

# **Assessment of Pilot Pollinator Action Areas**

## **Final Report**



**Prepared for Limerick City and County Council**

**By**

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## Summary

In order to give effect to the National Biodiversity Action Plan, Limerick City and County Council began trialling actions in 3 Pilot Pollinator Action Areas around Limerick city in June 2018: Corbally Road Meadow, College Park Meadow and a site on Childer's Road. This Report summarises the assessment, the aims of which were: to document the composition of the vegetation in the three areas; to assess the value to pollinators and other animals of the plant species in each area; to assess the impact if any of native and non-native invasive plants on these areas; to comment on the approaches being taken to encourage pollinator diversity and to advise on appropriate management regimes to encourage the more valuable plant species and discourage less valuable/invasive species.

Of the 3 sites comprising this study, the Corbally Road Meadow harbours the largest diversity of plants- 122 species. This is largely due to the size of the site and also the variation in soil type. Herbaceous perennials, biennials and annuals, most of which are pollinator-friendly, comprise 67% (79 species) of all plant species here. The Childer's Road Site contains a mosaic of habitats, and 104 species were recorded from site. The College Park Meadow was poorer in species (45 species).

In terms of value to pollinating insects, the Corbally Road meadow was much superior to the other two sites because of the range of plants present, their extent and the length of their flowering period. The Meadow has a high level of plant diversity and is probably the best semi-natural area of plant diversity within the city limits. The Childer's Road Site also had a wide range of pollinator plants, but in a smaller area. The value of this site to pollinators is compromised by the susceptibility of parts of the site to disturbance, and the on-going colonization by woody plant species. The College Road Meadow contains a much smaller range of pollinator plant species and is the least valuable to pollinating insects.

Autumn mowing and removal of the cut vegetation is recommended as the optimum strategy to encourage plant diversity in the Corbally Road Meadow, accompanied by active control of invasive species such as common horsetail, willows and docks. Introduction of some native species as seed is suggested. A similar approach is recommended for the College Park meadow. There is much more scope here for plant introductions, either as seed or by spot planting, but the success of this is dependent on reduction of the vigorous grass growth. In the Childer's Road Site, the frontal berm covered by grassland should be managed as described previously for the Corbally Road Meadow. There also scope for native pollinator plant introduction here. The main part of the Childer's Road Site, comprising the area of waste ground requires intervention and more active management if it is to be optimized for pollinators.

## 1. Introduction

The International Panel on Biodiversity and Ecosystem Services (IPBES) concluded in 2016<sup>1</sup> that pollinators, which are economically, ecologically and socially important, are increasingly under threat from human activities, including climate change, pesticide use and habitat loss. Wild pollinators (wild bees, hoverflies and other flies, butterflies and moths, and more) are critical to pollination even when managed bees are present in high numbers. The European Red List of Bees (2014) concluded that at the EU-27 level, 9.1% of bee species are threatened with extinction and a further 5.4% of bees are considered Near Threatened, while the status 55.6% of species is unknown<sup>2</sup>.

In September 2015 the All-Ireland Pollinator Plan (AIPP)<sup>3</sup> was launched by a multi-stakeholder steering group including 68 governmental and non-governmental organisations from the Republic of Ireland and Northern Ireland, and was published by the National Biodiversity Data Centre (NBDC). The Pollinator Plan identifies 81 actions under 5 main objectives:

- Making farmland, public land and private land in Ireland pollinator friendly.
- Raising awareness of pollinators and how to protect them.
- Managed pollinators – supporting beekeepers and growers.
- Expanding our knowledge on pollinators and pollination service.
- Collecting evidence to track change and measure success.

The Irish government's National Biodiversity Action Plan 2017-2021<sup>4</sup> aims to implement the All-Ireland Pollinator Action Plan and supports its business and farm guidelines. The AIPP recognises that local authorities can play a leading role in supporting pollinator diversity and populations. The National Biodiversity Data Centre guidance document "*Councils: Actions to help Pollinators*"<sup>5</sup> suggests actions under three headings:

**A. Protect what you have**, e.g. manage and restore semi-natural habitats and their native plants; Identify and protect existing sources of food and shelter for pollinators on general council land.

**B. Alter the frequency of mowing**, e.g. identify locations and create meadows that can be mown under low-intensity pollinator-friendly regimes.

**C. Pollinator-friendly planting**, e.g. plant native perennial wildflower meadows and hedgerows, select pollinator-friendly species for ornamental tree planting.

**D. Provide nesting habitats.**

**E. Reduce use of pesticides.**

In order to give effect to this plan, Limerick City and County Council began trialling these actions in some green areas around Limerick city. Three Pilot Pollinator Action Areas were included in this project, Corbally Road Meadow, College Park Meadow and a Childer's Road Site (Figs A1-A3. Appendix 1). The substance of this Report is the assessment of the areas. The aims of the assessment were to:

- Document the composition of the vegetation in the three areas.
- Assess the value to pollinators and other animals of the plant species in each area.
- To assess the impact if any of native and non-native invasive plants on these areas.
- Comment on the approaches being taken to encourage pollinator diversity.
- Advise on appropriate management regimes to encourage the more valuable plant species and discourage less valuable/invasive species.
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## **2. Methodology**

Monthly surveys were carried out at each of the three areas from June to September 2018 and from March to May 2019. The surveys were walk-over surveys that recorded the plant species present and in flower. Naming of plants (scientific names, common names and authorities) followed the species list of the Botanical Society of Britain and Ireland<sup>6</sup>. Photographs were taken of flowering, pollinator-friendly species. A report describing the species present in flower and their value to pollinating was submitted after each monthly survey. On the first survey (June 2019) a visual assessment was made of the relative abundance of plants using the DAFOR Scale (**D**ominant, **A**bundant, **F**requent, **O**ccasional, **R**are). The list of species was updated as new species came to light up to May 2019 (See Table 1, Appendix 2).

