features (PRFs).

5.2.4 Birds

Bird species encountered either within or flying over the focus areas included one red-listed species, grey wagtail *Motacilla cinerea* which were observed flying over the river. Two amber-listed species were also recorded within the focus area- house sparrow *Passer domesticus* and swallow *Hirundo rustica*. Green-listed species which are associated with aquatic habitats were recorded along the Burren River- moorhen *Gallinula chloropus* and dipper *Cinclus cinclus.* The other bird species recorded within this focus area were common urban, green-listed species and included jackdaw *Corvus monedula,* rook *Corvus frugilegus*, hooded crow *Corvus cornix*, wood pigeon *Columba palumbus,* goldfinch *Carduelis carduelis,* pied wagtail *Motacilla alba* and blackbird *Turdus merula.*

In addition, five bird boxes, suitable for tits, were observed on trees within the park. Structures, trees and shrubs in the area represent suitable nesting habitat for birds.

5.2.5 Other Fauna Records

Incidental records of other fauna species observed throughout the ecological surveys of the Focus Area:

Bumblebee: The following bumblebee species were observed in the Hanover Park area: Common carder bee *Bombus pascuorum*; and Large red tailed bumblebee *Bombus lapidaries.*

Butterfly: A large white *Pieris brassicae* and a comma butterfly *Polygonia c-album* were observed within the park.

5.3 Focus Area 3: Burren River Linear Walk

5.3.1 Habitats

The Burren River Linear walk consists of a walking/cycling route alongside the Burren River. Five main habitat types exist along the portion of the trail surveyed: amenity grassland GA2, a mosaic of treelines and

scrub WL2/WS1, depositing lowland rivers FW2, a small section of buildings and artificial surfaces BL3, and dry meadows and grassy verges GS2.

Figure 6: Habitat map of the Burren River Linear Walk (Focus Area 3).

Figure 7: Invasive species recorded along the northern section of the Burren River Linear Walk (Focus Area 3)

Figure 8: Invasive species recorded along the southern section of the Burren River Linear Walk (Focus Area 3)

5.3.1.1 Amenity Grassland (GA2)/ Buildings and Artificial Surfaces (BL3)

Plate 13. Amenity grassland strip planted with alder trees along the Burren River Linear Walk

The amenity grassland habitat along the Burren River Linear Walk is very similar in species composition to GA2 found in Hanover Park, however it is less species rich floristically. It is tightly mown alongside the river and contains a row of alder trees *Alnus glutinosa*. Evidence of herbicide use (bare patches of soil with sparse

yellow vegetation) can be seen around the tree bases (Plate 13) There is an artificial tarmacadam cycleway/ walkway running parallel to the strip of GA2, hence this habitat is mapped as a mosaic habitat.

5.3.1.2 Treelines/ Scrub (WL2/ WS1)

Plate 14. Mosaic of Treelines/ Scrub along the south section of the site

A mosaic of treelines and scrub is found at the south eastern section of the focus area. The treeline is comprised of three native species: willow species *Salix spp.*, elder *Sambucus nigra* and hawthorn *Crataegus monogyna.* Native scrub species include bramble *Rubus fruticosus agg.*, gorse *Ulex europaeus*, ash *Fraxinus excelsior* and broom *Cytisus scoparius.* Non-native scrub species include sycamore *Acer pseudoplatanus*, rose species *Rosa spp.* and butterfly-bush *Buddleja davidii*, a non-native invasive species For a full species list see Appendix A.

5.3.1.3 Buildings and Artificial Surfaces (BL3)

Plate 15. Railway bridge- Buildings and artificial surfaces

The cycleway/ walkway along the river is comprised of an artificial surface and there is a railway bridge at the southern curve of the linear walk.

5.3.1.4 Depositing/ lowland rivers (FW2)

Plate 16. Section of Burren River along Linear Walk showing signs of eutrophication

The in-stream and lower bank vegetation is consistent with the same habitat found in Hanover Park (section 5.2.1.4) Full species lists are available in Appendix A. Some sections of the river along the Linear Walk appear to be showing signs of eutrophication (i.e. excessive growth of algae, see Plate 16 above). The most recent (2018) Water Framework Directive (WFD) water quality status for this river is '*Moderate*'[5], this means the river is slightly polluted. Some areas of the bank are infested with the invasive alien (non-native)[6] plant species Himalayan balsam *Impatiens glandulifera* and Japanese knotweed *Fallopia japonica* (see Plate 17, and Figures 7 and 8).

5.3.1.5 Dry Meadows and Grassy Verges (GS2)

Plate 18. Rank GS2 grassland

The south eastern section of the Burren River Walk widens out to a relatively large area of rank/rough grassland (GS2 habitat). The grassland is largely unmanaged at present (Plate 18).

[5] EPA Maps. Monitoring Station Code: RS14B050485. Available: https://gis.epa.ie/EPAMaps/, Accessed: 31/10/2019

[6] **"**Invasive alien species" means an alien species whose introduction and/or spread threaten biological diversity. Available: http://www.biodiversityireland.ie/projects/what-is-an-invasive-species/, Accessed: 01/11/2019

5.3.2 Invasive Species

Five stands of Himalayan balsam and one stand of Japanese knotweed were recorded along the Burren River Linear Walk. Butterfly-bush *Buddleja davidii* was also noted in the scrub area near the treeline in the south eastern section of the focus area. Although butterfly-bush is not listed on the Third Schedule of the Birds and Habitats Regulations, it is considered to be an undesirable invasive species as it can form dense stands and outcompete native flora.

Plate 17. Himalayan balsam and Japanese knotweed recorded along the banks of the Burren River

5.3.3 Bats

Three bat species were recorded along the Burren River Linear Walk: Leisler's bat *Nyctalus leisleri,* common pipistrelle *Pipistrellus pipistrellus*, and soprano pipistrelle *Pipistrellus pygmaeus*.

A small number of *Myotis* spp. calls were also recorded, although the bat call analysis software did not differentiate which species of *Myotis* spp. was recorded. Ireland has three species of *Myotis* bat: Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri,* and whiskered bat *Myotis mystacinus*. Given the habitats present in this area, the calls recorded were most likely from Daubenton's bat which has a feeding specialism along waterways.

The most frequently recorded bats were soprano pipistrelle and common pipistrelle. Bat calls were most frequent along the straight section of the walk, in the northern portion of the focus area, where the river is located on the west. This was followed by the southern curve of the walk which is dominated by rough grassland with treelines and hedgerows to the north and south. The area of least bat activity corresponds to the section where the walk passes a large housing estate to the north. This may be because there is more disturbance from light pollution and human activity in this area, and less suitable foraging habitat.

5.3.4 Birds

Bird species encountered either within or flying over the focus areas included one red-listed species- grey wagtail *Motacilla cinereal* and five amber-listed species kingfisher *Alcedo atthis*, house sparrow *Passer domesticus*, starling *Sturnus vulgaris*, swallow *Hirundo rustica* and mute swan *Cygnus olor.* Other bird species recorded within this focus area are green-listed urban/ river species and included blackbird *Turdus merula*, goldfinch *Carduelis carduelis*, wood pigeon *Columa palumbus*, hooded crow *Corvus cornix*, moorhen *Gallinula chloropus*, grey heron *Ardea cinerea*, dunnock *Prunella modularis,* great tit *Parus major* and long-tailed tit *Aegithalos caudatus*

5.3.5 Other Fauna

Incidental records of other fauna species observed throughout the ecological surveys of the Focus Area:

Mammal: A dead pygmy shrew *Sorex minutus* observed on the river bank adjacent to Gala at Paupish.

A number of mammal tracks were observed throughout the rough grassland area to the south of the focus area. It is not possible to definitively conclude what mammal made the tracks, but it could include badger, fox or even dogs.

Bumblebee: The following bumblebee species were observed in the area: Common carder bee *Bombus pascuorum*; and Large red tailed bumblebee *Bombus lapidaries.*

Butterfly: The following butterfly species were observed along the Burren River Linear Walk: large white *Pieris brassicae*; painted lady *Cynthia cardui*; and speckled wood *Pararge aegeria.*

5.4 Focus Area 4: Barrow River Section

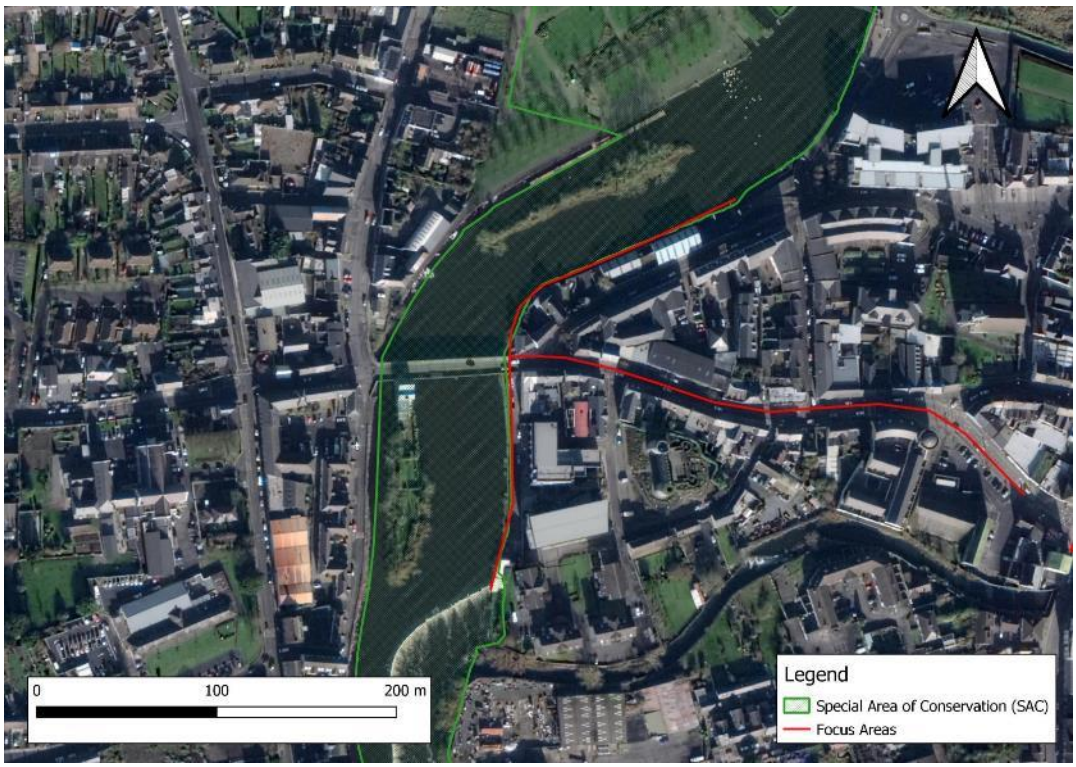
It was not possible to survey this area due to lack of safe access along the route, therefore a description of this area has been provided based on desktop results and incidental records of biodiversity recorded while in the area. A desktop search of the National Biodiversity Data Centre (NBDC) database was carried out on the Barrow River Section Focus Area and the immediately surrounding area.

5.4.1 Background

The River Barrow is the second longest river in Ireland, at 192km. It rises in the Slieve Bloom Mountains in County Laois and flows through counties Kildare, Kilkenny, Carlow, Wexford and Waterford. It is one of 'The Three Sisters' along with the Rivers Suir and Nore, which all flow into one another before entering the sea at Waterford Harbour. The River Barrow is a Special Area of Conservation (SAC), meaning that it has gained legal protection for habitats and species of European importance (See Table 2 below).

As the River Barrow is an SAC, there are a limited number of actions that can be suggested for biodiversity enhancement however, it has been included as a Focus Area due to it being the most important ecological feature of Carlow Town.

Figure 9: Map of the Barrow River Section (Focus Area 4).



5.4.2 Habitats

The River Barrow and River Nore Special Area of Conservation (SAC) lies within this area. This SAC is designated on the basis of the presence of habitats and species listed on Annex I/II of the E.U. Habitats Directive, (see Table 2).

Floating river vegetation is well represented in the Barrow and in many of its tributaries. In the Barrow the species found include water-starworts *Callitriche* spp., Canadian pondweed *Elodea canadensis*, bulbous rush *Juncus bulbosus*, water-milfoils *Myriophyllum* spp., the pondweed *Potamogeton x nitens*, broad-leaved pondweed *Potamogeton natans*, fennel pondweed *Potamogeton pectinatus*, perfoliated pondweed *Potamogeton perfoliatus* and crowfoots *Ranunculus* spp. (NPWS, 2011).

The latest Water Framework Directive (WFD) water quality score for the Barrow taken at station RS14B012200 in 2018 was "3-4 *Moderate*"[7]. Moderate WFD status indicates that the water is "*slightly polluted*"[8].

Table 2. Annex I/II habitats and species for which the River Barrow and River Nore SAC is designated[9]

Habitats
Estuaries
Mudflats and sandflats not covered by seawater at low tide
Reefs
Salicornia and other annuals colonising mud and sand
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
Mediterranean salt meadows (*Juncetalia maritimi*)
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
European dry heaths
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
Petrifying springs with tufa formation (*Cratoneurion*)
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)
Species
Desmoulin's Whorl Snail *Vertigo moulinsiana*
Freshwater Pearl Mussel *Margaritifera margaritifera*
White-clawed Crayfish *Austropotamobius pallipes*
Sea Lamprey *Petromyzon marinus*
Brook Lamprey *Lampetra planeri*
River Lamprey *Lampetra fluviatilis*

[7] EPA Maps. Available: https://gis.epa.ie/EPAMaps/, Accessed: 24/10/2019

[8] EPA River Quality Surveys. Available: http://www.epa.ie/QValue/webusers/, Accessed: 24/10/2019

[9] NPWS (2011) *Conservation Objectives: River Barrow and River Nore SAC 002162. Version 1.0*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Twaite Shad *Alosa fallax fallax*
Salmon *Salmo salar*
Otter *Lutra lutra*
Killarney Fern *Trichomanes speciosum*
Nore Pearl Mussel *Margaritifera durrovensis*

5.4.3 Invasive Species

The NBDC desktop search returned records of two invasive species in the vicinity of the focus area, one of which is listed on the Third Schedule- water fern *Azolla filiculoides*. Winter heliotrope *Petasites fragrans*, an undesirable non-native species was also recorded in the vicinity of the focus area.

