

All-Ireland Pollinator Plan 2015-2020



Pollinator Plan

This Plan was initiated by Úna FitzPatrick (National Biodiversity Data Centre) and Jane Stout (Trinity College Dublin), and then developed by a fifteen member All-Ireland steering group. The final Plan was produced by the steering group following a consultation phase, which included both public and stakeholder engagement. During the stakeholder engagement a

total of 70 organisations were invited to comment on the Plan. The stakeholder engagement was not an exhaustive process and it is acknowledged that not all relevant organisations will have been contacted. It is hoped that more organisations will come on board to support the Plan over the coming years.

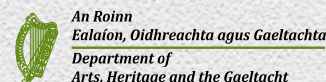
Pollinator Plan Steering Group

Member	Affiliation
Dr Úna FitzPatrick (chair)	National Biodiversity Data Centre
Dr Jane Stout (deputy chair)	Trinity College Dublin
Ms Catherine Bertrand	Butterfly Conservation NI
Mr Ken Bradley	DOE Environmental Policy Division
Dr Gerry Clabby	Local Authorities: Fingal County Council
Ms Catherine Keena	Teagasc
Dr Damian McFerran	Centre for Environmental Data and Recording (CEDaR)
Dr John McMullan	Honeybee expert
Dr Archie Murchie	Agri-Food and Biosciences NI
Dr Tomás Murray	National Biodiversity Data Centre
Dr Brian Nelson	National Parks and Wildlife Service
Dr Vincent O'Malley	Transport Infrastructure Ireland
Ms Melina Quinn	Northern Ireland Environment Agency
Dr Veronica Santorum	Limerick's Buzzing
Mr Jerome Walsh	Department of Agriculture, Food and the Marine



The Pollinator Plan was developed by the steering group and published by the National Biodiversity Data Centre.

Suggested citation: All-Ireland Pollinator Plan 2015-2020.
National Biodiversity Data Centre Series No. 3, Waterford.



The National Biodiversity Data Centre is an initiative of the Heritage Council and is operated under a service level agreement by Compass Informatics. The Centre is funded by the Department of the Arts, Heritage & the Gaeltacht and the Heritage Council.

Thanks to botanical artist, Shevaun Doherty, for the front cover painting - Garden bumblebee (*Bombus hortorum*) on Knapweed.

Foreword



I am delighted to provide the foreword for this All-Ireland Pollinator Plan. The publication of such a Plan on an All-Ireland basis is indicative of the fact that there is a real issue to resolve, and very importantly that the actions identified, if implemented, will contribute considerably to reversing pollinator decline.

Everyone has responsibility to ensure implementation. Gone are the days when we can choose to ignore warning signs. Our science is sound, the data are available and everyone knows what has to be done. Our concern has to be to get it done within the timeframes identified and to secure the resources that are required. The alternative is not acceptable, and should not be acceptable to anyone.

Those champions of this initiative that gave of their time so freely as part of the steering group deserve both congratulations and ongoing support. The actions that have been identified are relevant to the public as a whole. They will improve the quality of the places in which we live, and work, and which we encourage tourists to visit. The Plan is about improving the quality of our environment, our sense of well-being, and our own contentment when we make things better than they were. That is the least we should be committed to doing. The Heritage Council will continue to find ways to encourage others to play a fuller part in the implementation of this Plan.

Michael Starrett

Chief Executive

The Heritage Council

July 2015



All-Ireland Pollinator Plan 2015-2020

Creating an Ireland where pollinators can survive and thrive

Irish pollinators are in decline. The problem is serious and requires immediate attention to ensure the sustainability of our food production, avoid additional economic impact on the agricultural sector, and protect the health of the environment.



Solitary bee (*Lasioglossum calceatum*) © Seán Falk

This is a shared plan of action. By working together we can collectively take steps to reverse pollinator losses and help restore populations to healthy levels. Over the next five years, this Plan will build a solid foundation to bring about a landscape where pollinators can flourish.

The loss of natural and semi-natural habitats has been a key driver in pollinator declines. At its core, this Plan is about providing food and shelter across all types of land so that our pollinators can survive and thrive. It creates a framework to bring together pollinator initiatives across the island, so that with coordination and cooperation we can achieve our goal.

If we don't protect our pollinators it will affect the food industry. Without the pollination service freely provided by our bees and hoverflies, it would be increasingly difficult and expensive for farmers to produce some crops at current scales, and could result in a loss of consumer choice for Irish grown products. The beauty of the Irish landscape would also be affected without pollinators to maintain the diversity of our wild plants and support healthy ecosystems.

The plan has

5

objectives:



1 Making Ireland pollinator friendly

By focusing on actions that can be taken on farmland, public land and private land, we want to achieve a joined-up network of diverse and flower-rich habitats to support pollinators across Ireland.

2 Raising awareness of pollinators and how to protect them

By working together we want to achieve an increased awareness of the importance of pollinators and the resources they need to survive.

3 Managed pollinators – supporting beekeepers and growers

By supporting beekeepers and growers we want to achieve healthy, sustainable populations of managed pollinators that can play a full role in delivering pollination services.

4 Expanding our knowledge on pollinators and pollination service

By continually addressing gaps in our knowledge through research, we want to achieve an evidence base that directs us towards the best and most cost-effective ways to protect our pollinators into the future.

5 Collecting evidence to track change and measure success

By building up our knowledge on where pollinators occur and how they are changing (including in response to management actions) we want to achieve a dynamic Plan that is targeted and effective.



Who is involved?

This Plan is a call to action. Every one of us can help.

At time of print, the following organisations have agreed to support this Plan and are committed to working together on its implementation. This is not a closed list, it is hoped that during the life of the Plan other organisations will also agree to get involved:

- National Biodiversity Data Centre
- Trinity College Dublin
- Heritage Council
- Northern Ireland Environment Agency
- Department of Arts, Heritage and the Gaeltacht (ROI)
- Department of Agriculture, Food & the Marine (ROI)
- Department of Agriculture and Rural Development (NI)
- Department of the Environment (NI)
- Agri-Food and Biosciences Institute (NI)
- Transport Infrastructure Ireland
- Teagasc
- CEDaR
- Butterfly Conservation
- Butterfly Conservation NI
- Fingal County Council
- Limerick's Buzzing
- ABP Food Group
- An Taisce
- ARENA Network, Business in the Community NI
- Ballyhoura Development Ltd
- Belfast City Council
- Belfast Hills Partnership
- BirdWatch Ireland
- Bord Bia
- Bord Na Mona
- Bumblebee Conservation Trust (UK)
- Burrenbeo Trust
- Chartered Institute of Ecology and Environmental Management (CIEEM)
- College of Agriculture, Food and Rural Enterprise, NI (CAFRE)
- Community Garden Network
- Council for Nature Conservation and the Countryside (CNCC)
- Dublin City Council
- Ecoseeds
- Environmental Protection Agency (EPA)
- Fáilte Ireland
- Federation of Irish Beekeepers' Associations
- Friends of the Earth Ireland
- Friends of the Earth Northern Ireland
- Grow It Yourself (GIY)
- Hedge Laying Association of Ireland
- Heritage Office of Kilkenny County Council
- Institute of Northern Ireland Beekeepers (INIB)
- Iranród Éireann
- Irish Organic Farmers and Growers Association
- Irish Peatland Conservation Council (IPCC)
- Irish Soft Fruit Growers Association
- Irish Wildlife Trust
- Keep Northern Ireland Beautiful
- Learning Through Landscapes UK (Polli:Nation)
- National Botanic Gardens
- National Trust
- Native Irish Honey Bee Society
- NI Environment Link
- Open Air Laboratories (OPAL) UK
- OPW
- RSPB
- South and East Cork Area Development (SECAD)
- Tidy Towns
- Translink
- Transport NI
- True Harvest Seeds
- Ulster Beekeepers Association
- Ulster Farmers' Union
- Ulster in Bloom
- Ulster Wildlife
- Waterways Ireland
- Wexford County Council
- Woodlands of Ireland

Limerick's Buzzing



How will the objectives be achieved?

Some goals may be achieved using existing policies and initiatives. Others will require us to do things differently.

Achieving targets through policy and government initiatives

The implementation of these existing policies can contribute to the success of the Pollinator Plan:

- Actions for Biodiversity 2011-2016, Ireland's 2nd National Biodiversity Plan (DAHG)
- Revised Northern Ireland Biodiversity Strategy 2015 (DOE)
- Republic of Ireland Rural Development Programme 2014-2020 (DAFM)
- Northern Ireland Rural Development Programme 2014-2020 (DARD)
- National Action Plan for the Sustainable Use of Pesticides 2013 (DAFM)
- UK National Action Plan for the Sustainable Use of Pesticides 2013 (DEFRA)
- Biodiversity Duty under the Wildlife and Natural Environment Act (NI) 2011
- Planning Policy Statement 2015 (DECLG)
- Strategic Planning Policy Statement 2015 (DOE)

Achieving targets through new projects

It is expected that various groups, including academics, communities, environmental groups, local authorities etc., will take particular objectives of this Plan and make them their own, developing new projects to achieve them. In this, it will be necessary to look to national funding instruments and their support agencies as well as to investigate European funding instruments (e.g. EU LIFE programme; European Regional Development Fund - INTERREG).

What is pollination and why is it important?

Pollination occurs when pollen is moved within flowers or carried from flower to flower by pollinating animals or by the wind. The transfer of pollen between flowers of the same species leads to fertilisation, and successful seed and fruit production for plants. Pollination ensures that the plant will produce full-bodied fruit and viable seeds. For crop producers this means reliable yields of high quality produce, and for consumers it means the availability of a range of fruit and vegetables at an affordable price. In the wider landscape, it means a profusion of fruits and seeds for animals to eat, and a continual renewing of our wildflower resource.

Economy & Wealth



Health & Wellbeing

Wildlife & Landscape



Pollinators are
estimated to contribute

€ **53** million
annually to the Irish economy



Solitary bee (*Andrena cineraria*) pollinating Oil Seed Rape © Steven Falk

Economy & Wealth



Reduction in the diversity and/or abundance of pollinators can reduce crop yield. The annual value of pollinators for human food crops has been estimated at €153 billion world-wide¹, £603 million in the UK², and at least €53 million in the Republic of Ireland³. Regional estimates of the value of pollinators to individual crops have also been made, with values of over £7 million per annum for apples in Northern Ireland⁴ and €3.9 million for oilseed rape in the Republic of Ireland⁵. The cost of replacing pollination services provided by animals by artificial means (e.g. human hand pollination or pollen dusting) can be substantially higher⁶. Animal-pollination can also improve the shelf-life of soft fruits, further increasing their value⁷.

In comparison to other countries, Ireland doesn't currently grow large numbers of crops that are pollinator dependent. However, globally the market share of pollinated crops is rising⁸ and in Ireland within the last ten years the value of soft fruit, field vegetable, and apple production has increased by 17, 21 and 24% respectively (see table for information sources). The Food Harvest 2020 strategy (DAFM) and the Going for Growth Strategy (Agri-Food Strategy Board, NI) want to ensure that the Agri-food sector contributes to the maximum extent in our export-led economic recovery. For this vision to materialise, pollinators will have a key role to play in maximising yields from our current crops and those that will be important in the future. The real economic value of pollinators to the Irish

economy is likely to be greater than currently estimated. Current evaluations don't take into account the value of pollinators to forage crops (clovers), in pest control (e.g., the role of hoverflies in protecting winter wheat crops), or their value to private gardeners and communities who grow a wide range of pollinator-dependent fruits and vegetables. Pollinators play an important role in maintaining healthy farm ecosystems which are a prerequisite for sustainable agricultural production. Maintaining biodiversity in the farm system future-proofs how the land can be used for generations to come. It is important to accept that if wild pollinator species were to be lost from the Irish landscape, they could not be replaced, regardless of monetary input.

Main pollinator dependent crops in Ireland, ranked by production area (Ha)

Outdoor crops

Apples (culinary & dessert)	<i>Malus domestica</i>
Apples (cider)	<i>Malus domestica</i>
Blackcurrants	<i>Ribes nigrum</i>
Pumpkin	<i>Cucurbita spp.</i>
Strawberries	<i>Fragaria spp.</i>
Courgettes and Marrows	<i>Cucurbita pepo</i>
Blueberries	<i>Vaccinium spp.</i>
Raspberries	<i>Rubus idaeus</i>
Blackberries	<i>Rubus fruticosus</i>

Indoor crops

Strawberries	<i>Fragaria spp.</i>
Raspberries	<i>Rubus idaeus</i>
Tomatoes	<i>Lycopersicon esculentum</i>
Cucumber	<i>Cucumis sativus</i>
Bell Pepper	<i>Capsicum annum</i>

Sources: DAFM - National Soft Fruit & Protected Vegetable Census 2013;
National Field Vegetable Census 2009; National Apple Orchard Census 2012



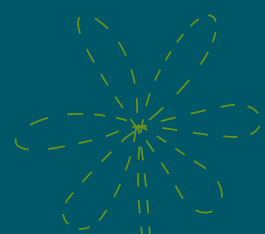
Health & Wellbeing



Animal-pollinated crops are known to be crucial for providing vitamins, anti-oxidants and other essential nutrients to the human diet^{9,10}. In addition, pollination has also been shown to improve the nutritional value of some crops¹¹. For growers, a loss of pollinators means lower crop yields or reductions in quality, and for consumers it means reduced choice and higher prices for the fruits and vegetables that are essential in our diet.

Pollinators also contribute directly and indirectly to human well-being in other ways. There are known mental health benefits from contact with greenspaces which increase with the quality of the biodiversity¹². People derive pleasure from bees and pollinator-dependent habitats such as flower-rich meadows. The value of this is harder to determine, but is demonstrated by public support for organisations such as Limerick's Buzzing and the UK Bumblebee Conservation Trust.

