

LOUISBURGH HABITAT SURVEY AND BIODIVERSITY MANAGEMENT PLAN



2020



An Chomhairle Oidhreachta
The Heritage Council



An Action of the County Mayo Heritage Plan

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FOR MAYO COUNTY COUNCIL

WITH FUNDING FROM THE HERITAGE COUNCIL



VISION STATEMENT:

THE ENHANCEMENT OF THE BIODIVERSITY OF LOUISBURGH THROUGH COMMUNITY ACTION, CREATING A MORE BEAUTIFUL AND MORE ENJOYABLE ENVIRONMENT FOR THE PEOPLE OF THE TOWN AND ITS VISITORS.

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List of Abbreviations

BSBI	Botanical Society of Britain and Ireland
CBD	Convention on Biological Diversity
CBS	Countryside Bird Survey
EPA	Environmental Protection Agency
EU	European Union
GIS	Geographical Information System
GMIT	Galway-Mayo Institute of Technology
ha	hectare
GPS	Global Positioning System
IFI	Inland Fisheries Ireland
km	kilometre
IUCN	International Union for the Conservation of Nature
m	metre
mm	millimetre
NHA	Natural Heritage Area
NBDC	National Biodiversity Data Centre
NPWS	National Parks and Wildlife Service
OS	Ordnance Survey
pNHA	Proposed Natural Heritage Area
RSPB NI	Royal Society for the Protection of Birds in Northern Ireland
SAC	Special Area of Conservation
SPA	Special Protection Area
TY	Transition Year

EXECUTIVE SUMMARY

Louisburgh is located on the southwest shore of Clew Bay in west Co. Mayo. It has a population of approximately 450, which swells during the summer tourist season. In the Mayo County Development Plan this area has been designated an “Area of outstanding natural beauty”. Highlights for amenity are unspoilt beaches, including popular surfing beaches, and extensive areas of uplands for walking. It is the nearest town to the ferry departure point for populated offshore islands Clare Island and Inishturk. The Bunowen River flows through the town, and is used for salmon fishing. There are areas formally designated for nature conservation within a few km of the town, Old Head Wood, Cloghmoyle Dunes and Tawnymackan bog.

Eighty-five hectares of land were included in the survey to map the habitats in the area. The Heritage Council classification system of Fossitt (2000) was used for this survey. Twenty-five habitats in Louisburgh were identified and mapped, including linear habitats such as hedgerows. Being a town, much of Louisburgh is classified as buildings and artificial surfaces (BL3), and parts of gardens have been included here. Of the other habitats, the highest cover values were for improved agricultural grassland (GA1), wet grassland (GS4) and amenity grassland (improved) (GA2). Small pockets of important natural areas occurred, including the wet willow-alder-ash woodland (WN6), marsh (GM1) and lowland/depositing river (FW2). Small parts of the grassland areas were good quality natural grassland, and the recolonising bare ground (ED3) was a diverse habitat.

Habitat descriptions give an impression of the nature of each habitat with its associated species. The digital mapping data and a database containing species names according to habitat that they were found in were produced during the project. Guidance is given on best practice and management of the habitats, together with suggestions for their interpretation. The overall aim of this report is to provide information to community groups and other interested parties on biodiversity in Louisburgh and its environs and on its management.

Twenty-seven management actions are recommended, contingent on five main objectives: 1) to establish effective habitat management; 2) to increase habitat connectivity; 3) to provide appropriate biodiversity interpretation with the aim of increasing appreciation and awareness of nature; 4) to implement group-specific conservation methods; and 5) to maintain and enhance the natural beauty of Louisburgh town. The establishment of a focus group to oversee the delivery of the actions, and to determine the most appropriate parties to take responsibility for each is recommended. In certain cases, the recommendation is to continue current practice, as is the case for much of the woodland area. Other actions require specific interventions, and may need specialist involvement

Examples of actions that will need specific interventions are:

- To establish seed plots for birds
- To create innovative interpretive signage, posters and leaflets, and to organize educational talks and guided walks

Louisburgh habitat survey and biodiversity management plan

- To erect bird and bat boxes, including swift nesting boxes
- To arrange baseline surveys for certain species groups in the town, such as bats
- To control and manage invasive plant species.

I.0 INTRODUCTION

1.1 Natural Heritage: Ireland's Position

Biodiversity in Ireland

Biodiversity or biological diversity simply refers to the variety of all living things on earth and includes people, plants, animals, fungi and micro-organisms. The term biodiversity, however, refers to more than individual species and includes the genes they contain, the habitats and ecosystems of which they form part, and also highlights the interdependence and interconnectedness of all living things (Convention on Biological Diversity, 2015)

Worldwide there are major environmental differences which determine tropical, temperate and polar ecosystem zones. Within each zone, variations in rainfall and temperature patterns sustain different groups of organisms and these form ecological zones. Ireland's wet and mild climate is greatly influenced by the North Atlantic Drift (Gulf Stream) resulting in much of its land being covered with forest, peatlands and grasslands. The different ecosystems have been classified into different "habitats", and each habitat has a range of particular organisms. The surrounding seas act as barriers to many species that occur in the UK and/or continental Europe. As a result, its habitats are special, differing from those in similar environments in other geographical areas, even in Atlantic Europe.

Habitat Classification and Conservation

Ireland's habitats have been classified and described by Fossitt (2000). This habitat classification is a hierarchical system, in that each main division is subdivided into more specific categories. Coastland, for example is subdivided into 89 non-marine and 28 marine habitats ranging from tidal rivers (CW2¹) to shingle and gravel banks (CB1), fixed dunes (CD3) and machair (CD6).

The categories in this national classification differ somewhat from those in the European-wide classification of natural habitats (European Commission, 1996). As Ireland has habitats and species combinations that are unique to this island, it is essential for Ireland to have its own classification in addition to the European overview. The habitats of European importance were officially listed in 2011,² and these require special conservation measures. Sixty of these occur in Ireland and of these, 16 are "priority habitats", identified as being in danger of extinction .

¹ The Fossitt (2000) classification uses a 3-level hierarchal system to act as a key to the identification of habitats in a 3 character code. For Tidal Rivers (CW2), the first letter 'C' refers to 'Coastland', the second letter 'W' refers to 'Brackish waters' and the final digit identifies its unique habitat code.

² Annex I of the EU Habitats Directive (Directive 92/43/EEC, amended by Directive 97/62/EC, and amended, transposed, and consolidated in the European Communities (Birds and Natural Habitats) Regulations 2011).

Species Diversity and Protection

A number of European and Irish laws protect some elements of biodiversity at species level. The EU Habitats Directive lists species in Annexes, and includes threatened organisms, as diverse as bryophytes, seed plants, molluscs, reptiles and mammals, including the marine. Of the *ca.* 100 listed Irish organisms (National Parks and Wildlife Service (NPWS), 2013), bats, whales, and dolphins are the best known. Birds are specifically protected by the Directive on the Conservation of Wild Birds (2009/147/EC). The Wildlife (Amendment) Act 2000, including the Flora (Protection) Order, 2015, protects many species of flora and fauna nationally. Rare and endangered species may be described in the Red Data Books, which are available to interested organizations, using a system supported by the International Union for the Conservation of Nature (IUCN).

1.2 Biodiversity in Mayo

Habitats of Mayo

Situated on Ireland's Atlantic coast, Mayo has a rich and varied natural heritage. It has extensive natural landscapes and is home to one of the largest National Parks in Ireland (Ballycroy National Park). Mayo's diversity and importance for nature originates in its long and indented Atlantic coast with many islands, and its pristine mountains, lakes and rivers. As a result rare and vulnerable species and habitats flourish. Having 25% of its area designated for nature conservation many of the habitats and species are protected by law and are important in local, national and international contexts.

An overview of Mayo's habitats and species was published in the *County Mayo Biodiversity Action Plan 2010-2015* (Mayo County Council, 2010). Much of its natural landscape is dominated by farmland, which includes a range of semi-natural habitats, the most widespread of these being categorized as "grassland" and "peatland". Peatland, which accounts for 212,000 ha in Mayo, includes blanket bogs, fens and heaths. While many of the semi-natural habitats are in good condition, pockets of other important habitats are threatened by field drainage, fertiliser application and development projects. Also at risk are coastal habitats where sea-cliffs and islands attract considerable colonies of nesting seabirds (Neff, 1999). Several other coastal habitats, including salt marshes provide important wintering areas for native and migrant birds. In addition, mammals such as otter thrive on the combination of habitats available in many coastal locations.

The EU Habitats Directive lists a number of species that must be protected and monitored and Mayo is home to many of these, including: several species of marine mammal (including common and grey seals, bottle-nose dolphin and harbour porpoise); the freshwater pearl mussel, Ireland's longest-lived animal, a number of protected rare bird species, including whooper swan, twite and corncrake, which inhabit the farmland; and rare plants: drooping lady's tresses orchid, bog orchid and yellow marsh saxifrage, which are protected by the Flora (Protection) Order, 2015 of the Wildlife (Amendment) Act 2000.

County Mayo has a network of villages and towns of varying size and each has its own unique natural features including hills and valleys, rivers and lakes, woodland, beaches, peatlands and farmland. These features could be used as a centre-piece of biodiversity, which could form an important aspect of plans for the economic development of each town or village.

The rural landscape of Co. Mayo is a patchwork of farmland, semi-natural habitats and populated areas. When semi-natural habitats are isolated from each other (*e.g.* by buildings or intensive farming) their biodiversity can decline. Indeed, habitat fragmentation is one of the major threats to nature conservation. Maintaining connections between habitat fragments can counteract the effect of isolation. These connections (or “ecological corridors”) can be in the form of hedgerows, treelines and other linear features.

Economics and Biodiversity in Mayo

Tourism, fishing and farming are important industries in the economy of Mayo and these, together with other industries, depend on vital ecosystem services provided by biodiversity³. For example, farming depends on soil structure, availability of nutrients, pollination and pest control. Fisheries need good yields of fish and other seafood, which in turn rely on the integrity of their ecological systems. All of these industries need functioning ecological systems to provide the required soils, landscapes and clean waters.

The value of ecosystem services in Ireland was recently estimated at over €2.6 billion per annum (Bullock *et al.*, 2007). In terms of farming, biodiversity services account for nutrient assimilation and recycling to the value of €1 billion per annum, and Mayo receives a significant proportion of that income. The development of attractions such as the Great Western Greenway in west Mayo has been shown to greatly benefit the local economies and certainly the users are attracted to the beauty of the natural scenery, which is biodiversity-based. A recent report measuring the success of the Great Western Greenway (Deenihan and Caulfield, 2014) demonstrates its value to be over €1 million per annum in direct expenditure.

1.2 Louisburgh - a Rural Town

Louisburgh is a small rural town positioned between the Atlantic coast, Clew Bay and Mweelrea Mountain, in west Mayo. In the Mayo County Development Plan this area has been designated an “Area of outstanding natural beauty”. Highlights for amenity are unspoilt beaches, including popular surfing beaches, and extensive areas of uplands for walking. Louisburgh has a population of approximately 450, which swells during the summer tourist season. It is the nearest town to the ferry departure point for populated

³ Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth. (CBD, 2015)

offshore islands Clare Island and Inishturk. The Bunowen River flows through the town, and is used for salmon fishing.