## **3. Descriptions of the Areas** (images in Appendix 2)

### **3.1 Corbally Road Meadow**

The Corbally Road Meadow is the largest of the three sites, covering approximately 1.4 ha and occupying a triangular strip located between the Corbally Road and the Abbey River. Three different areas are distinguished in the Corbally Road site: a small area of meadow at the southern end (A); a main central meadow area (B); an area of wetter meadow (C) (Fig. 1). Based on presence of certain plant indicators, the soil is neutral, to alkaline in drier areas in particular. Although mostly dry, in

area B there are small wetter depressions characterised by the dominance of sedges and rushes. Soil depth varies throughout the meadow; Areas A and C contain the deepest soils, while Area B contains areas of very shallow soil. As a consequence, the impact of drought on the vegetation in the dry summer of 2018 was much more severe in Area B than in the other Areas. Much of area C contains heavy soil with impeded drainage characterised by the presence of damp-loving plants such as rushes (*Juncus* spp.) meadow-sweet, ragged-robin, marsh bedstraw, purple loosestrife and fleabane.

### **3.2 The College Park Meadow**

This is a smaller meadow area of quite different character, located adjacent to the Corbally Road meadow. It contains a much smaller range of meadow plant species probably as a consequence of a more homogenous soil cover, more routine cutting and the absence of reseeding with a diverse seed mixture as in the Corbally Road meadow. The northern part of the meadow is adjacent to houses and has been routinely cut, whereas the southern part has a taller meadow sward, which appears to be cut perhaps only once a year at most (last cut in autumn 2018). In 2018, a diagonal strip was dug through the area for waterworks and grassland vegetation has not yet completely re-established on the strip. Soil moisture is higher in the southern half of the meadow as evidence by the presence of floating sweet grass, marsh bedstraw, fool's watercress and the relatively uncommon tubular water-dropwort (Fig. 18) all of which prefer damp soils.

### **3.3 Childers Road Site**

This is an area of approximately 0.75 ha adjacent to Childers Road and bounded by the Kilmallock Road, the Ballysimon Road and the railway line. Two distinct habitats are evident: a grassland area (A), most of which comprises a 1m-high berm, the front of which adjacent to the roadway is routinely cut, and area to the rear of this (B) which is a waste-ground habitat with patchy soil cover, poor drainage in places, bare ground and mounds of rock spoil. The site is a mosaic of unmanaged habitats which are converting to scrub.

## **4. Plant Diversity**

### **4.1 Corbally Road Meadow**

Of the 3 sites comprising this study, the Corbally Road Meadow harbours the largest diversity of plants- 122 species (Table 1, Appendix 3). This is largely due to the size of the site and also the variation in soil type. Within the Meadow, Area B contains the greatest diversity. Corbally Road meadow (Fig. 1), but grasses are probably the largest in terms of biomass. Grasses dominate in A and B (Yorkshire fog, crested dogs-tail, meadow grass and others), in combination with herbaceous perennial plants such as white and red clover, meadow vetchling, ribwort plantain, oxe-eye daisy, wild carrot, birds foot trefoil, creeping and, meadow buttercups. Grasses also dominate in C but

creeping bent, marsh foxtail, and floating sweet grass are more common here, along with damp-loving herbaceous perennials such as flag iris, purple loosestrife, meadowsweet, ragged robin, common spotted orchid, and sedges and rushes such as hard rush and hairy sedge.

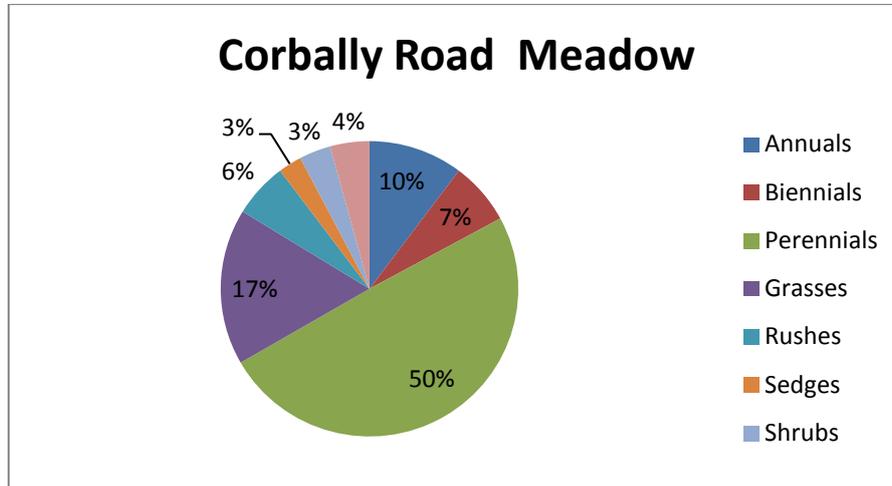


Fig. 1. Relative numbers of species (% of total) of different plant life forms in the Corbally Road Meadow.

Most of the plants encountered are widely distributed, with the exception of salad burnet, melilot and chicory. The latter two species are most likely a legacy of the seed mixture used in reseeding this site. The abundance of wild carrot and oxeye daisy is also a likely effect of this. Yellow rattle (*Rhinanthus minor*) was not recorded in 2018 but would be expected to occur in such a meadow habitat. It was introduced as seed in autumn 2018 and had established a number of colonies by spring 2019. Red bartsia, a hemi-parasite similar to yellow rattle was present, but at low densities. The composition of the vegetation reflects the effects of reseeding with a meadow seed mixture in spring 2017. Eight species are non-native, including the invasive Japanese knotweed, which forms a small colony on the southern edge of the meadow. Based on vegetation composition, the Corbally Road Meadow can be classified as semi-natural grassland using the Heritage Council classification<sup>7</sup>; the southern drier portion approximates to a “Dry Meadow” habitat (GS2) with features of “Calcareous and Neutral Grassland” (GS1), and the northern portion approaches “Wet Grassland” (GS4).

#### 4.2 College Park Meadow

A large proportion -25%- were grasses (Yorkshire fog, foxtail, meadow fescue, creeping bent and others and others) and these outstripped all others in terms of biomass. An unexpected occurrence is tubular water-dropwort (*Oenanthe fistulosa*) in the damp southern portion of the meadow. This has been recorded by Reynolds<sup>8</sup> from a number of locations in Limerick, including the swampy ground between the Abbey River and Corbally Road. The Corbally Park population is probably a

remnant of an older more extensive, but now vanished population. The Corrbally Park Meadow is species-poor compared to the previous and could be classified as “Improved Amenity Grassland “ with the wetter parts approximating to “Wet Grassland” (GS4). It has deeper soils with a higher level of fertility than the nearby Corrbally Road Meadow.