Without pollinators it would be extremely difficult to have a healthy balanced diet



Wildlife & Landscape



Pollinators play a key role in our ecosystems. In taking action to protect them, we start a chain reaction that has positive benefits for the general health of our environment. Bees and hoverflies don't just pollinate crops, they also help maintain the diversity of wildflowers that we have in Ireland. In temperate zones an estimated 78% of flowering plants require animal pollination¹³. Without these wildflowers, the Irish landscape, cherished by us and crucial to our tourism sector, would be a less beautiful and colourful place.

Plants are the building blocks of our natural heritage; providing food and shelter for our birds and mammals, and habitats that enhance many other animal

populations, including many insects that attack crop pests and provide additional financial benefits.

Pollinators are tangible. We can see them and relate to them. Monitoring their numbers, diversity and range helps us to understand how effective our conservation measures are. By protecting and enhancing the habitats they need, we can help create an Ireland with a healthy and resilient biodiversity that provides us with the ecosystem services on which we are reliant (ecosystem services are the outputs from natural systems that contribute to human wellbeing).



Protecting pollinators helps protect the general health of our environment





Solitary bee (*Halictus rubicundus*) © Steven Falk

Who are the pollinators in Ireland?

Although a range of animals visit flowers to collect food (nectar and/or pollen), the most important pollinators in Ireland are insects; particularly bees and flies.

Globally, bees are the most important pollinators because they visit flowers to collect pollen for their larvae, as well as feeding exclusively on the nectar of flowers as adults. Hence, the entire life-cycle of bees is dependent on interactions with flowering plants. Of the 100 crops that provide 90% of the world's food supply, 71 are pollinated by bees. In Europe alone, 84% of the 264 crop species are animal pollinated and 4,000 vegetable varieties exist thanks to pollination by bees¹⁴. While adult hoverflies feed mainly on nectar and pollen, the larvae of many species are voracious predators of aphids and other pests. As a result, hoverflies contribute to both pollination and pest control.

Managed pollinators

Managed pollinators are those that have some of their needs looked after by humans. The most important managed pollinator in Ireland is the honeybee, which has long been domesticated for honey production and/or crop pollination. Although we often associate it with honey, the honeybee's role as a pollinator is of far greater economic value. Within the last 20 years, one species of bumblebee has also been employed as a managed pollinator in Ireland. *Bombus terrestris* colonies are imported on an annual basis from other EU Member States to pollinate high-value crops like strawberries and tomatoes in glasshouses and polytunnels. They are also used on a smaller scale within apple orchards.

100 crops provide

90% of the world's food
71 are pollinated by bees



The most important managed pollinator in Ireland is the honeybee



Only **1**
Honeybee species



20 +
Bumblebee species



77 =
Solitary bee species



Wild bee
species



Wild pollinators

Wild pollinators exist naturally within the environment and are now known to be crucial for maintaining pollination services. In Ireland, there are 98 different species of bee, including the familiar honeybee (1 species) and bumblebees (20 species). The

remaining species are solitary, meaning they do not form colonies. Only the honeybee produces commercially extractable honey. Solitary bees are often extremely efficient pollinators.

Studies in apple orchards have shown that a single mason solitary bee can do the work of hundreds of honeybees¹⁵. The economic contribution of pollination by wild bees has been assessed as £1,800 or \$3,000 per hectare¹⁶.

There are 180 species of hoverfly in Ireland. The precise contribution of hoverflies to pollination service is not well understood, but research on oilseed rape has suggested their pollination efficiency is about one fifth that of wild bees¹⁷. Hoverflies pollinate a much smaller range of plant species due to the fact that they have unspecialised mouth parts and forage mainly on open flowers where the nectar/pollen are not hidden. Very recent studies have shown that non-hover flies also play a role in crop pollination¹⁸.

"The economic contribution of pollination by wild bees has been assessed as £1,800 or \$3,000 per hectare¹⁶"

To provide stable pollination services for our crops, crop wild relatives (potential future crops) and other wild plants, we need healthy honeybee colonies in combination with high abundance and species richness of wild bee populations, as well as other wild pollinators such as hoverflies.

A range of factors have contributed to recent colony losses in honeybees, and have caused widespread worry with regard to crop pollination, particularly in North America¹⁹. Concerns about global honeybee declines have highlighted the risks associated with the reliance on a single pollinating species. Whilst the honeybee is an important crop pollinator, recent studies in the UK have shown that it is not as important as previously believed²⁰, and it makes up only a small fraction of insect visits to flowers in Irish agricultural systems²¹. The importance of wild, non-managed bees as pollinators of not only crops, but also wild plants is becoming more and more apparent^{22,23,24,25}.

Pollination service cannot be provided by simply increasing the number of honeybee hives

Recent studies now indicate that a diversity of pollinator types is important for maximizing pollination service^{26,27,28}. For example, in field studies covering 600 fields and 41 crop systems worldwide, fruit set increased significantly with wild-insect visitation in all systems, whereas only 14% of systems experienced increases with honeybee visitation. However, maximal fruit set was only achieved where both wild pollinators and honeybees were present²⁴.

Other insects such as butterflies, moths, beetles, wasps, and ants visit flowers and carry out small amounts of occasional pollination. Although these insects may be frequent flower visitors, their presence does not always result in consistent or successful pollination. While these insects may not contribute as much to crop pollination in Europe as bees, some species do contribute to pollination of some of our native plants e.g., Butterfly Orchids are only pollinated by night flying moths.



Large carder bee: widespread in Ireland but vulnerable at the European level

Bombus muscorum © John Breen

Both managed and wild pollinators are declining in Ireland

Are pollinators under threat in Ireland?

Recent research has shown that more than half of Ireland's bee species have undergone substantial declines in their numbers since 1980, with 30% of species considered threatened with extinction from Ireland according to IUCN criteria²⁹. Three bee species that occur in Ireland are also threatened with extinction at the European level and an additional

four species are near threatened³⁰. Unfortunately, we don't have historical data to assess changes in the abundance of our common wild pollinator species in Ireland. The All-Ireland Bumblebee Monitoring Scheme was established in 2011 to provide these data on bumblebees into the future.



Bombus distinguendus © Dara Stanley

Great yellow bumblebee: endangered in Ireland and vulnerable at the European level

Pollinator	Taxonomic name	Status in Ireland
Honeybee	Order Hymenoptera; Family Apidae; <i>Apis mellifera</i>	1 species Managed honeybee hives are thought to have declined since the introduction of the parasitic mite <i>Varroa destructor</i> in 1997. In 2010, the number of hives was estimated to be 24,000 in ROI. Current populations can be sustained if the level of overwintering losses remains below 15% p.a., however this rate has been exceeded in four of the past five winters with an average loss of 22.6% p.a. in ROI and 22.8% p.a. in NI.
Bumblebees	Order Hymenoptera; Family Apidae; <i>Bombus</i> species	20 species of which six are threatened with extinction from Ireland. An additional 3 species are near threatened.
Solitary bees	Order Hymenoptera; Families Andrenidae, Colletidae, Halictidae, Megachilidae	77 species of which 24 are threatened with extinction. An additional 9 species are near threatened.
Hoverflies	Order Diptera; Family Syrphidae	180 species. An official conservation assessment has not yet occurred but approximately 20% of species are estimated to be under threat (Martin Speight, <i>pers comm.</i>)

All bee larvae are fed exclusively on pollen

Shrill
carder bee:
endangered in
Ireland



Bombus sylvarum © John Breen

What do wild pollinators need?

The needs of managed honeybees are very different to those of wild pollinators. Beekeepers can move colonies to where forage sources are available, and can provide extra resources over the winter. Wild pollinators are much more dependent on their immediate environment.

All bee larvae are fed exclusively on pollen, with nectar providing an important energy source for the adults. Wild bees need pockets of flower-rich habitat across the landscape (including grasslands, sand dunes, peatlands, woodlands, parks, roadside verges, hedgerows and gardens) to provide them with nesting areas and a diverse diet. While common perennial wildflowers like clovers, vetches and knapweeds are excellent food sources, many bedding plants and annuals are not rich in pollen or nectar, and provide little support to our pollinators.

Well-managed hedgerows can provide good food sources, safe places to nest, and linking corridors between different habitats. They are a vital resource for maintaining pollinator populations, particularly within intensively managed farmland. Road verges can also provide a refuge for wildflowers and if managed appropriately can be an important wildlife corridor.

Hoverfly larvae are very varied in how they feed. Many species feed on insect crop pests like aphids, leafhoppers and scale insects. Others feed on plants, or on dead or decaying organic matter. Many adult hoverflies feed on pollen/nectar during their very short life stage which generally lasts from a few days to a few weeks.

Well-managed hedgerows are a vital resource for maintaining pollinator populations





Nest of *B. pascuorum* © Noel Clohessy

Bumblebee queens make their nest on the surface of the ground or just underneath, generally in long grass, or bracken, often at the base of a hedgerow. They will occasionally use an abandoned rodent nest

Life Cycle: Bumblebees

Most bumblebee queens emerge from hibernation in early spring. Some species are associated with grassland floras and don't emerge from hibernation until early summer when these resources are most likely to be available

The length of the bee's tongue determines what flowers the bee can feed on, with long tongued species being more adapted to feeding on plants with long tubular flowers