The promotion of biodiversity as an issue in towns is very important. As centres of human population, raising awareness of biodiversity here affects the support for the large tracts of natural landscapes that are so important for Mayo's natural heritage complement. Most children living in Louisburgh and surrounding areas, including offshore islands, attend school here. Fostering an appreciation for the nature surrounding them in the town among schoolchildren instills a sense of how important the environment is to people. It promotes an interest in and a sense of responsibility for their surroundings that will extend beyond the town context. Learning about different species deepens appreciation for the inter-connectedness of nature, and shows how plants and animals depend on others for their survival.

The rural landscape is a patchwork of farmland, semi-natural habitats and populated areas. From the standpoint of habitats and wildlife, habitat corridors form a very important part of this landscape. These mitigate against isolation of species and habitats, a characteristic that can result in the decline in quantity and/or quality of each. Small fragments of habitat can be important refuges for nature, but being connected with other semi-natural habitats increases their chances of survival and the maintenance or enhancement of the variety of species in them.

While Louisburgh is not directly adjacent to any designated (for conservation) areas, linear networks of habitat (hedgerows, the river) connect the town with surrounding areas with high nature value (Figure 1 shows nearby areas formally designated for nature conservation). This proximity enhances the pockets of semi-natural habitat in the town, which can share species with larger areas in the wider landscape. However, in order to manage the town's biodiversity to produce an optimum distribution and variety of habitats and species, information gaps need to be filled. In particular, the information required is: What are the habitats in Louisburgh? Where are they? What condition are they in? In terms of species, many are associated with different habitats, so information on habitats can provide some insight into the species diversity of the town. Ideally the town should have a checklist of species that have been recorded from it.

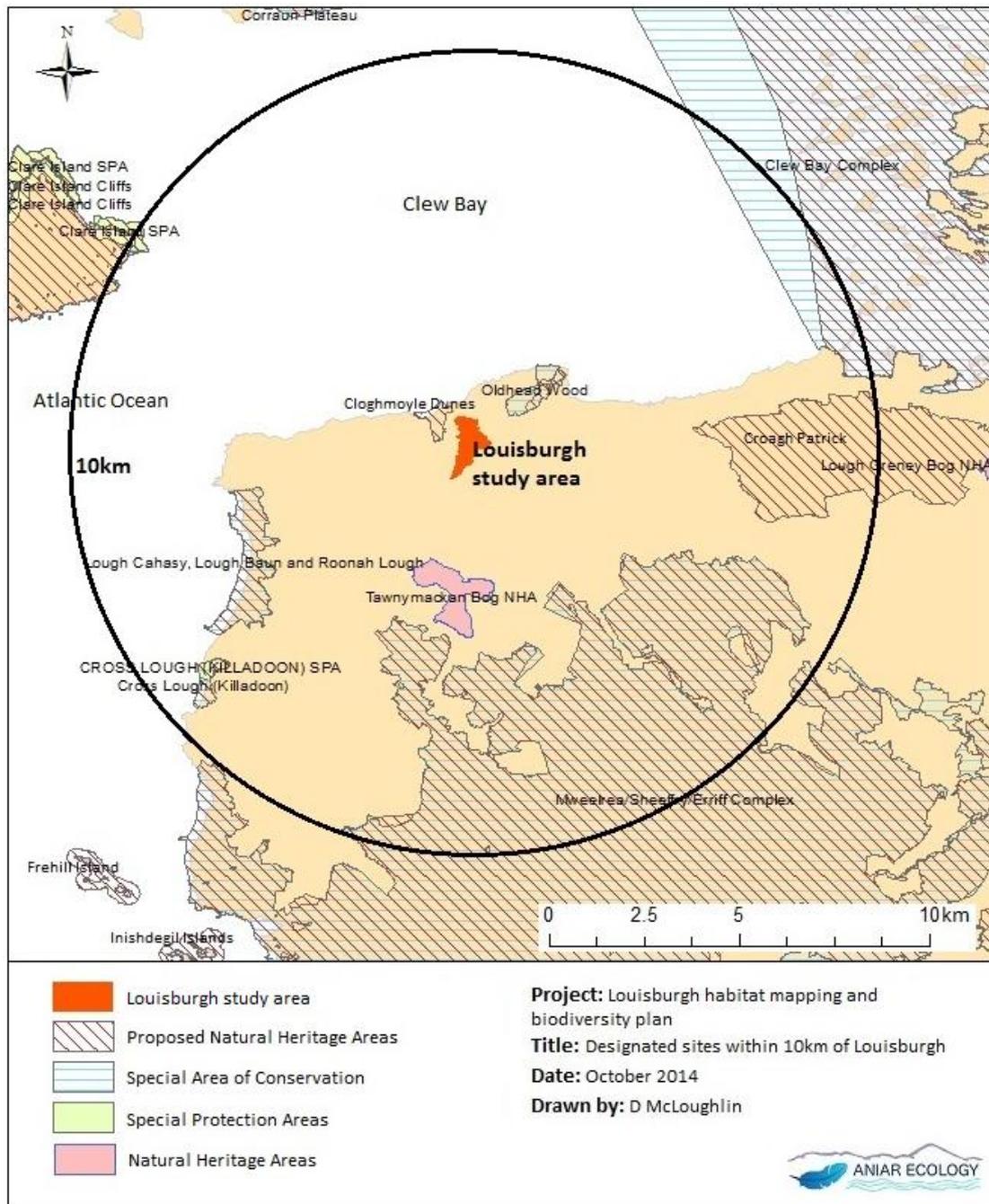


Figure 1. Louisburgh at centre of 10km radius showing designated sites including Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas, and proposed Natural Heritage Areas.

1.3 Scope of this Report

Recording the biodiversity status of the Louisburgh study area provides baseline ecological information, together with guidance for the management of its biodiversity. Suitable locations for biodiversity interpretation have been identified.

Specific aims of the project were:

Louisburgh habitat survey and biodiversity management plan

1. To undertake a baseline habitat survey of a defined Louisburgh Study Area using:
 - Extant written, mapped and aerial photo sources
 - Local knowledge
 - Targeted fieldwork
2. To prepare habitat maps of the area in accordance with Fossitt, (2000) procedures
3. To outline management recommendations, where appropriate
4. To identify suitable sites for biodiversity interpretation.

2.0 METHODS

2.1 Desk Review and Consultation

Information on biodiversity in the Louisburgh region was sought from relevant organisations and individuals. This background data was used to inform some aspects of fieldwork and biodiversity recommendations. Sources of biodiversity data of national and county-wide importance, such as the National Biodiversity Data Centre and the Botanical Society of Britain and Ireland (BSBI), were consulted.

Specifically the following agencies and individuals were consulted:

- Mayo County Council, for geographic datasets, including aerial photos and Ordnance Survey maps
- Institutes of higher learning and targeted scientists, for any biodiversity studies specific to the Study Area
- Relevant statutory bodies including NPWS rangers, for information and recommendations
- Louisburgh Tidy Towns Committee and Rural Social Scheme, for any input, advice or concerns (Figure 2).



Figure 2. Meeting with representatives of Louisburgh Tidy Towns committee and Rural Social Scheme.

2.2 Fieldwork

Fieldwork took place mainly between July and August 2014. Following the principles set out in the *Best Practice Guidance for Habitat Survey and Mapping* (Smith *et al.*, 2011), it involved the use of aerial photos, Ordnance Survey maps and GPS technology. Indicative plants of many habitats listed were identified using current academic sources (see

References). Habitats within the study area were mapped to Level III of the Heritage Council classification system (Fossitt, 2000). Indicator species of each habitat type were noted, together with structural and other environmental details, where appropriate. Buildings, built ground and curtilage were generally not surveyed. Habitats of high biodiversity and conservation concern were recorded in greater detail, including those listed on Annex I of the European Habitats Directive.

Apart from plants, other organisms encountered during the survey were recorded including birds, mammals and invertebrates. Local areas of biodiversity value, such as ecological corridors and buffer zones were identified, surveyed and mapped, and hedgerow characters were noted. The occurrence of rare and/or invasive species and of elements of importance for biodiversity interpretation and education were noted. A database was created for all species recorded during this study.

2.3 Habitat Mapping

Information gathered during the surveying was used to create comprehensive maps of the habitats and biodiversity of the town. This major exercise was carried out in ArcGIS 10 at a minimum scale of 1:6,000 using layers. All elements of specific interest were related to the specific place on the map. Four separate maps were produced:

1. A general habitat map.
2. A map with linear habitats
3. A map ranking the lands in terms of conservation importance and special points of interest
4. Grid map of Japanese knotweed infestation.

3.0 HABITATS AND BIODIVERSITY OF LOUISBURGH

3.1 Overview of Habitats in Louisburgh

Twenty habitats in Louisburgh were identified and mapped, including some just outside the town boundary. Table 1 shows habitat names and the area covered by each; their distribution is shown in Figure 3. Most linear habitats are shown in more detail in Figure 4. Habitats outside the boundary were included in the survey only if they were of significant biodiversity importance or they influenced habitats within the boundary. Being a town, much of Louisburgh is included in buildings and artificial surfaces (BL3), and inevitably parts of gardens and other vegetated areas have been included here. Of the other habitats, the highest cover values were for improved agricultural grassland (GA1), wet grassland (GS4) and amenity grassland (improved) (GA2). Small pockets of important natural areas occurred, including the wet willow-alder-ash woodland (WN6), marsh (GM1) and lowland/depositing river (FW2). Small parts of the grassland areas were good quality natural grassland, and the recolonising bare ground (ED3) was a diverse habitat.

Table 1. List of habitats in Louisburgh that appear on the map in Figure 3, with area covered by each. * Fragment of linear habitat. #This habitat includes parts of gardens

Habitat	Habitat code	Area (ha)
Horticultural land	BC2	0.09
Tilled land	BC3	0.41
Flower beds and borders	BC4	0.06
Buildings and artificial surfaces [#]	BL3	40.18
Upper salt marsh	CM2	0.88
Spoil and bare ground	ED2	0.88
Recolonising bare ground	ED3	1.82
Artificial lakes and ponds	FL8	0.05
Depositing/lowland rivers [*]	FW2	1.01
Improved agricultural grassland	GA1	20.64
Amenity grassland (improved)	GA2	5.01
Marsh	GM1	0.03
Dry calcareous and neutral grassland	GS1	0.10

Dry meadows and grassy verges	GS2	0.34
Wet grassland	GS4	9.13
Mixed broadleaved/conifer woodland	WD2	0.22
Scattered trees and parkland	WD5	0.84
Wet willow-alder-ash woodland	WN6	1.01
Scrub	WS1	2.04
Immature woodland	WS2	0.26
Total mapped habitats	All codes	85

Linear habitats that contribute greatly to wildlife health and prosperity were mapped (Figure 4). These include hedgerows (WL1), treelines (WL2), stonewalls and other stonework (BL1), lowland/depositing rivers (FW2), eroding/upland rivers (FW1) and drainage ditches (FW4). A total of 11.75 km of six linear habitats were mapped (Table 2), and the map shows that these are throughout the town, but there are parts of the town that could have a strengthening of their linear habitat complement.