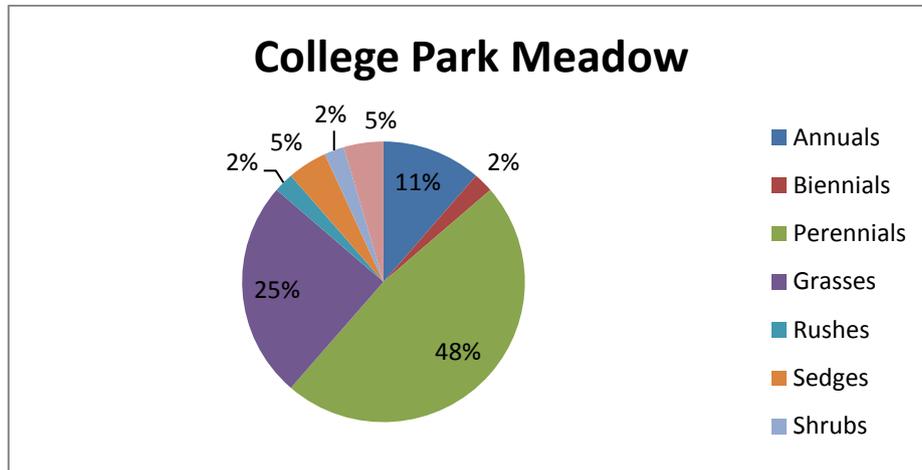


Fig. 2. Relative numbers of species (% of total) of different plant life forms in the College Park Meadow.

#### 4.3 Childer’s Road

A total of 104 species were recorded from the Childer’s Road site. The grassland habitat, which includes the frontal berm, contained 35 species, 21 (60%) of which were herbaceous perennials and 8 (23%) grasses (Fig. 3).

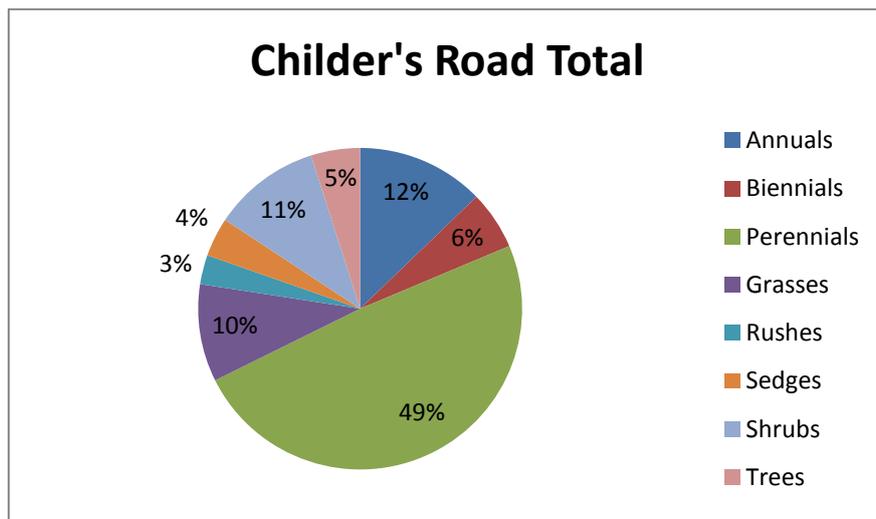


Fig. 3. Relative numbers of species (% of total) of different plant life forms in the Childer’s Road Site.

The comparatively low number of species reflects the relatively small area of grassland within the total area of the Childer's Road Site and the fact that the berm was reseeded in the recent past and has not had enough time to accumulate more species. Ten species are non-native, including the invasive butterfly bush and red valerian. The waste-ground area is much more extensive and varied in habitat, and this is reflected in the greater number of plant species -98. Weedy annuals, biennials and perennials are much more diverse here than in the grassland habitat. This habitat is completely unmanaged and much of it is likely to transition to scrub dominated by gorse, butterfly bush, sallies, traveller's joy and other woody species. The Childer's Road site included a mosaic of habitats: Dry Meadow (GS2), Open Scrub (WS1) and Disturbed Habitats (ED).

## **5. Value to Pollinators**

Insect pollinators include bees, two-winged flies (especially hoverflies), butterflies, wasps, beetles, moths and ants, among others. Bees are the most important group, comprising 99 species in Ireland including the domesticated honey bee. There are 180 species of hoverfly and 35 butterfly species recorded from Ireland<sup>9</sup>. The total number of pollinators is much greater; for example 1500 are listed from the UK. A pollinator visits flowers as a source of food (nectar and/or pollen), and in the process transfers pollen within and between flowers resulting ultimately in seed production. Many flowering plants have co-evolved with pollinating insects and consequently have flowers that attract pollinators by providing them with food. Some plant groups such as grasses, sedges, rushes and many tree species are wind-pollinated and are not utilized by pollinators. An important exception are the willows, the flowers of which are mainly wind-pollinated, but also produce nectar, and are a food source for pollinators in early spring when other sources of nectar and pollen are scarce. Plant species that are visited by pollinators are not equally valuable to pollinators; that value depends on the volume of nectar/pollen produced and its sugar and protein content, the abundance of the plant, and the length of its flowering season. For example members of the daisy family (Asteraceae) such as ox-eye daisy, knapweed, thistles, dandelions and other yellow flowered members of the family produce large volumes of nectar compared to other "pollinator-friendly" plants, but pollen of lower protein content which is less valuable to bee pollinators<sup>10,11</sup>. In contrast, annual plant species such as poppies may produce better pollen resources than perennials<sup>12</sup>, but smaller amounts of nectar, and generally have a shorter flowering period. Consequently, perennial meadows (such as Corbally Road) have been found to produce up to 20 times as much nectar, and 6 times as much pollen as annual meadows<sup>10</sup>. Clovers, vetches, trefoils and other members of the pea family (Fabaceae) produce pollen with a high protein content, which is valuable to bees in particular<sup>11</sup>.