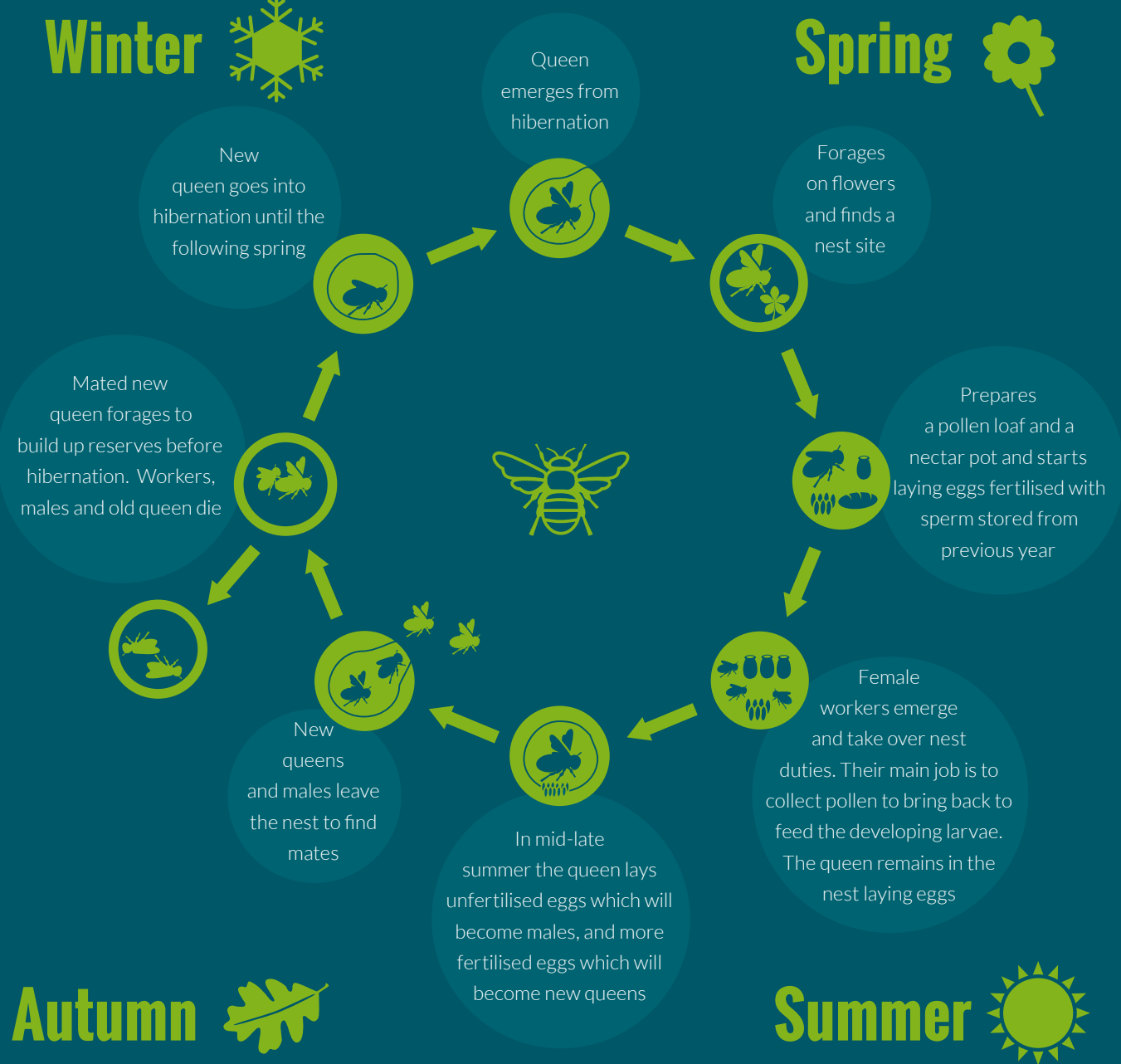


Bombus distinguendus © Dara Stanley

Winter



Spring



Autumn



Summer



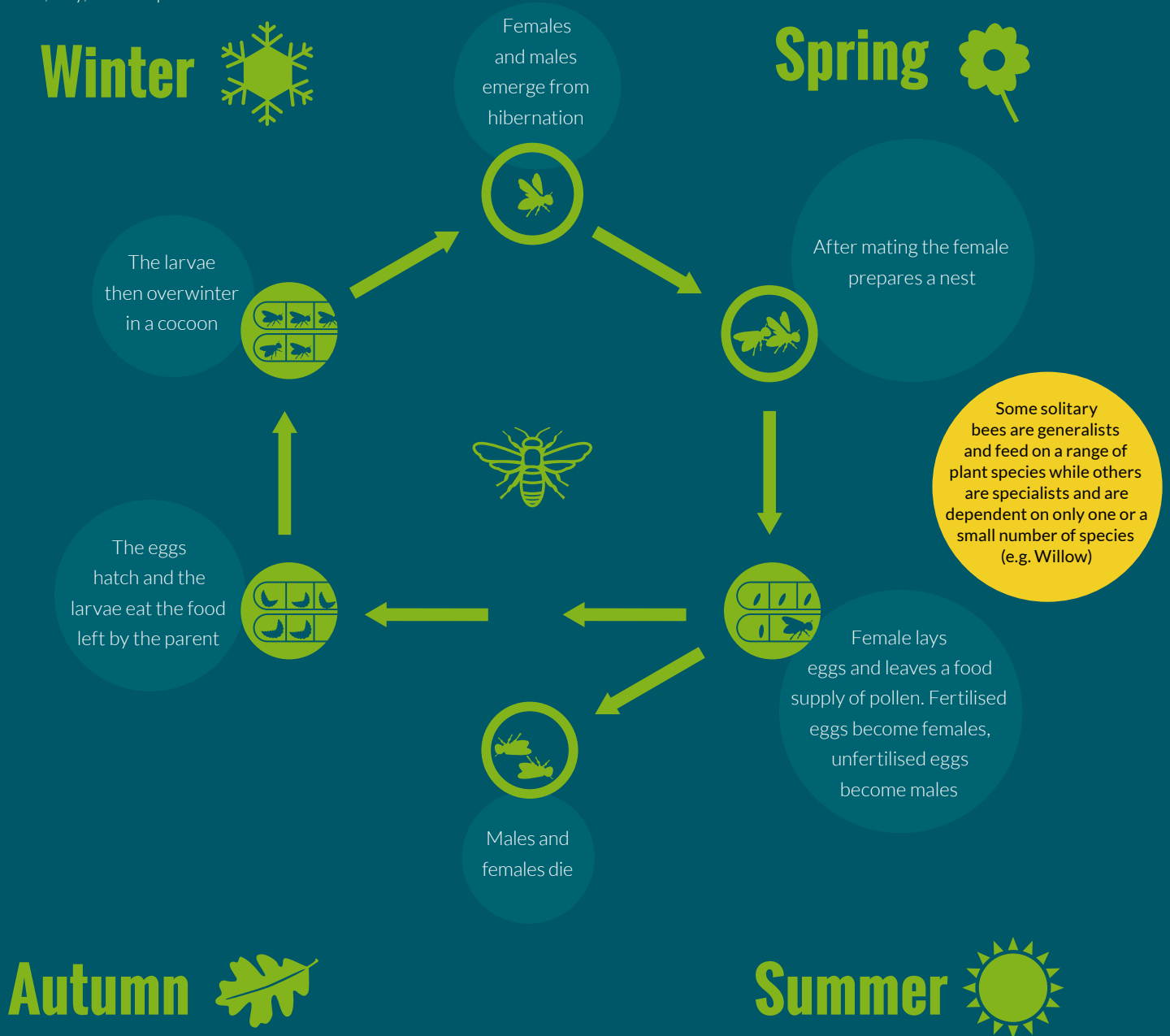
Life Cycle: Solitary Bees

Solitary bees take one whole year to pass through a complete life cycle, and may only survive as adults for a few weeks. This isn't long enough for them to raise their offspring, so the young bees have to fend for themselves. Some species are cavity nesters and will nest in hollowed twigs or holes in wood or masonry. One species, *Osmia aurulenta*, lives on sand dunes and will only nest in empty snail shells. Most solitary bees in Ireland are mining bees, and make their nests in bare ground or in south facing banks of stable soil, clay, sand or peat.

Solitary bees emerge as adults at various times during the spring and summer depending on the species and whether their preferred flower type is available



Megachile willughbiella © Steven Falk



We are asking our pollinators to perform services in an increasingly inhospitable landscape

What are the pressures causing a decline in Ireland's pollinators?

Habitat loss, fragmentation and degradation - Homelessness

Loss of natural and semi-natural habitats has been a key driver in pollinator declines. The availability of food plants and nesting sites has been drastically reduced through conversion of low-intensity farmland and semi-natural land to intensive farmland, forestry and urban/industrial use. Declines have occurred across all habitats from grasslands to woodlands, sand dunes, peat lands, and mature hedgerows. Those areas of habitat that remain have also declined in quality. This change has had most impact on wild pollinators because they are totally reliant on resources available in the landscape. It has been shown that the number of visits to crop fields by wild pollinators tends to drop with distance from semi-natural areas³¹. **Effective pollination by wild pollinators requires crop land to be interspersed with more natural areas requiring a landscape scale/farm-wide approach.**

General declines in wildflowers within the landscape - Hunger

It is important that pollinators have a balanced diet from a range of plant species. They require food (nectar and pollen) throughout their active foraging season which lasts from early spring until late autumn. Declines in wildflowers are largely due to changing farming practice, particularly the movement from hay to silage production³². Increases in the amount of fertiliser applied to arable fields has resulted in increased crop yields, but has led to a strong decline in species diversity and flower richness within managed fields³³ and in semi-natural habitats adjacent to fertilised fields^{34,35}. Our tendency to tidy up the landscape rather than allowing wildflowers to grow along roadsides, field margins, and in parks and gardens is also playing a role in fewer of these resources being available. **Maintaining pollination service requires providing a sufficient abundance and diversity of food plants across the landscape for our pollinators from early spring to late autumn.**

Pests and disease - Sickness

When managed pollinators are imported into Ireland they can inadvertently bring with them new pests and diseases. Pests and diseases are the main threat to honeybees, particularly an introduced parasitic mite (*Varroa destructor*), other invertebrates, bacteria, fungi and viruses. In 2006, nearly three quarters of 135 apiaries surveyed across the Republic of Ireland were infected with *Varroa destructor*³⁶. Wild bees may be affected by disease transfer from imported bumblebees that have been released in glasshouses and polytunnels^{37,38}, and by pests and diseases traditionally considered confined to honeybees³⁹. Emerging pests and diseases are considered one of the key risks to wild pollinators, particularly bee populations. **Vigilance and swift action from those working with managed pollinators and assessing potential future threats is essential.**

Pesticides - Poisoning

To meet global population growth and resultant food demand, the pressure on pesticides (insecticides, herbicides, fungicides) to deliver higher standards for crop protection has increased; with agriculture currently using the highest volume of pesticides than at any other point in history⁴⁰. These insecticides, herbicides and fungicides are applied to crops, but reach the pollinators through pollen, nectar, and through the air, water or soil. Although herbicides and fungicides may not have direct toxic effects on pollinators, herbicides reduce the amount of food available, and fungicides may interact with other pesticides and have negative impacts on bees⁴¹. Insecticides can get into the nectar and pollen either as a result of foliar spraying or via systemic treatments whereby the pesticide is taken up by the plant and expressed in all plant tissues. Although the relative role of pesticides in global pollinator declines remains poorly understood, it is now more evident than ever that some insecticides show clear negative effects on the health of pollinators, both individually and at the colony level^{42,43,44,45,46}. Whilst all pesticides pose

a risk to pollinators if inappropriately applied, recent concerns have focused on the risks associated with the widespread use of a class of systemic insecticides, the neonicotinoids⁴⁷. Although the type and intensity of pesticide use varies across Ireland⁴⁸, there has been no field-level research on their impacts on pollinators in Ireland. The only Irish research related to pesticides and pollinators looked at organic dairy farms and found that they had higher numbers of both flowers and insects⁴⁹.

Continued research into Irish agricultural systems, chemical controls and the effect on pollinators is essential to future management of our pollinator resource.

Climate change - Changing environment

Recent studies have shown that wild pollinators are highly vulnerable to climate change^{50,51}. The impact of climate change on pollination service can be difficult to predict^{52,53}. However, with likely changes in the timing of flowering, the occurrence of important life cycle events of pollinators (e.g. emergence from hibernation, production of offspring etc.), and the geographic ranges of plants and pollinator species, there is the potential for mismatches between plants and their pollinators²³, as well as risks associated with more frequent severe weather events (e.g. storms, floods, late frosts etc.). This means that crops or wild plants may flower before their pollinators emerge from hibernation; or the pollinators themselves may emerge first and find it difficult to survive due to a lack of food sources if the crops or wild plants are not yet flowering. Within habitat restoration work in which wild flowers are deliberately planted within the landscape, it is preferable to use locally collected seed as it is more likely to be in sync with the local climatic conditions. **It is important to increase the connectivity and quality of pollinator friendly habitats so that pollinators can move in response to climate change and we retain as much resilience within our ecosystems as possible.**





Bumblebees © Joe Curtis



What are our options?

If we don't take action on pollinator declines this could potentially reduce crop pollination and hence production, resulting in a loss of consumer choice for Irish grown products. If declines continue, it is extremely unlikely we would run out of food, but it would mean farmers would find it increasingly difficult and expensive to produce some crops at the current levels of scale. Pollinators also maintain the diversity of wild plants and support healthy ecosystems. Continuing declines will have knock-on impacts for a range of ecosystem services. We do not fully understand the range and magnitude of potential knock-on effects, making it highly risky to take no action.

The most cost-effective option is to develop an Irish landscape where pollinators can survive and thrive. This will also have positive knock-on benefits for other biodiversity and ecosystem services, but it will require a series of actions that need to be implemented. A shortage of nesting sites and suitable food plants are among the main drivers of decline in wild pollinators. This could be reversed by large-scale restoration of pollinator habitat – essentially this means a collective effort to create a mosaic of nesting areas and flower-rich habitat across our landscape to support both wild pollinators and managed honeybees. This is the solution proposed by this Plan.

Substituting insect pollination with manual hand-pollination or with commercially reared colonies of bees is not a viable option in Ireland. Hand-pollination is unfeasible even for crops, let alone wild plants. Studies indicate that pollination service cannot be maintained by honeybees alone²⁴ and whilst using commercial colonies may be possible for bumblebee-pollinated protected crops (e.g. soft fruits), there are associated risks to farmers in relying on colonies being available for import, and to wild bees which may face competition and pest/disease spillover⁵⁴. Alternatively, non-pollinator dependent varieties could be substituted for the pollinator-dependent ones, but the value of the latter is greater¹ and would result in pollinator-dependent crops being imported. This is expensive (in economic terms and with respect to carbon emissions) and with future transport costs likely to rise, it is not a sustainable solution.

We need to adopt evidence-based best practices from around the world

Do we know how to make Ireland pollinator friendly and reverse declines?

Reversing pollinator declines in Ireland will require us all to take collective action. Worldwide, the number of studies testing a variety of management options to improve pollinator populations is continually growing. Therefore, we now have a suite of evidence-based actions that have been shown to promote pollinator populations in other countries and provide an ideal starting point for conservation actions within Ireland. National Pollinator Strategies have also recently been published in Wales (2013) and England (2014) making it possible to draw on experiences elsewhere.

The most cost-effective solution is to change our management practices to increase the wildflowers that grow naturally within the landscape; and to retain or create natural nesting habitat for our pollinators. Where direct intervention is required, best practice examples include:

- **Plant patches of urban areas with wildflowers.** Evidence from Scotland showed that patches planted with wildflower seed mix had x25 more flowers, x50 more bumblebees and x13 more hoverflies compared with plots where wildflower seed had not been sown⁵⁵.
- **Incorporate pollinator friendly plants into gardens.** Nineteen of the 25 different plant species trialed in British gardens were found to be of particular value to insect pollinators⁵⁶.
- **Allow lawn weeds to flower.** Evidence from the USA showed that Dandelions and White Clover on lawns supported 37 species of bee. White Clover was important for bumblebees and honeybees, whereas solitary bees, honeybees and hoverflies predominated on Dandelion⁵⁷.

- **Incorporate wildflower strips within cropped fields.** Evidence from the USA showed that wildflower strips sown within 3m of blueberry crops can, after three to four years, attract almost double the abundance of wild bees and hoverflies, and increase fruit set by 10% with an estimated net profit of US\$8,750 per 0.8 ha of wildflower patches after 10 years⁵⁸.
- **Allow field margins to grow wild.** Evidence from the UK showed that naturally regenerated field margins supported over 2.5 times the abundance of flowers and 3-16 times the abundance of bees, compared to field margins with reduced spraying regimes and no input of fertilizer⁵⁹.
- **Incorporate clovers into grass-dominated swards.** Evidence from the UK showed that permanent pasture sown annually with a mix of legumes, or grass and legumes, supported over 6.5 times the abundance of bumblebees compared to seven other grass management options⁶⁰.
- **Incorporate artificial solitary bee nests into urban gardens.** Evidence from the UK and Ireland shows that nest boxes can be occupied by small numbers of cavity nesting solitary bees^{61,62}.

In Ireland, solitary bee nest boxes will only attract the very small number of species who are cavity nesters. Over 80% (62 species) of Ireland's solitary bees are mining bees, who simply require bare ground or stable south facing slopes of bare substrate (soil, sand, clay or peat) for nesting.

of the 77 solitary
bee species, only

10 are
likely
to use a
garden nest box

**BEE
HOTEL**



What progress have we made so far in Ireland?