Table 2. Length of linear habitats mapped in Louisburgh

Habitat name	Habitat code	Length (m)
Stone walls and other stonework	BL1	1,121
Eroding / upland rivers	FW1	806
Depositing / lowland rivers	FW2	556
Drainage ditches	FW4	3884
Hedgerows	WL1	3196
Treelines	WL2	2188
Total		11,751

Louisburgh habitat survey and biodiversity management plan

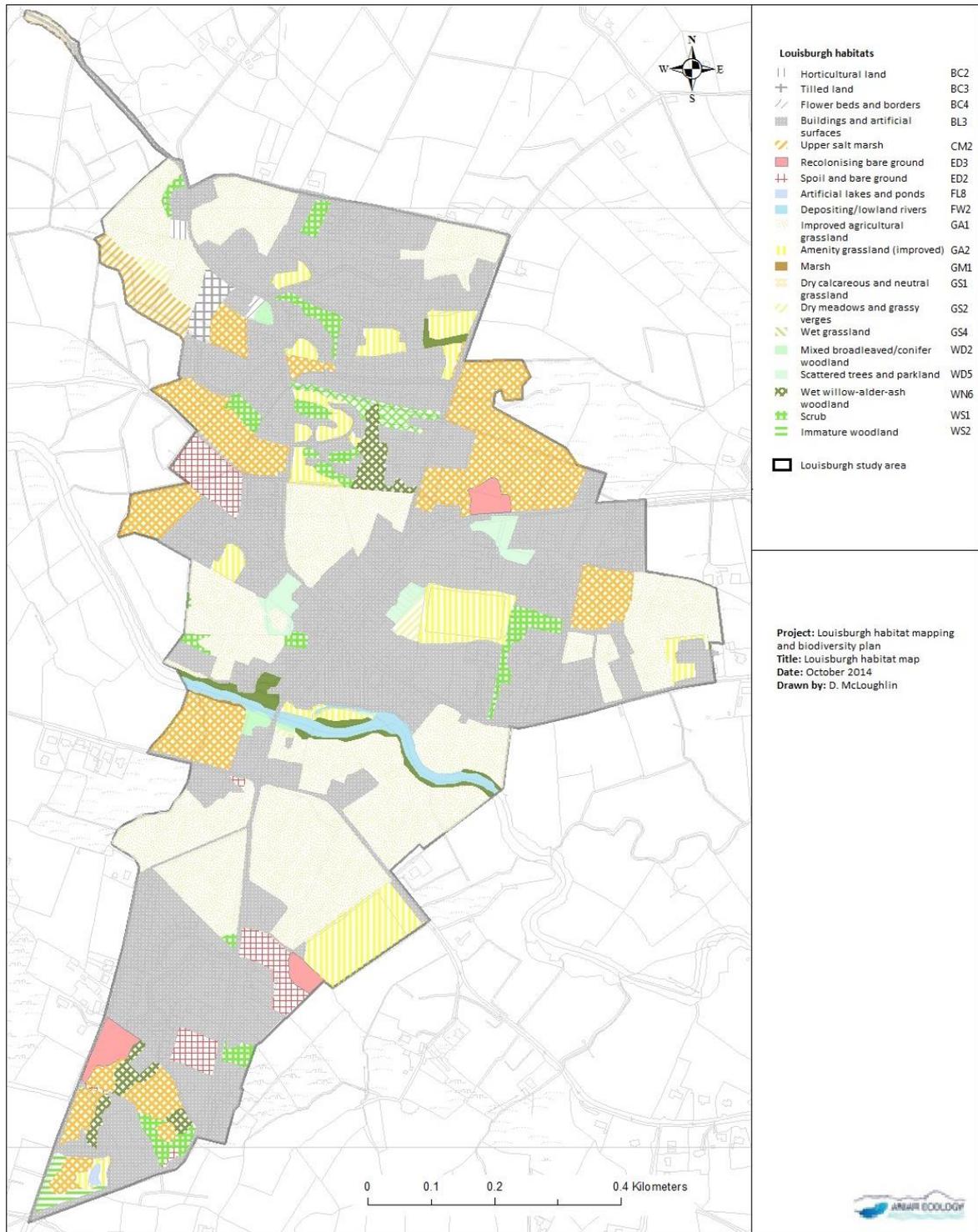


Figure 3. Areal habitat map of Louisburgh.

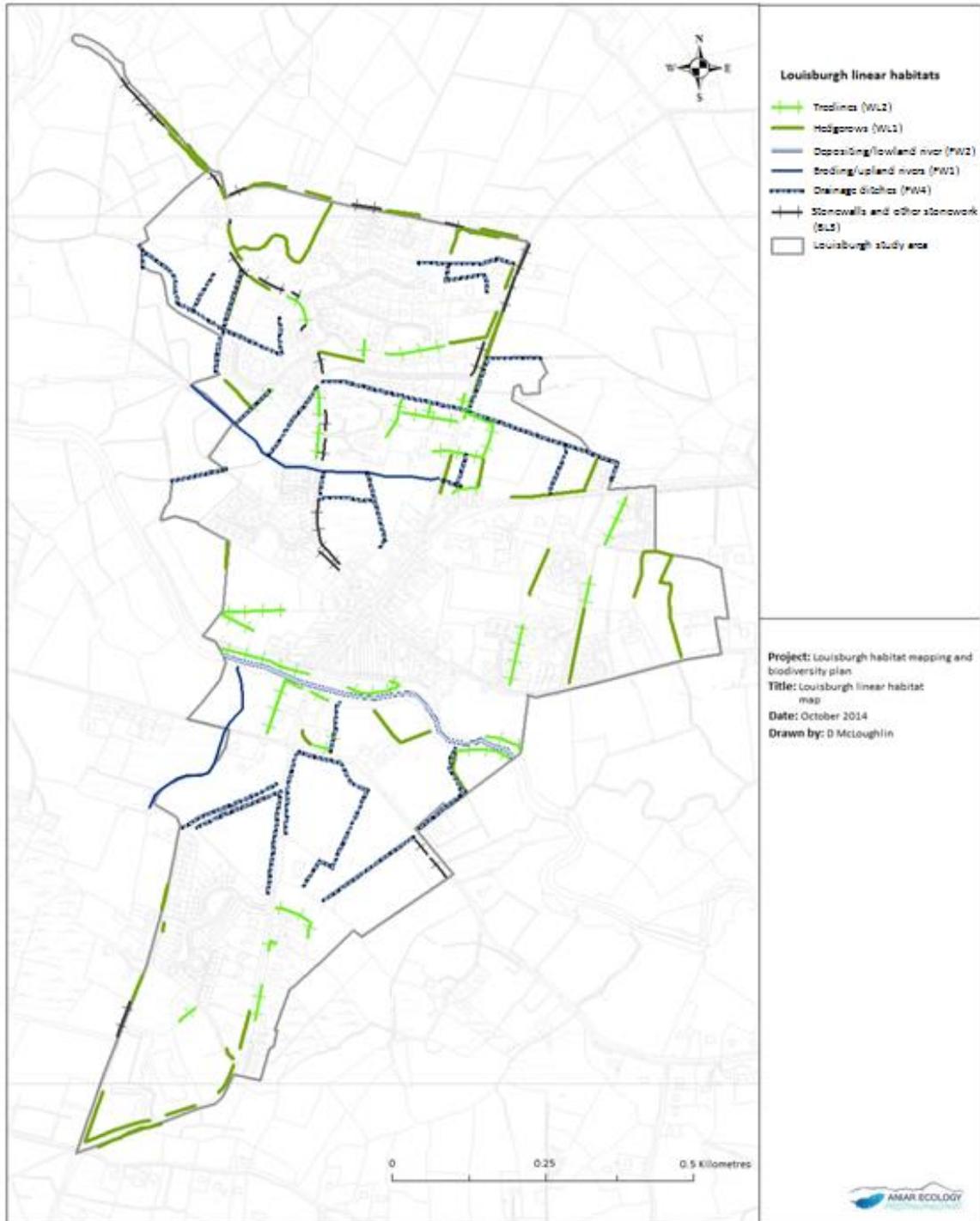


Figure 4. Linear habitat map of Louisburgh.

3. 2 Habitat Descriptions

3.2.1 Freshwater Habitats

Eroding/upland Rivers (FW1)

This habitat includes sections of rivers where there is little or no deposition of fine sediment. The beds of these rivers are characterized by exposed bedrock and loose rock. Pebbles, gravel and sand may accumulate in places.

Depositing/lowland Rivers (FW2)

The Bunowen River rises in the Sheefry Hills and flows through Louisburgh. A detailed survey of the river was not possible within the constraints of this project. However, some characteristics included wider, slower-moving parts and narrower stretches where flow was faster. Large boulders and smaller rocks occurred in the river. Submerged plants and dense bank vegetation were noted, the bank vegetation varying from native reeds to non-native ornamental shrubs and herbs. Overhanging trees cast shade in a number of places (Figure 5), as did the main bridge in the town (Figure 6). The river divides and flows around a substantial island in the western part of the town, and other smaller islets are created from groups of rocks. It is an important salmon and trout fishery and has a population of freshwater pearl mussel upstream of the town (NPWS personal communication).



Figure 5. Bunowen river with overhanging trees creating shade



Figure 6. Bunowen river and main bridge in town

Drainage Ditches (FW4)

These are ditches that are wet enough to include wetland vegetation. Water levels may fluctuate with season. These ditches are often associated with hedgerows or other field boundaries, and can require intermittent clearing to remove soil and/or vegetation.

3.2.2 Grassland Habitats

There are four different types of grassland in Louisburgh according to the Heritage Council classification (Fossitt 2000; Table 1): improved agricultural grassland (GA1), amenity grassland (improved) (GA2), dry meadows and grassy verges (GS2) and wet grassland (GS4). In much of Mayo there is wet grassland (GS4) that has been modified to a certain extent by livestock, but not as intensively as to categorise it as improved agricultural grassland (GA1). In the present study which focuses on biodiversity, these have been separated out and named “improved wet grassland (GSi4)” in the database (the database accompanying this report). However these were not specifically mapped during this project.

Improved Agricultural Grassland (GA1)

In Louisburgh improved agricultural grassland (GA1) covers 20.64 ha. These grasslands are intensively used for farming and may be impacted by grazing animals and/or modified by the application of artificial fertiliser and re-seeding. They are characterised by low species-diversity and include areas that are dominated by rye-grasses, often with white clover.

Some additional species found during the survey were yorkshire fog, crested dog's tail and creeping buttercup.



Figure 7. Improved agricultural grassland (GA1)

Amenity Grassland (Improved) (GA2)

In Louisburgh amenity grassland (improved) (GA2) covers 5.01 ha. This includes recreational and landscaped grasslands such as sports fields and lawns. Generally species-poor, these have species in common with improved agricultural grassland (GA1), *e.g.* clover, but rye-grasses not generally dominant. Other species characteristic of amenity grassland (improved) (GA2) are the broadleaved herbs daisy, dandelion and plantains.



Figure 8. Amenity grassland (improved) (GA2)

Dry Meadows and Grassy Verges (GS2)

In Louisburgh dry meadows and grassy verges (GS2) covers 0.34 ha. This habitat generally occurs in small areas such as grassy roadside verges and the margins of tilled land, but can also develop in ungrazed fields that are mown twice a year to produce hay. The habitat is characterised by tall, coarse grasses that may form tussocks (false oat-grass and cock's-foot as well as yorkshire fog, and meadow foxtail). Tall or climbing broadleaf herbs also occur such as cow parsley, hogweed, common knapweed, nettle, meadow vetchling and bush vetch. The survey also recorded three clovers including yellow clover/shamrock, glaucous sedge, red and sheep's fescue and devil's bit scabious, and some mosses: pointed spear moss, glittering woodmoss, and springy turf-moss.