The Corbally Road Meadow and the Childer’s Road Site harboured the largest number of pollinator plants -77 species each, and the College Park Meadow harboured only 18 species. Pollinator plants form the majority of the plant species in the Corbally Road Meadow and the Childer’s Road Site (63% and 66% respectively) and 50% in the College Park Meadow. The numbers of pollinator plants in flower on each of the sampling dates between June 2018 and May 2019 peaked in the summer months of June and July 2018, and May 2019 (Fig 4). The Childers Road site produced the greatest number in any month (44 in July 2010) but relatively few later in the summer. This probably reflects the greater number of short-flowering annual and biennials here compared to the Corbally Road Meadow where 21 species were still in flower in September, including red clover, yarrow, knapweed, hybrid knapweed, bird’s-foot trefoil, and autumn hawkbit, and providing a valuable late-season resource for pollinators.

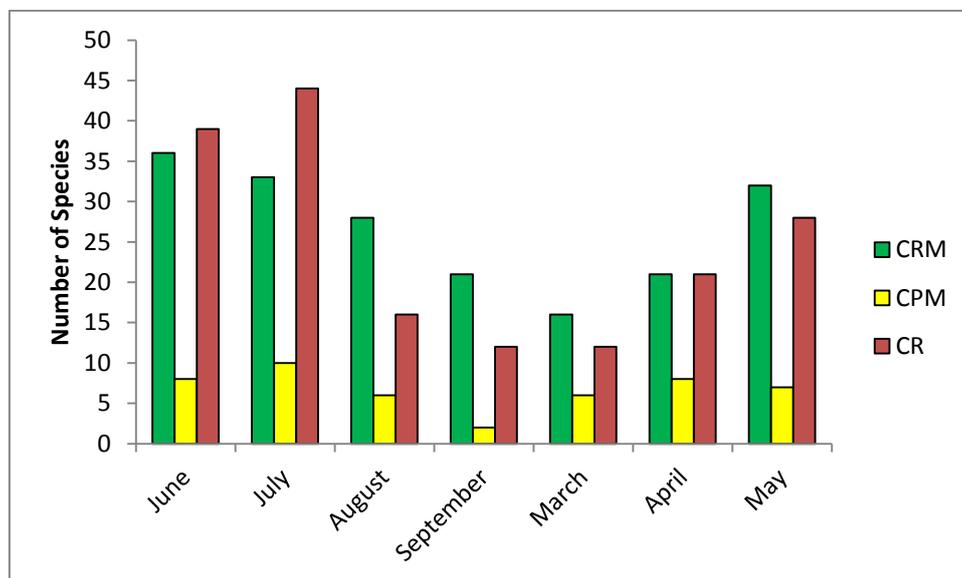


Fig. 4 . Numbers of pollinator plant species in flower in Corbally Road Meadow (CRM), College Park Meadow (CPM) and Childer’s Road site (CR) from June 2018 to May 2019.

The sequence of the main pollinator plants flowering at each of the sites from June 2018 to May 2019 (winter months excluded) is shown in Tables 1 and 2. The majority of the plants are herbaceous perennials, biennials or annual, but a number of shrubs and trees are included. The plants included are those that were the most abundant pollinator plants on-site on individual sampling dates based on visual assessment; pollinator plants that occurred less commonly are not included (see Table 1 Appendix 1 for a complete list).

Table 1. Sequence of main pollinator plant from June to September 2018. S=shrubs; T=Trees

2018	Corbally Road Meadow	College Park Meadow	Childer's Road Site
June	Oxe-eye daisy Red clover White clover Meadow vetchling Birds-foot trefoil Creeping buttercup Meadow buttercup Black medick Bush vetch Tufted vetch Yarrow Creeping thistle Chicory	Red clover White clover Meadow buttercup Creeping buttercup Marsh bedstraw Tubular water dropwort	Oxe-eye daisy Red clover White clover Birds-foot trefoil Meadow vetchling Creeping buttercup Black medick, Bush vetch Tufted vetch Red valerian Traveller's joy (S) Gorse (S)
July	Wild carrot Knapweed Chicory Red bartsia Red clover Fleabane Yarrow Meadowsweet Purple loosestrife Creeping thistle Common thistle Ragwort Rosebay willow-herb	Red clover White clover Meadow buttercup Marsh bedstraw Tubular water dropwort Common ragwort Great willow-herb	Knapweed Common ragwort Fennel Teasel Red valerian Common thistle Traveller's joy (S) Butterfly bush (S) Bramble (S)
August	Wild carrot Chicory Red clover Birds-foot trefoil Yarrow Meadowsweet Purple loosestrife Ragwort Hybrid knapweed Autumn hawkbit	Meadow buttercup	Butterfly bush (S) Red valerian Canadian fleabane Autumn hawkbit Yarrow
September	Yarrow Hybrid knapweed Knapweed Red clover Autumn hawkbit Birds-foot trefoil Black medick Meadow buttercup Viper's bugloss	Meadow buttercup	Butterfly bush Red valerian Canadian fleabane Autumn hawkbit Yarrow

Table 2. Sequence of main pollinator plant from March to May 2019. S=shrubs; T=Trees.

2019	Corbally Road Meadow	College Park Meadow	Childer's Road Site
March	Dandelion Daisy Meadow buttercup Lesser celandine Coltsfoot Wild turnip Cowslip Sally (S) Gorse (S)	Dandelion Daisy Meadow buttercup Lesser celandine Common mouse-ear	Dandelion Daisy Meadow buttercup Lesser celandine Coltsfoot Wild turnip Sally (S) Gorse (S) Wild cherry (T)
April	Meadow buttercup Ribwort plantain Black medick Red clover Smooth hawk's-beard Cowslip Ox-eye daisy Bush vetch Common vetch Wild turnip Sally (S) Gorse (S)	Meadow buttercup Creeping buttercup Lady's smock Common mouse-ear Daisy	Meadow buttercup Ribwort plantain Black medick Red clover Smooth hawk's-beard Bird's-foot trefoil Ox-eye daisy Bush vetch Common vetch Wild turnip Gorse (S)
May	Ox-eye daisy Red clover Birds-foot trefoil Meadow buttercup Black medick Ragged robin Knapweed Bush vetch Common vetch Smooth hawk's-beard Ribwort plantain Yellow rattle	Meadow buttercup Creeping buttercup Common mouse-ear Lady's smock Daisy	Ox-eye daisy Smooth hawk's-beard Birds-foot trefoil Black medick Red clover Knapweed Common vetch Bush vetch Red valerian

Some pollinator plants have a long flowering season (ox-eye daisy, red clover, knapweed, bird's-foot trefoils, yarrow) while others are more restricted in time; for example dandelions and cowslips in the early part of the growing season, and viper's bugloss in the late summer.