The number of pollinator initiatives in Ireland has been increasing in recent years, and progress has already been made in a number of areas:

- An All-Ireland Bee Red List was published in 2006. It stated the conservation status of all species and identified those that are most at risk of extinction²⁹.
- The EU and Irish Government co-funded National Apiculture Programme has collected data on Irish honeybee colony losses each year since 2008. It is also looking at ways to address the causes for these losses.
- The Native Irish Honey Bee Society (NIHBS) was established in 2012 to support the various strains of Native Irish Honey Bee (*Apis mellifera mellifera*) throughout the country.
- An EU neonicotinoid regulation is currently in place that bans the use of three of the neonicotinoid insecticides on flowering crops attractive to bees.
- The Irish Pollinator Initiative was set up by the National Biodiversity Data Centre in 2011 and is actively working to drive pollinator conservation through better data. One of the components of this initiative is the All-Ireland Bumblebee Monitoring Scheme which has been monitoring wild pollinators across the landscape since 2011. Along with a GB equivalent, it is the first scheme of its kind in Europe. Currently more than eighty volunteers walk a 1-2km fixed route once a month and record the bumblebee diversity and abundance that they observe.
- Since 2003, the 'Plant-Animal Interactions' research group in Trinity College Dublin has been researching the drivers and consequences of pollinator decline in Ireland and has published >30 scientific papers on

Irish pollinators and pollination services.

- On the ground, sectors such as agriculture are beginning to take pollinator specific action through Agri-environment initiatives and through the development of a National Action Programme for the sustainable use of pesticides which will also have benefits for pollinators. The Ulster Beekeepers Association and Ulster Farmers Union have worked together to produce a 'Farming for Bees' information leaflet promoting pollinator friendly actions and also highlighting advice from the voluntary pesticide use scheme.
<http://www.ubka.org/wp-content/uploads/2014/05/ufu-ubka-farming-for-bees.pdf>
- Local authorities are increasingly embracing pollinator friendly management plans, and transport authorities have adopted biodiversity initiatives along national road networks. Local schemes (e.g., Don't Mow Let it Grow; Wexford County Council - Life Lives On The Edge) have encouraged pollinator friendly actions along roadside verges and in public spaces. Local initiatives in schools and communities (e.g., Limerick's Buzzing) have also increased; and the public is becoming more aware of actions they can take in their own gardens to help Ireland's pollinators.

This plan aims to capitalise on the progress that has been made to date, coordinating our efforts into a cohesive All-Ireland strategy that will take positive steps for pollinators over the next 5 years, and inform future actions beyond then.

**All-Ireland Pollinator Plan 2015-2020
– creating an Ireland where pollinators
can survive and thrive**

A call to action



Early bumblebee (*Bombus pratorum*) © Steven Falk

This is a shared plan of action. At its core, it is about providing food and shelter across all types of land so that Irish pollinators can survive and thrive. Everyone has a role to play. By working together we can collectively take steps to reverse pollinator losses and help restore populations to healthy levels.

The main objective of the Plan is to make Ireland pollinator friendly by taking actions on farmland, public land and private land.

This will be supported by additional actions across four other objectives. Within each objective, targets have been set and actions have been identified to help achieve that target. A total of 24 targets and 81 actions are identified.

Organisations who have volunteered to accept responsibility are stated, but in all cases there is scope and space for others to get involved and play a role in delivery. It is hoped that over the life of this Plan new initiatives and new ideas to address each target will be identified and implemented.

Progress will be measured in terms of the number of actions that are achieved; and by changes in the abundance of wild and managed pollinators in the landscape. This Plan is about working together and achieving as much as we can for Irish pollinators by working strategically and cohesively over the period 2015-2020.

www.biodiversityireland.ie/pollinator-plan

- ❶ Making Ireland pollinator friendly: By taking action on farmland, public land and private land, we want to achieve a joined-up network of diverse and flower-rich habitats to support pollinators across Ireland:
 - 1.1 Farmland: 4 targets & 12 actions
 - 1.2 Public land: 3 targets & 22 actions
 - 1.3 Private land: 2 targets & 5 actions
 - 1.4 Supporting the creation of pollinator friendly habitats: 1 target and 3 actions
- ❷ Raising awareness of pollinators and how to protect them: 3 targets & 11 actions
- ❸ Managed pollinators – supporting beekeepers and growers: 4 targets & 7 actions
- ❹ Expanding our knowledge on pollinators and pollination services: 4 targets & 11 actions
- ❺ Collecting evidence to track change and measure success: 3 targets & 6 actions

Some core actions will be completed by spring 2016 (these are marked *), with the remaining actions completed within the life of the Plan (pending funding where this is relevant).



1 Making Ireland pollinator friendly

All types of land use can become more pollinator friendly. Whether you own a farm or a window box, everyone can play a role in making Ireland a place where pollinators can survive and thrive. Together these patches can become a national network of pollinator habitat. Pollinators need places with flowers to feed and suitable habitat to complete their lifecycles. They also need to be protected from chemicals that are toxic to them.

Targets have been set for farmland, public land and private land. The people that will be involved and the action to be taken to meet each target are explained below.

Target 1.1.1:
Increase the area of farmland that is farmed in a pollinator friendly way



1.1 Making Ireland Pollinator Friendly: Farmland

Farmers are in an ideal position to help improve the quality and amount of diverse and flower-rich habitat for pollinators.

Farmland targets for 2015-2020

- 1.1.1 Increase the area of farmland that is farmed in a pollinator friendly way
- 1.1.2 Create a network of meadows and other flower-rich habitats to serve as pollinator havens
- 1.1.3 Encourage the sustainable use of agricultural pesticides (insecticides, herbicides & fungicides)
- 1.1.4 Provide clearer information on pollinators to the farming community

TARGET 1.1.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A1. Incorporate pollinator friendly actions and prescriptions into agri-environment schemes	<ul style="list-style-type: none"> Incorporation of pollinator conservation actions into agri-environment schemes Uptake by farmers 	DAFM, DARD
A2. Encourage pollinator friendly management of ecological focus areas which are necessary to satisfy the basic payment scheme requirements under the Common Agricultural Policy (CAP)	<ul style="list-style-type: none"> Information provided to tillage farmers on incorporating pollinator friendly crops and how to enhance these habitats for pollinators * Uptake by farmers 	DAFM, Teagasc, National Biodiversity Data Centre (IPI)
A4. Encourage farmers to take voluntary actions to make their farms pollinator friendly	<ul style="list-style-type: none"> Participation in the Organic Farming Scheme 	DAFM
	<ul style="list-style-type: none"> Promotion of organic farming and pollinator friendly actions 	Irish Organic Farmers and Growers Association and others
	<ul style="list-style-type: none"> Provision of clear guidelines for actions that can be taken on all farms, along with additional actions specific to farm type * Promotion through farming associations 	National Biodiversity Data Centre (IPI), Teagasc
	<ul style="list-style-type: none"> Development of an online system so that farmers can log actions taken and pollinator friendly farms can be mapped [Action 76] * 	National Biodiversity Data Centre (IPI)

Agri-environment schemes: Pollinator friendly actions and prescriptions have been incorporated into the new Green Low Carbon Agri-Environment Scheme (GLAS) in the Republic of Ireland, and the Environmental Farming Scheme (EFS) in Northern Ireland.

Voluntary actions for farmers

These are general actions that can be taken to make your farm more pollinator friendly. Additional specific actions will be prepared for each sector (dairy, beef, tillage, sheep, horse, soft-fruit growers, orchards).

1 Maintain good quality hedgerows: flowering hedgerows that contain Hazel, Willow, Blackthorn and Hawthorn provide food in spring when wild bees come out of hibernation. Bramble is a good source of food in summer, and Ivy in the autumn. Cut hedgerows every three years, or cut a third annually. The base of the hedgerow shouldn't be sprayed to leave flowering plants like Clovers, Vetches and Knapweed which provide additional food throughout the season. Keep any sandy, earth, or earth and stone banks to provide nest sites for solitary bees.

2 Allow wildflowers to grow around the farm: flowers/weeds like Dandelion, Clovers, Knapweed, Vetches and Creeping thistle growing along lanes and in field corners provide vital food sources for bees.

3 Plant nectar and pollen rich trees and shrubs: good native species are Willow, Hazel, Hawthorn, and Blackthorn. Fruit trees are also a great food source.

4 Provide nesting areas around the farm: bumblebees nest in patches of long tussocky grass or nettles. Most Irish solitary bees nest on bare ground that isn't too compacted, or in south/east facing banks of bare earth (soil, sand, clay, peat).

5 Maximise wildflowers within field margins/ buffer strips: cut field margins and buffer strips only once or twice; cutting should ideally occur before April, with a late cut taken in early September (ideally followed by aftermath grazing). This gives wildflowers a chance to set seed, retains late forage sources for pollinators, and avoids disturbance of late stage bumblebee nests.

These are general actions that can be taken to make your farm more pollinator friendly



Target 1.1.2:
Create a network of meadows and other flower-rich habitats to serve as pollinator havens

TARGET 1.1.2		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A5. Promote existing species rich habitats as a haven for pollinators	<ul style="list-style-type: none"> Promotion of the NI scheme: Save our Magnificent Meadows Increase in the number of participating sites Development of a network of regional demonstration sites Provision of a 'how-to' guide on how to create and manage a species rich meadow 	Ulster Wildlife, NIEA, DARD, BCNI, Fermanagh and Omagh District Council, European Forum for Nature Conservation and Pastoralism.
	<ul style="list-style-type: none"> Investigation of funding sources with a view to expanding Save our Magnificent Meadows to new areas 	UW, NIEA, other partners as appropriate
	<ul style="list-style-type: none"> Development of an online map showing the location of all species rich habitats within existing and future schemes [Action 76] * 	National Biodiversity Data Centre (IPI)



Restoring meadows: Save Our Magnificent Meadows is the UK's largest partnership project transforming the fortunes of vanishing wildflower meadows, grasslands and wildlife. Led by Plantlife, the partnership of 11 organisations including Ulster Wildlife, is working to restore 6,000 hectares of wildflower meadows and grasslands, primarily funded by the Heritage Lottery Fund. The project aims to protect, conserve and restore wildflower meadows, and provides a model for how this target may be met. During the 3 year project (2014 to 2017), partners

will continue to develop and promote the scheme to increase the number of participating sites. These sites will serve as a network of regional demonstration sites and act as hubs for pollinator conservation. Within the Republic of Ireland a new initiative or expansion of the Magnificent Meadows Project is required to meet this objective. Funding sources to achieve such a network of grassland sites will need to be investigated e.g., European Regional Development Fund (INTERREG).

The NI project aims to influence the management of 250 hectares of meadow and rush pasture. Sites within the project include publicly owned, private farmland, school grounds and roadside verges. The project will therefore also contribute to targets 1.2.1 and 1.2.2.

Target 1.1.3:
Encourage the sustainable use of agricultural pesticides

TARGET 1.1.3		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A6. Encourage the responsible and sustainable usage of pesticides (insecticides, herbicides & fungicides) in Ireland	<ul style="list-style-type: none"> In conjunction with the National Action Plan for the Sustainable Use of Pesticides, develop best-practice guidelines for farmers to reduce their use outside of cropping systems to minimise risk to pollinators. 	DAFM
	<ul style="list-style-type: none"> Support existing work to raise awareness on the responsible use of pesticides within agriculture by enhancing online resources to provide clear and simple guidelines 	DAFM, AFBI, National Biodiversity Data Centre (IPI)
	<ul style="list-style-type: none"> Within NI, support the UK wide Voluntary Initiative on Promoting Responsible Pesticide Use 	UFU
A7. Maintain data on pesticide use across Ireland	<ul style="list-style-type: none"> Maintain data on the pesticides that are used in Ireland, where they are used, and what for 	AFBI, DAFM

TARGET 1.1.4

ACTION	PROGRESS MEASURE	RESPONSIBILITY
A8. Establish a farming subgroup to discuss the best ways to ensure the Irish agricultural landscape retains sustainable pollinator populations into the future *	<ul style="list-style-type: none"> Establish the subgroup with invitations extended to representatives from the IFA, UFA, Macra na Feirme, The Soft Fruit Growers Association, the horse farming sector & Women in Agriculture, and well as representatives of intensive and non-intensive farmers across sectors Group to discuss: <ul style="list-style-type: none"> Mechanisms for implementation of the Plan & identification of any issues that minimise the chance of success Pollinator actions for incorporation into future agri-environment schemes How best to communicate the message to the farming community 	Steering group
A9. Provide clear information on actions that can be taken on farms to make them more pollinator friendly	<ul style="list-style-type: none"> Creation of on-line resources providing clear guidelines on actions that can be taken on all farms, along with additional actions specific to farm type * Dissemination of these resources in an appropriate way to the farming community * Ballyhoura Development Ltd. to pilot a peer to peer approach for communicating pollinator information to farmers 	National Biodiversity Data Centre (IPI), Teagasc, Ballyhoura Development Ltd., other partners
	<ul style="list-style-type: none"> Investigate potential mechanisms for providing training on pollinators and pollinator friendly management to farm advisors 	Steering Group
	<ul style="list-style-type: none"> Development of cost-benefit analyses providing farmers with information on the cost implications of management actions <p>Note: this is a research action that will be dependent on funding</p>	Academic partners
A10. Adoption of pollinator friendly management within agricultural and horticultural college sites as a teaching & awareness raising tool	<ul style="list-style-type: none"> Uptake by participating colleges Promotion as reference sites 	CAFRE, Teagasc
A11. Provide farmers with information on which pollinators are most important for each Irish crop species, including new crops which may increase in cultivation in the future	<ul style="list-style-type: none"> Establishment of a publicly available All-Ireland Database on plant-pollinator interactions with an emphasis on crop species. This database will indicate all known pollinators and flower visitors of crops and wild plants, with the most effective pollinators highlighted where this information is available Populate as research data becomes available [Action 65] 	Plant Animal Interactions research group (TCD) & National Biodiversity Data Centre (IPI)
A12. Provide farmers with a system that will indicate potential crops based on geographic area, known pollinator distribution, and floral resource availability. This system will also flag areas where lack of pollinators is likely to be a limiting factor.	<ul style="list-style-type: none"> Completion of research on the most appropriate methodologies [Actions 65,66,67] Development of a framework for an integrated GIS based system that will combine data sources in this model Populate as data becomes available Identification of future data needs <p>Note: this is a long term aim that is closely linked with the research actions</p>	National Biodiversity Data Centre (IPI) & Plant Animal Interactions research group (TCD)

Target 1.1.4: Provide clearer information on pollinators to the farming community



1.2 Making Ireland Pollinator Friendly: Public Land

Adopting pollinator friendly management practices on public land such as roadside verges, parks and schools can play a vital role. Road networks in particular have huge potential to create linking areas of flower-rich habitat and help achieve our aim of a joined-up network of pollinator friendly sites across Ireland.