Figure 9. Dry meadows and grassy verges (GS2)



Figure 10. Dry meadows and grassy verges (GS2)



Figure 11. Dry meadows and grassy verges (GS2)

Wet Grassland (GS4)

In Louisburgh wet grassland (GS4) covers 9.13 ha. This grassland type occurs on flat or sloping land, and includes poorly drained and/or seasonally flooded lands. There is a great variation in this grassland type, depending on location, environmental factors and management, both present and past, so the species complement is not necessarily similar from place to place. However, the grasses yorkshire fog and creeping bent are generally present, and it often contains abundant rushes and/or small sedges. In addition to these a number of broadleaved herbs are found, such as creeping buttercup, silverweed, meadowsweet, devil's bit scabious. Spotted orchids were recorded during the survey in some wet grassland (GS4) in Louisburgh. Towards the river banks tall broadleaved herbs become more abundant.

Improved Wet Grassland (GSi4)

Much of the grassland in and around Louisburgh is improved agricultural grassland (GA1), using the official criteria for the classification (Fossitt 2000). However, the intensity of management plays a large part in the classification of a grassland, in particular whether it comes under improved grassland (GA) or semi-natural grassland (GS), and this boundary can be vague. Many of the grasslands in and around Louisburgh are, strictly speaking, in the improved grassland (GA) category because they are regularly grazed, and therefore well manured. However, there is a big difference in species complement between an improved grassland (GA) that is artificially fertilised, intensively grazed and regularly re-seeded, and one that has minimal intervention except for grazing, such as many in the Louisburgh area. These have the more "natural" characteristics of wet grassland (GS4) as well as the more artificial characteristics of improved agricultural grassland (GA1). Where possible these grasslands were noted during the field survey, and have been classified as improved wet grassland (GSi4) in the database accompanying this report. These were not

mapped on the habitat maps. Common rush, sedges and yellow flag were recorded in this habitat type in Louisburgh, indicating wet conditions.



Figure 12. Improved wet grassland (GSi4) (foreground).

3.2.3 Woodland Habitats

Wet Willow-Alder-Ash Woodland (WN6)

In Louisburgh wet willow-alder-ash woodland (WN6) covers at least 1.01 ha, with some occurrences being too small to map. Sally is dominant in these areas (Figure 13) with eared willow present mainly at the woodland edges. Other tree species found during the survey included alder, sycamore, holly and hawthorn. Among herbs characteristic of this habitat are creeping bent, remote sedge, meadowsweet, marsh bedstraw and purple loosestrife, and the characteristic lady fern was recorded in Louisburgh along with a number of other ferns: male fern, scaly male fern, broad buckler fern and hard fern. Other woody species were bramble and the climbers ivy and honeysuckle. The somewhat invasive plant montbretia was also recorded.

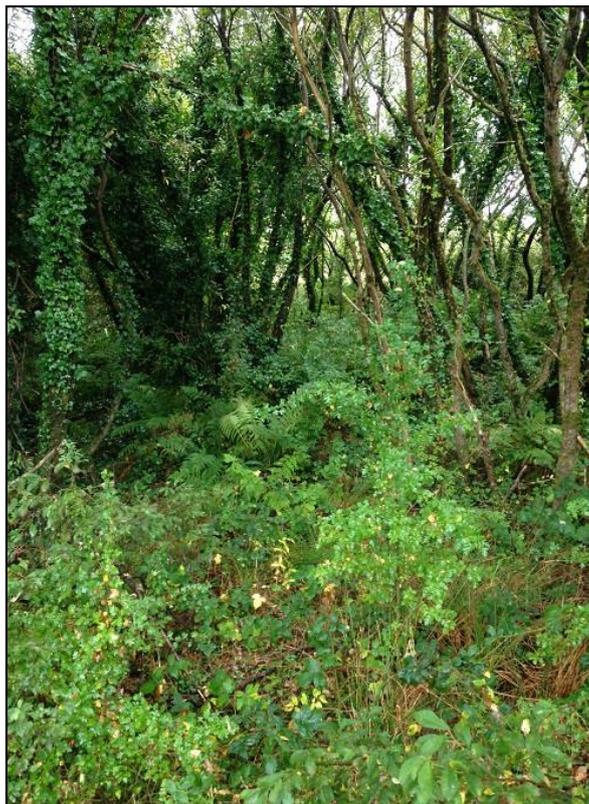


Figure 13: Wet willow-alder-ash woodland (WN6).

Hedgerows (WL1)

Hedgerows (WL1) are used as field or property boundaries in much of Louisburgh, and were mapped recently in a national study by Teagasc and described in detail in a Co. Mayo study (Foulkes 2007). In some cases hedgerows (WL1) are associated with a drainage ditch, which can support water-loving plant species. The stage of maintenance that the hedgerow is at when observed generally dictates its structure and the relative abundance of plant species. Hedges forming boundaries of gardens are more likely to be formed of non-native species that have been planted specifically for the purpose of forming a hedge, *e.g.* oval-leaved privet and beech. Hedges at field boundaries are more likely to be mainly composed of the native species blackthorn, hawthorn and willow species. Bramble is a frequent component. Hedges provide a refuge for animal species and can be important as ecological corridors between semi-natural habitats. The hedgerows (WL1) may become dominated by more mature trees if not regularly cut back, including the larger species: ash, wych elm, sycamore and holly, and a woodland character can become more prominent in the habitat. Other plants associated with hedges can include climbers and plants associated with woodlands such as honeysuckle, ivy, hedge bindweed, bush vetch and ferns. However, if trees over 5m become dominant in the hedgerows (WL1), they should be classified under treelines (WL2).



Figure 14. Hedgerow (WL1) in Louisburgh



Figure 15. Hedgerow (WL1) in Louisburgh. Trees are less than 5m high, otherwise this would be classified as a treeline (WL2)

Treelines (WL2)

As for hedgerows (WL1), treelines (WL2) are often used to mark property boundaries, and mature "hedgerows" that support a high percentage of tall trees are included here. In Louisburgh both native and non-native tree species were recorded in treelines (WL2), including sycamore, cherry species, whitebeam, alder, downy birch and sally.

3.2.4 Coastland Habitats

Upper Salt Marsh (CM2)

Upper salt marsh (CM2) occurs outside the town boundary in Louisburgh but it is important to note as it occurs in a tidal floodplain of the town river, and forms part of the continuum of habitats towards the sea. Salt marshes (CM) are not common habitats as they occur on tracts of low-lying coastal land that are often under pressure for use by people for farming, recreation and development, and their ecosystem is dependent on a balance of salinity and inundation regime. The saline influence in this upper salt marsh (CM2) is evidenced by the following plants: common scurvygrass, sea arrowgrass, lesser sea spurrey, sea plantain and Borrer's salt-marsh grass (Figure 16).



Figure 16. Upper salt marsh (CM2).

3.2.5 Exposed Rock and Disturbed Ground

Spoil and Bare Ground (ED2)

Spoil and bare ground ((ED2) is generally transient in nature because heaps of rubble or spoil from building activities eventually become colonised if left undisturbed. Only 0.88 ha were recorded during the survey. Two invasive species were recorded in this habitat type in Louisburgh: giant rhubarb and montbretia.

Recolonising Bare Ground (ED3)

Recolonising bare ground (ED3) (1.82 ha) occurs where bare or disturbed ground eventually becomes colonised by plants. This habitat proliferates *e.g.* where building and development works have been interrupted, and is mainly composed of herbs. Woody species may also be a component, but they are not dominant in this category. These areas may be quite diverse and can be important for wildlife. Species found during this survey included coltsfoot, knapweed, common centaury, self-heal, common mouse-ear and white clover, and the mosses common haircap moss, pointed spear-moss and rough-stalked feather-moss. A wetter area supported more water-loving species: star sedge, glaucous sedge, yellow-sedge, common marsh-bedstraw, marsh thistle and yellow flag. Encroaching scrub was represented by ling heather, European gorse, tutsan and young tree species alder and Scot's pine (Figure 17).



Figure 17. Recolonising bare ground (ED3)

3.2.6 Cultivated and Built Land

Gardens: Flower Beds and Borders (BC4), Amenity Grassland (Improved) (GA2), Ornamental Scrub (WS3)

The gardens in Louisburgh are many and varied, and support a wide variety of garden plants. Many of these are non-native species, but these can be useful for wildlife. Generally the less rigorously maintained gardens are more important for biodiversity, as they have more natural characteristics, and native species may occur in the form of "weeds". Three of the Heritage Council habitat classes occur most commonly in gardens, including flowerbeds and borders (BC4), lawns (amenity grassland (improved) (GA2)) and shrub-dominated areas (ornamental scrub (WS3). Hedgerows (WL1) and treelines (WL2) may also occur, as well as habitats of built land (BL) (*e.g.* stone walls and other stonework (BL1).

Stone Walls and Other Stonework (BL1)

Most stone walls are included here. Older and less rigorously-maintained walls (less spraying, weeding, maintenance of mortar) tend to support a higher complement of biodiversity, including invertebrates, seed plants, ferns, bryophytes and lichens. Ivy can provide a refuge for biodiversity, and derelict structures and old bridges can be very important for bats and birds. Native plant species on walls may include the ferns wall-rue, rusty-back fern, hart's tongue and polypody (Figure 18).



Figure 18. Stone walls and other stonework (BL1)

3.2.7 Habitats not Individually Mapped

Some habitats were not mapped for reasons of size or lack of importance for biodiversity. For the most part, built-up areas and gardens were excluded from detailed habitat

mapping. They were included in the area designated as buildings and artificial surfaces (BL3), and mainly include small occurrences of the following habitats: buildings and artificial surfaces (BL3), amenity grassland (improved) (GA2), flower beds and borders (BC4), ornamental scrub (WS3), stone walls and other stonework (BL1) and earth banks (BL2).

Habitats outside the town but that offer particular biodiversity, amenity and recreational outlets for the people of the town are:

Oak-birch-holly Woodland (WN1)

A very special variant of this woodland type occurs at Old Head, within 5 km (Figure 1) of Louisburgh. The woodland is an old oak wood at the Atlantic coast and as such is protected by the European Habitats Directive ("Old sessile oak woods with Ilex and Blechnum in the British Isles (91A0)").

Coastal Areas Close to Louisburgh Provide the Following Habitats:

Sand shores (LS2), sand dune systems (CD) habitats including embryonic dunes (CD1) and marram dunes (CD2), five categories of littoral rock habitats (LR1, LR2, LR3, LR4, LR5), sea walls, piers and jetties (CC1). These may include habitats protected under the European Habitats Directive, but a separate study would be required to target the biodiversity of these coastal habitats and their management.

Peatlands (P)

Louisburgh lies at the foot of the mountains that extend from the east (including Croagh Patrick) to the south (Mweelrea). Much of these uplands support bog vegetation, in particular upland blanket bog (PB2). This habitat is protected under European law (Blanket bog (7130)), and includes priority protected habitat where the bog is "active".

3.3 Species diversity: Emphasis on Animals.

Louisburgh supports a wide variety of habitat types, each of which have a particular associated flora and fauna. This study was too brief to give a detailed species record for each habitat, but during the survey a number of species were generally recorded for each habitat.

A wide variety of species were represented in Louisburgh, many being characteristic of specific habitat types. Species were within different taxonomic groups, including seed plants, ferns, bryophytes, mammals, birds and invertebrates, including butterflies (Figure 19).