A number of the useful pollinator plants are non-native: hybrid knapweed, chicory, cornflower, musk-mallow, white melilot and ribbed melilot in the Corbally Road Meadow, and red valerian, butterfly bush, Canadian fleabane and cotoneaster in the Childer's Road site. The Corbally Road plants are probably a legacy of seed mixtures. Some of these are likely to decline in abundance over time; the mellilots and campions were not found in 2019 and cornflower was very uncommon-only two plants found in 2019. In contrast the non-native plants in Childers Road could be considered invasive, for example red valerian and butterfly bush.

In terms of value to pollinating insects, the Corbally Road Meadow was much superior to the other two sites because of the range of plants present, their extent and the length of their flowering period. The Meadow has a high level of plant diversity and is probably the best semi-natural area of plant diversity within the city limits. The meadow margins here are also a valuable habitat because they contain willows, bramble, gorse and a variety of tall herbaceous perennials such as nettles and thistles which are valuable to pollinating and non-pollinating invertebrates. The Childer's Road Site also had a wide range of pollinator plants, but in a smaller area. The value of this site to pollinators is compromised by the susceptibility of large parts of the site to disturbance, and the on-going colonization by woody plant species. The College Road Meadow contains a much smaller range of pollinator plant species and is the least valuable to pollinating insects.

## **6. Recommendations for Management**

As already mentioned, two of the main aims of the All-Ireland Pollinator Plan (AIPP) was to make farmland, public land and private land in Ireland pollinator friendly and to raise awareness of pollinators and how to protect them. The three areas described in this report are different and will require different management approaches to achieve these aims.

### **6.1 Corbally Road Meadow**

**Cutting regime:** This has a high degree of plant diversity corresponding to a semi-natural grassland, and has a large element of pollinator-friendly herbaceous perennials, biennials and annual plants. Of the three areas, it is by far the most valuable to pollinating insects and also to non-pollinating invertebrates, small mammals and birds. A meadow by definition is an anthropogenic and managed habitat; The aim of management should be to at least maintain, and preferably increase the diversity of pollinator plants. If left to its own, a meadow will become colonized by "weedy" herbaceous species and will transition to scrub and eventually woodland, which will support fewer pollinators over the summer period (but possibly a broader range of non-pollinator animals<sup>13</sup>). Cutting is an essential part of meadow management that prevents this transition. In 2018, cutting was carried out

in early October and the cut vegetation was left *in situ*. Autumn cutting facilitates late-flowering plant species such as yarrow and wild carrot. It also leaves available the seed heads of thistles and knapweed, which are attractive to seed-eating birds in autumn. However, leaving the cut sward continuously *in situ* is undesirable as it will form a “thatch” on the ground and encourage grass growth at the expense of herbaceous plants that are more valuable for pollinators, particularly in areas of the meadow such as Area B where grass cover is naturally heavy. It is therefore recommended that the cut sward be removed soon after a single cutting in late September/early October.

**Control of weedy and invasive species** : Colonization by docks and creeping thistles was evident in parts of the main meadow in 2018. Autumn cutting will not reduce the incidence of these because they will have set and dispersed their seed by then. Manual removal of the flowered stalks, taking care not to disperse the seed, is recommended as soon as possible in early summer. This was carried out in summer 2018 and seems to have been effective in reducing the incidence of these in 2019.

A more serious problem is the colonization by common horsetail (*Equisetum arvense*). This plant has a deep and extensive root system, which confers strong competitive abilities and allows the plant to thrive and spread in drought conditions such as prevailed in summer 2018. The colonized areas will need to be cut at least once, and preferably twice during the growing season. Repeated assiduously over a number of seasons, cutting may eliminate the horsetail. Careful spot-spraying with glyphosate or a selective herbicide such as triclopyr should be considered.

Encroachment by plants such as brambles, gorse canary grass and willows from the western hedgerow margin of the meadow can be addressed by maintaining a cut strip between the hedgerow and the meadow from spring onwards. This strip could replace the existing path through the centre of the meadow. Autumn cutting will not eliminate young willow saplings that have established in the centre of the meadow -manual removal of young saplings is recommended. A small colony of Japanese knotweed in area A should be eliminated.

**Plant Introductions:** The Corbally Road Meadow has a diverse range of pollinator plants so large-scale, deliberate introductions of additional species is not required. Yellow rattle, a hemi-parasite that reduces grass growth, was introduced as seed in autumn 2018 and has established a number of colonies. Broadcasting seed from these to other areas of the meadow is recommended. Devil’s-bit scabious (*Succisa pratensis*), a common pollinator plant of meadows, is absent and its introduction as seed or spot plants should be considered. Field scabious (*Knautia arvensis*) is a floriferous late-flowering pollinator plant that could be established in the drier parts of the meadow from seed, and could replace the non-native chicory, which is likely to decline over time.

## 6.2 College Park Meadow

**Cutting regime:** There is a very limited range of pollinator plants in this meadow, so the cutting regime should be designed to assist these to establish, whether by natural colonization or deliberate introductions. The fertile soil and heavy grass sward is an obstacle to successful introductions of herbaceous pollinator plants. Cutting and removal of the cut will over time reduce the vigour of the dominant grass sward. Two cuttings per year should be considered, the first early in growing season and the second no earlier than August or September as was done in 2018. It is essential that the cut vegetation be removed in order to reduce grass dominance.

Some casual dumping of garden waste occurred in 2018 and this will possibly increase if the meadow assumes a semi-natural appearance. A management plan for the meadow needs to be drawn up that involves consultation with local residents in order to find the optimum balance between amenity use of the meadow and sustaining its biodiversity value. The value of the meadow as a biodiversity resource should be highlighted by signage and information fliers to the local community.

**Plant Introductions:** There is scope to augment pollinator plants here by introductions; e.g. yellow rattle, knapweed, meadow vetchling, yarrow and bush vetch in the drier areas; and meadowsweet, tufted vetch, devil's bit scabious and purple loosestrife on the damper soils.