Public land targets for 2015-2020

1.2.1 Increase the area of public & semi-state land that is managed in a pollinator friendly way

1.2.2 Create linking areas of flower-rich habitat along transport routes

1.2.3 Reduce the use of pesticides (insecticides, herbicides, fungicides) on public land

Specific guidelines for pollinator friendly management will be developed for each sector/organisation [Action 51]. A series of 'how-to' guides for specific actions will also be developed [Action 52]. The Data Centre will provide a publicly available online system where all site based actions taken can be logged and pollinator friendly areas mapped and recognised [Action 76]. Actions 51, 52 and 76 will all be completed by spring 2016.

Target 1.2.1:
Increase the area of public land that is managed in a pollinator friendly way

TARGET 1.2.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A13. Encourage pollinator friendly management of State and public-owned Nature Reserves and National Parks and, where this is appropriate, Natura 2000 and nationally designated sites (NHAs, ASSIs)	<ul style="list-style-type: none"> Uptake where appropriate on a site basis 	NPWS, NIEA, Local Authorities
A14. Encourage pollinator friendly management of public parks and green spaces	<ul style="list-style-type: none"> Integration of the Pollinator Plan into future county/city development or biodiversity plans (where appropriate and when reviewed) 	Steering Group to consult all Local Authorities/Councils (in conjunction with Heritage & Biodiversity Officers)
	<ul style="list-style-type: none"> Incorporate pollinator prescriptions into the An Taisce Green Parks Initiative 	An Taisce
A15. Encourage pollinator friendly management of educational properties and raise awareness of the importance of pollinators	<ul style="list-style-type: none"> Pollinators incorporated into the Green-Schools and Eco-Schools Initiatives Increase numbers of school students, teachers, principals and caretakers exposed to pollinator information 	An Taisce – Green-Schools ROI; Keep Northern Ireland Beautiful – Eco-Schools NI
	<ul style="list-style-type: none"> Pollinators incorporated into the Green-Campus initiative Guidance Documents Existing and newly registered campus committees on the Green-Campus programme to be informed of the Plan 	An Taisce – Green-campus
A16. Adoption of pollinator friendly management within the National Trust network of sites and properties in N. Ireland	<ul style="list-style-type: none"> Undertake monitoring through the Bumblebee Monitoring Scheme at key NT properties Incorporate pollinators into property/land use management plans (where appropriate and when reviewed) 	National Trust

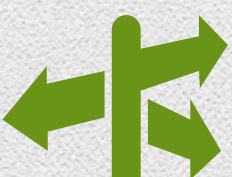
TARGET 1.2.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A17. Adoption of pollinator friendly management within the Bord na Mona network of sites *Note this is semi-state land	<ul style="list-style-type: none"> • Identification of potential pollinator friendly habitats on cutaway bogs • Identification of corridors to link pollinator friendly areas • Incorporate pollinator actions within the next BnM Biodiversity Action Plan 	Bord na Mona
A18. Adoption of pollinator friendly management within BirdWatch Ireland reserves where appropriate	<ul style="list-style-type: none"> • Undertake monitoring through the Bumblebee Monitoring Scheme at key reserves • Maintain habitats for nesting bees • Incorporate pollinators into reserve management plans (where appropriate and when reviewed) • Support pollinator policy and advocacy work where appropriate through developing and strengthening integrated biodiversity policies and actions 	BirdWatch Ireland
A19. Adoption of pollinator friendly management within RSPB reserves where appropriate	<ul style="list-style-type: none"> • Undertake monitoring through the Bumblebee Monitoring Scheme at key reserves • Maintain habitats for nesting bees • Incorporate pollinators into reserve management plans (where appropriate and when reviewed) 	RSPB
A20. Encourage pollinator friendly management of national monuments and historic properties	<ul style="list-style-type: none"> • Number of participating sites 	An Taisce, NIEA
A21. Adoption of pollinator friendly management within the National Botanic Gardens network of sites	<ul style="list-style-type: none"> • Number of participating sites 	OPW
A22. Investigate whether local communities can be encouraged and supported to take pollinator friendly management actions by Local Development Companies	<ul style="list-style-type: none"> • Development of a blueprint for community involvement in implementing the Pollinator Plan [Action 47] • SECAD & Ballyhoura Development Ltd. to act as test cases for roll out through a Local Development Company • Engagement with the ILDN (Irish Local Development Network) to investigate whether this could be rolled out nationally 	Steering group; SECAD, Ballyhoura Development Ltd.
A23. Make information on pollinator friendly management available through the Tidy Towns Initiative	<ul style="list-style-type: none"> • Promotion of pollinator actions within the initiative • Growth in the number of towns adopting actions within public spaces 	Tidy Towns
A24. Pollinator friendly garden actions promoted within the Community Garden Network	<ul style="list-style-type: none"> • Promotion to members • Uptake by members 	Community Garden Network



TARGET 1.2.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A25. Promote the development of reference sites and case studies across public land to act as education and training tools	<ul style="list-style-type: none"> Partners to consider making sites that are managed in a pollinator friendly way available as reference sites 	All partners
	<ul style="list-style-type: none"> The location of reference sites made available 	National Biodiversity Data Centre (IPI)
	<ul style="list-style-type: none"> Development of publicly available case studies that can act as a tool to others considering pollinator friendly management 	National Biodiversity Data Centre (IPI), relevant partners
A26. Development of cost-benefit analyses providing land managers with information on the cost implications of management actions e.g., regular spraying and mowing versus twice annual cut and removal of grass [Action 68]	<ul style="list-style-type: none"> Identification of all cost-benefit analyses that would be useful 	Steering group
	<ul style="list-style-type: none"> Completion of these cost-benefit analyses and appropriate dissemination of information <p>Note: this is a research action that will be dependent on funding</p>	Academic partners
A27. Promote the Pollinator Plan to other organisations involved in managing public or semi-state land	<ul style="list-style-type: none"> Increase in the number of other organisations supporting the Plan 	Steering group

Examples of pollinator friendly actions that can be taken on public land.

- 1 The most important action that can be taken on public land is to reduce the frequency of mowing to allow wildflowers to grow. Where possible, grassy areas should only be mown once or twice annually. They should be cut in early September to allow wild plants to flower and set seed. If doing an early cut, mow in late spring after the first flush of dandelions. Remove grass when cut in order to reduce coarse grasses and increase wildflower diversity. On a wildflower-rich site, where feasible, grass should be turned after cutting to allow seeds to fall. Allow grassy areas to grow and carry out an initial species survey to determine if a seed mix is required. Where appropriate, mow paths through wildflower meadows so that the public can visit and enjoy the resource.
- 2 Plant a suite of pollinator friendly trees and shrubs that will flower throughout the pollinator season.
- 3 Reduce or eliminate the use of pesticides (insecticides, herbicides & fungicides) and fertilizers
- 4 Maintain or create good quality hedgerows
- 5 Create wild pollinator nesting habitat – areas of long grass for bumblebees; compacted bare soil or south/east facing banks of bare earth (soil, sand, clay, peat) for mining solitary bees; south facing stone walls, masonry, wooden structures or commercially available nest boxes for cavity nesting solitary bees.



Don't Mow Let it Grow - Approach to Garvagh Village (Co. Derry) showing a flower-rich verge which hosts Common Spotted-Orchid, Heath Spotted-Orchid, Northern Marsh-Orchid, Oxeye Daisy, Common Knapweed, Red Clover and Meadow Vetchling. A total of 33 flowering plants were recorded in 2014



TARGET 1.2.2

Target 1.2.2:
Create linking
areas of flower-rich
habitat along
transport routes

ACTION	PROGRESS MEASURE	RESPONSIBILITY
A28. Adoption of an All-Ireland scheme to create pollinator highways along road networks	<ul style="list-style-type: none"> Development of guidelines for pollinator friendly roadside management * 	Don't Mow Let it Grow Steering Group, Life lives on the Edge (Wexford CoCo), IWT, National Biodiversity Data Centre (IPI)
	<ul style="list-style-type: none"> Incorporation of pollinator actions into existing landscaping guidelines or environmental handbooks where appropriate and when reviewed 	Transport Infrastructure Ireland, Transport NI, Local Authorities
	<ul style="list-style-type: none"> Secure funding for the 'Don't Mow Let it Grow' NI pilot scheme Implement 'Don't Mow Let it Grow' pilot scheme and roll out to other areas Provide cost benefit analyses for a reduced mowing regime <p>Note: elements of this action are resource dependent & require identification of funding sources</p>	Don't Mow Let it Grow Steering Group
	<ul style="list-style-type: none"> Implement 'Networks for Nature' pilot scheme and roll out to other areas in ROI 	IWT
	<ul style="list-style-type: none"> Promote the future development of wildflower highways along roadsides where appropriate 	Don't Mow Let it Grow Steering Group, Wexford County Council (Life lives on the Edge), IWT, Fáilte Ireland
	<ul style="list-style-type: none"> Investigate whether pollinator friendly actions can be incorporated into the 'pure mile' project which encourages local community groups to manage a mile long stretch of road for biodiversity 	Steering group
A29. Adoption of an All-Ireland scheme to create pollinator highways along rail networks	<ul style="list-style-type: none"> Provision of guidelines for pollinator friendly rail network management * 	National Biodiversity Data Centre
	<ul style="list-style-type: none"> Incorporation of pollinator actions into existing biodiversity plans where appropriate and when reviewed Level of uptake 	Translink, Iarnród Éireann
A30. Adoption of an All-Ireland scheme to create pollinator highways along waterway towpaths	<ul style="list-style-type: none"> Provision of guidelines for pollinator friendly towpath management * 	National Biodiversity Data Centre, Waterways Ireland
	<ul style="list-style-type: none"> Incorporation of pollinator actions into existing biodiversity plans where appropriate and when reviewed Level of uptake 	Waterways Ireland
A31. Provision of pollinator friendly management guidelines to the National Trails Office who inspect 744 recreational trails (on public and private land)	<ul style="list-style-type: none"> Provision of guidelines 	Steering group
A32. Promote pollinator friendly management of future transport routes e.g., future greenway cycle routes	<ul style="list-style-type: none"> Guidelines on pollinator friendly management provided to those responsible for future transport routes 	Steering group

Target 1.2.3: Reduce the use of pesticides (insecticides, herbicides, fungicides) on public land

TARGET 1.2.3		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A33. Reduce pesticide application on roadsides and in public parks and green spaces	<ul style="list-style-type: none"> In conjunction with the National Action Plan for the Sustainable Use of Pesticides, develop best-practice guidelines to reduce their use and minimise risk to wild pollinators 	DOE, DECLG, Transport Infrastructure Ireland, Local Authorities
A34. Encourage safer application of pesticides	<ul style="list-style-type: none"> Support existing work to raise awareness on the responsible use of pesticides by enhancing online resources to provide clear and simple guidelines 	DAFM, AFBI, National Biodiversity Data Centre (IPI)



1.3 Making Ireland Pollinator Friendly: Private Land

Protecting the future of pollinators requires action by all of us. Whether you have a window box, multiple business properties or a golf course, you can play a role.

Private land targets for 2015-2020

- 1.3.1 Increase the number of gardens across Ireland that are pollinator friendly
- 1.3.2 Encourage businesses to become pollinator friendly

Target 1.3.1: Increase the number of gardens across Ireland that are pollinator friendly

TARGET 1.3.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A35. Pollinator friendly garden actions promoted within the Grow It Yourself (GIY) network - 50,000 members across Ireland	<ul style="list-style-type: none"> Provision of guidelines for pollinator friendly management * 	National Biodiversity Data Centre (IPI)
	<ul style="list-style-type: none"> Promotion to members Uptake by members Actions adopted at GIY HQ and used for demonstration purposes 	GIY
A36. Garden friendly pollinator actions promoted within the An Taisce Green Communities network	<ul style="list-style-type: none"> Provision of guidelines for pollinator friendly management * 	National Biodiversity Data Centre (IPI)
	<ul style="list-style-type: none"> Promotion to members Uptake by community groups 	An Taisce
A37. Encourage the public to take voluntary actions to make their gardens and rural lanes pollinator friendly	<ul style="list-style-type: none"> Creation of on-line resources providing clear guidelines on how to make your garden pollinator friendly Investigation of funding sources with a view to developing an All-Ireland garden pollinator scheme <p>Note: promotion of a public scheme is resource dependent & requires identification of funding sources</p>	National Biodiversity Data Centre (IPI) & partners
A38. Encourage the Garden Centre sector to provide information on plants that are pollinator friendly	<ul style="list-style-type: none"> Engagement with the sector and identification of actions that can be taken 	Steering group

Examples of pollinator friendly actions that can be taken in gardens:

- 1 Grow more flowers, shrubs and trees that provide nectar and pollen for pollinators. Try to make sure that your garden has at least one flowering food source from spring right through to winter e.g., Willow (early spring) – Dandelion (spring) - Clovers (early summer) – Lavender (late summer) – Ivy (autumn) – Mahonia (winter).
- 2 Leave small areas of your lawn uncut to allow plants like Clover and Bird's-foot trefoil to flower. Don't view Dandelions as a weed but as a vital spring food source for pollinators.
- 3 If your garden is large enough, let areas grow wild with long grass to create nesting habitat for wild pollinators.
- 4 Avoid using pesticides. Where absolutely necessary, use them sparingly. Always follow the instructions closely and try to avoid applying pesticides at times of the day when pollinators are active or when plants are in flower.
- 5 Try to avoid disturbing nesting or hibernating pollinators in areas like grass margins, bare soil, dead wood or walls.