Figure 19. Peacock butterfly on knapweed

An examination of species records in the National Biodiversity Data Centre (www.biodiversityireland.ie; Appendix 3) for the Louisburgh area, along with field observations from the field surveys and previous knowledge of the area showed a good range of species groups present in Louisburgh. Since many plants have already been named in the habitat descriptions in Section 3.2, this Section focuses on animals. These include bats, otters, badgers, foxes, various freshwater species, and birds (Appendix 2), and are described below:

3.3.1 Bats

Bats are fur-covered mammals are warm blooded, give birth (rather than laying eggs) and suckle their young. There are over 1,000 species of bat worldwide, all classed in the Order Chiroptera. The greatest diversity of bat species is found in warm equatorial areas where there are fruit-, fish-, insect-, pollen- and even frog-eating types. Ireland's ten species belong to the Sub-order Microchiroptera and to two Families – the Vespertilionidae (with nine species) and the Rhinolophidae (with one species) (Bat Conservation Ireland, 2014). Flies, moths and midges form the largest part of their diet, though different species have different feeding specialties, *e.g.* Daubenton's bat flies low over open water to catch insects from the surface, and the long-eared bat targets spiders from branches of trees. Bats consume large numbers of insects that may be pests, such as midges. A single soprano pipistrelle (Figure 20), which weighs about 7g, may consume over 3,500 midges in one night's flying.

Bats are not blind, relying on a system called echolocation to catch their prey. Echolocation involves very high pitch, fast squeaks causing sound waves to impinge on surrounding obstacles and prey. The generated "sound map" enables bats to navigate and catch their food in darkness.



Figure 20. Soprano pipistrelle, weighing about the same as a one euro piece coin, in a typical resting posture
[Photo © with permission Sue Callaghan]

Many myths about bats have developed—mainly because of people’s fear of the unknown. Bats do not spread disease, chew cables or wood, nor bring nesting material into their roosts. They are strictly insect-eating.

Because populations of most bat species have declined in the past decades, they have been protected by Irish Law, since 1976, as well as by European law. It is a criminal offence to:

- Disturb a bat in its roost
- Damage or destroy the breeding or resting place of a bat
- Intentionally or recklessly obstruct access to a bat roost

More information on bats in Ireland can be found on bats at:

- Bat Conservation Ireland web-site: www.batconservationireland.org/
- National Parks and Wildlife Service ‘Bats in houses’ information leaflet: [http://www.npws.ie/publications/leaflets/Bats in Houses leaflet.pdf](http://www.npws.ie/publications/leaflets/Bats%20in%20Houses%20leaflet.pdf)

Where a property owners has concerns about bats in their property, they should contact the National Parks and Wildlife Service free Bat Helpline on 1800 405 000.

At least one species of pipistrelle occurs in Louisburgh. This is the species that can be seen flying around soon after dusk with its rapid twisting flight. Pipistrelles frequently roost in

houses, but also roost in hollows in trees and ivy. It is possible that Leisler's and Daubenton's bat also occur in Louisburgh although a full bat survey is required to establish the range of species and numbers, and important roost and foraging areas. In the absence of this detail, bat boxes can be provided at suitable locations including under bridges, mature trees and buildings.

3.3.2 Non-volant Mammals (mammals other than bats)

Otters are known to occur on the Bunowen River and are occasionally seen upstream of the N59 road bridge. Based on the location of casual otter sightings and tracks and trails, it is probable that there is a holt (otter's resting place) nearby. An otter can have several holts in its territory of which one will be used to raise cubs. The principle signs of otters are spraints (droppings) sites where they mark their territory. These are typically prominent features such as rocks along the river bank and occasionally bridges. Also, footprints and slides along the river bank (young otters slide on their back into the water as part of play) confirm the presence of otters in an area.

Otters feed predominantly on fish including salmon, trout, sticklebacks, and eels, but they opportunistically target frogs, birds and small mammals. They tend to be most active at dawn and dusk.

Evidence of badgers and foxes was observed throughout the dryer grassland areas in Louisburgh. As with otters, footprints, spraint or scat, and guard hairs (outer hairs) stuck on the lower bands of wire fences, provide evidence of their presence. Badgers leave further clues of their presence with latrines (shallow holes in the ground in which they leave their droppings).

The Irish hare also occurs within the study boundary.

Otters, badgers, and hares are protected under the Wildlife Act 1976, with otters also being protected under the EU Habitats Directive as an Annex II species.

3.3.3 Freshwater Species

The Bunowen river is a popular amongst anglers for salmon and sea trout fly-fishing, with the best fishing stretches upstream of Louisburgh. Freshwater pearl mussel, which is listed under Annex II of the EU Habitats Directive, occurs upstream of Louisburgh town. This population is thought not to be regenerating – possibly as a result of siltation from further upstream. These species depend on very good water quality. The most recent EPA report rates the water quality of the river as Q3-4 on the Q-value scale of 1-5, with Q1 being very poor quality, and Q5 being excellent (EPA 2013).

3.3.4 Birds

Birds are a ubiquitous group of species that are, for most people, the primary link to nature. Individual bird species have adapted to live in virtually all habitats on earth. In fact, the bird fauna of an area is generally a reflection of the habitats present. In a town setting, rooks, jackdaws, house sparrows, starlings and pied wagtails can be expected, while open semi-natural grassland in the countryside may have skylark, meadow pipit and

occasionally rare species such as corncrake. Birds are considered to be very good indicators of a healthy biodiversity.

The wide variety of habitats in Louisburgh and within 2km of the town is reflected in the diversity of bird life, including several species on the Red-list of Birds of Conservation Concern in Ireland. Although a targeted bird survey was not completed for this report characteristic birds of a particular habitat type were recorded.

To monitor the status of birds on the island of Ireland, BirdWatch Ireland and Royal Society for the Protection of Birds in Northern Ireland (RSPB NI) have published a list of *Birds of Conservation Concern in Ireland* (Colhoun and Cummins, 2013). This presents a hierarchy of birds in terms of their conservation concern. All birds are classified into one of three lists: Red List birds are those of the highest conservation concern, Amber List birds are those of medium concern and Green List birds, those that are not considered threatened.

River Species:

The stretch of the Bunowen River through the town sustains grey heron foraging area, grey wagtail, dipper (Figure 21) and, although not recorded during this survey, kingfisher also occurs on the river.



Figure 21. Dipper with prey © Micheal Casey with permission.

Town-dwelling Species:

Typical town-dwelling species occur in Louisburgh including rook, jackdaw, pied wagtail, and house sparrow. The main rookery is one of up to c.300 birds in the grounds of the Catholic church. The Church of Ireland grounds also sustains a winter rookery of 50-100 birds. Information from a survey of swifts, Huxley (2014) reports an interesting absence from the town. The nearest breeding sites are in Westport. Swifts (Figure 22) can be encouraged to start nesting in the town through the provision of nest boxes at carefully selected locations on buildings in the town (Figure 23).



Figure 22. Swift in flight (© Micheal Casey with permission). Note the dark body and sickle-shaped wings. Swifts only land to access their nests.



Figure 23. Swift nest boxes on an otherwise unattractive gable end (© Micheal Casey with permission).

Woodland/hedgerow/garden species:

All common garden birds occur in Louisburgh but more notable species of woodland and hedgerow occurring in Louisburgh include goldcrest, long-tailed tit, siskin, bulfinch, white-throat and chiffchaff.

Open Ground Including Grasslands:

Semi-natural grasslands and meadows are important for a range of bird species that have declined markedly over the past 20 years. These include common snipe, skylark, and meadow pipit, all of which have been recorded in the study area. Common snipe depend on wet extensively farmed grassland where they feed on insects. Declining numbers of meadow pipit, which is Red-listed on the Birds of Conservation Concern in Ireland, is the probable reason for declining numbers of the much loved cuckoo, who targets the meadow pipits as host parents to its offspring. Black-headed and herring gull were noted in the environs of the town with curlew observed roosting in field adjacent to the town.

Other Areas:

Although the seashore was not included in the scope of this study, this habitat near Louisburgh is quite productive, particularly for seabirds and wading birds including fulmar, sanderling, dunlin, redshank, turnstone, and ringed plover, but also for birds of prey including kestrel that nest on the cliffs at Carramore beach during the summer months. Species including long-eared owl and hen harrier are recorded within 5km of the town each year, with the latter occurring only in winter.

4.0 ACTIONS FOR BIODIVERSITY IN LOUISBURGH

4.1 Aims of management for biodiversity

Management for biodiversity should generally aim at retaining or restoring the "naturalness" of the habitat. This broad-brush approach should encourage more native species and maintain those species that already occur. While some management actions will require intervention of varying intensity, such as the removal and control of invasive alien species, in some cases the approach may be to intervene as little as possible. In an intact, functioning, natural ecosystem, the management should aim at maintaining systems thereby ensuring the supply of input (of nutrients, water, *etc.*) remains at a level that will sustain the system, while minimising the threat from any outside agents (pollution, invasive species). Thus the ethos of management practices should be to minimise interference with nature, minimise rigorous "cleaning" actions, and promote support for natural systems through supplying elements of the ecosystem that may be in short supply, or under threat.

Species-specific actions should be put in place where a vulnerable or endangered species is under threat locally. Those actions should not interfere with the natural systems that support the species, rather they should aim to maintain enhance those systems. In certain cases specific actions will be required to remove threats, such as invasive species, which will change the supporting ecosystems, or to actively enhance the natural habitat through, *e.g.* blocking drains that are facilitating the drying-out of a wetland habitat.

A very important aspect of management for biodiversity is to raise the awareness of the people living in the vicinity and also of visitors to that area. This may be accomplished through public talks, guided walks, signage and targeted brochures/leaflets, but especially through schools and other civic groups such as the Tidy Towns initiative. Most importantly the people of Louisburgh and environs should be encouraged to feel ownership of the town's rich natural heritage. Ownership creates a certain enthusiasm for protection and enhancement: with this, the forward thrust is bolstered and a solid foundation for advancing the biodiversity cause is created.

4.2 General principles for selected biodiversity management issues

4.2.1 Grasslands

Grasslands in Ireland are almost entirely the result of habitat modification and management by humans. In the absence of continued management by cutting, grazing, burning and/or soil disturbance, grasslands would quickly be colonised by shrubs and eventually transition into our natural climax vegetation, woodland. The most common aims of grassland management for conservation are 1) to influence the sward composition with the specific aim of increasing or maintaining species richness (diversity), 2) to maintain a vegetation height and structure favoured by a range of fauna and 3) to prevent colonisation by scrub. In terms of management, the main factors influencing grasslands

are as follows: the intensity (height of cut), selectivity and timing of vegetation removal; the extent to which suitable bare patches and gaps are created for germination and establishment; and the level of fertility.

The basic principle behind removal of vegetation is that if grassland is dominated by one or a few vigorous grasses or forbs, then removing vegetation will reduce their dominance and allow less competitive species to survive. Provided the cuttings are always removed, it also has the added effect of reducing soil fertility, which benefits less vigorous plants. In most cases, this will increase species-richness, especially if it is carried out at the end of the growing season (*i.e.* late autumn). Apart from allowing annuals to set seed and providing food and shelter for many animals during the summer months, the benefit of this is that there will be limited re-growth during the following spring, giving annuals a much improved chance of re-establishment in the short sward. Where a very short sward is desired for neatness or functionality (*e.g.* golf course fairways or road verges), a two- or three-zone cutting regime used, where some selected areas are cut once a year only. It is generally best, if possible, not to cut an entire zone at once, but to cut in stages to allow invertebrates and mammals to escape into uncut areas. Uncut borders are often an attractive feature rather than a compromise made for the sake of wildlife. These systems usually reduce the amount of cutting required, thereby saving time and expense.