5.4.4 Bats

This area could not be surveyed for bats (see limitation section 4.6 above). However, the NBDC desktop search returned records of three bat species in the vicinity of the focus area: soprano pipistrelle *Pipistrellus pygmaeus*, Daubenton's bat *Myotis daubentonii* and Natterer's bat *Myotis nattereri*.

5.4.5 Birds

The NBDC desktop search returned records for a range of bird species in the vicinity of the focus area: swallow *Hirundo rustica*, blackbird *Turdus merula*, robin *Erithacus rubecula,* mute swan *Cygnus olor*, song thrush *Turdus philomelos* and wren *Troglodytes troglodytes.*

Bird species encountered during the field surveys included two amber-listed species- mute swan *Cygnus olor* and house sparrow *Passer domesticus.* Two common green-listed species were also recorded- mallard *Anas platyrhynchos* and feral pigeon *Columba livia domestica.*

5.4.6 Other Fauna

Incidental records of other fauna species observed throughout the ecological surveys of the focus area are provided below.

Butterfly: Two small tortoiseshell *Aglais urticae* were observed in the area.

5.5 Focus Area 5: The Plots (Hanover Harps)

5.5.1 Habitats

The Plots are situated in a residential area. They consist of the following habitat types: amenity grassland (GA2) (Hanover Harps Playing Pitches); treelines (WL2); scattered trees and parkland (WD5); horticultural land (BC2); recolonising bare ground (ED3); dry meadows and grassy verges (GS2); hedgerows (WL1), buildings and artificial surfaces (BL3) and flower beds and borders (BC4).

Figure 10: Habitat map of The Plots (Hanover Harps) (Focus Area 5).

5.5.1.1 Amenity Grassland (GA2)

Plate 19. Hanover Harps Amenity Grassland Playing Pitches

The Hanover Harps playing pitches are dominated by a tight, highly maintained sward of perennial ryegrass *Lolium perenne*. This is typical of improved grasslands.

5.5.1.2 Treelines (WL2)

(a) Treeline containing mixed tree species and herbaceous understorey

(b) *Black horehound- rare and declining in Ireland (credit: www.freenatureimages.eu)[10]

Plate 20. Treeline within the Plots

There is a row of c. ten mature trees running along the north of the site. This habitat consists of a mixed overstorey on an unmown bank. The tree species present in this habitat include native species such as wild cherry *Prunus avium,* silver birch *Betula pendula* and rowan *Sorbus aucuparia.* Non-native species include common lime *Tilia x europea,* sycamore *Acer pseudoplatanus* and cherry *Prunus spp.* The unmown understorey is comprised of a range of grasses and herbs including cock's foot *Dactylis glomerata,* common chickweed, *Stellaria media*, dandelion, *Taraxacum officinale* agg., wild radish *Raphanus raphanistrum*, false oat-grass, *Arrhenatherum elatius,* perennial ryegrass *Lolium perenne* and yarrow *Achillea millefolium*. Of note was the presence of black horehound *Ballota nigra*- a rare and declining species in Ireland (Plate 20 b).

[10] Parnell, J., Curtis, T., Cullen, E. (2012). Webb's An Irish Flora. (8 ed.). Cork University Press, Cork.

Scattered Trees and Parkland (WD5)

Plate 21. Sycamore trees and barberry shrubs interspersed with parkland

The north-east of the site contains a small area of scattered trees and parkland. The trees are mature sycamores *Acer pseudoplatanus*. Ornamental shrubs were also recorded in this area- purple-leaved barberry *Berberis thunbergii* var.

5.5.1.3 Horticultural Land (BC2)

Plate 22. Community allotments

The Plots contain a community allotment to the east of the site. Most of this area is typically planted with a variety of fruit and vegetables, however a number of wild plants tolerant of disturbance were also recorded, including red dead-nettle *Lamium purpurea*, common sow thistle *Sonchus oleraceus*, and the rare and declining henbit *Lamium amplexicaule*.

Plate 23. Henbit - rare and declining in Ireland

5.5.1.4 Recolonising Bare Ground (ED3)

Plate 24. Recolonising Bare Ground

To the east of the community allotments is an old car park which has a loose gravel substrate that is being recolonised by ruderal plant species. This habitat grades into dry meadows and grassy verges habitat (GS2), further east and south of the site. Species recorded in this area are typical of this habitat type and included red clover *Trifolium pratense*, Canadian fleabane *Conyza canadensis, w*hite clover *Trifolium repens,* ribwort plantain *Plantago lanceolata,* cat's-ear *Hypochaeris radicata* and dandelion *Taraxacum officinale* agg. For a full species list see Appendix A.

5.5.1.5 Dry Meadows and Grassy Verges (GS2)

There is a strip of dry meadow and grassy verges habitat to the east and south of the site. Most of this habitat is currently rank, tall, tussocky vegetation dominated by coarse grasses), however the eastern portion is floristically richer. Grass species recorded in this habitat include false oat-grass *Arrhenatherum elatius,* red fescue *Festuca rubra* and cock's foot *Dactylis glomerata.* Common weedy species recorded include curled dock *Rumex crispus,* ribwort plantain *Plantago lanceolata*, dandelion *Taraxacum officinale* agg. and ragwort *Senecio jacobaea*. For a full species list see Appendix A.

5.5.1.6 Hedgerows (WL1)

Plate 25. Mixed hedgerow along south eastern boundary of focus area

A mixed hedgerow runs along the south eastern portion of the site and is comprised of a range of native tree and shrub species such as hawthorn *Crataegus monogyna*, bramble *Rubus fruticosus agg.,* and blackthorn *Prunus spinosa*. A small portion of the hedgerow at the northern end was dominated by the ornamental evergreen tree Leyland cypress *Cupressus x leylandii*. This hedgerow has a predominantly native herbaceous understorey and is comprised of species such as curled dock *Rumex crispus, c*ommon mallow *Malva sylvestris*, hedge bindweed *Calystegia sepium* and hedge geranium *Geranium pyrenicum.* For a full species list see Appendix A.

5.5.1.7 Buildings and Artificial Surfaces (BL3)

There are small sections of artificial surfaces, e.g. tarmacadam pathways and a gravel carpark, throughout the Plots. The only fixed building on the site is the Hanover Harps club house situated to the south west of the site.

5.5.1.8 Flower beds and borders (BC4)

(a) Flower bed beside the allotments containing ornamental plants

(b & c) Flower containers with ornamental plants along the north east of the site

Plate 26. (a-c) Flower beds and containers

Plate 27. Non-native invasive montbretia plant within the Plots

A small number of flower beds/borders and plant containers are situated at the Plots (see Plate 26. a-c). These contain non-native ornamental plant varieties of low/ no value to pollinators and other wildlife. The flower beds and borders within the Plots contain the non-native invasive plant species montbretia *Crocosmia x crocosmiflora* (Plate 27).

5.5.2 Invasive Species

Montbretia, a non-native invasive species was recorded in the flower bed and borders within the Plots. Montbretia originates from South Africa. The cross is a horticultural hybrid which was developed in France for ornamental purposes. While this species is not listed on Third Schedule of the Birds and Habitats Regulations, montbretia outcompetes local flora and reduces floral diversity in its vicinity.[11]

5.5.3 Bats

Three bat species were recorded during surveys in the Plots: common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus* and Leisler's bat *Nyctalus leisleri*. Common pipistrelle calls dominated, followed by soprano pipistrelle and a small number of Leisler's calls. The majority of bat activity

[11] Department of Agriculture Food and the Marine. Invasive plant information note. Available: https://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/glastraining/MontbretiaFinalDraft230616.pdf. Accessed: 01/11/2019

was recorded in the area to the north east of the focus area where bats were foraging along the sycamore treeline. There was also high levels of bat activity recorded to the east of the site in an area alongside the allotments.

5.5.4 Birds

One amber-listed bird species was recorded within this focus area- starling *Sturnus vulgaris.* Other species present were common urban, green-listed species and included hooded crow *Corvus cornix*, wood pigeon *Columba palumbus*, jackdaw *Corvus monedula* and pied wagtail *Motacilla alba.*

5.5.5 Other Fauna

Bumblebee: The following bumblebee species were observed in The Plots: common carder bee *Bombus pascuorum*; buff-tailed bumblebee *Bombus terrestris* and white-tailed bumblebee *Bombus lucorum*

Butterfly: A white butterfly species *Pieris spp.* Was observed

Mammals: A dead rabbit was recorded within the car-park area.

6 Biodiversity Actions

6.1 Biodiversity Actions for the Carlow Town Area

The Focus Areas were chosen based on their potential for biodiversity and their locations within the town, in consultation with The Carlow Town Development Forum. However, there is scope to incorporate a range of biodiversity enhancement measures into the wider Carlow Town area, for example in the Town Park. The measures outlined in this section should be introduced wherever possible throughout Carlow Town, and strategically implemented to strengthen the Green Infrastructure network (See summary of actions in Table 3 below).

The proposed biodiversity actions are described briefly in this section and detailed implementation and management details are provided in the appendices.

The actions included in this plan will be subject to funds being available and to appropriate budgets and resources being made available to ensure their successful implementation over time.

6.1.1 Table 3. Biodiversity Actions for the Carlow Town Area

Action number	Biodiversity Action	Location	Timing	Potential partner(s)
BA1	Incorporate biodiversity friendly planting schemes	Flower beds/ borders/ boxes, hanging baskets and roadside verges throughout the town.	Short to mid term	Carlow Co Co
BA2	Incorporating biodiversity friendly grassland management	Grassy areas throughout the town	Short to mid term	Carlow Co Co
BA3	Incorporating biodiversity-friendly roadside grass verge management	Grass verges throughout the town	Short to mid term	Carlow Co Co
BA4	Reducing chemical use (herbicides, pesticides, fertilisers)	Areas where chemicals are used throughout the town, particularly near watercourses	Short to mid term	Carlow Co Co Other landowners
BA5	Planting new hedgerows	Parks and open spaces throughout the town	Mid term	Carlow Co Co Other landowners
BA6	Installing bat boxes and bird boxes/towers	Bat boxes can be installed on trees and buildings throughout the town, in proximity to waterbodies and semi-natural habitats and where conditions such as lighting are suitable Bird boxes and towers can be installed on trees/ buildings and in open	Short to mid term	Carlow Co Co Other landowners

		space areas throughout the town		
BA7	Invasive species management	Areas where there are invasive species throughout the town	Short to long term	Carlow Co Co Other landowners
BA8	Installing sensitive bat lighting	Adjacent to waterbodies, semi-natural habitats and hedgerows/ treelines throughout the town	Long term	Carlow Co Co Other landowners
BA9	Climbers, green walls, green bus shelters and green roof options	Suitable walls and buildings throughout the town	Mid term	Carlow Co Co Other landowners
BA10	Biodiversity awareness murals	Walls and electrical boxes throughout the town	Short term	Visual Local artists
BA11	Biodiversity awareness	N/A	Short to mid term	Carlow Co Co

6.1.2 *Incorporating biodiversity-friendly planting schemes*

With the increasing intensification of agriculture, and loss of semi-natural habitat due to development, urban areas such as parks, gardens and planters are increasingly becoming an important refuge for pollinators and other wildlife. Our wild pollinators benefit most from the planting of flowers, shrubs and trees with a high nectar and pollen content. Diversity is key too- different pollinators have different tongue lengths suited to gathering nectar from certain plant species. Catering to these preferences encourages a more diverse suite of flower-visiting insects. Another important consideration is flowering time- different pollinators emerge and are on-the-wing at different times of the year, typically from early spring through to autumn. Pollinators therefore require a continuous food resource during this time. Paying attention to flowering time when creating a planting plan also makes sense from an aesthetic point of view, so the two of these priorities can be complementary.

Unfortunately, the most commonly planted urban flowers, such as begonias, petunias, geraniums and busy lizzies, have little to no nectar or pollen content. This is because they are over-bred by horticulturalists with the primary focus of producing the showiest most colourful flowers. No attention has been paid to their value for pollinators during the breeding process. Double-flowered plants should also be avoided, as they are often inaccessible to pollinating insects. The good news is that there are a huge variety of attractive pollinator-friendly flowers, shrubs and trees that can be grown in an urban setting. A recent study by Rollings and Goulson (2019) looked at the attractiveness of garden flowers for pollinators and found that native plants attracted a significantly higher diversity of flower-visiting insects, compared to non-native plants. Suitable planting lists for Carlow town have been adapted from the resources available on pollinators.ie and are outlined in Appendix B. Useful online resources to help create biodiversity planting schemes are also included in Appendix B. Where wildflower planting is proposed, seed mixes suitable for the soil type should be chosen. Where wetland areas are unvegetated, they may be planted with the species outlined in Appendix B. Increasing vegetation cover helps to prevent the spread of invasive species. Native species should be used for formal hedging within Carlow Town. Suitable species include hazel *Corylus avellana*, wild privet *Ligustrum vulgare*, guelder rose *Viburnum opulus* and yew *Taxus baccata*.

Planting schedules should have regard to Invasive Species Ireland's *Amber list*. Planting schedules must not include species on these lists, as they may have invasive properties which would be detrimental to the overall biodiversity of Carlow Town. Landowners within Carlow town such as the County Council, the OPW and business owners should be encouraged to replace low biodiversity planting with the species suggested in Appendix B.

6.1.3 *Incorporating biodiversity-friendly grassland management*

Green spaces are often over-manicured and cut far too regularly, leaving few flowers for pollinators and wildlife. There are many areas of grassland in Carlow town that could benefit from a change in management regime. The options available are briefly explained below and implementation/ management instructions are detailed in Appendix C.

Option 1: Consider changing your cutting regime

Often green areas have a good seed bank of wildflower seed lying dormant in the soil ready to spring up if given a chance. In order to encourage what is already present in the seed bank- aim to take two cuttings a year, one before March, and then a second one between late July and September.