## 6.3 Childer's Road Site

The frontal part of the site, Area A- comprising the berm covered by grassland should be managed as described previously for the Corbally Road Meadow; i.e. a cut in September or October. It is important to suppress the growth of tussock-forming grasses here such as cocksfoot and false oat-grass, so the cut vegetation should be removed. Yellow rattle should be introduced as seed in autumn and consideration should be given to introduction of field scabious. The area of the berm behind the weighbridge has few pollinators. Seeds of ox-eye daisy and other flowering herbaceous plants should be spread here.

The main part of this site, Area B, is an extensive strip of waste ground that is fairly open and contains patches with a range of pollinator plants. If left unmanaged, the area will progress by the natural process of succession to open scrub, mainly of brambles, gorse and sally initially, and later of ash and sycamore and the value to pollinators will be reduced. Consideration should be given to establishing a meadow similar to the Corbally Road Meadow. This would require infill, levelling, topsoil and seeding with a perennial meadow seed mix. It would need to be separated from the pedestrian pathway and cycle lane by a physical barrier in order to prevent fly-tipping and temporary habitations.

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## Appendix 1

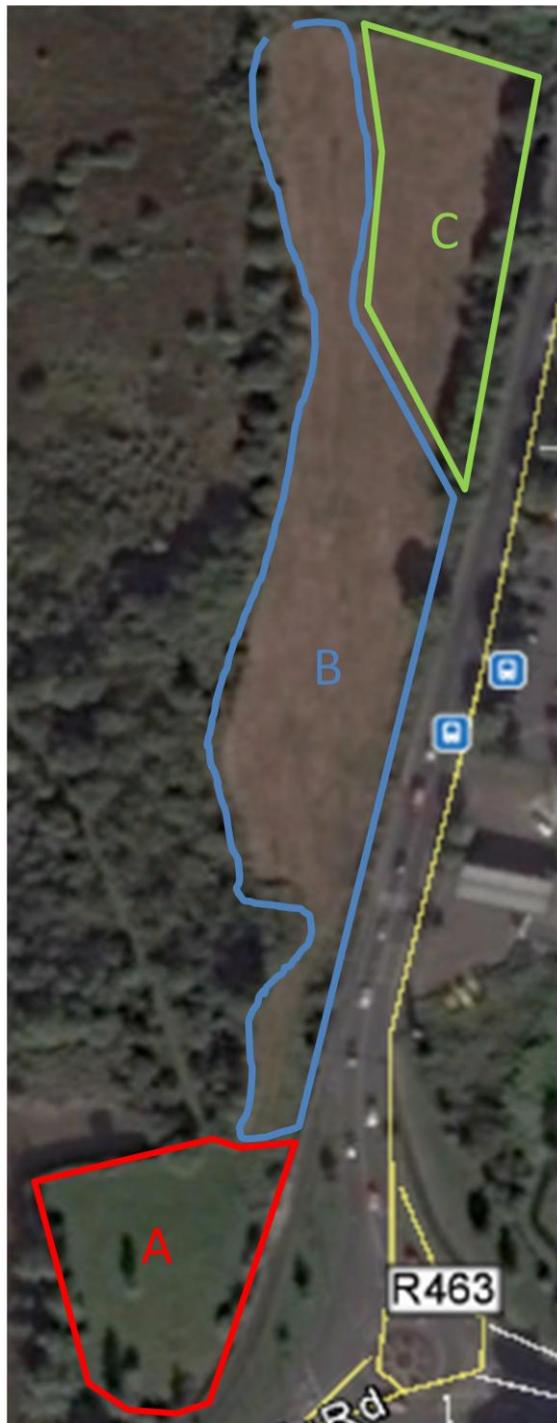


Fig. A1 Corbally Road Meadow



Fig. A2 College Park Meadow



Fig. A3. Childer's Road Site

## Appendix 2



Corbally Road Meadow June 2018



College Park Meadow April 2019



Frontal berm Childer's Road Site, May 2019.

### Appendix3

Table A1 List of Plant species recorded from Corbally Road Meadow (CR), College Park Meadow (CPM) and Childer's Road Site (CR). A=abundant; F=frequent; O=occasional; R=rare. Asterisk = onon-native plants. Type: P=pollinator plants.

Species	Authority	Common Name	CR M	CPM	CR	Type
<b>Herbaceous perennials</b>						
<i>Achillea millefolium</i>	L.	Yarrow	F		A	P
<i>Aegopodium podagraria</i>	L.	Ground-elder			R	P
<i>Anacamptis pyramidalis</i>	(L.) Rich.	Pyramidal Orchid			R	P
<i>Anthyllis vulneraria</i>	L.	Kidney Vetch	O			P
<i>Apium nodiflorum</i>	(L.) Lag.	Fool's-water-cress		O		
<i>Aquilegia sp.</i>		Columbine			R	P
<i>Arctium minus</i>	(Hill) Bernh.	Lesser Burdock			R	P
<i>Bellis perennis</i>	L.	Daisy		F		P
<i>Berula erecta</i>	(Huds.) Coville	Lesser Water-parsnip		O		
<i>Calystegia sepium</i>	(L.) R. Br.	Hedge Bindweed	O	O	O	P
<i>Calystegia silvatica</i>	(Kit.) Griseb.	Large Bindweed	O			P
<i>Cardamine pratensis</i>	L.	Cuckoo-Flower, Lady's Smock	F	A		P
<i>Centaurea nigra</i>	L.	Common Knapweed	A		F	P
<i>Centaurea nigra x jacea = C. x moncktonii*</i>	C.E. Britton	Hybrid Knapweed	F			P
<i>Centranthus ruber*</i>	(L.) DC.	Red Valerian			F	P
<i>Cerastium fontanum</i>	Baumg.	Common Mouse-ear	F		F	P
<i>Chamerion angustifolium</i>	(L.) Holub	Rosebay Willowherb	O		O	P
<i>Chrysanthemum sp.</i>					R	P
<i>Cichorium intybus*</i>	L.	Chicory	F			P
<i>Cirsium arvense</i>	(L.) Scop.	Creeping Thistle	F		F	P
<i>Crocsmia x crocosmiiflora*</i>	(Lemoine) N.E.Br.	Montbretia			O	P
<i>Dactylorhiza fuchsii</i>	(Druce) Soó	Common Spotted-orchid	R			P
<i>Epilobium hirsutum</i>	L.	Great Willowherb	F	O	O	P
<i>Equisetum arvense</i>	L.	Field Horsetail	A	A	F	
<i>Equisetum fluviatile</i>	L.	Water Horsetail		F		
<i>Fallopia japonica*</i>	(Houtt.) Ronse Decr.	Japanese Knotweed	R			
<i>Filipendula ulmaria</i>	(L.) Maxim.	Meadowsweet	A			P
<i>Foeniculum vulgare*</i>	Mill.	Fennel			O	P
<i>Galium palustre</i>	L.	Marsh-bedstraw	F	F	O	P
<i>Galium verum</i>	L.	Lady's Bedstraw	O			P
<i>Hypericum androsaemum</i>	L.	Tutsan			R	P
<i>Hypericum perforatum</i>	L.	Perforate St John's-wort			F	P
<i>Hypericum tetrapterum</i>	Fr.	Square-stalked St John's-wort			O	P