4.2.2 Bare Ground, Within and Outside of Grassland

Annual or biennial plants need suitable patches of bare ground (*i.e.* without competition to regenerate). These “germination gaps” are usually created by clearance for building projects or a low level of trampling by grazing animals. Consistent creation of some bare or disturbed ground is necessary to conserve such plants. Applications of inorganic fertiliser will invariably reduce species-richness. Short-term, low density of grazing will not usually damage the sward, and will probably encourage structural diversity. In grasslands, slightly elevated stocking density in July/August (known as “aftermath grazing”) can help to suppress re-growth and to create “germination gaps”. These gaps also benefit certain invertebrates such as burrowing spiders.

4.2.3 Woodland

Management strategies for small woodlands usually involve removal of invasive species; creation of structural diversity (tall trees, shrubs, gaps and glades); encouragement of “soft edges” (scrubby margins with many shrubs and flowering broad-leaved herbs) and retention of dead and decaying wood (important for invertebrates, fungi and birds that nest in holes). In general, structural diversity improves the habitat for nesting birds, and sheltered areas with nectar-producing plants are favoured by invertebrates such as butterflies, hoverflies, bees and wasps. The presence of late-flowering plants (*e.g.* bramble and ivy) and early-flowering plants (*e.g.* blackthorn and willow) provide a food supply for birds and insects at times when it is otherwise scarce.

4.2.4 Hedgerows

Proper hedgerow maintenance encourages vigour and wildlife potential. The maintenance of healthy hedgerows takes into consideration many of the principles of

woodland management. The primary concern is encouragement of a broad bushy base with occasional tall trees. Cutting and shaping hedges into an A-shaped profile will encourage species richness. A small buffer zone around the base of the hedgerow will support many flowering plants and provide good cover for mammals such as hedgehogs, wood mice, pygmy shrews and bats. Hedgerows play an important role in forming connections between isolated habitats and can mitigate the some of the ill-effects of woodland fragmentation.

4.2.5 Non-native Species

Native species, having evolved and adapted alongside each other for millions of years, lead to greater habitat diversity than in the case of relatively -recently introduced non-native species. Non-native, invasive species, such as Japanese knotweed, have few natural controlling agents in Ireland; they spread very rapidly, and can form almost impenetrable thickets. They cast a very dense shade that excludes almost all other plant species, preventing regeneration. Japanese knotweed dies back in winter leaving an unsightly bare patch, which may be vulnerable to soil erosion. Even young and small clusters can damage buildings and hard surfaces. All such species have severe negative impacts on biodiversity and are difficult to eradicate. An awareness of their effects on the environment is an important step in preventing their establishment and spread.

4.2.6 Pollinators

Pollinators are animals that move pollen within a flower or from flower to flower, thereby enabling fertilization. Only fertilized plants can make fruit and/or seed, and without pollinators, plants cannot reproduce. In Ireland most insect pollination is effected by bees, flies, hoverflies and butterflies; however, many species in these groups are in serious decline. The primary reasons for decline are habitat loss, decline in numbers of wildflowers, pests and disease, overuse of pesticides and climate change impacts. Cognizant of the loss of pollinators, which in monetary terms is calculated at €53 million annually the Pollinator Plan Steering Group, (2015) published the '*All-Ireland Pollinator Plan 2015-2020*'. The pollinator plan aims to prevent further loss of pollinators and sets out five objectives to meet this aim through a number of suggested actions. The biodiversity plan for the Louisburgh area incorporates some of these into the actions suggested in Section 4.3. The five objectives of the pollinator plan are listed below.

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.

(Source: All-Ireland Pollinator Plan, 2015-2020)

4.3 Points of ecological interest and biodiversity highlights of Louisburgh

Louisburgh has excellent biodiversity potential that can be enhanced through the implementation of suggested actions in Section 4.4 of this report. The habitat areas were ranked in terms of their importance for biodiversity and in order to focus management efforts. Habitats of low, medium and high value are mapped in Figure 24, along with points of ecological interest. To be categorised as high value, the habitat should display excellent species diversity that is characteristic of that habitat in its most natural form and include areas that equate to Annex habitat. Habitats of medium value were in a reasonable semi-natural state, and those ranked low were in a degraded form, including showing the effects of fertiliser application or other more intense management practices. The percentage of the Louisburgh area covered by habitat of high ecological significance was 3%, that of medium value was 17%, and that of low value was 34%. The remainder was built land (not ranked) (Table 3). Particular points of ecological interest in Louisburgh (Figure 24) were chosen for the following reasons: 1) sites that are currently ecologically important habitats, 2) not currently important sites but suitable candidates for biodiversity management, or 3) sites that currently require management of an invasive species.

Table 3. Proportions of area considered of low, medium and high ecological importance

Ecological importance	Area (%)
Built land and gardens (not ranked)	46
Low	34
Medium	17
High	3

The current biodiversity highlights of Louisburgh include (Figure 24):

- The Bunowen River – Point of ecological interest 5: Important salmon and sea trout fishery, otter habitat, river banks provide an important semi-natural wildlife corridor, and important habitat for birds including kingfisher and dipper, and foraging bats.
- Species-rich semi-natural grassland sites – including Points of ecological interest 1, 13 and 14: Of particular note is the wildflower verge at Point 14 at the mouth of the Bunowen River.
- Carramore Beach: Although not part of the survey area, Carramore beach and dunes represent a considerable point of local ecological interest, particularly for sea and wading birds, and sand dune habitats. These dunes, called Cloghmoyle Dunes, are proposed Natural Heritage Areas and are recognized as areas of ecological interest. They are afforded some protection through the County Development Plan.
- Species of interest: Several interesting and protected species occur in the town boundary itself including otter, kingfisher, and bat species.
- Domestic gardens: Although largely not part of this study, the domestic gardens in Louisburgh provide a richness of biodiversity, particular where there are mature trees, ivy, and areas that are not managed intensively.

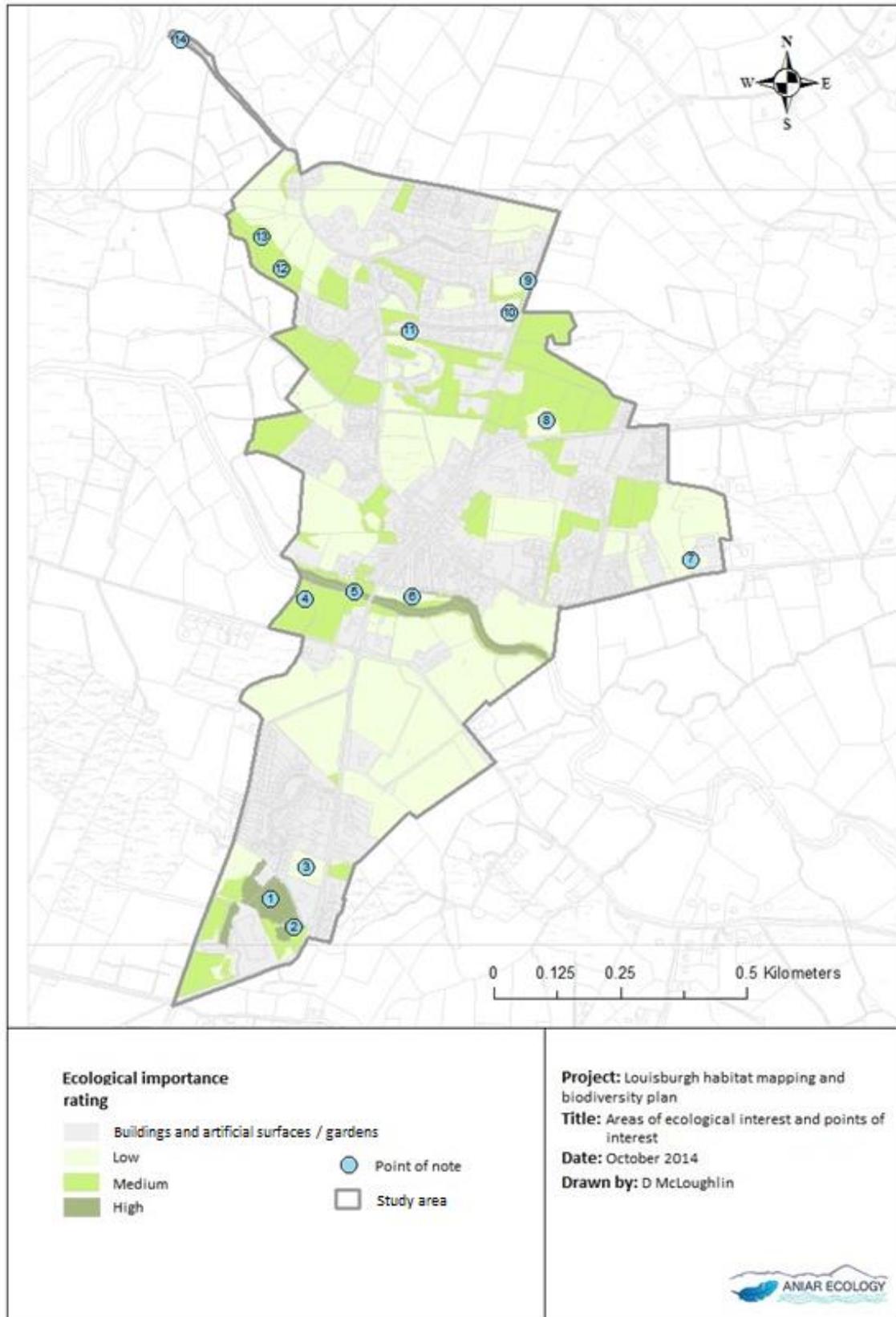


Figure 24. Areas of ecological conservation importance ranking for Louisburgh and numbered points of note.