Option 2: Increasing floral diversity of your existing grassland

Floral diversity of existing grassland may be increased by sowing native wildflower seed into existing grassland. Seeds can either be bought from a reputable supplier or harvested from a suitable local donor site.

Option 3: Sowing wildflower seed onto bare ground

Grasslands may be created from scratch by sowing wildflower seed onto bare ground.

Option 4: Sowing strips/margins of wildflower seed

If there is limited space available or a restricted seed budget, wildflower strips/ margins can be sown.

6.1.4 *Incorporating biodiversity-friendly roadside grass verge management*

Where health and safety considerations for road safety and traffic management allow, roadside verges should be managed as semi-natural grasslands to allow wildflowers to bloom. Pollinator friendly planting along roadsides should be considered. 'Habitat islands' on roundabouts/ other leftover space on road networks may also be managed for pollinators. These can be managed according to Appendix C '*biodiversity friendly grassland management*'. Further details on how to increase biodiversity along roadsides is available in the following document: NBDC (2019) *Pollinator-friendly management of Transport Corridors.*

6.1.5 *Reducing chemical use (herbicides, pesticides, fertilisers)*

Pesticides and herbicides can harm wildlife both directly and indirectly. Directly, these chemicals can cause death, and indirectly they can poison food sources. In order to minimise the negative impacts of chemicals on biodiversity they should only be used when absolutely necessary, and care should be taken to avoid using them in particularly sensitive areas e.g. near waterways and on non-target species e.g. bees.

The over-use of fertilisers can lead to a reduction in floral diversity, as wildflowers general thrive best in low-fertility soils. When fertility in the soil is high it leads to the growth of strong grasses and weedy species that outcompete wildflowers. Excess fertiliser can also leach into waterbodies as run-off from the surrounding landscape, this can lead to an overloading of nutrients (eutrophication) in the waterbody, which can reduce oxygen, and put pressure on aquatic life. Details on how to reduce chemical use are provided in Appendix D.

6.1.6 *Planting new hedgerows*

Hedgerows are important ecological features of Irish countryside. Diverse, native hedgerows provide invaluable food and shelter resources for a range of fauna groups including birds, pollinators and mammals. Hedgerows also provide connectivity of habitat and provide corridors for species movement. Planting a native hedgerow is one of the most beneficial actions that can be taken to support biodiversity. Guidelines on how to successfully plant a hedgerow are outlined in Appendix E. Suitable species for planting hedgerows are listed in Appendix B.

6.1.7 *Installing bat boxes and bird boxes/towers where suitable*

Installing bat and bird boxes/ towers are an easy, low-cost way to attract a range of fauna to an area to roost or breed. When choosing locations and styles of boxes/ towers, consideration should be given to the species already present in the area and how best to attract them. Guidelines on selection and installation of boxes/ towers are provided in Appendix F.

6.1.8 Invasive Species Management

Non-native invasive species are a huge threat to native biodiversity as they compete for important resources and can take over entire ecosystems. Two species which are listed on the Third Schedule of the *European Communities (Birds and Habitats) Regulations 2011* as amended were recorded during surveys in Carlow Town- Himalayan balsam *Impatiens glandulifera* And Japanese knotweed *Fallopia japonica*. There are specific provisions that govern control of these listed species and it is an offence to release or allow to disperse or escape, species listed on the Third Schedule of the Regulations without a Licence. Other undesirable non-native species which may become invasive in certain habitats were also recorded within Carlow Town. In order to improve biodiversity in Carlow Town, actions should be taken to remove these species and prevent their spread. Details on invasive species legislation and treatment options are provided in Appendix G. The following steps can act as a starting point:

Step 1: Identification and Awareness Raising

Become familiar with invasive species identification and raise awareness about these species and how to differentiate them from similar non-invasive species.

Step 2: Develop a site-specific management plan

Highlight all the areas where invasive species occur, map these areas, and develop a plan on how to control these species over time. You may wish to employ an ecologist, invasive species specialist or similarly experienced professional to help produce a site-specific management plan.

Step 3: Employ a specialist contractor when needed

Himalayan balsam can be manually controlled by careful management by volunteers, however species such as Japanese Knotweed require specific herbicide treatment and should only be handled by an experienced professional.

Step 4: Safe handling and disposal

Follow best practice guidelines and professional expertise on how to handle invasive species and dispose of them safely in order to prevent further spread of the species.

Step 5: Health and safety

All invasive species control methods should comply with relevant health and safety procedures.

Step 6: Monitoring

Regular monitoring should take place in order to identify any areas that need repeat treatment.

Steps based on key guidance provided by Invasive Species Ireland. Available: https://invasivespeciesireland.com/invasive-plant-management/, Accessed: 05/11/2019

6.1.9 *Installing bat sensitive lighting*

Bats are nocturnal species and forage for insect prey at night using echolocation. Artificial lighting causes disturbance to bats and may result in them abandoning a roosting site or avoiding an otherwise suitable commuting or foraging route. It is recommended that when installing lighting in Carlow Town, light spill is minimised. Light spill minimisation requires consideration of design and will be influenced by baseline conditions however, the following advice may be useful:

- **Consider whether lighting is necessary at all, particularly in areas of semi-natural vegetation (*e.g.* in urban parks, along rivers etc.). All Irish bat species are somewhat sensitive to light spill, particularly species strongly associated with woodland habitats. The introduction of lighting to an area, even with the application of measures to minimise light spill is likely to have some impact on bat activity.**
- **Minimising light spill is complicated, and lighting design should be undertaken by a qualified and experienced lighting professional and reviewed by a suitably qualified and experienced ecologist.**
- **In general, light spill can be minimised by the use of luminaires that direct light spill in a single direction. Other measures for consideration will include height of light podiums, density of podiums, and screening of light sources by nearby vegetation.**

6.1.10 *Build a pond*

It is not considered that any of the focus areas in this plan are suitable sites for pond creation however, ponds are one of the most cost-effective ways to conserve biodiversity in urban areas. It is recommended that they be considered for inclusion within other sites in Carlow Town, where appropriate. They provide vitally important habitat for a wide range of flora and fauna including aquatic plants, amphibians, fish and insects. They also provide food for birds, bats and other mammals. New wetlands can also promote green infrastructure and provide connectivity of habitat for wildlife. Ponds should be carefully designed with biodiversity in mind and should have shallow, sloping sides to create suitable habitat for amphibians. Where possible, ponds should connect to other habitats of ecological interest such as hedgerows and meadows. A suitable riparian/ wetland planting mix for ponds is provided in Appendix B. Detailed design and implementation advice may be sought from 'Freshwater Habitats Trust (2008). *Million Ponds Project. Pond Creation Toolkit*'.

6.1.11 *Climbers, green walls, green bus shelters and green roof options*

Urban areas are often of limited biodiversity value as they provide few resources to wildlife. The following actions are all great ways to green urban environments. Each measure is briefly outlined below, and detailed implementation and management instructions are provided in Appendix H.

Climbers

Climbing plants provide habitats and a food source for wildlife in urban areas. Several shade-tolerant native plant species generally do well in urban environments (See Appendix B). Climbers may provide cover for nesting birds, invertebrates and roosting bats as well as food resources for pollinators, birds and small mammals. Ornamental climbing plants may also be beneficial for wildlife.

Green walls

Green walls, also known as living walls, can make a bold statement in an urban setting. A variety of plant types can be used for different effects e.g. ferns, mosses, flowering plants, edible plants. The following are some of the benefits of green walls: air purification, habitat and forage provision for birds and insects, insulation/cooling properties for buildings and connecting people with nature. However, installation of green walls can be technically challenging and expensive. A professional landscaper should be commissioned to install a green wall. Growing climbers can provide the same benefits as green walls.

Green bus shelters

In August 2019, it was announced that plans were underway to add 1,200 'green bus shelters' to Dublin city. Inspiration for the initiative has come from Utrecht, The Netherlands, where over 300 bus shelters have been transformed by the addition of Sedum to their roofs. Sedum, also known as stonecrop is a hardy plant with succulent leaves and flowers that are attractive to pollinators. It forms a dense mat of vegetation, making it suitable as roof vegetation. The most beneficial sedum species to biodiversity are native varieties, such as: English stonecrop *Sedum anglicum*, and biting stonecrop *Sedum acre*. Sedum roofs not only provide a food stop for pollinators they also collect rainwater and can help purify polluted air. Perhaps Carlow could lead the way and become the first town in Ireland to pilot this initiative?

Green roofs

Green roofs are roofs that are covered in vegetation, growing in a thick or thin substrate, above a waterproof membrane. They may also be called living roofs, vegetated roofs, eco-roofs, and brown roofs. Benefits to installing green roofs include increased biodiversity, reduction of water run-off, absorption of sound and they are visually appealing. There are two main types of green roofs: intensive and extensive.

Intensive green roofs tend to have deeper substrate than extensive green roofs, which allows them to hold a more complex range of plant types e.g. trees, shrubs, lawns, herbs. These roofs are usually intended to be accessed by people. Extensive green roofs generally require less maintenance and are regarded as more sustainable than intensive green roofs. They are lighter in weight and usually have a greater focus on biodiversity enhancement

There are many green roof variations and some designs incorporate elements of both types of green roof e.g. semi-extensive green roofs, which have a slightly thicker substrate than extensive green roofs

Photo credit: livingwalls.ie

6.1.12 Biodiversity awareness murals

Although it might not seem directly relevant at first, art can play a role in helping to conserve biodiversity. The first step on the road to biodiversity conservation is to raise awareness about local biodiversity- what species exist in the locality? What do they look like? Why are they important? What threats do they face? Street art can help start these important conversations and add to the touristic value of an urban area. Arrieta (2014) explored street art as a tool for increasing biodiversity awareness. She concluded that "*street art can help serve and promote discussion about environmental topics and tap into the population's perceptions and emotions about the impacts of biodiversity on the planet and implications for humans (as well as wildlife)*".

Photo credit: Cork City Walls Project. Artist: Curtis Hylton

6.1.13 Biodiversity training

Biodiversity friendly green spaces are important refuges for wildlife in urban areas. The Carlow County Council staff, contractors, community groups and other organisations involved in the hands-on management of parks and green spaces should be conscious of creating and conserving habitats which may be used by wildlife. It is therefore recommended that these staff and members of the public take part in training to empower them to identify opportunities for wildlife and implement biodiversity enhancement measures within the town. Once training has taken place, these individuals would be well equipped to implement this plan.

It is also recommended that biodiversity awareness programmes take place in local schools. Increasing awareness of biodiversity among children is imperative to ensure the long-term conservation of wildlife. Schools may also be encouraged to carry out a biodiversity project, incorporating some of the measures outlined in this plan.

6.1.14 Monitoring and citizen science

It is important that when implementing biodiversity enhancement measures, biodiversity is recorded and monitored. This will allow for the assessment of the efficacy of the measures implemented and where they have not been successful, indicates where changes must be made. Biodiversity recorders in Carlow Town should be encouraged to take part in citizen science projects and submit their records and findings to the relevant organisations. These organisations include Birdwatch Ireland, The National Biodiversity Data Centre, Botanical Society of Britain & Ireland and Bat Conservation Ireland.

6.1.15 Strategic Biodiversity Planning

Carlow County Council as policy makers, decision makers and land owners can strategically incorporate ways to protect and enhance biodiversity in the County. The upcoming County Development Plan (CDP) review is an ideal opportunity to consider the Council's approach to biodiversity countywide.

Protection and enhancement of biodiversity at a strategic level is most effectively achieved through the policies and objectives contained in the CDP which will govern how the Council makes its decisions over the coming years and create consistency for how planning applications are assessed. In addition to the policies that are included in the CDP in relation to protection of natural heritage and designated sites such as Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Natural Heritage Areas (NHAs), some ideas are provided below for how biodiversity can be considered through policies and objectives at a more strategic level within the CDP.

- To integrate biodiversity considerations into all Council departments and activities by ensuring that appropriate training and guidance is available when needed
- To prepare a Biodiversity Plan for the County, in accordance with national biodiversity policy
- To identify, protect and conserve a representative sample of the County's habitats and species of local, county and international level importance, not otherwise protected by legislation
    - In order to facilitate this, consider commissioning habitat mapping of the main settlements in the County to identify important local biodiversity areas, including habitats and ecological corridors/stepping stones such as watercourses, wetlands, hedgerows and treelines to be protected.
    - Include site specific policies/objectives within the CDP to ensure protection of these areas at pre-planning planning discussion stage and in consideration of appropriate conditions.
- Prepare a Green Infrastructure Network for County Carlow that facilitates ecological connectivity between important biodiversity areas.
- Where uncertainties arise with regard to the level of intervention required on individual sites an Ecological Impact Assessment (EcIA) should be requested with the planning application to ensure that potential impacts on habitats and species are considered fully, such as bats, otters, birds etc.
- Encourage the inclusion of biodiversity enhancement measures in development applications
    - Through pre-planning meetings, outline any planning requirements in order to retain and enhance biodiversity e.g. green networks, retaining treelines, hedgerows, bat boxes, blue infrastructure enhancements etc.
- Ensure that any planning application being considered is in accordance with the biodiversity policies within the CDP and any biodiversity action plan that may be prepared for or within the county.
- In terms of land use zoning, the Council should consider including appropriate riparian habitat zones (5-10m, ideally 10m) along all watercourses and wetlands within the County. This is to facilitate ecological connectivity as well as acting as a buffer between development and important biodiversity areas. This would contribute to the green infrastructure strategy also.

In relation to incorporating planning policies for the Biodiversity Focus Areas

A map indicating an ecological network in Carlow has been included within this plan. This incorporates the five focus areas. See Figure 1.

Based on the findings of ecological surveys and consultation with the community, the following is recommended in relation to the focus areas:

Hanover Park

- Zone a 10m riparian habitat area along the River Burren on each bank where existing development does not preclude this. This will maintain a buffer between any development activities and the River Burren which is beneficial for many things including wildlife and water quality.
- Bats were recorded utilising the River Burren for commuting and foraging, as well as potential roost site. Any lighting in the area, or development proposing lighting, should consider the impact of lighting on bats. Any lighting plan should be reviewed by a suitable qualified ecologist to ensure the plan is sensitive to the presence of bats and that light spill near the river bank is minimised.
- Consideration should be given as to whether the park area can be protected from future development through zoning as green space/amenity area, especially given that there will be a focus on biodiversity enhancement of this area.