<i>Hypochaeris radicata</i>	L.	Cat's-ear	O		O	P
<i>Iris pseudacorus</i>	L.	Yellow Iris	O			P
<i>Lathyrus pratensis</i>	L.	Meadow Vetchling	A		F	P
<i>Leucanthemum vulgare</i>	Lam.	Oxeye Daisy	A		A	P
<i>Lotus corniculatus</i>	L.	Common Bird's-foot-trefoil	A		A	P
<i>Lotus pedunculatus</i>	Cav.	Greater Bird's-foot-trefoil			F	P
<i>Lychnis flos-cuculi</i>	L.	Ragged-Robin	F			P
<i>Lythrum salicaria</i>	L.	Purple-loosestrife	F			P
<i>Malva moschata*</i>	L.	Musk-mallow	R			P
<i>Medicago lupulina</i>	L.	Black Medick	A		A	P
<i>Oenanthe fistulosa</i>	L.	Tubular Water-dropwort		F		P
<i>Ophrys apifera</i>	Huds.	Bee Orchid			R	P
<i>Persicaria amphibia</i>	(L.) Delarbre	Amphibious Bistort	O			
<i>Persicaria maculosa</i>	Gray	Redshank		O		
<i>Petasites fragrans</i>	(Vill.) C. Presl	Winter Heliotrope	R			P
<i>Plantago lanceolata</i>	L.	Ribwort Plantain	A	A	A	P
<i>Potentilla anserina</i>	L.	Silverweed	F	F	O	P
<i>Potentilla reptans</i>	L.	Creeping Cinquefoil	O		A	P
<i>Primula veris</i>	L.	Cowslip	O			P
<i>Prunella vulgaris</i>	L.	Selfheal	F		O	P
<i>Pulicaria dysenterica</i>	(L.) Bernh.	Common Fleabane	F			P
<i>Ranunculus acris</i>	L.	Meadow Buttercup	A	A	A	P
<i>Ranunculus repens</i>	L.	Creeping Buttercup	A	A	A	P
<i>Rumex acetosa subsp. acetosa</i>	L.	Common Sorrel			O	
<i>Rumex crispus</i>	L.	Curled Dock	F	O	O	
<i>Rumex obtusifolius</i>	L.	Broad-leaved Dock	F	O	O	
<i>Rumex sanguineus</i>	L.	Wood Dock	O	O	R	
<i>Sanguisorba minor subsp. minor</i>		Salad Burnet	O			P
<i>Scorzoneroideis autumnalis</i>	(L.) Moench.	Autumn Hawkbit	A		A	P
<i>Scrophularia auriculata</i>	L.	Water Figwort	O			P
<i>Scrophularia nodosa</i>	L.	Common Figwort	O		O	P
<i>Senecio jacobaea</i>	L.	Common Ragwort	O		O	P
<i>Silene latifolia</i>	Poir.	White Campion	R			P
<i>Silene vulgaris subsp. vulgaris</i>		Bladder Campion	R			P
<i>Stachys sylvatica</i>	L.	Hedge Woundwort	R		O	P
<i>Stellaria graminea</i>	L.	Lesser Stitchwort	O		O	P
<i>Symphytum officinale</i>	L.	Common Comfrey			R	P
<i>Taraxacum vulgare agg.</i>		Dandelion	A		F	P
<i>Trifolium pratense</i>	L.	Red Clover	A	A	F	P
<i>Trifolium repens</i>	L.	White Clover	F	F	O	P
<i>Tussilago farfara</i>	L.	Colt's-foot	O		F	P
<i>Urtica dioica</i>	L.	Common Nettle	O	O	O	
<i>Veronica beccabunga</i>	L.	Brooklime	O			P
<i>Veronica chamaedrys</i>	L.	Germander Speedwell	O			P