Table 4. Points of ecological interest in Louisburgh with suggested actions

Point number	Habitat	Ecological interest	Suggested action	Action no.s
1	Dry meadows and grassy verges	High quality semi-natural grassland that equates to lowland hay meadow Annex grassland type	Prevent scrub briar and willow encouragement	1.1
2	Wet willow-alder-ash woodland	Well establish native woodland	Conserve	
3	Recolonising bare ground	Good range of interesting plants colonising gravel substrate.	Potential wildflower area with management of scrub	1.1
4	Semi-natural wet grassland	Good example of wet grassland with grasshopper warbler and sedge warbler	Continue current management	N/A
5	Depositing / lowland river	Important habitat for salmonids, otter, specialist birds, and freshwater pearl mussel	Focal point of biodiversity interest in Louisburgh. Biodiversity information station including "otter prints" etc. This area would also form a good start point for a potential river walk .	1.1, 3.8, 3.9, 4.1, 4.2, 4.3
6	Amenity grassland	Scot's Island. Adjacent to areas of high biodiversity interest	Provision of small bird feeding stations (seed plots) and biodiversity interpretation area. Establishment of insect hotel in conjunction with the primary school	3.5
7	Amenity grassland	Primary school. Relatively low interest. Excellent potential.	Tree planting, small seed plot for birds,	2.2, 2.3, 3.8, 4
8	Bare ground	Only recorded site with giant rhubarb	Treatment with suitable herbicide	1.3
9	Hedgerows	Good quality hedgerow	Continue current management	1.4
10a	Amenity grassland	An excellent site for tree planting	Plant native trees including oak and ash to create a parkland-type habitat	1.5, 2.1
10b	Amenity grassland	Strip of grassland between road and stone wall would be suitable for wildflower meadow management suggestion	Wildflower management	1.1
11a	Amenity grassland	Suitable wildflower meadow management area	Continuation of wildflower management	1.1
11b	Wet grassland	Wet grassland area dominated by soft rush	Planting with willow/alder with view to creating a willow maze	1.5
12	Upper saltmarsh	Saltmarsh plant community	None	N/A
13	Dry meadows and grassy verges	Botanically interesting habitat	Continue current management	N/A
14	Calcareous grassland	Excellent example of an establish wildflower area along road at mouth	Botanical intrepritation	3.5

		of Bunowen river. This habitat equates to Annex habitat type grassland.		
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4.4 Detailed Management Prescriptions

To ensure a proactive approach towards the management of biodiversity in a town, village and hinterlands it is advisable to establish a biodiversity action group or committee. The first task of this group would be to agree a list of activities to be undertaken, many of which are outlined in this section. A schedule of tasks should be compiled and each one assigned to a particular person or sub-group. The main group may be composed of representatives from interested stakeholders including:

- Mayo County Council
- Tidy Towns of Ireland
- Rural Social Scheme/ Social Protection group
- Residents' Committees
- Primary school(s)
- Principal village business representative(s)
- Landowners' representative(s)
- Local ecologist, if possible
- National Parks and Wildlife Service representative

When the biodiversity action group for Louisburgh and its environs has been established, activities supporting the enhancement of biodiversity should be addressed in a comprehensive and effective manner. Many of these activities, defined and assessed during this study, should be rehearsed and confirmed in consultation with local groups. The five main objectives should be centre-stage:

1. To establish effective habitat management
2. To increase habitat connectivity
3. To provide appropriate biodiversity interpretation with the aim of increasing appreciation and awareness of wildlife
4. To implement group-specific conservation methods
5. To maintain and enhance the natural beauty of the Louisburgh area.

The above five objectives are set out separately in Table 5, in which "actions" are indicated according to Timeframe, Priority (on an ordinal scale) and Other Objectives. An action is given "high priority" where it is considered important/ essential to the stated objectives of the entire plan.

Table 5. Proposed management actions for biodiversity in Louisburgh

Objective 1 – To Establish Effective Habitat Management			
Action	Timeframe	Other objectives served	Priority Level
1.1 Grassland management: Establishment of modified cutting regime for road verges and grassland areas	Annual	5	High
1.2 Reduction in herbicide/pesticide use	Annual	5	High
1.3 Removal of invasive species	Short term	5	High
1.4 Hedgerow maintenance	Annual	2, 5	High
1.5 Tree planting	Short term	2, 5	High
1.6 Leave plants on buildings and walls	On-going	5	High
1.7 Monitor efficacy of management	Annual	-	High
Objective 2 – To Increase Habitat Connectivity			
2.1 Hedgerow planting	Short to Medium term (Autumn)	1, 5	High
2.2 Treeline planting	Short to Medium term (Autumn)	1, 5	Medium
2.3 Leave uncut areas	On-going	1, 5	High.
Objective 3 – Biodiversity Interpretation: Increasing Appreciation and Awareness of Nature			
3.1 Targeted ecology surveys, e.g. bats	Summer	-	High
3.2 Guided Walks	Annual (summer)	-	Med.
3.3 Community Walks	Regular	-	Low
3.4 Talks and seminars	When possible	-	Low
3.5 Interpretive signage	Short Term	-	High

Louisburgh habitat survey and biodiversity management plan

3.6 Leaflets and posters	Short Term	-	High
3.7 Community clean-ups	Annual (spring)	1, 5	Low
3.8 Insect hotel	Short Term	4	Low
3.9 School projects	Annual	1, 2, 4, 5	High
3.10 NPWS involvement	Ongoing		High
Objective 4 – To Implement Group-Specific Conservation Methods			
4.1 Erect bird boxes (particularly swift boxes)	Short Term	-	Med.
4.2 Erect bat boxes	Short Term	-	Med.
4.3 Plant seed plots for birds	Annual (spring)	-	Med.
4.4 Monitoring (plant and animal surveys)	Annual		High
Objective 5 – To Maintain and Enhance Natural Beauty			
5.1 Connecting Bunowen and Carrowmore	Short Term	1	Low
5.2 Woodland conservation	Ongoing	3	Low
5.3 Nomadic display lake	Ongoing	3	Low

Objective 1. To Establish Effective Habitat Management

Action 1.1. Grassland Management and Enhancement of Natural Wildflower Areas: Establishment of Modified Cutting Regime for Road Verges and Grassland Areas

For the greatest biodiversity value, grassland areas would be cut once, or perhaps twice a year, at the end of the growing season (August/September) and, if necessary, in early spring. Additional cuts may be carried out after the main August/September cut to ensure that the sward is cropped short at the onset of winter. If this were deemed unacceptable, a possible compromise would be to simply reduce the frequency of mowing and to consider suspending regular mowing during the height of the growing season (July/August). Cuttings should always be removed.

Where the verge is sufficiently wide a two-zone system should be established. The verge could be divided into bands, running parallel to the road. A strip around the perimeter of the grassland could be kept short, maintaining a kempt appearance, while allowing wild grasses and forbs to proliferate in the middle strip, which would be cut, as above, once or twice a year. This system will have rapid positive results. In larger grassland areas, areas with thick densities of grasses can be cut to create pathways through the grassland habitat which, again, can follow the above-suggested mowing regime. An example of one such area where this two-tier cutting method is currently used is adjacent to the playground. It is important to target the areas of denser grassland for regular pathway cutting to maintain routes through the taller grass.



Figure 25. Grass cutting regimes could be altered to give more variety to the sward and encourage species diversity.

Action 1.2. Reduction in Herbicide/pesticide Use

Use of herbicide should be avoided, *e.g.* on walls and paths, to enable occasional colonisation by plants and the development of small ecological communities. Minimal, targeted use may be required to effectively eradicate invasive species (see Action 1.3). Pesticides other than herbicides should only be used when absolutely necessary.

Action 1.3. Removal of Invasive Species

Invasive species are species that have been introduced (whether deliberately or by accident) and have a negative impact on biodiversity. After habitat loss, invasive species are the most serious threat to biodiversity worldwide. Examples in Ireland include roach, introduced for angling and rhododendron, an ornamental garden plant. Other invasive species such as mink have become escapees from farms, or as stowaways in cargos of imported goods.

Japanese knotweed was recorded throughout Louisburgh whereas giant rhubarb was found at a single location within the town, although it is known to occur in several areas in the environs of the town boundary. Of these two, Japanese knotweed has become a serious problem and work should be undertaken immediately to establish a programme with the objective of its eradication. Removal of these species using correct planning and best-practice methods should reduce the potential for further spread and increases in costs for removal. Vigilance should be kept on the movement of soil and rubble throughout the town, particularly at new construction sites. This is an important element in dealing with colonisation of new sites.

Before initiating any control methods, more detailed information should be sought about the identification of the target species and the control method to be used. It is important to ensure that funds are available for follow-up treatments before commencement. A single treatment without follow-up monitoring and treatment may exacerbate the problem. Any eradication programme should work over a two to three year period at least.

Japanese Knotweed

Japanese knotweed may become a serious problem and work should be undertaken immediately to establish a programme to eradicate it (see Action Box 1). Removal of this species using correct planning and best-practice methods should not only reduce the potential for further spread, but save money. Japanese knotweed thrives in areas of disturbed ground and is often associated with construction sites and adjacent areas with human activity (Figure 26). The distribution of Japanese knotweed in Louisburgh is shown in Figure 27. It should be noted that many of the private holdings in the village centre where there could be further areas of growth, were not surveyed during this study.



Figure 26 Japanese knotweed pushing up through tarmacadam.

Action box 1 Suggested removal plan framework

Due to the scale of Japanese knotweed distribution in Louisburgh a systematic approach needs to be taken towards controlling its spread. This project must have achievable goals on a two-yearly cycle. This will involve the following steps:

- a)** Establishment of invasive species committee/steering group that would include local interest groups, e.g. Tidy Towns, Rural Social Scheme, Local Authority. This group will coordinate removal effort including mapping of individual stands of Japanese knotweed, removal planning, liaison with private landowners, securing of funding for equipment / suitable chemicals etc.
- b)** Regular updating of the map detailing the distribution of Japanese knotweed in Louisburgh. This could provide a very interesting student project that would be applicable for students for such competitions as BT Young Scientist. A map showing indicative areas is presented in Figure 27.
- c)** Production of awareness leaflet for inhabitants of Louisburgh.
- d)** Development of a soil removal/transfer protocol / guidance
- e)** Commencement of a removal programme based on a grid-square approach (Figure 27) where certain squares are targeted based on level of threat of continuing spread of the knotweed.

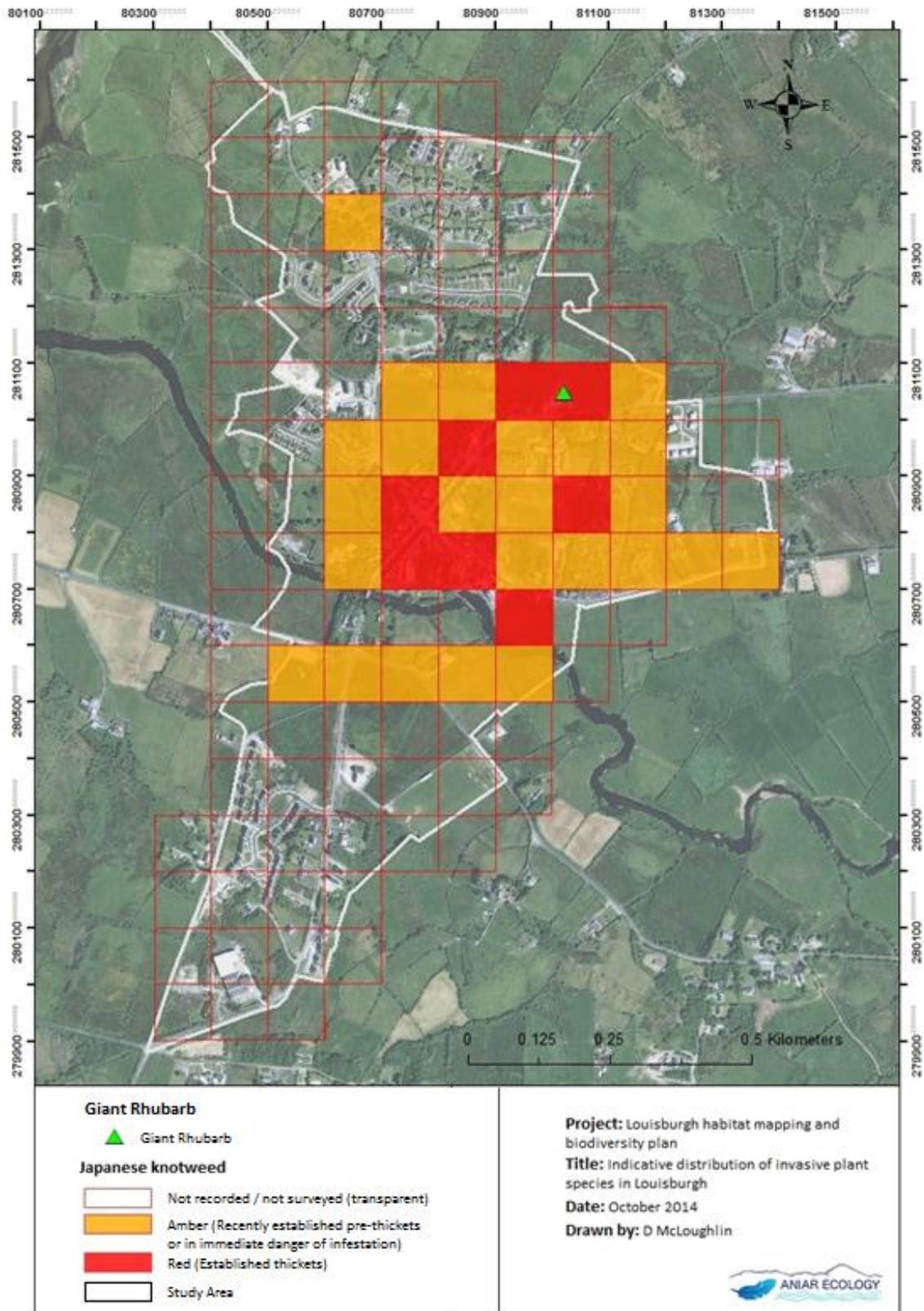


Figure 27. 100 metre grid showing distribution of Japanese knotweed in Louisburgh, and location of giant rhubarb (*Gunnera*).