Burren River Linear Walk

- Zone a 10m riparian habitat area along the River Burren on each bank where existing development does not preclude this. This will maintain a buffer between any development activities and the River Burren which is beneficial for many things including wildlife and water quality.
- Bats were recorded utilising the River Burren for commuting and foraging, as well as a potential roost site. Any lighting in the area, or development proposing lighting, should consider the impact of lighting on bats. Any lighting plan should be reviewed by a suitable qualified ecologist to ensure the plan is sensitive to the presence of bats and that light spill near the river bank is minimised.
- Consideration should be given as to whether the rank grassland at the south eastern end of this area can be protected from future development through zoning as green space/amenity area/flood plain, and whether an urban biodiversity park might be appropriate in this location.

River Barrow

- Zone a minimum 10m riparian habitat area along the River Barrow on each bank where existing development does not preclude this. This will maintain a buffer between any development activities and the River Barrow which is beneficial for many things including wildlife and water quality.

6.2 Focus Area Biodiversity Actions

The following measures outlined can be applied to the Focus Areas identified. Further actions have been identified that support implementation of the plan and enhancement of biodiversity in a more general sense across Carlow town and County. The proposed biodiversity actions will complement the town's annual planting and flora systems. The actions in Table 5 for Hanover Park need to be considered in conjunction with other possible development plans & proposed usage for the park i.e. development of enhanced cycling, pedestrian and increased public access and use.

6.2.1 Table 4. Focus Area 1: Town Centre

Action number	Biodiversity Action	Location	Timing	Potential partner(s)
TC1	Create more biodiversity/pollinator friendly and visually enhancing planting scheme for next planting season which complements the town's annual planting and flora systems (See Appendix B).	Flower beds/ borders/ boxes, hanging baskets and roadside verges throughout the Town Centre. It should also be considered to include pollinator friendly planting in containers which would create interest	Short – Mid Term	Carlow Co Co, Green Group Town Forum Carlow Youth Service

	Where hanging baskets are proposed in Carlow Town, consideration should be given to installing water storage tanks underneath the baskets to cut down on wastage of water.	e.g. bicycle baskets, tree stumps, wheelbarrows etc. Some walls may be suitable for growing climbers or conversion to green walls. Tullow St – focus on improving window boxes and hanging baskets		
TC2	Replace annuals with perennials where feasible in planted bed, boxes, window boxes and hanging baskets which complement the town's annual planting and flora systems. Encourage biodiversity friendly window boxes and hanging baskets throughout the town (See Appendix B).Where hanging baskets are proposed in Carlow Town, consideration should be given to installing water storage tanks underneath the baskets to cut down on wastage of water.	Flower beds/ borders/ boxes, hanging baskets and roadside verges throughout the town.	Short term	Carlow Co Co, amenity trust and Local businesses and building owners
TC3	Where feasible, replace low value non-native shrubs such as cotoneaster, leylandii and cherry laurel with shrubs outlined in Appendix B. Where feasible, replace geraniums and other ornamental planting with species outlined in Appendix B.	Throughout the town	Mid term	Carlow Co Co Local businesses
TC4	Where the bases of trees are planted with ornamental plants or surrounded by gravel allow wildflowers to grow or plant snowdrops, crocuses and native bluebells where feasible.	Tree bases throughout the town	Short term	Carlow Co Co Green Group Town Forum
TC5	Create 'habitat islands' on roundabouts/ dead space in the road network with suitable	Road network throughout Carlow Town	Short to mid term	Carlow Co Co

	planting/ flower boxes where safe and appropriate.	Empty space beside Basil Asian Street Food		Green Group Town Forum
TC6	Promote an education programme around biodiversity/pollinator friendly planting in the town centre e.g. through signage	Throughout the town	Long term	Carlow Co Co School Carlow Youth Service
TC7	Explore ways in which car parks can be put to better use for biodiversity and reduce concrete cover, reduce lighting, increase biodiversity friendly planting and introduce permeable paving	Car parks throughout the town	Long term	Carlow Co Co Car park owners
TC8	Commission local artists or school children to create murals to raise biodiversity awareness	Walls and electrical boxes throughout the town. Potentially suitable areas include: • Electricity box opposite Eddie Rockets • Buildings on Charlotte Street	Mid term	Visual or local artists
TC9	Install swift boxes and swallow nests on empty buildings e.g. Burrin Street. Install swift towers in appropriate locations throughout the town Encourage the incorporation of bird boxes/ nests into new builds. See Appendix F for information.	Locations where these species have been recorded/ are likely to occur. Swallows were recorded on College Street and Charlotte Street during field surveys. Potentially suitable locations for swift boxes include: • Carlow College St. Patrick's. • Old Perry's Cash and Carry, Kennedy St. • Gaelscoil • Green Road School • Youth Centre • Carlow College of Further Education	Short term	Carlow Co Co and building owners

TC10	Install bat boxes in the vicinity of the Burren River Corridor	Throughout the town, in proximity to waterbodies and semi-natural habitats and where conditions such as lighting are suitable	Short to mid term	Carlow Co Co The Green Group Various landowners
TC11	Improve biodiversity friendly planting in the Liberty tree area	Liberty tree area	Short term	Private landowners The Green Group Tidy Towns
TC12	Identify walls potentially suitable for climbing plants.	Throughout the town centre on walls of derelict buildings or dead spaces Some areas that are potentially suitable include: Carlow Shopping Centre wall (*note if this is a protected structure any planting may require some level of assessment or input from a conservation architect)* Byrne Electrical wall Stone wall on eastern side of unnamed road linking Tullow Street to Carlow Shopping Centre. If suitable, it is recommended that honeysuckle or other night-scented species are planted here as high levels of bat activity were recorded in the property behind the wall.	Short to mid term	The Green Group Carlow Tidy Towns Love Carlow Carlow Chamber of Commerce Invite wider community involvement such as primary/ secondary schools, TY students and Carlow Youth Services
TC13	Explore options with landowners to incorporate biodiversity friendly planting. Potential opportunity for planting noted around the ESB substation	Lands throughout the town and the ESB substation	Short to mid term	The Green Group Landowners
TC14	Explore the potential for green roofs in the area with biodiversity friendly planting.	Throughout the town centre. The flat roof on Carlow Co Co building looks	Long term	Building owners

		potentially suitable for green roof installation.		
TC15	When replacing trees at Potato Market use native tree species for biodiversity and visual enhancement (See Appendix B)	Potato Market	Mid term	Carlow Co Co
TC16	Implement a tree planting programme on arterial routes to the town centre. Tree species should be native species and of local provenance (See Appendix B)	Town centre	Mid to long term	Carlow Co Co
TC17	Explore the idea of green bus shelters – speak to Bus Eireann about existing bus shelters and NTA about proposed town centre routes	Town centre	Mid term	Carlow Co Co Green Group
TC18	Consider extending the Green Group's Biodiversity Garden planting along all of the suitable area on Barrack Street	Barrack Street	Short term	Carlow Co Co Green Group
TC19	Promote Biodiversity Training to Council Parks Department and Contractors, and include the requirement for biodiversity knowledge and adherence to this plan in the tendering process within the County Council	N/A	Short to mid term	Carlow Co Co
TC20	Develop a Green Infrastructure Strategy for the Town Centre and wider town area		Short term	Carlow Co Co Planning Dept
TC21	Treat invasive species. See Appendix G.	Town centre (See Figure 4)	Mid term	Carlow Co Co Private landowners Invasive species specialists

6.2.2 Table 5. Focus Area 2: Hanover Park

Action number	Biodiversity Action	Location	Timing	Potential partner(s)
HP1	Train the local volunteers to manage the park in a more biodiversity friendly way	N/A	Short to mid term	Carlow Co Co Local volunteers
HP2	Set up a project team to tackle anti-social behaviour along the River Burren. Engage addiction services to help/advise with this	N/A	Long term	TBC
HP3	Install signage to highlight that the park is a 'Managed for Wildlife Area' e.g. using All Ireland Pollinator Plan signage	Hanover Park	Short term	Tidy Towns, Residents Associations
HP4	Install an interpretive information board to raise biodiversity awareness e.g. illustrating species you might observe on the river or in the park such as kingfisher, grey wagtail, dipper, otter, bats.	Along the River Burren	Short term	Carlow Co Co
HP5	Increase planting of native tree species along the river corridor where suitable. Species that are tolerant of wet conditions include: alder, willow, downy birch, hawthorn, blackthorn and hazel	Hanover Park and near Bus Station	Mid term	Carlow Co Co
HP6	Remove non-native sycamore, fuschia and Chinese bramble around the edges of the park and plant with pollinator friendly native shrubs or wildflower patches. (See Appendix B).	Throughout Hanover Park	Mid term	Carlow Co Co
HP7	Where the bases of trees are planted with ornamental plants, left bare or surrounded by gravel allow wildflowers to grow or plant snowdrops, crocuses and native bluebells where feasible.	Throughout Hanover Park	Short term	Carlow Co Co

HP8	Replace annuals with perennials, and increase perennial planting where feasible (See Appendix B)	Throughout Hanover Park	Short term	Carlow Co Co Local volunteers
HP9	Plant and manage wildflower meadow by car park area (See Appendix C)	Adjacent to Hanover Park car park	Mid term	Carlow Co Co Hanover Volunteers?
HP10	Manage the grassland area to have mowed pathways through it, leaving the rest for biodiversity, next growing season	Hanover Park	Short to mid term	Carlow Co Co Community and Voluntary Groups Tidy Towns Residents Associations
HP11	Where possible, reduce/ eliminate the use of herbicides along the river bank (See Appendix D)	River Burren bankside	Short term	Carlow Co Co
HP12	Investigate options for enhancing biodiversity in the bus park area, for example install a green roof on the bus shelter	Bus shelter	Mid term	Carlow Co Co Carlow Tidy Towns
HP13	Install bat and bird boxes at appropriate locations along the river and in the park (See Appendix F)	Bat boxes on large trees in the park Dipper boxes under the bridge, adjacent to the water		Carlow Co Co
HP14	Set up a voluntary group to work with LAWCO to champion projects that improve water quality in the Burren River	N/A	Mid term	LAWCO Officer Green Group Angling Clubs
HP15	Through the County Development Plan Review process, zone 10m riparian habitat corridors either side of the Burren River, where feasible. This will create a buffer between development and the river which will serve a number of functions including intercepting run-off,	N/A	Short to mid term	Carlow Co Co (through the CDP and associated SEA and AA processes)

	maintaining habitat connectivity and movement of species along the river corridor.			
HP16	Give consideration to appropriate lighting in the area, especially the river corridor. In advance of any upgrades to lighting (e.g. LEDs) or new lighting installation, Carlow Co Co should consult with an appropriately qualified bat ecologist	N/A	Short term	Carlow Co Co
HP17	Consider the feasibility of installing swift towers within the park as colonies have been confirmed within the Riverside estate (See Appendix F)	Hanover Park	Short term	Carlow Co Co
HP18	Prepare an Invasive Species Management Plan (ISMP) to identify appropriate treatment options for invasive species identified along the river corridor. *Note: this will likely require re-survey of the area for invasive species*	Along the Burren River	Short to mid term	Carlow Co Co LAWCO Licenced contractors where required
HP19	Employ invasive species specialists to treat and eradicate the invasive species. See Appendix G.	Along the Burren River	Mid term	Carlow Co Co LAWCO

6.2.3 Table 6. Focus Area 3: Burren River Linear Walk

Action number	Biodiversity Action	Location	Timing	Potential partner(s)
BuR1	Empower and equip residents association to clean up the area and connect to nature e.g. organise some information exchange events and regular litter picks	Burren River linear walk area	Short to mid term	Carlow Co Co, Tidy Towns and Residents Association
BuR2	Explore the feasibility of setting up a project team to	N/A	Long term	Carlow Co Co, local Gardaí

	tackle anti-social behaviour along the River Burren. Engage addiction services to help/advise with this			
BuR3	Install signage in the town centre and adjacent to the train station to raise awareness of this river walkway	Town centre	Short term	Carlow Co Co
BuR4	Identify landowner and explore the feasibility of managing the grassland area in the south eastern section to have mowed pathways through it, leaving the rest for biodiversity. See Appendix C.	South eastern section of the area, after the railway bridge	Short term	Landowner Volunteers Carlow Co Co
BuR5	Install signage to highlight that the grassland in the south eastern section of the area is a 'Managed for Wildlife Area'	South eastern section of the area, after the railway bridge	Mid term	Carlow Co Co
BuR6	Install an interpretive information board to raise biodiversity awareness e.g. illustrating species you might observe on the river such as kingfisher, grey wagtail, dipper, otter.	Along the River Burren	Mid term	Carlow Co Co
BuR7	Commission local artists or school children to create murals to raise biodiversity awareness.	Railway bridge Boundary walls of the adjacent housing estates	Short term	Carlow Co Co Residents Association
BuR8	Explore managing for wildflowers in the grassland margin areas alongside the walkway/ cycleway and consider implementing a 'low mow' policy along the walkway. See Appendix C	Along the River Burren	Short term	Carlow Co Co Residents Association
BuR9	Where the bases of trees are planted with ornamental plants, left bare or surrounded by gravel, allow wildflowers to grow or plant snowdrops,	Throughout the focus area	Short term	Carlow Co Co Residents Association

	crocuses and native bluebells where feasible.			
BuR10	Consider the possibility of planting climbers on walls. See Appendix B & H.	Walls within the focus area	Short term	Carlow Co Co Residents Association
BuR11	Plant more native tree species along the river corridor where suitable. Species that are tolerant of wet conditions include: alder, willow, downy birch, hawthorn, blackthorn and hazel	Along the River Burren	Mid term	Local Anglers
BuR12	Investigate the feasibility of developing a sign-posted Biodiversity Walking Route to include this area and link to other biodiversity areas in Carlow town. This might also increase footfall to the area and help to reduce anti-social behaviour.	N/A	Mid term	Carlow Co Co Possible partners include: Sports Partnership, Running Clubs in the area, local Gardaí, Residents Association, Community Groups
BuR13	Commission further detailed ecological surveys of the flora and fauna in the area	Burren River Walk area	Mid term	Carlow Co Co Carlow Town Development Forum
BuR14	Eliminate/ reduce the use of herbicides along the river bank where possible. See Appendix E.	Along Burren River	Short term	Carlow Co Co
BuR15	Through the County Development Plan Review process, zone 10m riparian habitat corridors either side of the Burren River, where feasible. This will create a buffer between development and the river which will serve a number of functions including intercepting run-off, maintaining habitat	N/A	Short to mid term	Carlow Co Co (through the CDP and associated SEA and AA processes)

	connectivity and movement of species along the river corridor.			
BuR16	Set up a voluntary group to work with LAWCO to champion projects that improve water quality in the Burren River	N/A	Mid term	LAWCO Officer Green Group Angling Clubs
BuR17	Prepare an Invasive Species Management Plan (ISMP) to identify appropriate treatment options for invasive species identified along the river corridor. *Note: this will likely require re-survey of the area for invasive species*	Burren River Walk area	Short to mid term	Carlow Co Co LAWCO Licenced contractors where required
BuR18	Employ invasive species specialists to treat and eradicate the invasive species. See Appendix G.	Burren River Walk area	Mid term	Carlow Co Co LAWCO