TARGET 1.3.2		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A39. Encourage business properties to make their outdoor spaces more pollinator friendly (including country hotels, golf courses, quarries, retail car parks)	<ul style="list-style-type: none"> Provision of guidelines for pollinator friendly management of general outdoor spaces that are appropriate for business. Developed in packages that are in line with the environmental systems used in many businesses (such as ISO 14001/ BS8555).* Achieve a target of 60 businesses signed up by 2020 Develop case studies across business types Develop specific guidelines for the following: golf courses, country hotels, retail car parks, quarries * 	National Biodiversity Data Centre (IPI), NIEA
	<p>As part of the development of this plan, the following businesses have already agreed to adopt pollinator friendly actions within their properties:</p> <p>ABP food group – Ireland</p>	Individual businesses
	<ul style="list-style-type: none"> Disseminate this information to the business community 	Bord Bia

Target 1.3.2:
Encourage businesses to become pollinator friendly

It is hoped that ARENA Network, Business in the Community NI can get involved in A39, but it is dependent on organisational funding.



1.4 Supporting the creation of pollinator friendly habitat

Actions have been identified to make farmland, public land and private land more pollinator friendly. Many of these actions will involve changes in management practice to allow natural regeneration of wildflowers

and areas of nesting habitat. Where direct intervention is required, additional supporting actions are necessary to maximise the chance of success.

Target 1.4.1:
Supporting the
creation of pollinator
friendly habitat

TARGET 1.4.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A40. Support the availability of local provenance native wildflower seed for restoration of flower-rich habitats where natural regeneration is not possible	<ul style="list-style-type: none"> Support local industries/initiatives to provide an affordable source of native wildflower seed Adopt a voluntary quality standard to ensure availability of high quality native origin seeds for pollinator habitat restoration schemes Investigate mechanisms to provide training in the small scale collection, storage and use of local seed in local restoration projects 	Steering Group
	<ul style="list-style-type: none"> Development of a 'how-to' guide for the collection, storage and use of local seed 	True Harvest Seeds
A41. Investigate mechanisms for the sharing and exchange of machinery, skills & advice	<ul style="list-style-type: none"> Investigate mechanisms for machinery rings Investigate mechanisms for skill exchange & advice sharing 	Steering Group
A42. Ensure that the Pollinator Plan is compatible with other biodiversity initiatives	<ul style="list-style-type: none"> Liaise with other partners to ensure land management advice for promoting biodiversity is joined up and is not contradictory 	Steering Group

Notes: For actions that involve deliberately planting pollinator-friendly wildflowers on natural, semi-natural and agricultural land, local provenance native wildflower seed should be used. This means that the seed used is sourced in Ireland from native species.

For local authorities, farmers, or other land managers one of the biggest constraints can be machinery to manage hay meadows or larger wild flower meadows.





Species rich grassland © BEC

Species rich grassland © BEC



2

Raising awareness of pollinators and how to protect them

We need to raise public awareness so that people and organisations know how to help pollinators. Pollinators need access to food supplies from February to October when they are active. They also need places to shelter and nest during this period, and over the winter. Based on actions that have been shown to promote pollinator populations in other countries, we need to produce clear guidelines for farmers, land managers, gardeners and members of the public. Guidelines will build upon work carried out in other jurisdictions to ensure good practice and see existing resources used to their fullest extent.

Raising awareness targets for 2015-2020

- 2.1 Increase the number of people who are aware of pollinators and who understand the need for pollinator conservation
- 2.2 Promote education on pollinators and their conservation at primary, secondary and tertiary level
- 2.3 Provide clear information to different sectors on how to take action to protect pollinators

Target 2.1: Increase the number of people who are aware of pollinators and who understand the need for pollinator conservation

TARGET 2.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A43. Raise awareness of pollinators and their importance to the wider community	<ul style="list-style-type: none"> Track numbers of published media articles and interviews Creation of infographics with key pollinator messages distributed through social media Creation of a media toolkit Development of a range of promotional materials to promote pollinators Investigate whether national events should be organised and what form this should take Creation of an online portal where news and progress on the Plan can be shared 	All partners
A44. Organise a biennial pollinator meeting to bring together those implementing the Plan and other interested parties	<ul style="list-style-type: none"> Biennial pollinator meeting organised to provide a forum for reporting on progress within the Plan Pollinator meeting venue to rotate around provinces 	National Biodiversity Data Centre (IPI)
A45. Raise awareness of pollinators and existing initiatives at Local Authority/Council level	<ul style="list-style-type: none"> Existing pollinator initiatives promoted at local levels by the Heritage and Biodiversity Officer network 	Heritage and Biodiversity Officers
A46. Professional advice provided to clients/developers/land owners in relation to Ecological Impact Assessment (EclA) and mitigation design to include pollinator friendly measures	<ul style="list-style-type: none"> Advice to include increasing awareness of the importance of pollinators, encouraging habitat creation and enhancement measures; encouraging the preparation of Biodiversity Action Plans (BAPs) Implementation of training for CIEEM members 	CIEEM

TARGET 2.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A47. Develop a blueprint outlining how communities can make their local areas more pollinator friendly and assist in implementation of the Plan	<ul style="list-style-type: none"> Development of a local community blueprint on how to take action on pollinators 	Limerick's Buzzing, Ballyhoura Development Ltd., SECAD
A48. Promote the conservation of a rare and endangered Irish bumblebee species and use as an educational tool for threatened species conservation	<ul style="list-style-type: none"> Provision of online information on the Shrill Carder Bee - where it occurs, why it is in decline, and how it can be conserved 	National Biodiversity Data Centre (IPI)
	<ul style="list-style-type: none"> Promote conservation of the species through EclA, mitigation design, BAP work 	CIEEM
	<ul style="list-style-type: none"> Raise awareness and encourage conservation of this species at the site level 	BurrenBeo Trust, Limerick's Buzzing

TARGET 2.2		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A49. Produce pollinator educational materials that can be used within the curriculum of primary and secondary schools	<ul style="list-style-type: none"> Preparation of material Investigation of platforms and methodologies of delivery to build on existing initiatives <p>Note: this action is resource dependent & requires identification of funding sources</p>	An Taisce Green-Schools, Eco-Schools, OPAL, Learning Through Landscapes (Polli:Nation) with assistance from other partners
A50. Incorporate material on the identification and conservation of pollinators within agricultural and horticultural colleges	<ul style="list-style-type: none"> Incorporation within appropriate curriculums Use of this material to raise awareness among all farmers 	CAFRE, Teagasc
	<ul style="list-style-type: none"> Provide optional Bumblebee Monitoring Scheme training to raise awareness of wild pollinators and as a means to monitor the success of any pollinator friendly management actions implemented 	National Biodiversity Data Centre

Target 2.2: Promote education on pollinators and their conservation at primary, secondary and tertiary level

TARGET 2.3		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A51. Develop tailored suites of pollinator friendly management actions for all sectors and make available online *	<ul style="list-style-type: none"> Publication of guidelines for pollinator friendly management across all sectors Investigate mechanisms to provide certification (where appropriate) to sites taking pollinator actions 	National Biodiversity Data Centre (IPI) & partners
A52. Provide detailed 'how-to' guides for specific actions *	<ul style="list-style-type: none"> Publication online of a series of 'how-to' guides for implementation of key pollinator actions 	National Biodiversity Data Centre (IPI) & partners
A53. Provide training courses on pollinator friendly management options across sectors	<ul style="list-style-type: none"> Provision of training courses to accompany the respective 'how-to' guides (hedge laying, wildflower meadow creation, creation of nesting bee habitats, roadside verge management etc.) <p>Note: the provision of training is resource dependent & requires identification of funding sources</p>	Relevant partners

Target 2.3: Provide clear information to different sectors on how to take action to protect pollinators

3

Managed pollinators - supporting beekeepers and growers

Managed pollinators have an important role to play in maintaining pollination service in Ireland. We need to support beekeepers in collecting data, and in improving the management of pest and disease risks. The importation of managed bees needs to be carefully regulated and increasingly restricted to native subspecies. New pests and diseases pose a continual threat (e.g. small hive beetle). Where importation of bees is necessary it is vital that existing Irish populations are protected through health screening, certification of all imports, and reproductive isolation from native populations.

Targets to support beekeepers & growers 2015-2020

- 3.1 Provide clear information on the distribution and condition of Irish honeybees
- 3.2 Support beekeepers in maintaining healthy honeybee populations
- 3.3 Support beekeepers in conserving native honeybee populations
- 3.4 Support growers by providing best practice advice on the use of imported bumblebee colonies

Target 3.1:
Provide clear information on the distribution and condition of Irish honeybees

TARGET 3.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A54. Maintain data on honeybee distribution	<ul style="list-style-type: none"> Identification of mechanisms for delivery of an All-Ireland honeybee map showing hive location and numbers Maintain annual data on winter losses Identification of a working group(s) to progress this action 	FIBKA, UBKA

Target 3.2:
Support beekeepers in maintaining healthy honeybee populations

TARGET 3.2		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A55. All-Ireland survey on disease prevalence in honeybees	<ul style="list-style-type: none"> Completion of national surveys Identification of mechanisms for delivery of an All-Ireland database on the prevalence of diseases in managed honeybee colonies 	Teagasc, AFBI, DAFM, DARD
A56. Identify the seasonal floral diversity available to honeybee colonies in Ireland	<ul style="list-style-type: none"> Participation of Ireland in the COLOSS CSI pollen project 	University of Limerick
A57. Ensure the ongoing regulation via health certification of the importation of honeybees, bumblebees and solitary bees.	<ul style="list-style-type: none"> With regards to managed pollinators, ensure appropriate health certification requirements are complied with Development of codes of practices for handling introductions of honeybees, bumblebees and solitary bees 	DAFM, DARD
A58. Provide beekeeper training in disease identification and treatment at the All-Ireland level	<ul style="list-style-type: none"> Identification of a delivery mechanism Delivery of training 	FIBKA, UBKA, NIHBS, INIB, AFBI



TARGET 3.3

ACTION	PROGRESS MEASURE	RESPONSIBILITY
A59. Develop an All-Ireland programme for the conservation of the native <i>Apis mellifera mellifera</i>	<ul style="list-style-type: none"> • Identification of a delivery mechanism for an All-Ireland conservation programme • Delivery of training 	NIHBS

Target 3.3: Support beekeepers in conserving native honeybee populations

TARGET 3.4

ACTION	PROGRESS MEASURE	RESPONSIBILITY
A60. Where horticultural growers find it necessary to use commercially imported bumblebees, provide advice on best practice	<ul style="list-style-type: none"> • Develop guidelines on importation, maintenance, disposal of commercial bumblebee colonies 	DAFM

Target 3.4: Support growers by providing best practice advice on the use of imported bumblebee colonies



4

Expanding our knowledge on pollinators and pollination services

The actions in this plan are based on studies that have been shown to promote pollinator populations. However, there are still gaps in our knowledge. In some situations we simply don't know the best management solution in the Irish context; in others we don't have a clear understanding of the full impact of further pollinator declines. We need to continually address these gaps through research so that we know the best and most cost-effective ways to protect our pollinators into the future.

Research targets 2015-2020

- 4.1 Identify evidence-based actions to promote pollinator populations in Ireland
- 4.2 Increase our understanding of the value of pollination service and the implications of pollinator loss
- 4.3 Understand the impact of pesticides on wild pollinators in an Irish context
- 4.4 Improve our understanding of bee health

Note: research actions are resource dependent & require identification of funding sources

Target 4.1:
Identify evidence-based actions to promote pollinator populations in Ireland

TARGET 4.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A61. Identify the most appropriate native wild flower plant mixes for pollinators in Ireland based on 8-10 key environmental typologies *	<ul style="list-style-type: none"> Collate existing knowledge to recommend the top plant species for different environmental conditions across the pollinating season Publish information on IPI website 	National Biodiversity Data Centre (IPI) & Plant Animal Interactions research group (TCD)
A62. Test methodologies and identify the most effective way to provide wild bee nesting habitat in the Irish context	<ul style="list-style-type: none"> Provide knowledge to inform conservation of existing and provision of new nesting habitat in farmland Determine best practice for small scale nest provision in rural and urban settings 	Plant Animal Interactions research group (TCD) & relevant partners
A63. Identify areas of importance to pollinators, and prioritise plans for restoration of pollinator habitat, based on those areas that will yield the greatest expected net benefits	<ul style="list-style-type: none"> Review publicly managed land in terms of suitability for key pollinator populations Identify current areas suitable for pollinators, particularly rare and threatened species Identify the most appropriate locations for linking areas to allow pollinators to move around the landscape Feed this information into active initiatives to improve future site selection with a view towards creating linked habitats across the landscape [Action 76] 	National Biodiversity Data Centre (IPI) and partners

Target 4.2:
Increase our understanding of the value of pollination service and the implications of pollinator loss