<i>Vicia cracca</i>	L.	Tufted Vetch	F		O	P
<i>Vicia sepium</i>	L.	Bush Vetch	F		F	P
<b>Biennials</b>						
<i>Centaureum erythraea</i>	Rafn	Common Centaury			R	p
<i>Cirsium palustre</i>	(L.) Scop.	Marsh Thistle			O	p
<i>Cirsium vulgare</i>	(Savi) Ten.	Spear Thistle	O		O	p
<i>Crepis capillaris</i>	(L.) Wallr.	Smooth Hawk's-beard	F		A	p
<i>Daucus carota</i>	L.	Carrot	A			p
<i>Dipsacus fullonum</i>	L.	Wild Teasel	O		F	p
<i>Echium vulgare</i>	L.	Viper's-bugloss	O			p
<i>Melilotus albus*</i>	Medik.	White Melilot	R			p
<i>Melilotus officinalis*</i>	(L.) Pall.	Ribbed Melilot	R			p
<i>Picris echioides</i>	L.	Bristly Oxtongue		O		p
<i>Reseda luteola</i>	L.	Weld	O			p
<i>Silene dioica</i>	(L.) Clairv.	Red Champion	R			p
<i>Tragopogon pratensis</i>	L.	Goat's Beard			R	p
<b>Annuals</b>						
<i>Anagallis arvensis subsp. arvensis</i>	L.	Scarlet Pimpernel	O		O	p
<i>Brassica rapa</i>	L.	Turnip	F		F	p
<i>Centaurea cyanus*</i>	L.	Cornflower	R			
<i>Chenopodium album</i>	L.	Fat-hen		O		
<i>Conyza canadensis*</i>	(L.) Cronquist	Canadian Fleabane			F	p
<i>Coronopus didymus</i>	(L.) Sm.	Lesser Swine-cress			O	
<i>Euphorbia peplus</i>	L.	Petty Spurge			O	p
<i>Galium aparine</i>	L.	Cleavers	O	O		
<i>Geranium dissectum</i>	L.	Cut-leaved Crane's-bill	O			p
<i>Geranium molle</i>	L.	Dove's-foot Crane's-bill	R			p
<i>Geranium robertianum</i>	L.	Herb-Robert			O	p
<i>Glebionis segetum</i>	L.	Corn Marigold	R			p
<i>Lapsana communis</i>	L.	Nipplewort			F	p
<i>Matricaria discoidea</i>	DC.	Pineappleweed			O	p
<i>Odontites vernus</i>	(Bellardi) Dumort.	Red Bartsia	F		O	p
<i>Papaver rhoeas</i>	L.	Common Poppy	R			p
<i>Papaver somniferum*</i>	L.	Opium Poppy			O	p
<i>Polygonum aviculare</i>	L.	Knotgrass		O		
<i>Rhinanthus minor</i>	L.	Yellow Rattle	O			p
<i>Senecio vulgaris</i>	L.	Groundsel		O		p
<i>Sinapis arvensis</i>	L.	Charlock			O	p
<i>Sisymbrium officinale</i>	(L.) Scop.	Hedge Mustard	R			p
<i>Sonchus oleraceus</i>	L.	Smooth Sow-thistle		O	O	p
<i>Veronica persica</i>	Poir.	Common Field-speedwell			F	p
<i>Vicia sativa</i>	L.	Common Vetch	O		F	p

<b>Grasses</b>						
<i>Agrostis stolonifera</i>	L.	Creeping Bent	A	A	A	
<i>Alopecurus geniculatus</i>	L.	Marsh Foxtail	O	O		
<i>Alopecurus pratensis</i>	L.	Meadow Foxtail	A	A		
<i>Anthoxanthum odoratum</i>	L.	Sweet Vernal-grass	A		O	
<i>Arrhenatherum elatius</i>	(L.) P. Beauv. ex Pres.	False Oat-grass	A	A	A	
<i>Briza media</i>	L.	Quaking-grass	O			
<i>Bromus hordeaceus subsp. hordeaceus</i>	L.	Common Soft-brome	O		R	
<i>Cynosurus cristatus</i>	L.	Crested Dog's-tail	A		F	
<i>Dactylis glomerata</i>	L.	Cock's-foot	A	A	F	
<i>Deschampsia cespitosa</i>	(L.) P. Beauv.	Tufted Hair-Grass	O			
<i>Elytrigia repens</i>	(L.) Desv. ex Nevski	Common Couch	F	F		
<i>Festuca arundinacea</i>	Schreb.	Tall Fescue		F		
<i>Festuca rubra</i>	L.	Red Fescue	F		F	
<i>Glyceria fluitans</i>	(L.) R. Br.	Floating Sweet-grass	O	O		
<i>Holcus lanatus</i>	L.	Yorkshire-fog	D	A	A	
<i>Lolium multiflorum</i>	Lam.	Italian Rye-grass	R			
<i>Lolium perenne</i>	L.	Perennial Rye-grass	O	F		
<i>Phalaris arundinacea</i>	L.	Reed Canary-grass	O			
<i>Phleum pratense</i>	L.	Timothy	F			
<i>Phragmites australis</i>			O			
<i>Poa pratensis</i>	L.	Smooth Meadow-grass	O		O	
<i>Poa trivialis</i>	L.	Rough Meadow-grass	A	A	F	
<i>Schedonurus pratensis</i>	(Huds.)P. Beauv.	Meadow Fescue	F	F		
<b>Rushes</b>						
<i>Juncus acutiflorus</i>	Ehrh. ex Hoffm.	Sharp-flowered Rush	F		F	
<i>Juncus articulatus</i>	L.	Jointed Rush	F	O		
<i>Juncus bufonius</i>	L.	Toad Rush	O			
<i>Juncus conglomeratus</i>	L.	Compact Rush	O			
<i>Juncus effusus</i>	L.	Soft-rush	F		F	
<i>Juncus inflexus</i>	L.	Hard Rush	F		F	
<i>Luzula campestris</i>	(L.) DC.	Field Wood-rush	O			
<b>Sedges</b>						
<i>Carex disticha</i>	Huds.	Brown Sedge	O		O	
<i>Carex flacca</i>	Schreb.	Glaucous Sedge	A		O	
<i>Carex hirta</i>	L.	Hairy Sedge	A	A	O	
<i>Carex otrubae</i>	Podp.	False Fox-sedge	O	O	R	
<b>Shrubs</b>						
<i>Buddleja davidii*</i>	Franch.	Butterfly-bush	O		A	p
<i>Clematis vitalba</i>	L.	Traveller's-joy			A	p
<i>Cornus sanguinea*</i>	L.	Dogwood			O	p

<i>Cotoneaster sp.*</i>		Cotoneaster			R	p
<i>Crataegus monogyna</i>	Jacq.	Hawthorn			F	p
<i>Lonicera periclymenum</i>	L.	Honeysuckle			O	p
<i>Lonicera sp.*</i>		Honeysuckle sp.			R	
<i>Rosa canina</i>	L.	Dog-rose			O	p
<i>Rosa sp.</i>		Wild rose	O			p
<i>Rubus fruticosus</i>		Bramble	F	O	F	p
<i>Sambucus nigra</i>	L.	Elder			F	p
<i>Symphoricarpos albus*</i>	(L.) S.F. Blake	Snowberry			O	p
<i>Ulex europaeus</i>	L.	Gorse	O		A	p
<b>Trees</b>						
<i>Acer pseudoplatanus</i>	L.	Sycamore	O		O	
<i>Alnus glutinosa</i>	(L.) Gaertn.	Alder	O			
<i>Fraxinus excelsior</i>	L.	Ash	O		F	
<i>Salix caprea</i>	L.	Goat Willow			O	p
<i>Salix cinerea</i>	L.	Sally	F	O	A	p
<i>Salix fragilis</i>	L.	Crack-willow	O		O	p
<i>Salix viminalis</i>	L.	Osier	O	O		p