6.2.4 Table 7. Focus Area 4: Barrow River Section

Action number	Biodiversity Action	Location	Timing	Potential partner(s)
BR1	Contact private landowners to investigate the possibility of extending public access or a possible walkway from Burren Street Bridge to the weir on the River Barrow	N/A	Long term	Carlow Co Co
BR2	Where no invasive species are present, bankside vegetation should be left in a 'wild' state	Banks of River Barrow	Long term	Carlow Co Co
BR3	Liaise with IFI to discuss how to increase/ encourage wildlife in the area, such as fish pass/ fish corridors	N/A	Mid term	IFI LAWCO
BR4	Investigate the feasibility of enhancing biodiversity at the Old Graveyard off the cemetery on the Barrow Way. This might include identifying landowners, commissioning ecological surveys	Old Graveyard on the Barrow Way	Mid term	Carlow Co Co Landowner

	and identifying actions for the site.			
BR5	Explore options to incorporate biodiversity enhancement into the management of Carlow Town Park e.g. through planting more pollinator friendly bedding plants, and more native trees, reducing use of herbicides and changing grassland management/mowing	Carlow Town Park	Short term	Carlow Co Co
BR6	Explore the feasibility of incorporating pollinator friendly flower boxes on the steps beside Carlow Rowing Club. See Appendix B.	Area beside Carlow Rowing Club	Short term	Carlow Co Co Green Group
BR7	Consider the feasibility of installing swift boxes/ towers along the River Barrow. See Appendix F for information	Suitable buildings/ areas for towers along the river.	Short term	Carlow Co Co Building owners

6.2.5 Table 8. Focus Area 5: The Plots (Hanover Harps)

Action number	Biodiversity Action	Location	Timing	Potential partner(s)
TP1	Run some training events for various community groups (incl. the allotment group) on how to manage the area for biodiversity (excl. the pitch). E.g. reducing use of herbicides and pesticides, planting pollinator friendly plants, managing marginal grassland areas	The Plots	Short- mid term	Askea Parish Church, Allotment Group, Askea Boys School
TP2	Develop wildflower verges at the pitch edges See Appendix C	The Plots/ Hanover Harps	Short term	Soccer Club, Allotment Committee and Residents Association from adjoining estates

TP3	Install bat and bird boxes	Trees within the focus area e.g. the sycamore trees	Short term	Carlow Co Co Allotment Committee
TP4	Eliminate/ reduce the use of pesticides on the grass margins. See Appendix D.	The Plots		Hanover Harps Residents Association Allotments Committee
TP5	Incorporate wild pollinator nesting habitat where possible, with regard to the NBDC how-to-guide	Adjacent to pollinator friendly planting within The Plots	Short term	Carlow Co Co Residents Association Allotments Committee
TP6	Incorporate native planting in wildflower verges, flower beds and borders etc. See Appendix B.	The Plots	Short term	Residents Association Allotments Committee
TP7	Where the bases of trees are planted with ornamental plants, left bare or surrounded by gravel allow wildflowers to grow or plant snowdrops, crocuses and native bluebells where feasible.	The Plots and Hanover Harps	Short term	Residents Association Allotments Committee
TP8	Remove montbretia as outlined in Appendix G.	The Plots	Short term	Residents Association Allotments Committee

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7 Appendices

7.1 Appendix A Species Lists from the Focus Areas

Relative Abundance classified by DAFOR Scale i.e. Dominant, Abundant, Frequent, Occasional or Rare

Focus Area 2- Hanover Park	
Amenity Grassland (GA2)	
Common name	**Scientific name and relative abundance**
Red fescue	*Festuca rubra* (D)
Perennial Ryegrass	*Lolium perenne* (D)
Yarrow	*Achillea millefolium* (A)
Dandelion aggregate	*Taraxacum* agg. (A)
Ribwort plantain	*Plantago lanceolata* (F)
Creeping cinquefoil	*Potentilla reptans* (F)
White clover	*Trifolium repens* (F)
Red clover	*Trifolium pratense* (O)
Smooth hawksbeard	*Crepis capillaris* (O)
Selfheal	*Prunella vulgaris* (O)
Broadleaf plantain	*Plantago major* (O)
Creeping buttercup	*Ranunculus repens* (R)
Speedwell sp.	*Veronica* sp. (R)
Mouse-ear chickweed	*Cerastium fontanum* (R)
Dock sp.	*Rumex* sp. (R)
Cock's-foot grass	*Dactylis glomerata* (R)
Common thistle	*Cirsium vulgare* (R)
Dove's foot Crane's bill	*Geranium mole* (R)
Common daisy	*Bellis perennis* (R)
Hop clover	*Trifolium dubium* (R)
Scattered trees and parkland (WD5)	
Common name	**Scientific name and relative abundance**
Willow spp.	*Salix* spp. (F)
Sycamore	*Acer pseudoplatanus* (F)
Alder	*Alnus glutinosa* (O)
Hawthorn	*Crataegus monogyna* (O)
Scot's pine	*Pinus sylvestris* (O)

Silver birch	*Betula pendula* (O)
Oak spp.	*Quercus* spp. (O)
Crab apple	*Malus sylvestris* (R)
Common apple	*Malus domestica* (R)
Horse chestnut	*Aesculus hippocastanum* (R)
Ash	*Fraxinus excelsior* (R)
Rowan	*Sorbus aucuparia* (R)
Osier willow	*Salix viminalis* (R)
Elder	*Sambucus nigra* (R)
Ornamental/ Non-Native Shrub (WS3)	
Common name	**Scientific name and relative abundance**
Shrubs	
Hardy fuchsia	*Fuchsia magellanica* (A)
Common ivy	*Hedera helix* (A)
Chinese bramble	*Rubus tricolor* (A)
Bramble	*Rubus fruiticosus* agg. (A)
Maple sp.	*Acer* sp. (A)
Sycamore	*Acer pseudoplatanus* (F)
Privet	*Ligustrum* sp. (O)
Cotoneaster sp.	*Cotoneaster* sp. (R)
Holly	*Ilex aquilifolium* (R)
Rose sp.	*Rosa* sp.
Understorey	
Cleavers	*Galium aparine* (A)
Herb Robert	*Geranium robertianum* (F)
Nettles	*Urtica dioica* (F)
Yarrow	*Achillea millefolium* (F)
Dandelion	*Taraxacum* agg. (O)
Hedge bindweed	*Calystegia sepium* (O)
Willowherb sp.	*Epilobium* sp. (O)
Hop clover	*Trifolium dubium* (O)
Couch grass	*Elytrigia repens* (O)
Curly dock	*Rumex crispus* (O)
False oat-grass	*Arrhenatherum elatius* (O)
Spear thistle	*Cirsium vulgare* (O)

Common poppy	*Papaver rhoeas* (O)
Yorkshire fog	*Holcus lanatus* (O)
Red clover	*Trifolium pratense* (O)
Common knapweed	*Centaurea nigra* (O)
Bush vetch	*Vicia sepium* (R)
Creeping cinquefoil	*Potentilla reptans* (R)
White clover	*Trifolium repens* (R)
Scarlet pimpernel	*Anagallis arvensis* (R)
Sanicle	*Sanicula europaea* (R)
Ragwort	*Senecio jacobaea* (R)
Mouse-ear chickweed	*Cerastium fontanum* (R)
Common vetch	*Vicia sativa* (R)
Red campion	*Silene dioica* (R)
Barren brome	*Bromus sterilis* (R)
Wall lettuce	*Mycelis muralis* (R)
St. John's wort	*Hypericum perforatum* (R)
Nipplewort	*Lapsana communis* (R)
Pignut	*Conopodium majus* (R)
Italian rye grass	*Lolium multiflorum* (R)
Petty spurge	*Euphorbia peplus* (R)
Sow thistle	*Sonchus oleraceus* (R)
Rosebay willowherb	*Epilobium angustifolium* (R)
Treelines (WL2)	
Common name	**Scientific name and relative abundance**
Overstorey	
Large-leaved lime	*Tilia x platyphyllos* (D)
Sycamore	*Acer pseudoplatanus* (F)
Alder	*Alnus glutinosa* (F)
Oak sp.	*Quercus* sp. (F)
Hawthorn	*Crataegus monogyna* (R)
Understorey	
Ivy	*Hedera helix* (F)
False oat-grass	*Arrhenatherum elatius* (F)
Bentgrass sp.	*Agrostis* sp. (F)
Bramble	*Rubus fruiticosus* agg. (O)
Annual meadow grass	*Poa annua* (O)
Nettles	*Urtica dioica* (O)

Dandelion	*Taraxacum* agg. (O)
Perennial ryegrass	*Lolium perenne* (O)
Pignut	*Conopodium majus* (O)
Cow parsley	*Anthriscus sylvestris* (O)
Chinese bramble	*Rubus tricolour* (O)
Hedge bindweed	*Calystegia sepium* (O)
Cleavers	*Galium aparine* (O)
Herb Robert	*Geranium robertianum* (R)
Wall lettuce	*Mycelis muralis* (R)
Redshank	*Persicaria maculosa* (R)
Ragwort	*Senecio jacobaea* (R)
Broad-leaved willowherb	*Epilobium montanum* (R)
Old man's beard	*Clematis vitialba* (R)
Barren brome	*Bromus sterilis* (R)
Box honeysuckle	*Lonicera nitida* (R)
Broad-leaved dock	*Rumex obtusifolius* (R)
Wild radish	*Raphanus raphanistrum* (R)
Prunus sp.	*Prunus* sp.
Guelder rose	*Viburnum opulus* (R)
Wheat	*Triticum aestivum* (R)
Tutsan	*Hypericum androsaemum* (R)
Depositing/ Lowland Rivers (FW2)	
Burren River in-stream vegetation	
Common name	**Scientific name and relative abundance**
Common duckweed	*Lemna minor* (O)
Branched bur-reed	*Sparganium erectum* (O)
Buttercup sp.	*Ranunculus* sp. (O)
Himalayan balsam	*Impatiens glandulifera* (O)
Brooklime	*Veronica beccabunga* (O)
Hemlock water-dropwort	*Oenanthe crocata* (R)
Common reed	*Phragmites australis* (R)
Hybrid butterbur	*Petasites x hybridus* (R)
Water horsetail	*Equisitum fluviatile* (R)
Common club-rush	*Schoenoplectus lacustris* (R)
Focus Area 3- Burren River Linear Walk	
Treelines/ Scrub (WL2/WS1)	
Common name	**Scientific name and relative abundance**
Treeline	
Willow spp.	*Salix* spp. (D)

Elder	*Sambucus nigra* (O)
Hawthorn	*Crataegus monogyna* (R)
Scrub	
Bramble	*Rubus fruiticosus* agg. (F)
Gorse	*Ulex europeaus* (F)
Ash	*Fraxinus excelsior* (O)
Sycamore	*Acer pseudoplatanus* (O)
Buddleia	*Buddleia davidii* (O)
Broom	*Cytisus scoparius* (R)
Rose sp.	*Rosa* sp. (R)
Focus Area 5- The Plots (Hanover Harps)	
Treelines (WL2)	
Common name	**Scientific name and relative abundance**
Overstorey	
Common lime	*Tilia x europea* (O)
Sycamore	*Acer pseudoplatanus* (O)
Silver birch	*Betula pendula* (O)
Wild cherry	*Prunus avium* (O)
Cherry sp.	*Prunus* sp. (O)
Rowan	*Sorbus aucuparia* (O)
Common privet	*Ligustrum vulgare* (R)
Understorey	
Cock's foot	*Dactylis glomerata* (A)
Black horehound	*Ballota nigra* (F)*
Common chickweed	*Stellaria media* (F)
Dandelion	*Taraxacum* agg. (F)
Wild radish	*Raphanus raphanistrum* (F)
False oat-grass	*Arrhenatherum elatius* (F)
Perennial ryegrass	*Lolium perenne* (F)
Yarrow	*Achillea millefolium* (O)
Common hogweed	*Heracleum sphondylium* (O)
Cut-leaved Crane's bill	*Geranium dissectum* (O)
Creeping buttercup	*Ranunculus repens* (O)
Curly dock	*Rumex crispus* (O)
Broad leaf plantain	*Plantago major* (O)
Sheep's sorrel	*Rumex acetosella* (O)
Ragwort	*Senecio jacobaea* (O)
Common nettle	*Urtica dioica* (O)

Ribwort plantain	*Plantago lanceolata* (O)
Spear thistle	*Cirsium vulgare* (O)
Yorkshire fog	*Holcus lanatus* (O)
Fumitory	*Fumaria officinalis* (O)
Cleavers	*Galium aparine* (O)
Red dead nettle	*Lamium purpureum* (R)
Nipplewort	*Lapsana communis* (R)
Herb-Robert	*Geranium robertianum* (R)