TARGET 4.2		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A64. Determine the economic value of pollination for food and non-food crops	<ul style="list-style-type: none"> • Use pollinator requirement and production/ yield data to determine marginal values for fruit/ seed crops (including fodder crops) • Determine non-market values of pollinators and pollination services 	Plant Animal Interactions research group (TCD); National Biodiversity Data Centre (IPI); NIEA (Biodiversity Unit); and others
A65. Understand the relative contribution of different pollinator taxa to prioritise conservation strategies for the delivery of pollination and natural pest control services	<ul style="list-style-type: none"> • Analyse plant-insect interaction database to determine relative abundance of different flower visitors versus their importance as pollinators for particular plant species, as well as potential as biocontrol agents (hoverflies) [Action 11] • Publish information on IPI website 	Plant Animal Interactions research group (TCD); National Biodiversity Data Centre (IPI)
A66. Integrate plant and land-cover data to generate floral resource heat-maps for Ireland showing which areas can provide adequate nutrition for pollinators and have the potential to provide pollination services for adjacent insect-pollinated crops	<ul style="list-style-type: none"> • Integrate data and produce national level maps [Action 12] 	Plant Animal Interactions research group (TCD); National Biodiversity Data Centre (IPI)
A67. Develop predictive models to determine the economic impacts of land-use changes on pollinators and pollination services	<ul style="list-style-type: none"> • Develop technologies to database, map, and evaluate pollination service in Ireland [Action 12] 	Plant Animal Interactions research group (TCD); National Biodiversity Data Centre (IPI); and others
A68: Carry out a series of cost benefit analyses for pollinator friendly actions	<ul style="list-style-type: none"> • Build on existing studies to determine the costs and benefits of pollinator friendly actions (e.g. legume-rich grassland vs. artificial fertilizer application; reduced mowing regime; changes in pesticide use), particularly on farmland, public and semi-state land 	Plant Animal Interactions research group (TCD); and others
A69. Determine how pollinators and pollination services vary according to the surrounding landscape at a range of scales	<ul style="list-style-type: none"> • Understand how land-use at different scales relates to pollinator abundance/ diversity and pollination services 	Plant Animal Interactions research group (TCD)

Target 4.3:
Understand the impact of pesticides on wild pollinators in an Irish context

TARGET 4.3		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A70. Determine the response of wild pollinators to pesticide use in the Irish context	<ul style="list-style-type: none"> • Determine levels of exposure and impacts of pesticides on pollinators in grass-dominated agricultural landscapes 	Plant Animal Interactions research group (TCD); DAFM; and others

Target 4.4:
Improve our understanding of bee health

TARGET 4.4		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A71. Determine variation in and prevalence of bee diseases/ pathogens and investigate options for management of bee health	<ul style="list-style-type: none"> • Improved understanding of prevalence, distribution, and management of disease in both wild and managed bees 	Bee Research Centre at NUI Galway; and others

5

Collecting evidence to track change and measure success

This Plan is about creating an Ireland where pollinators can survive and thrive. To measure success we need baseline data of where pollinators occur and how abundant they are, and we need to monitor how that changes into the future. That is the ongoing goal of the Irish Pollinator Initiative which was set up by the National Biodiversity Data Centre in 2011 to drive pollinator conservation through better data.

In parallel to tracking changes across the landscape, it is important that we track the impact of implemented actions made on farmland, public, semi-state and private land to the diversity and abundance of our pollinators.

By tracking change on a site basis we can determine what works best, and future actions can evolve to become as effective as possible.

Tracking change targets 2015-2020

- 5.1 Build taxonomic capacity so that we can collect better information on our pollinators
- 5.2 Monitor changes in the abundance and distribution of wild pollinators across Ireland
- 5.3 Provide mechanisms to track progress in implementation of the Plan

Target 5.1:
Build taxonomic capacity so that we can collect better information on our pollinators

TARGET 5.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A72. Increase the number of active recorders who can accurately identify pollinator species	<ul style="list-style-type: none"> Run annual identification workshops and field based events 	National Biodiversity Data Centre (IPI), CEDaR, CIEEM & relevant partners
	<ul style="list-style-type: none"> Increase the number of online identification resources available through the IPI 	National Biodiversity Data Centre (IPI)

Target 5.2:
Monitor changes in the abundance and distribution of wild pollinators across Ireland

TARGET 5.2		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A73. Maintain data on wild pollinator distribution and make available through an online Atlas of Irish pollinators	<ul style="list-style-type: none"> Growth of the All-Ireland bee database Growth of All-Ireland hoverfly database Display of information through an online Atlas of Irish pollinators 	National Biodiversity Data Centre (IPI)

TARGET 5.2		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A74. Monitor wild pollinators across the landscape to detect the early warning signs of a threat to Irish pollination service	<ul style="list-style-type: none"> Continue to support and grow the All-Ireland Bumblebee Monitoring Scheme Provide training to all interested parties 	National Biodiversity Data Centre (IPI)
	<ul style="list-style-type: none"> Use the All-Ireland Bumblebee Monitoring Scheme as a mechanism to assess the success of site based actions taken to wild pollinator populations. Voluntary training to be provided by the Data Centre 	National Trust, BnM, BirdWatch Ireland, RSPB, Local Authorities, Ulster Wildlife, Community Garden Network; SECAD; Ballyhoura Development Ltd., others as appropriate
	<ul style="list-style-type: none"> Establish a national sampling framework for solitary bees and hoverflies that identifies the most efficient way to collect data to assess changes in conservation status (Red List) at 10 yearly intervals Initiate an All-Ireland bee and hoverfly survey within this sampling framework in collaboration with academic partners (note: this action is resource dependent) 	National Biodiversity Data Centre (IPI)

Target 5.3:
Provide mechanisms to track progress in implementation of the Plan

TARGET 5.3		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A75. Develop a publicly available online management system to track progress in the 81 actions within this Plan. *	<ul style="list-style-type: none"> Development of a system where those who have responsibility for an action can log on and submit annual progress reports Use of the online management system 	National Biodiversity Data Centre (IPI)
A76. Develop an publicly available online system to map locations where pollinator friendly actions have been taken with a view towards creating an integrated network of pollinator habitat across the landscape *	<ul style="list-style-type: none"> Development of a system where all those who have taken pollinator friendly actions (farmers, schools, land managers, individuals) can log their location and the action(s) taken. System to be interactive and show progress in the creation of pollinator friendly habitat across the landscape 	National Biodiversity Data Centre (IPI)
A77. Provide an evidence base to advise, support & monitor pollinator friendly actions so that they can become as effective as possible	<ul style="list-style-type: none"> Provide a framework for individuals or organisations to monitor the impacts of site based actions to create pollinator habitat within farmland, public and private land in terms of changes in wild pollinator populations present [Action 74] Use of the emerging online map of pollinator friendly habitat [action 76] to direct future actions to the most appropriate areas Where sites are being monitored and actions are not proving effective, this to be investigated so that future actions can become as effective as possible 	National Biodiversity Data Centre (IPI) & partners

Delivery Of The Plan And Measuring Progress

The All-Ireland Pollinator Plan is voluntary. Organisations who have endorsed an action take responsibility for its delivery.

Some goals may be achieved using existing policies and initiatives. Others will require us to do things differently and to develop new projects and find new sources of funding.

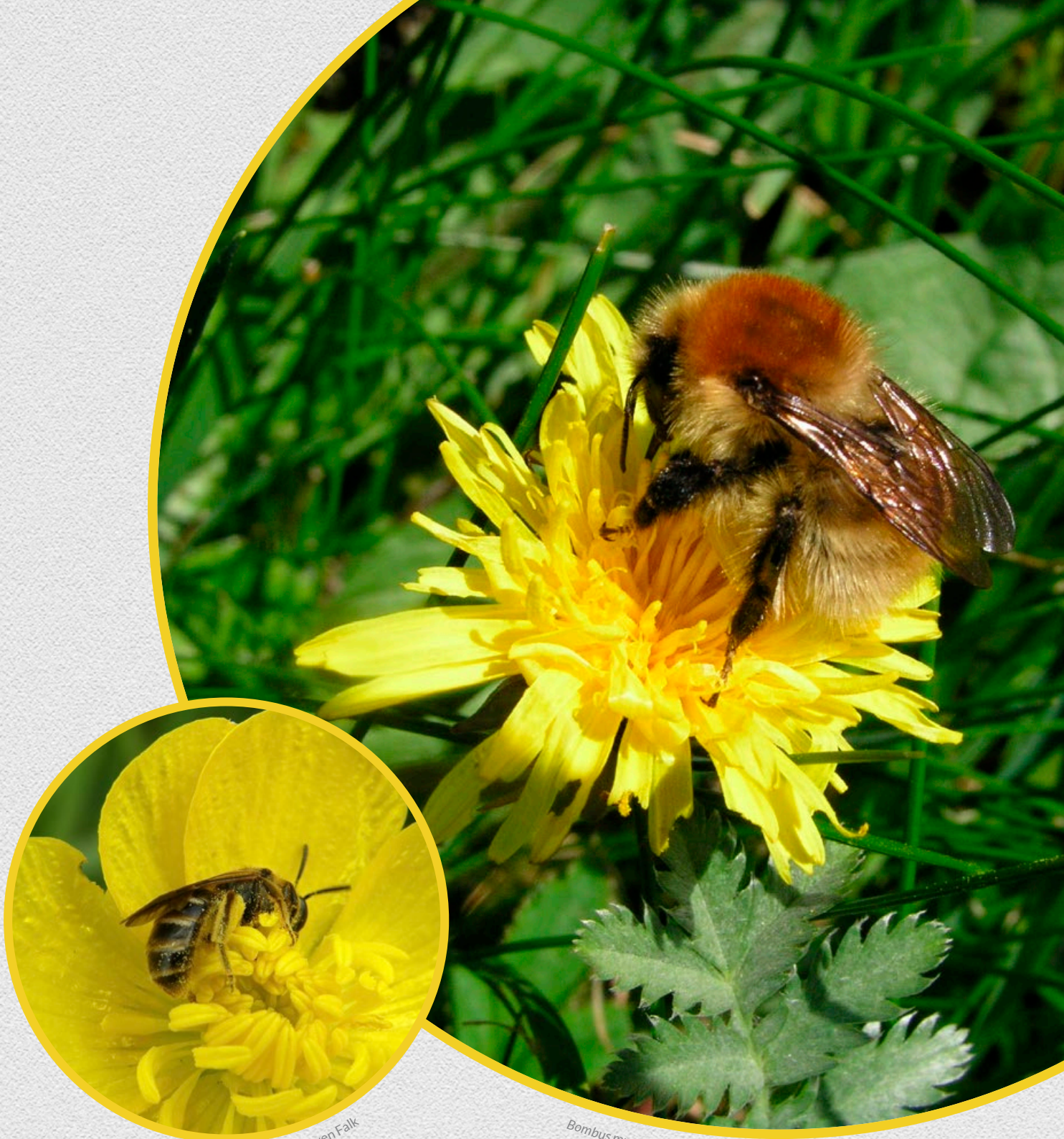
The following general actions are identified:

The following general actions are identified:

TARGET 5.1		
ACTION	PROGRESS MEASURE	RESPONSIBILITY
A78. Annually review the steering group	<ul style="list-style-type: none"> Review the steering group annually and expand/restructure as required 	Steering group
A79. Establish a subgroup on funding and innovation to progress the funding needs within implementation of the Plan *	<ul style="list-style-type: none"> Establish a subgroup to investigate existing funding options (e.g., Cap II, LIFE, INTERREG) and discuss future innovations Group to liaise with the DoELG and Local Authority Environmental Awareness Officers to prioritise pollination initiatives in Agenda 21 grants 	Steering group
A80. Incorporation of the Pollinator Plan into future relevant national strategies	<ul style="list-style-type: none"> Promotion of the Plan to relevant organisations 	Steering group
A81. Renew the Plan in 2020	<ul style="list-style-type: none"> A new version of the Pollinator Plan to be developed for 2020-2025 	Steering group

The steering group will oversee progress within the Plan through:

- Publication of a mid-term review at the beginning of 2018
- Development and use of an online management system to track progress in the 81 actions within this Plan. Those organisations with responsibility for actions will be requested to submit short annual progress reports into the system by the 30th November each year, beginning 2016.
- Organisation of a biennial event where those involved in implementation of the Plan can get together and report on progress [action 44].
- Mechanisms will be created to measure the number of individual site based actions that are taken [action 76]. This Plan aims to create a joined-up network of diverse and flower-rich habitats to support pollinators across Ireland. An online map of pollinator friendly sites will track progress towards this goal.
- Ultimately, success will be measured in increases in the abundance and diversity of pollinators within the Irish landscape [actions 73 and 74].