Recolonising Bare Ground (ED3)	
Common name	**Scientific name and relative abundance**
Red Clover	*Trifolium pratense* (A)
Canadian Fleabane	*Conyza canadensis* (A)
White clover	*Trifolium repens* (F)
Ribwort plantain	*Plantago lanceolata* (F)
Cat's-ear	*Hypochaeris radicata* (F)
Dandelion	*Taraxacum* agg. (F)
Yorkshire fog	*Holcus lanata* (O)
Red fescue	*Festuca rubra* (O)
Hop clover	*Trifolium dubium* (O)
Smooth Hawk's beard	*Crepis capillaris* (O)
Broadleaf plantain	*Plantago major* (O)
Ragwort	*Senecio jacobaea* (O)
Perennial ryegrass	*Lolium perenne* (O)
Cock's foot	*Dactylis glomerata* (O)
Common groundsel	*Senecio vulgaris* (R)
Marsh thistle	*Cirsium palustre* (R)
Lesser hawkbit	*Leontodon saxatilis* (R)
Buddleia	*Buddleia davidii* (R)
Bent grass	*Agrostis* sp. (R)
St. John's wort	*Hypericum perforatum* (R)
Curly dock	*Rumex crispus* (R)
Redshank	*Persicaria maculosa* (R)
Daisy	*Bellis perennis* (R)
Wall barley	*Hordeum murinum* (R)
Pignut	*Conopodium majus* (R)
Fumitory	*Fumaria officinales* (R)
Red dead-nettle	*Lamium purpureum* (R)
Fat hen	*Chenopodium album* (R)
Wild radish	*Raphanus raphanistrum* (R)
Petty spurge	*Euphorbia peplus* (R)

Dry Meadows and Grassy Verges (GS2)	
Common name	**Scientific name and relative abundance**
False oat-grass	*Arrhenatherum elatius* (D)
Red fescue	*Festuca rubra* (D)
Cock's foot	*Dactylis glomerata* (A)
Curly Dock	*Rumex crispus* (A)
Ribwort plantain	*Plantago lanceolata* (A)
Dandelion	*Taraxacum* agg. (F)
Ragwort	*Senecio jacobaea* (F)
Creeping bentgrass	*Agrostis stolonifera* (F)
Perennial ryegrass	*Lolium perenne* (F)
Yorkshire fog	*Holcus lanatus* (F)
Creeping buttercup	*Ranunculus repens* (F)
Cat's ear	*Hypochaeris radicata* (O)
Wall Barley	*Hordeum murinum* (O)
Red clover	*Trifolium pratense* (O)
Spear thistle	*Cirsium vulgare* (O)
Cut-leaved Crane's bill	*Geranium dissectum* (O)
Wild radish	*Raphanus raphanistrum* (O)
Couch grass	*Elytrigia repens* (O)
Alexanders	*Smyrnium olusatrum* (R)
Cleavers	*Galium aparine* (R)
Oilseed rape	*Brassica napus* (R)
English elm	*Ulmus procera* (R)
Bush vetch	*Vicia sepium* (R)
Silverweed	*Potentilla anserina* (R)
Sow thistle	*Sonchus oleraceus* (R)
Hedgerows (WL1)	
Common name	**Scientific name and relative abundance**
Overstorey	
Hawthorn	*Crataegus monogyna* (A)
English elm	*Ulmus procera* (F)
Bramble	*Rubus fruiticosus* agg. (F)
Common privet	*Ligustrum vulgare* (R)
Blackthorn	*Prunus spinosa* (R)
Elder	*Sambucus nigra* (R)
Understorey	

Bentgrass	*Agrostis* sp. (F)
Dandelion	*Taraxacum* agg. (F)
Ribwort Plantain	*Plantago lanceolata* (F)
White clover	*Trifolium repens* (F)
Cock's foot	*Dactylis glomerata* (F)
Yorkshire fog	*Holcus lanatus* (F)
Black horehound	*Ballota nigra* (O)
Curly Dock	*Rumex crispus* (F)
Common mallow	*Malva sylvestris* (F)
Hedge bindweed	*Calystegia sepium* (F)
Hedge geranium	*Geranium pyrenicum* (F)
Hogweed	*Heracleum sphondylium* (O)
Ragwort	*Senecio jacobaea* (O)
Perennial ryegrass	*Lolium perenne* (O)
Ivy	*Hedera helix* (O)
English elm	*Ulmus procera* (O)
Wild radish	*Raphanus raphanistrum* (O)
Wall Barley	*Hordeum murinum* (O)
Spear thistle	*Cirsium vulgare* (R)
Common nettle	*Urtica dioica* (R)

7.2 Appendix B Biodiversity Friendly Planting Schemes

Useful resources

The National Biodiversity Data Centre (NBDC) and collaborators have produced a wide range of helpful factsheets outlining ways in which we can all work together to help our pollinators survive and thrive. These factsheets have been produced for a range of sectors including communities, gardens, schools, councils, businesses, faith communities and transport corridors. They are available to download from the following link: https://pollinators.ie/.

These factsheets have been used to compile the pollinator friendly planting lists below for use by the local community and the Council's own Parks Department.

Local Communities Factsheet (National Biodiversity Data Centre)

The Bumblebee Conservation Trust (https://www.bumblebeeconservation.org/) has a useful tool called 'Bee Kind', which allows one to input the plants they currently have in their garden or urban space, and how much area these plants occupy (m^2). It then provides the user with a score indicating how good their garden or urban space is for pollinators and recommends ten extra plant species that can be incorporated into the space to improve it for pollinators. This is a great resource that can be used in combination with the NBDC pollinator factsheets.

Bee Kind- Bumblebee Conservation Trust https://beekind.bumblebeeconservation.org/

Photographs of some popular wildflowers

Plate B1: Grassland with corncockle, common poppy, cornflower and ox-eye daisy

Plate B2: Tufted vetch

Plate B3: Field of common poppy

Plate B4: Corn marigold

Plate B5: Pyramidal orchid

Plate B6: Cowslips

Biodiversity Friendly Planting Lists

These lists have been created with reference to the resources available on pollinators.ie.

Biodiversity Friendly Planting Lists	
Climbers	
Common name	**Scientific name**
Native species	
Honeysuckle	*Lonicera periclymenum*
Ivy	*Hedera helix*
Field rose	*Rosa arvensis.*
Non-native species	
Passion flower	*Passiflora spp.*
Wisteria	*Wisteria sinensis*
Star jasmine	*Jasminum multiflorum*
Firethorn	*Pyracantha coccinea*
Climbing hydrangea	*Hydrangea anomala subsp. petiolaris*
Tube clematis	*Clematis heracleifolia*
Persian ivy	*Hedera colchica*
Spanish traveller's joy	*Clematis cirrhosa*
Trumpet honeysuckle	*Campsis radicans*
Dwarf morning glory	*Convolvulus tricolor*
Climbing hydrangea	*Hydrangea anomala subsp. petiolaris*
Common jasmine	*Jasminum officinale*
Boston ivy	*Parthenocissus tricuspidata*
Trees **To note, some of these species may not be suitable for street planting. Expert advice should be sought.**	
Common name	**Scientific name**
Native species	
Hazel	*Corylus avellana*
Willow	*Salix spp.*
Blackthorn	*Prunus spinosa*
Hawthorn	*Crataegus monogyna*
Wild Cherry	*Prunus avium*
Wild Privet	*Ligustrum vulgare*
Crab apple	*Malus sylvestris*

Elder	*Sambucus nigra*
Whitebeam	*Sorbus spp.*
Rowan	*Sorbus aucuparia*
Silver birch	*Betula pendula*
Downy birch	*Betula pubescens*
Alder	*Alnus glutinosa*
Aspen	*Populus tremula*
Pedunculate oak	*Quercus robur*
Sessile oak	*Quercus petraea*
Scott's pine	*Pinus sylvestris*
Yew	*Taxus baccata*
Non-native species	
Juneberry Tree	*Amelanchier x grandiflora* 'Robin Hill'
Upright Hawthorn	*Crataegus monogyna* 'Stricta'
Pillar crab	*Malus tschonoskii*
Callery pear	*Pyrus calleryana* 'Chanticleer'
Lime	*Tilia cordata* 'Greenspire'; Tilia x europaea 'Euchlora'
Juneberry	*Amelanchier* species (not A. lamarckii which may be invasive)
Indian bean tree	*Catalpa bignonioides*
Apple	*Malus* species/cultivars
Foxglove tree	*Paulownia tomentosa*
Bird Cherry	*Prunus padus*
Japanese cherry	*Prunus serrulata* 'Tai Haku' Japanese flowering cherries are available in a wide range of cultivars, those with single flowers most pollinator attractive
Pear	*Pyrus* species and cultivars
Lime	*Tilia americana* 'Redmond' *Tilia cordata/ Tilia x europea/ Tilia platyphyllos/ Tilia tomentosa*
Shrubs	
Common name	**Scientific name**
Native	
Broom	*Cytisus scoparius*
Blackthorn	*Prunus spinosa*
Hawthorn	*Crataegus monogyna*
Guelder rose	*Viburnum opulus*
Gorse	*Ulex eueropaeus*

Dog rose	*Rosa canina*
Field rose	*Rosa arvensis*
Non-native	
Autumn flowering	
Strawberry tree	*Arbutus unedo*
Ebbinge's silverberry	*Elaeagnus × ebbingei*
Silverthorn	*Elaeagnus pungens*
Japanese aralia	*Fatsia japonica*
Winter flowering	
Purpus honeysuckle	*Lonicera × purpusii*
Oregon grape	*Mahonia species*
Musk willow	*Salix aegyptiaca*
Laurustinus	*Viburnum tinus*
Spring flowering	
Darwin's barberry	*Berberis darwinii*
Japanese quince	*Chaenomeles species*
Redvein enkianthus	*Enkianthus campanulatus*
Darley dale heath	*Erica × darleyensis*
Alpine heath	*Erica carnea*
Hebe	*Hebe* species
Kojo-no-mai	*Prunus incisa*
Dwarf russian almond	*Prunus tenella*
Summer flowering	
Orange ball tree	*Buddleja globosa*
Shrubby hare's ear	*Bupleurum fruticosum*
Beautyberry	*Callicarpa bodinieri var. giraldii*
Caryopteris	*Caryopteris × clandonensis*
Red-barked dogwood	*Cornus alba*
Cornish heath	*Erica vagans*
Wallflower	*Erysimum* 'Bowles's Mauve'
Escallonia	*Escallonia* species
Hebe	*Hebe* species
Paniculate hydrangea	*Hydrangea paniculate*
Mountain laurel	*Kalmia latifolia*
Lavender species	*Lavandula × intermedia*, (Lavandin) *Lavandula angustifolia* (English lavender) *Lavandula stoechas* (French lavender)

Tree lavatera	*Lavatera olbia*
Native hedgerows	
Common name	**Scientific name**
Trees/ Shrubs	
Hazel	*Corylus avellana*
Willow	*Salix spp.*
Blackthorn	*Prunus spinosa*
Hawthorn	*Crataegus monogyna*
Broom	*Cytisus scoparius*
Bramble	*Rubus fruticosus*
Wild Cherry	*Prunus avium*
Wild Privet	*Ligustrum vulgare*
Crab apple	*Malus sylvestris*
Elder	*Sambucus nigra*
Whitebeam	*Sorbus spp.*
Rowan	*Sorbus aucuparia*
Dog rose	*Rosa canina*
Field rose	*Rosa arvensis*
Guelder rose	*Viburnum opulus*
Honeysuckle	*Lonicera periclymenum*
Ivy	*Hedera helix*
Gorse	*Ulex eueropaeus*
Raspberry	*Rubus idaeus*
Spindle	*Euonymus europaeus*
Herbaceous understorey	
Bluebell (native)	*Hyacinthoides nonscripta*
Cowslip	*Primula veris*
Devil's bit scabious	*Succisa pratensis*
Meadowsweet	*Filipendula ulmaria*
Cow parsley	*Anthriscus sylvestris*
Wild angelica	*Angelica sylvestris*
Wild carrot	*Daucus carota*
Wood avens	*Geum urbanum*
Sweet violet	*Viola odorata*
Dog violet	*Viola riviana*

Lesser knapweed	*Centaurea nigra*
Yarrow	*Achillea millefolium*
Teasel	*Dipsacus fullonum*
Primrose	*Primula vulgaris*
Riparian margins/ wetland planting	
Common name	**Scientific name**
Fool's watercress	*Apium nodiflorum*
Marsh marigold	*Caltha palustris*
Cuckoo flower	*Cardamine pratensis*
Marsh willowherb	*Epilobium palustre*
Yellow iris	*Iris pseudacorus*
Purple loosestrife	*Lythum salicaria*
Water forget-me not	*Myosotis scorpiodes*
Common reed	*Phragmites australis*
Common Club-rush	Schoenoplectus lacustris
Celery-leaved buttercup	*Ranunculus scleratus*
Meadow buttercup	*Ranunculus acris*
Bulrush	*Typha latifolia*
Meadowsweet	*Filipendula ulmaria*
Red clover	*Trifolium pratense*
Wild angelica	*Angelica sylvestris*
Redshank	*Polygonum persicaria*
Water mint	*Mentha aquatica*
Ragged robin	*Silene flos-cuculi*
Formal flower beds/ borders / hanging baskets	
Common name	**Scientific name**
Bulbs	
Autumn flowering	
Autumn crocus	*Colchicum* species
Crocus, autumn-flowering	*Crocus* species
Winter flowering	
Crocus, winter-flowering	*Crocus* species
Winter aconite	*Eranthis hyemalis*
Common snowdrop	*Galanthus nivalis*
Spring flowering	
Crocus, spring-flowering	*Crocus* species

Armenian grape hyacinth	*Muscari armeniacum*
Common star of Bethlehem	*Ornithogalum umbellatum*
Summer flowering	
Allium species	*Allium* species
Perennials for flower beds and borders	
Autumn flowering	
Carmichael's monk's hood	*Aconitum carmichaelii*
Japanese anemone	*Anemone × hybrida*
Chinese anemone	*Anemone hupehensis*
Michaelmas daisy	*Aster* species and hybrids
Trailing bellflower	*Campanula poscharskyana*
Hardy blue-flowered leadwort	*Ceratostigma plumbaginoides*
Chrysanthemum	*Chrysanthemum* species & hybrids
Dahlia	*Dahlia* species & hybrids
Perennial sunflower	*Helianthus × laetiflorus*
Autumn ox-eye	*Leucanthemella serotina*
Sage -autumn-flowering	*Salvia species*
Winter flowering	
Helleborus species and hybrids	*Hellebore*, winter-flowering
Spring flowering	
Alpine rock cress	*Arabis alpina subsp. caucasica*
Juniper-leaved thrift	*Armeria juniperifolia*
Aubretia	*Aubrieta* species
Gold dust	*Aurinia saxatilis*
Elephant ear	*Bergenia* species
Leopard's bane	*Doronicum × excelsum*
Wallflower 'Bredon'	*Erysimum* 'Bredon'
Mediterranean spurge	*Euphorbia characias*
Cushion spurge	*Euphorbia epithymoides*
Hellebore, spring-flowering	*Helleborus* species & hybrids
Alpine candytuft	*Iberis saxatilis*
Perennial candytuft	*Iberis sempervirens*
Spotted dead nettle	*Lamium maculatum*
Lungwort	*Pulmonaria species*
Summer flowering	
Yarrow	*Achillea* species

Dyer's chamomile	*Anthemis tinctoria*
Columbine	*Aquilegia species*
Lesser calamint	*Calamintha nepeta*
Bellflower species	*Campanula carpatica* (Tussock bellflower), *Campanula glomerata* (Clustered bellflower), *Campanula lactiflora* (Milky bellflower), *Campanula latifolia* (Giant bellflower), *Campanula persicifolia* (Peach-leaved bellflower)
Perennial cornflower	*Centaurea montana*
Dahlia	*Dahlia* species
Purple coneflower	*Echinacea purpurea*
Globe thistle	*Echinops* species
Fleabane	*Erigeron* species
Siberian wallflower	*Erysimum × allionii*
Garden strawberry	*Fragaria × ananassa*
Cranesbill (summer -flowering)	*Geranium* species
Avens (summer -flowering)	*Geum* species
Dame's violet	*Hesperis matronalis*
Macedonian scabious	*Knautia macedonica*
Broad -leaved everlasting pea	*Lathyrus latifolius*
Shasta daisy	*Leucanthemum × superbum*
Spearmint	*Mentha spicata*
Bergamot	*Monarda didyma*
Peony	*Paeonia* species
Cinquefoil	*Potentilla* species
Coneflower	*Rudbeckia* species
Sage	*Salvia* species
Garden scabious	*Scabiosa caucasica*
Small scabious	*Scabiosa columbaria*
Checkerbloom	*Sidalcea malviflora*
Stokes' aster	*Stokesia laevis*
Pyrethrum	*Tanacetum coccineum*
Purple top	*Verbena bonariensis*
Garden speedwell	*Veronica longifolia*
Perennial species for hanging baskets	
Aubrieta	*Aubretia* species
Wallflower	*Erysimum* species

Bellflower	*Campanula* species
Trailing Verbena	*Glandularia canadensis*
Herb bed species	
Rosemary	*Rosmarinus officinalis*
Oregano	*Origanum* species
Thyme	*Thymus* species
Borage	*Borago* species
Chives	*Allium schoenoprasum*
Lavender	*Lavandula* species
Sage	*Salvia officinalis*

7.3 Appendix C Biodiversity Friendly Grassland Management

Option 1: Consider changing your cutting regime

In order to encourage what is already present in the seed bank- aim to take two cuttings a year, one before March, and then a second one between late July and September. Take care to remove the cuttings, as this helps to reduce nutrient build-up in the soil. Wildflowers thrive in nutrient poor soils, as they have less competition from fast-growing 'thug' species, in particular nutrient-greedy grasses. Taking a cutting before March helps to reduce grass dominance, leaving space for wildflowers to germinate, while taking a second cutting in late summer/autumn allows flowers to set seed before they are cut.

If you feel it is not possible to take so few cuttings, consider implementing this cutting regime on a section of your land, leaving some areas of longer grass for insects, and rotating where this section is located on a yearly basis. Implementing good management can sometimes be sufficient to increase floral diversity in a grassland, however, you may need to introduce key species that are missing if there is no seed source nearby.

Plate 28. An example of alternating wild and mown wildflower grassland

Option 2: Increasing floral diversity of your existing grassland

Increasing floral diversity of existing grassland can be achieved by sowing wildflower seed. Wildflower seed may be harvested from a suitable local donor site or purchased from a seed-merchant which supply native-origin seed mixes of local provenance, for example, Design by Nature.

(a) Purchasing seed

If the land is adjacent to semi-natural habitat, it is worth looking at what wildflower species naturally occur in this area to help decide what seed mix will suit the grassland best. It is important to always carry out a basic soil test to check for fertility levels (particularly phosphate levels), and pH, as this will help to inform you about what seed mixes are suitable based on soil type and will also indicate whether or not you need to take steps to reduce nutrient levels before adding seed. Soil testing kits can be bought online or from garden centres.

(b) Sourcing seed from a suitable local donor site

Seed can be harvested by brush harvesting, using a leaf vacuum or harvesting green hay. Different seeds will be suitable for the various soil types, and information on these can be found in the 'sourcing wildflower seed' factsheets on the Bumblebee Conservation Trust (BBCT) website. The NBDC have produced a useful guide which details how to collect and store wildflower seed: 'How-to-guide. Collecting and using pollinator friendly wildflower seed'.

Sowing Wildflower Seed into Existing Grassland	
Step 1: Site preparation	1. Reduce levels of perennial weeds. This can be achieved by mechanical removal or repeated cutting. 2. Mow grass very short (2-3 cm). 3. Create 50% bare ground across site. The seed needs exposed soil to germinate in, and the gaps need to be big enough for the wildflowers to become established free from grass competition. This can be done mechanically with discs, by chain harrowing or rotovating (scarification) The disturbance needs to be rigorous or the grass will grow back to fill the gaps. Disturbance and seeding are best applied at a time when grass growth is in decline in late summer.
Step 2: Over-sowing seeds	1. Seeds can be sown in spring (mid-March – end of April) or late summer (late August - September), but tend to be more successful if sown in late summer as the soils are warmer and there is more moisture available. Sowings into existing grass work best in autumn. 2. Sow 100% wildflower seed at a rate of 1.5 – 2g/m^2 onto the prepared area of land (6 – 8 kg per acre). This can be done by hand broadcasting or seed/fertiliser distributor. It is useful to mix the seed with a carrier such as sand to help bulk it out. Sow half the mixture in one direction and half in the other to ensure even coverage.

	3. Do not incorporate seed by drilling/harrowing – just broadcast onto surface. Wildflower seed is very fine and will not germinate if buried. 4. Roll once or twice after sowing to ensure good contact between seed and soil. Or pace over the seed to help the seed make contact with the soil.
Management guidance: Year 1	1. The first summer is often dominated by a flush of annual weeds and grasses. Regular cutting in Year 1 is essential to help suppress these and help perennial wildflowers to become established. Mowing will kill the annuals but not the perennials. 2. Aim for 2 – 3 cuts in first 12 months to take the height down to around 5 – 7cm (first cut end of March if autumn sowing). If the site is fertile you might need to cut more. Volume of material is usually low so can flail and leave cuttings. If there is a large amount of vegetation try to collect and remove if possible. 3. You may not see many flowers in year one but should get a good show by year two. 4. Manually pull for control of injurious weeds if they are a problem, or as a last resort apply herbicide to spot treat or weed wipe.
Management guidance: Year 2 onwards	1. An initial cut in spring (March/April) can help to reduce grass dominance. 2. Allow wildflowers to grow up and set seed between April – mid July/end of August. 3. Take a hay cut from the area – ideally turn and dry the hay over 3 – 5 days to allow the seed to shed. 4. Collect or bale the cuttings and remove from the area – this will help to remove nutrients from the site to lower the fertility. It will also stop the cut vegetation smothering the wildflower seeds and preventing germination the following year.
Increasing floral diversity of the grassland	Yellow rattle (*Rhinanthus minor*) is an annual plant that is semi-parasitic on grass. It is a very useful plant to help control grass growth, and to increase the viability of other wildflowers. However, as it is an annual it needs to set seed (around July) to persist in a seed mix. As regular cutting is recommended in year one of the project, yellow rattle would not be able to survive this regime. An option available would be to establish a diverse mix of other wildflowers during year one, and then to add yellow rattle to the field at the end of year 1 (late August onwards) and manage as described below.

	 1. The grass should be cut short (2 -3 cm) before sowing and scarified to create bare patches. 2. Broadcast seed onto soil at a rate of 1 – 2g/m^2 3. After sowing, continue cutting or grazing over winter/early spring to keep the grass short. 4. At the beginning of March you should aim for short grass (2 – 3 cm) ready for the yellow rattle seedlings to start pushing up. 5. Do not cut the grass between early March and late July to allow the seed to set. Then manage as a normal meadow by cutting for hay and removing the cuttings.

Option 3: Sowing wildflower seed onto bare ground

Wildflower seed should be either purchased or harvested as outlined in Option 2 above.

Sowing Wildflower Seed onto Bare Ground	
Step 1: Site preparation	Clear all vegetation and weeds from the site. This can be done mechanically with discs, by chain harrowing or rotovating (scarification).
Step 2: Sowing seed	Broadcast seed mix in late August/ September or in March/ April.
Management guidance	Management of the meadow will depend on the type of seed mix sown. If seed was purchased, the supplier's guidelines should be followed. Alternatively, detailed guidelines are available from the NBDC's document 'How-to-guide. Creation and management of a wildflower meadow'
Rotational cutting to maximise biodiversity value	If there are multiple fields then consider mowing on rotation at different times to ensure there are always some areas flowering throughout the summer. Or, leave buffer zones around the edges of the fields. This can be set up on a four-year rotational cutting system, so that one strip along the edge of the meadow is left un-cut every year. Continue this each year and rotate the uncut strip along to the next edge. This will provide refuge and late summer forage for bumblebees. This is also beneficial to other invertebrate species that can use it as a refuge when the main area of meadow is cut in late summer. Do not consistently mow the same areas late each year as species diversity will start to decline.

Option 4: Sowing strips/margins of wildflower seed

If there is limited green space available or a restrictive seed budget wildflower strips/ margins can be sown.

Sowing Wildflower Seed onto Bare Ground	
Step 1: Site selection	1. Sunny, sheltered sites favoured by invertebrates. Often south facing side of hedges and field corners. 2. Avoid weedy, shaded or waterlogged areas. 3. Sow in blocks of 0.25Ha or margins of 2-6m wide. 4. Legumes (members of the pea and bean plant family) can be tolerant of high fertility levels but lush grass or weed growth should be controlled.
Step 2: Deciding seed mix and timing	1. Native legume varieties tend to flower earlier in the season than the agricultural varieties, and by sowing both types in the margin you can help to extend the flowering period. 2. Add a couple of native wildflower species to the mix to help provide nectar over a longer period. Do not include grasses in the mix. 3. Margins can be sown in spring (mid-March – end-April) or late summer (mid-July – end-August), but tend to be more successful in late summer as the soils are warmer and there is more moisture available. 4. Avoid sowing legumes after the beginning of September as the soil temperature will be too low. They are slow growing plants and need time to establish before the frosts arrive.
Step 3: Site preparation	1. Clear weeds and vegetation from site. This can be done with repeated cultivation and/or repeated application of herbicide over the growing season (e.g. glyphosate). 2. If there is time then you can allow the first flush of annual weeds to come up, lightly cultivate to create a stale seed bed. 3. Harrow and roll to produce a fine tilth and firm surface. Most seeds are small so need a good seedbed quality. 4. Ensure area free from large ruts and stones to allow for mowing later.
Step 4: Seed sowing	1. Sow seed at rate of 10 – 12 kg/Ha. It is possible to bulk out seed with carrier such as sand or sawdust to get more even coverage. 2. Sow mixture evenly using hand broadcasting or mechanical distribution (seed or fertiliser spreader).

	3. Do not incorporate seed by drilling/harrowing – just broadcast onto surface. The seeds are very fine and will not germinate if buried. 4. Roll once or twice after sowing to ensure good contact between seed and soil. Very important in dry weather. Do not roll if site is very wet. (Cambridge roll ideal)
Management guidance- Year 1	1. Regular cutting in year one can help suppress weeds in the canopy and will help sown species to become established. 2. Aim for 4 – 5 plants of target species per m^2 with at least 3 leaves each per plant. It is time to cut if you look down into sward and can't see target species because of weeds or grass. 3. The margin could need 2 – 3 cuts in first 12 months (first cut at the end of March if autumn sowing). The volume of material is usually low, so it is possible to flail the margin and leave cuttings. If there is a large amount of vegetation, it should be collected and removed is possible. 4. You may not see many flowers in year 1 but should get a good show by year two.
Management guidance- Year 2 onwards	1. Carry out an early cut on half the plot in mid-June to early July to stimulate late flowering. This helps to provide pollen and nectar later in the year which benefits later emerging pollinator species. This can be done with a flail mower, but do not cut if breeding birds are present. 2. If any injurious weeds are present, herbicide may be applied by spot treatment or weed wipe. 3. Cut whole area between 15th September and 31st October. Aim to collect and remove vegetation if lots of material is produced.