Lasiglossum calceatum ©Steven Falk

Bombus muscorum ©John Breen



Acronyms

List of acronyms used in the Plan:

ACRONYMS		
AFBI	Agri-Food and Biosciences Institute	NI
BnM	Bord na Mona	ROI
CAFRE	College of Agriculture, Food and Rural Enterprise	NI
CEDaR	Centre for Environmental Data and Recording	NI
CIEEM	Chartered Institute of Ecology and Environmental Management	ROI & NI
DAFM	Department of Agriculture, Food & the Marine	ROI
DAHG	Department of Arts, Heritage and the Gaeltacht	ROI
DARD	Department of Agriculture and Rural Development	NI
DECLG	Department of the Environment, Community and Local Government	ROI
DEFRA	Department for Environment Food & Rural Affairs	UK
DOE	Department of the Environment	NI
FIBKA	Federation of Irish Beekeepers' Associations	ROI
GIY	Grow it Yourself	ROI & NI
INIB	Institute of Northern Ireland Beekeepers	NI
IPI	Irish Pollinator Initiative – National Biodiversity Data Centre	ROI
IWT	Irish Wildlife Trust	ROI
NIEA	Northern Ireland Environment Agency	NI
NIHBS	Native Irish Honey Bee Society	ROI
NPWS	National Parks and Wildlife Service	ROI
TII	Transport Infrastructure Ireland (previously National Roads Authority)	ROI
TCD	Trinity College Dublin	ROI
OPAL	Open Air Laboratories	UK
OPW	Office of Public Works	ROI
RSPB	Royal Society for the Protection of Birds	UK
SECAD	South and East Cork Area Development	ROI
UFU	Ulster Farmers Union	NI
UKBA	Ulster Beekeepers Association	NI
UW	Ulster Wildlife	NI

References

- ¹Gallai, N., Salles, J.-M., Settele, J. & Vaissière, B. E. (2009) Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. *Ecological Economics*, 68: 810-821
- ²Hanley, N., Ellis, C. & Breeze, T. (2013) Accounting for the value of pollination services. Issue Paper 1.3 Valuation for Accounting Seminar 11/11/2013.
- ³Bullock, C., Kretch, C. & Candon, E. (2008) The Economic and Social Aspects of Biodiversity: Benefits and Costs of Biodiversity in Ireland. In: Department of the Environment Heritage and Local Government (ed.). Dublin: Government of Ireland.
- ⁴UK National Ecosystem Assessment: Northern Ireland summary (2011) <http://www.nienviromentlink.org/cmsfiles/policy-hub/files/documentation/Eco/Northern-Ireland-NEA-Summary.pdf>
- ⁵Stanley, D., Gunning, D. & Stout, J. (2013) Pollinators and pollination of oilseed rape crops (*Brassica napus* L.) in Ireland: ecological and economic incentives for pollinator conservation. *Journal of Insect Conservation*, 17: 1181-1189.
- ⁶Allsopp, M. H., De Lange E, W. J. & Veldtman, R. (2008) Valuing Insect Pollination Services with Cost of Replacement. *PLoS ONE*, 3, e3128.
- ⁷Klatt, B. K., Holzschuh, A., Westphal, C., Clough, Y., Smit, I., Pawelzik, E. & Tscharrntke, T. (2014) Bee pollination improves crop quality, shelf life and commercial value. *Proceedings of the Royal Society B: Biological Sciences*, 281.
- ⁸Aizen, M.A., L.A. Garibaldi, S.A. Cunningham & A.M. Klein (2008) Long-term global trends in crop yield and production reveal no current pollination shortage but increasing pollinator dependency. *Current Biology*, 18: 1572-1575.
- ⁹Eilers, E. J., Kremen, C., Smith Greenleaf, S., Garber, A. K. & Klein, A.-M. (2011) Contribution of Pollinator-Mediated Crops to Nutrients in the Human Food Supply. *PLoS ONE*, 6, e21363.
- ¹⁰Ellis, A.M., Myers, S.S., Ricketts, T.H. (2015) Do Pollinators Contribute to Nutritional Health? *PLoS ONE* 10(1): e114805.
- ¹¹Brittain, C., Kremen, C., Garber, A. & Klein, A.-M. (2014) Pollination and Plant Resources Change the Nutritional Quality of Almonds for Human Health. *PLoS ONE*, 9, e90082.
- ¹²Fuller, R.A., Irvine, K.N., Devine-Wright, P., Warren, P.H. & Gaston, K.J. (2007) Psychological benefits of greenspace increase with biodiversity. *Biology Letters*, 3: 390-394.
- ¹³Ollerton, J., Winfree, R. and Tarrant, S. (2011) How many flowering plants are pollinated by animals? *Oikos*, 120: 321-326.
- ¹⁴UNEP (2010) UNEP Emerging Issues: Global Honey Bee Colony Disorder and Other Threats to Insect Pollinators. United Nations Environment Programme.
- ¹⁵Vicens, N. & Bosch, J. (2000) Pollinating efficiency of *Osmia cornuta* and *Apis mellifera* (Hymenoptera: Megachilidae, Apidae) on "Red Delicious" apple. *Environmental Entomology*, 29: 235-240.
- ¹⁶Kleijn, D., Winfree, R., et al. (2015) Delivery of crop pollination services is an insufficient argument for wild pollinator conservation. *Nature Communications* 6:7414
- ¹⁷Jauker, F., Bondarenko, B., Becker, H.C., & Steffan-Dewenter, I. (2012) Pollination efficiency of wild bees and hoverflies provided to oilseed rape. *Agricultural and Forest Entomology*, 14: 81-87.
- ¹⁸Orford, K. A., Vaughan, I. P. & Memmott, J. (2015) The forgotten flies: the importance of non-syrphid Diptera as pollinators. *Proceedings of the Royal Society B*. 282: 20142934.
- ¹⁹Johnson, R. (2008) Recent honey bee colony declines. (ed Resources Science and Industry Division). CRS Report for Congress.
- ²⁰Breeze, T. D., Bailey, A. P., Balcombe, K. G. & Potts, S. G. (2011) Pollination services in the UK: How important are honeybees? *Agriculture Ecosystems and Environment*, 142: 137-143.
- ²¹Stout, J. C., Power, E. F., Stanley, D. A. & Mullen, S. A. (2011) Pollinators and pollination networks in Irish farmland: implications for conservation of pollination services. *Conserving Farmland Biodiversity: Lessons Learned and Future Prospects* (eds D. Ó hUallacháin & J. A. Finn), pp. 34-35. Teagasc, Wexford, Ireland.
- ²²Winfree, R., Williams, N. M., Gaines, H., Ascher, J. S. & Kremen, C. (2008) Wild bee pollinators provide the majority of crop visitation across land-use gradients in New Jersey and Pennsylvania, USA. *Journal of Applied Ecology*, 45: 793-802.
- ²³Thomson, J. D. (2010) Flowering phenology, fruiting success and progressive deterioration of pollination in an early-flowering geophyte. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365: 3187-3199.
- ²⁴Garibaldi, L.A., et al. (2013) Wild Pollinators Enhance Fruit Set of Crops Regardless of Honey Bee Abundance. *Science*, 339(6127):1608-11.
- ²⁵Mallinger, R. E., & Gratton, C. (2014) Species richness of wild bees, but not the use of managed honey bees, increases fruit set of a pollinator-dependent crop. *Journal of Applied Ecology*, 52: 323-330.
- ²⁶Hoehn, P., Tscharrntke, T., Tylianakis, J. M. & Steffan-Dewenter, I. (2008) Functional group diversity of bee pollinators increases crop yield. *Proceedings of the Royal Society B: Biological Sciences*, 275: 2283-2291.
- ²⁷Carvalho, L. G., Seymour, C. L., Veldtman, R. & Nicolson, S. W. (2010) Pollination services decline with distance from natural habitat even in biodiversity-rich areas. *Journal of Applied Ecology*, 47: 810-820.
- ²⁸Classen A. et al. (2014) Bee pollination improves crop quality, shelf life and commercial value. *Proceedings of the Royal Society of London B* 281: 1775.
- ²⁹FitzPatrick Ú., Murray T.E., Byrne A., Paxton R.J., Brown M.J.F. (2006)



Regional Red List of Irish Bees, Publ. Rep. to National Parks and Wildlife Service (Ireland) and Environment and Heritage Service (N. Ireland).

³⁰Nieto, A., Roberts, S.P.M., Kemp, J., et al. (2014) European Red List of bees. Luxembourg: Publication Office of the European Union.

³¹Ricketts, T.H., Regetz, J., Steffan-Dewenter, I., et al. (2008) Landscape effects on crop pollination services: are there general patterns? *Ecology Letters*, 11: 499–515.

³²FitzPatrick, Ú., Murray, T. E., Paxton, R. J., Breen, J., Cotton, D., Santorum, V. & Brown, M. J. F. (2007) Rarity and decline in bumblebees - A test of causes and correlates in the Irish fauna. *Biological Conservation*, 136: 185–194.

³³Kleijn D. et al. (2009) On the relationship between farmland biodiversity and land-use intensity in Europe. *Proceedings of the Royal Society of London B*, 276: 903–909.

³⁴Berendse F. et al. (1992) Competition and nitrogen loss from plants in grassland ecosystems. *Ecology*, 73: 46–53.

³⁵Bakker J. & Berendse F. (1999). Constraints in the restoration of ecological diversity in grassland and heathland communities. *Trends in Ecology and Evolution*, 14 (2): 63–68.

³⁶Coffey, M. F., Barth, S., Hayes, K. & Breen, J. (2013) The health status of Irish honeybee colonies in 2006. *Irish Journal of Agricultural and Food Research*, 52: 39–51.

³⁷Murray, T. E., Coffey, M. F., Kehoe, E., & Horgan, F. G. (2013) Pathogen prevalence in commercially reared bumble bees and evidence of spillover in conspecific populations. *Biological Conservation*, 159: 269–276.

³⁸Graystock, P., Yates, K., Evison, S. E. F., Darvill, B., Goulson, D. & Hughes, W. O. H. (2013) The Trojan hives: pollinator pathogens, imported and distributed in bumblebee colonies. *Journal of Applied Ecology*, 50: 1207–1215.

³⁹Furst, M. A., McMahon, D. P., Osborne, J. L., Paxton, R. J. & Brown, M. J. F. (2014) Disease associations between honeybees and bumblebees as a threat to wild pollinators. *Nature*, 506: 364–366.

⁴⁰Tilman, D., Fargione, J., Wolff, B., et al.

(2001) Forecasting Agriculturally Driven Global Environmental Change. *Science*, 292: 281–284.

⁴¹Iwasa T. et al. (2004). Mechanism for the differential toxicity of neonicotinoid insecticides in the honey bee, *Apis mellifera*. *Crop Protection*, 23: 371–378.

⁴²Mullin, C.A., Frazier, M., Frazier, J.L., et al. (2010) High levels of miticides and agrochemicals in North American apiaries: implications for honey bee health. *PLoS ONE*, 5: e9754.

⁴³Henry, M.I., Beguin, M., Requier, F., et al. (2012) A Common Pesticide Decreases Foraging Success and Survival in Honey Bees. *Science* 1215039.

⁴⁴Whitehorn, P.R., O'Connor, S., Wackers, F.L., & Goulson D. (2012) Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production. *Science* 1215025.

⁴⁵Easton, A.H. & Goulson, D. (2013) The Neonicotinoid Insecticide Imidacloprid Repels Pollinating Flies and Beetles at Field-Realistic Concentrations. *PLoS ONE*, 8: e54819.

⁴⁶EASAC (2015) Ecosystem Services, Agriculture and Neonicotinoids. EASAC policy report 26, April 2015, ISBN: 978-3-8047-3437-1.

⁴⁷Goulson, D. (2013) An overview of the environmental risks posed by neonicotinoid insecticides. *Journal of Applied Ecology*, 50: 977–987.

⁴⁸Zhao, Y., Singleton, P., Meredith, S. & Rennick, G.W. (2013) Current status of pesticides application and their residue in the water environment in Ireland. *International Journal of Environmental Studies*, 70: 59–72.

⁴⁹Power, E. F. & Stout, J. C. (2011) Organic dairy farming: impacts on insect–flower interaction networks and pollination. *Journal of Applied Ecology*, 48: 561–569.

⁵⁰Fründ, J., Zieger, S. L., & Tscharnkte, T. (2013) Response diversity of wild bees to overwintering temperatures. *Oecologia*, 173(4): 1639–1648.

⁵¹Rasmont P., Franzén M., Lecocq T., et al. (2015) Climatic Risk and Distribution Atlas of European Bumblebees. *Biorisk* 10 (Special Issue), 246 pp.

⁵²Memmott, J., Craze, P. G., Waser, N. M. & Price, M. V. (2007) Global warming and the disruption of plant–pollinator

interactions. *Ecology Letters*, 10: 710–717.

⁵³Hegland, S. J., Nielsen, A., Lázaro, A., Bjerknes, A.-L. & Totland, Ø. (2009) How does climate warming affect plant–pollinator interactions? *Ecology Letters*, 12: 184–195.

⁵⁴Goulson, D. (2010) Impacts of non-native bumblebees in Western Europe and North America. *Applied Entomology and Zoology*, 45: 7–12.

⁵⁵Blackmore, L. M. & Goulson, D. (2014) Evaluating the effectiveness of wildflower seed mixes for boosting floral diversity and bumblebee and hoverfly abundance in urban areas. *Insect Conservation and Diversity*, 7: 480–484.

⁵⁶Comba, L., Corbet, S. A., Hunt, L., & Warren, B. (1999) Flowers, nectar and insect visits: Evaluating British plant species for pollinator-friendly gardens. *Annals of Botany*, 83(4): 369–383.

⁵⁷Larson, J. L., Kesheimer, A. J. & Potter, D. A. (2014) Pollinator assemblages on dandelions and white clover in urban and suburban lawns. *Journal of Insect Conservation*, 18: 863–873.

⁵⁸Blaauw, B. R., & Isaacs, R. (2014) Flower plantings increase wild bee abundance and the pollination services provided to a pollination-dependent crop. *Journal of Applied Ecology*. DOI: 10.1111/1365-2664.12257

⁵⁹Kells, A. R., Holland, J. M., & Goulson, D. (2001) The value of uncropped field margins for foraging bumblebees. *Journal of Insect Conservation*, 5(4): 283–291.

⁶⁰Potts, S. G., Woodcock, B. A., Roberts, S. P. M., Tscheulin, T., Pilgrim, E. S., Brown, V. K., & Tallowin, J. R. (2009) Enhancing pollinator biodiversity in intensive grasslands. *Journal of Applied Ecology*, 46(2): 369–379.

⁶¹Gaston, K. J., Smith, R. M., Thompson, K., & Warren, P. H. (2005) Urban domestic gardens (II): experimental tests of methods for increasing biodiversity. *Biodiversity & Conservation*, 14(2): 395–413.

⁶²Stanley, D.A. & Stout, J.C. (2013) Quantifying the impacts of bioenergy crops on pollinating insect abundance and diversity: a field-scale evaluation reveals taxon-specific responses. *Journal of Applied Ecology*, 50: 335–344.



Not all supporting organisations provided logos for inclusion



www.biodiversityireland.ie/pollinator-plan