7.4 Appendix D Guidance on Reducing Chemical Use

Reducing Chemical Use

1. Manually remove 'weeds' where possible
2. Use specific pesticides/herbicides to spot treat the problem organism rather than broad spectrum chemicals that can cause harm to non-target species
3. Blanket spraying should always be avoided
4. Avoid spraying when it is windy (this limits chemical drift)
5. Avoid spraying during hours of sunlight (this limits contact with pollinators and other wildlife)
6. Investigate Integrated Pest Management (IPM). IPM is a holistic approach to pest and pathogen control, whereby non-chemical methods are used to manage weeds, pests and diseases. This approach helps minimise the cost and environmental damage caused by chemical inputs. IPM can be used everywhere from gardens to agricultural land and even natural areas. The word 'integrated' hints at the most important aspect of IPM; instead of using one approach to tackle pests a combination of approaches are used, this is a more sustainable long-term way to manage pests. Good practice IPM involves a combination of the following: biological control (e.g. the use of natural enemies, such as predators to control pests), cultural controls (e.g. reducing suitable pest habitat around a crop), mechanical/physical controls (e.g. traps) and chemical control (last resort) (e.g. responsible use of pesticides only when absolutely necessary, delivered using the safest methods possible)
7. Test your soil first before adding fertiliser, it may not be necessary

7.5 Appendix E Guidelines on Planting New Hedgerows

Planting new hedgerows	
Site selection	Hedgerow locations should be chosen to connect features of ecological value i.e. rivers, woodland, treelines, meadows. This provides connectivity of habitat for a range of fauna species and promotes green infrastructure
Supplementary planting of treelines	Where treelines are already present, supplementary shrub and herbaceous understorey planting creates hedgerows. This is beneficial as the trees will be more mature.
Planting hedgerows	A range of native tree and shrub species should be planted to create a more biodiverse hedgerow. A herbaceous understorey of shade tolerant species should be planted alongside the main hedgerow.
Hedgerow maintenance	Hedgerows should be correctly maintained for biodiversity according to the following document: *The Heritage Council (2016)* *Conserving Hedgerows*. Appropriate management involves cutting them outside the breeding bird season, avoidance of herbicides and pesticides and planting gaps in the hedge.

7.6 Appendix F Guidelines on the Installation of Bat and Bird Boxes/Towers

Installing bat boxes and bird boxes/ towers	
Bat box selection	Woodcrete bat boxes are most suitable for installation in Ireland. They offer an advantage over wooden boxes due to their thermal properties – they are better at trapping heat from solar radiation.
Bat box site selection	The boxes should be located at least 3m above ground level. Apart from providing a "drop" zone for bats flying out of the roost, the boxes need to be placed out of reach of humans. In general, it is recommended that several bat boxes (3+) be placed in clusters on the same tree. South and west facing aspects will maximise warmth of the boxes.
Bat box installation	Boxes are best installed in places that are not subject to light spill. Bats are sensitive to lighting and light spill may discourage bats from using a box which is otherwise suitable for roosting in. Boxes should ideally be located close to suitable foraging habitat. Irish bats are associated with woodland and woodland edge habitats, such as hedgerows and treelines. In urban areas, they will be associated with parks, and watercourses such as rivers and canals, particularly ones that are lined with trees and scrub.
Bird box installation	When installing any bird boxes, they should be located away from windows to minimise collision risk and bright spotlights. There should not be any obstructions around the nest boxes.
Swallows/ house martins/ swifts	Nest boxes or bricks for swallows, house martins and swifts may be installed on buildings/ included within the structure of a new building. To note, it would not be appropriate to install swift boxes on buildings that may be demolished in the near future. Swift towers may also be erected. As these species are colonial nesters, multiple boxes placed side by side would be recommended and a dropping shelf should be installed beneath the nests. To maximise the potential of box uptake by birds, it is preferable to locate swift boxes and towers in proximity to existing colonies. Information on swift nesting sites in Carlow Town can be found in the following document: Padraig Webb (2018). *A survey of Swift (Apus apus) nesting sites in County Carlow 2018.* Specific guidance to attract swifts can be found in the following document: Swift Conservation Ireland (2019) *How to build-in swift nest boxes into cement block walls.*
Other bird boxes	Consideration should be given to installing nest boxes on trees/ structures within green spaces. Nest boxes designed to accommodate a range of different bird species should be installed including boxes for raptors, large

	birds, small birds etc. Boxes should be facing between north and east to provide some protection from direct sunlight, wind and rain. The box should be tilted slightly forward to allow any rain to run off.

7.7 Appendix G Invasive Species Management

Invasive Species Management	
Relevant National Legislation	The *Wildlife Act 1976-2018* (herein the Wildlife Acts) contain provisions relating to non-native invasive species. Regarding exotic species, it is prohibited for anyone without a licence to plant or otherwise cause to grow in a wild state, in any place in the State, any species of flora, or the flowers, roots, seeds or spores of flora. The Minister may also issue regulations prohibiting possession or introduction of any species of wild bird, animal or flora, or any part, product or derivative of such wild bird, wild animal or wild flora which may be detrimental to native species (NRA, 2010). The Wildlife Acts do not contain specific provisions that directly govern invasive species control or removal, however it is stated within the legislation that *"anyone who plants or otherwise causes to grow in the wild – in any place in the State any species of (exotic) flora, or the flowers, roots, seeds or spores of (exotic) flora shall be guilty of an offence."*
Relevant European Legislation	The *European Communities (Birds and Natural Habitats) Regulations 2011* as amended (herein the Birds and Habitats Regulations) contains specific provisions that govern control of Japanese knotweed, in addition to other listed invasive species. It is an offence to release or allow to disperse or escape, species listed on Third Schedule of the Regulations without a Licence. The Regulation that deals specifically with this scheduled list of species is: • Regulation 49: Prohibition of introduction and dispersal of certain species; Hence it is necessary to highlight that the following is prohibited: • Dumping invasive species cuttings in the countryside; • Planting or otherwise causing to grow in the wild (hence the landowner should be careful not to cause further spread); • Disposing of invasive species at a landfill site without first informing the landfill site that the waste contains invasive species material (this action requires an appropriate licence); and, • Moving soil which contains specific invasive species in the Republic of Ireland requires a licence from National Parks and Wildlife Service (NPWS). *Regulation (EU) 1143/2014 on invasive alien species* (herein the "IAS Regulation") was agreed by the European Council on 22nd October 2014 and came into force on 1st January 2015. This IAS Regulation conveys the rules to prevent, minimise and mitigate the adverse impacts of the introduction and spread (both with and without intention) of invasive alien species on biodiversity and the related ecosystem services, as well as other adverse

	impacts on human health or the economy (European Commission, 2017). Target 4.4 of Ireland's *National Biodiversity Action Plan 2017-2021* (DCHG, 2017) is that "*harmful invasive alien species are controlled and there is reduced risk of introduction and/or spread of new species*".
Measures to control and eradicate Himalayan balsam *Impatiens glandulifera*	Although Himalayan balsam can rapidly spread, it is not particularly difficult to eradicate owing to the fact it has a shallow root ball which is easy to remove, and the majority of seeds are only viable for one year (sometimes two). It can therefore be eradicated by community groups following the guidance below. Repeated cutting or mowing is an effective control measure if the plant is cut below the lowest node to prevent regeneration. Small infestations can be removed by pulling up the root ball. Physical control programmes must be carried out over a two-year period to eradicate the plant as seeds remain viable for up to two years. Plants should not be disturbed if seed pods are visible (from May). Programmes should be undertaken in April or early May. Himalayan balsam can also be eradicated by chemical control carried out by a qualified contractor.
Measures to be undertaken by communities with regards to Japanese knotweed *Fallopia japonica* infestations	Japanese knotweed eradication programmes must be undertaken by a suitably qualified and licenced contractor. However, there are measures that communities can undertake to reduce the chances of this species spreading. Signs should be erected near the stands of Japanese knotweed, warning people not to cut. If a plant is broken up or disturbed, it can readily re-grow from fragments in new areas where material is transported to. It is recommended that existing stands are fenced off with a buffer of $7m^2$ (where feasible so as to prevent disturbance to the stand).
Measures to control and eradicate Montbretia *Crocosmia x crocosmiiflora*	Montbretia grows from underground corms that form linear chains. The corms readily break apart, and the flowers produce viable seed which gives the plant opportunity to spread. It is therefore recommended that is not included within any planting lists. **Option 1: Physical control** Physical control of this plant is difficult as the corms readily break apart and can result in re-infestation and spread. Where the infestation is small, the entire stand can be excavated and buried at a depth of 2m, incinerated or disposed of to licensed landfill. The corms are not suitable for composting. A regular monitoring programme should be put in place to record any re-infestation.

	Option 2: Chemical control[12] Control of this plant can be achieved through spraying of a suitable herbicide (e.g. glyphosate) during active growth in late spring or summer.
Measures to control and eradicate Butterfly-bush *Buddleja davidii*	Each plant can produce up to 3 million seeds that can remain viable in the soil for many years. It creates competition for resources such as pollinators, light and space and poses a threat to native plant species within the lands. **Option 1: Physical control** Physical removal of butterfly-bush is only suitable for very small infestations of this species. If this is the chosen method of removal, care should be taken to remove all parts of the plant as branches are capable of re-rooting from cuttings. The plants should not be removed when in seed as there would be a risk of spreading the seeds further. Where removal of mature plants is not immediately feasible, the flower heads should be removed in June before they go to seed. It is essential to plant the ground with native species immediately following removal to prevent new seedlings taking hold. **Option 2: Chemical control**[10] It is recommended that plants are cut back to a stump during active growth (late spring to early summer) and then immediately treated with a systemic weed killer (brushed on). Foliar application of herbicide may be adequate for smaller infestations of younger plants but must be followed up on a 6-monthly basis.
Measures to control and eradicate winter heliotrope *Petasites fragrans*	Winter heliotrope has a rhizomatous root system which enables it to spread vegetatively. Apparently only the male plant is present in Ireland. This species is often present along roadsides and rivers. **Option 1: Physical Control- Excavation and Burial** Physical removal of winter heliotrope is difficult due to the plant's extensive rhizome network and this approach is only practical on a limited scale. Where larger infestations occur, and mechanical means can be employed, it is best to use a combination of excavation and follow-up herbicide application. Excavation can take place at any time of year when the soil is suitably dry. Disposal of plant material should be undertaken with due care to prevent accidental spread. Material can be buried at a depth of at least 2m. **Option 2: Chemical Control- Herbicide Application**[10]

[12] [12] It is important to note that any information provided on the use of chemicals is given on the understanding that it is a recognised treatment option, dependant on a number of criteria. Under the provisions of Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides, advice on the use of particular pesticides and their applications must only be delivered by a qualified Pesticide Advisor, appropriately trained and registered with the Department of Agriculture, Food and the Marine.

	Application of glyphosate herbicide as a foliar spray, spot treatment or wiper applicator can also be used to control this species. Herbicide application should take place after flowering in February – March or in mid – late summer, before the foliage begins to die back. The preferred control option for dealing with this invasive species on site is a combination of excavation and follow-up herbicide application as described above.
Prevention of the introduction of other non-native invasive species	Planting schedules should have regard to Invasive Species Ireland's *Amber list*. Planting schedules must not include species on these lists, as they may have invasive properties which would be detrimental to the overall biodiversity of Carlow Town.

7.8 Appendix H Guidelines on Climbers, Green Walls, Green Bus Shelters and Green Roofs

Climbers, green walls, green bus shelters and green roofs	
Climber species	Native climbing species should be chosen where possible. Suitable species include honeysuckle *Lonicera periclymenum*, ivy *Hedera helix*, and field rose *Rosa arvensis*. Honeysuckle attracts pollinators; particularly moths, and birds. Ivy is evergreen, it provides cover for nesting birds, invertebrates and roosting bats. It also provides a rich source of nectar and pollen late in the season for hoverflies, wasps and bees. Ivy berries provide food for numerous birds and small mammals, whereas field rose is another attractive native plant that is visited by bees and other insects. There are a variety of attractive ornamental climbers that are also good for wildlife. These include, passion flower *Passiflora* spp., wisteria *Wisteria sinensis*, star jasmine *Jasminum multiflorum*, firethorn *Pyracantha coccinea*, and climbing hydrangea *Hydrangea anomala* subsp. *petiolaris*. Passion flower is rich in nectar and pollen and attracts bees and other beneficial insects. Wisteria is a member of the legume family, it provides shelter for wildlife as well as a good source of nectar and pollen. Star jasmine provides good cover for birds and insects and a nectar and pollen source, its strong sweet smell attracts night-flying moths. Firethorn provides two sources of food for wildlife- flowers in spring-time and berries in the autumn, whereas climbing hydrangea is particularly popular with hoverflies.
Planting climbers* * Instructions adapted from gardenersworld.com	1. Decide on which climbing species to be planted. Some species may require the installation of a trellis or other form of support 2. Make sure the plant support (trellis, wall or other) is in good condition. 3. Dig organic matter into the planting area (down to two spades deep). 4. Plant the climber c. 30-45cm from the wall. 5. Lean the stems into their new support and tie securely. For self-clinging climbers, put in short canes to bridge the gap between the plant and the wall
Green walls	Green walls provide resources to wildlife and are visually pleasing. Growing plants vertically, however, can be technically challenging, and relies on three key requirements: (1) a suitable growing substrate, (2) a way of holding the growth substrate and plants in place, and (3) a mode to deliver water and nutrients. For these reasons green walls often need professional installation and maintenance, which can be financially costly.

	 Example of relatively simple green wall, Battleby, Perthshire, UK[13]  Example of more technical green wall[14]
Green roofs	Green roofs are recommended for consideration on appropriate flat-roofed buildings. Planting proposed for green roofs should be of native species and preferably species that are local to the area. Native Irish perennial seed mixes can be sources from various suppliers, for example Design by Nature. Extensive/ brown roofs are also recommended as they require less maintenance and are lighter weight, making them suitable for inclusion on existing buildings. A substrate should be applied and then left unplanted, allowing local plants to colonise. The following documents provide advice on installing green and brown roofs: • Tepui (2008). *Green Roofs Over Dublin. A Green Roof Policy Guidance Paper for Dublin.* • ELIOS (2012). *Case Study. Green and Brown Roofs.* • WWT Consulting & RSPB (2012). *Sustainable Drainage Systems. Maximising the potential for people and wildlife.*

[13] Scottish Pollinators. Living Wall. Available: https://scottishpollinators.wordpress.com/2018/11/02/living-wall/, Accessed: 06/11/2019

[14] SAP Group. Living Walls. Available: https://sapgroup.com/living-wall/, Accessed: 06/11/2019