Giant Rhubarb

A giant rhubarb stand is present at the construction storage site on the Westport Road, opposite Sancta Maria College (Figure 28).

Like Japanese knotweed, it can grow from small fragments of the rhizome. Control methods include physical removal, chemical spraying and the cut-and-paint method. The latter is recommended since cutting allows access to the rest of the stand and only a very small amount of herbicide is used, reducing the risk to the person applying it and to other organisms. This method has had success by Mayo County Council on Achill.

It involves cutting the stems low to the ground in August/September and applying glyphosate (Roundup) to the cut surface with a paintbrush. Rhizomes remain underground so regrowth must be monitored and re-treated in the same way. More information is available on www.invasivespeciesireland.com.



Figure 28. Giant rhubarb on revegetating land.

Rhododendron

Rhododendron was recorded at only one location, along the Bunowen River at Scot's Island. This is a single specimen and appears to be well established but currently not noticeably spreading. This should be removed, but is not as urgent an issue as the Japanese knotweed problem. However, rhododendrons produce millions of seeds annually, so the longer it remains, the more seeds will be distributed in the environs. The following method should be considered for its removal.

Trunks should be cut close to the ground, in dry weather, before flowering (October-February) and 20% glyphosate solution be applied to the stems with a paintbrush within 30 seconds of cutting. Food dye, added to the solution, will distinguish stems that have

been treated from those that have not. Rhododendron re-grows vigorously from stumps if left untreated. Following treatment, shoots should be spot sprayed annually for at least three years, and any seedlings in the vicinity should be uprooted. This means that eradication/control is a long-term commitment, requiring planning and site prioritisation. However, the problem in Louisburgh is not currently severe and should not worsen if addressed soon.

Action 1.4. Hedgerow Maintenance

Established hedgerows (WL1) need cutting about once every three years. This should be carried out between early September and late February, when the hedgerow plants are dormant and nesting birds are absent. Neglected or remnant hedgerows will require more vigorous intervention to be restored to functionality and vigour, probably replanting, laying or coppicing. The maintenance should aim to produce a hedge with an A-shaped profile with a bushy top. "Gappy" hedgerows can be laid or planted with hawthorn or blackthorn saplings. Many hedgerows in Ireland are in need of rejuvenation: laying is good for this, and The Hedge Laying Association of Ireland (<http://www.hedgelaying.ie/>) has good information on this practice. More information is given below for Action 2.1.

Action 1.5. Tree Planting

There are areas in Louisburgh that have already benefited greatly from tree planting, *e.g.* the school, where a hedgerow of diverse trees has been planted. Other areas would benefit from tree planting including the area around the GAA pitch and in the housing estates. There is very little woodland in Louisburgh: perhaps the biodiversity action group, when established, would consider the possibilities for creating new woodlands or even small copses. Trees should be native and preferably of local stock or origin. Examples of native trees that would suit a damp, exposed area like Louisburgh include ash, birch, hawthorn, aspen, pedunculate oak, sessile oak, rowan, yew, juniper, whitebeam alder, willow, cherry and holly. alder, birch and willow are particularly suited to wet areas. While most trees would be planted to grow as single-trunked trees, options for patches of coppice could also be explored (see <http://www.muintirnacoille.ie>).

Planting in Louisburgh could be organised as a community or school event, perhaps coinciding with National Tree Week. The ideal time to plant varies with species but is usually either in autumn or late winter. Please be sure to plant correctly to avoid waterlogging, overly compact and rocky substrate, and other stressors. During dry periods recently planted trees need to be diligently watered: many young trees, while lovingly planted, can die in the same year from lack of water. More advice on native tree species, planting and sourcing of local stock can be obtained from the Tree Council of Ireland (www.treecouncil.ie), Woodlands of Ireland (www.woodlandsofireland.com) or Crann (www.crann.ie).

Action 1.6. Leave Plants on Buildings and Walls

Wall plants can be a valuable component of the biodiversity of a town or village environment. These include mosses, lichens, liverworts, ferns and some seed plants. On the whole these plants should be left *in situ* (Figure 29), and only sprayed if they become problematic (*i.e.* likely to dislodge stones).



Figure 29. Wall plants: ferns growing in crevices in a wall.

In some cases plants such as Ivy can become established and, depending on the nature of the building or structure on which they grow, can eventually cause some structural damage. Where this happens the ivy should not be mechanically removed but rather cut near the base and left *in situ*. The advice of a structural engineer should be sought. Robust herbs, shrubs or trees such as ash or sycamore can become established in crevices and gaps, and require treatment at an early stage.

Action 1.7. Monitoring Efficacy of Management

It is important to ensure that any actions carried out achieve the desired results or, if they do not, to try to establish how to modify the method to better to achieve the objective in future. It is recommended that both the management actions carried out and the results of monitoring be recorded in writing to help inform future decisions. This monitoring should be reported back to the Action group established to manage the biodiversity plan.

Objective 2 – To Increase Habitat Connectivity

Action 2.1. Hedgerow Planting

Planting of new hedgerows around Louisburgh is a high priority to in order to establish greater biodiversity connectivity between sites of ecological interest. Target areas should include most of the roadside areas to the south of the river, including the GAA pitch, and along the road from the National School towards the town centre. It is understood that the GAA Club in Louisburgh hope to shield off visual access to the pitch by the use of hedging that will protect it throughout the year.

In each case, if there is a concern that thorny trees might puncture footballs, blackthorn, hawthorn and dog rose could simply be avoided and replaced by other shrubs. Other suitable trees and shrubs include ash, oak, alder, willow, bird cherry, wild cherry, birch, spindle, crab apple, whitebeam, holly, rowan, elder and guelder rose. Although not native, if necessary, Beech could be included in the hedge line. Beech retains its previous season's leaves usually until early spring and would provide a visual barrier from the main road.

A bank and ditch may be necessary to provide good drainage. About 2-3m should be allowed for the mature hedgerow. Plants (local stock, if possible) should be planted close together (max. 50cm) in a zigzag pattern with a depth of 3-4 trees. The trees must be protected from exposure (tree shelters) and grazing (fencing) and weeds (regular weeding) in the initial 1-3 years. Clipping may be necessary to encourage the correct shape. The hedge should be regularly checked in its first four years for any poor/dead trees and these should be replaced. Additional information can be obtained from Teagasc (<http://www.teagasc.ie/environment/heritage/Hedgerows.asp>) and The Heritage Council (<http://www.heritagecouncil.ie>) among other sources.

Action 2.2. Treeline Planting

Treelines (WL2) provide important corridors for wildlife, just as hedgerows (WL1). The planting of treelines in conjunction with hedgerows should be carried out in a planned fashion. The network of these linear habitats will contribute significantly to the movement of wildlife and connectivity of the discrete habitats in the town. Species recommended are as for hedgerows: preferably native tree species.

Action 2.3. Leave Uncut Areas

See Action 1.1: strips of grassland (verges, amenity grassland, lawns) left uncut can join up with adjacent patches of habitat to form a network of havens for biodiversity. A stretch of regularly mown grass can form a barrier to movement of species, so the uncut area becomes a corridor through which wildlife can mix with the biodiversity in a nearby patch of habitat. The uncut strip augments linear habitats such as treelines (WL2) and

hedgerows (WL1). Without this uncut area the regularly mown "barrier" may be too difficult to move through.

Objective 3 – Biodiversity Interpretation: Increasing Appreciation and Awareness of Nature

Action 3.1. Targeted Ecological Studies

There is a dearth of information on some species groups such as bats. Targeted baseline surveys should be completed (possibly as part of Actions 3.2-3.4) where an expert conducts surveys throughout the town. This could be done in collaboration with the local NPWS Conservation Ranger.

Actions 3.2-3.4. Walks, Talks, and Activities

Environmental educators and biodiversity specialists should be invited to run events such as a dawn chorus outing (*e.g.* Birdwatch Ireland), a night bat walk (*e.g.* Bat Conservation Ireland), and create a wildlife trail based on the actions suggested in this report. Nature excursions may include the excellent natural areas a short distance from the town, *e.g.* Carrowmore strand, Old Head Woodland and the mountain ranges nearby for good upland blanket bog (PB2) habitats. Talks of nature interest should be held particularly during the winter, when an evening indoors may be more inviting to the community than an excursion. These may be organised by the biodiversity action group, or a subset of that group. If possible the students in Transition Year (TY) in the College should be encouraged to get involved in the organisation and running of these events. This would have the advantage of enabling them to practice their organisational, team building and public presentation skills, and they would learn about the natural world from invited speakers.

Ideally, interested parties in the village, *e.g.* the biodiversity action group, should have access to a bat detector to record bat activity as part of possible "bat evenings" that could be arranged between April and September each year. These evenings would contribute towards raising awareness of the importance of bat species in the overall biodiversity of Louisburgh and the surrounding area (see also Actions 3.4, 3.8 and 4.2).

Action 3.5. Interpretive Signage

In order for the community to support the work of the biodiversity action group, a low-profile campaign to raise awareness of nature and its importance should be run in the town. The "Walks and Talks" in Actions 3.2-3.4 will be part of this thrust, but more is needed so that everyone in the town, and visitors, may learn about what they are seeing while they go about their daily business or visit particular points of interest. Some guidelines for the production of interpretive materials are given in Appendix 3. It is recommended that, as part of a wider publicity drive, interpretive signs be designed and erected in the town, particularly at the following locations:

- Coastal Habitats - Carrowmore Beach and at mouth of Bunowen River
- Atlantic Salmon, Trout & Otters – at Scot's Island
- Importance of Invertebrates – at 'Insect Hotel'
- Grassland management for biodiversity - beside playground
- Native Trees – along riverside walk
- Importance of Hedgerows – next to planted hedgerow
- Importance of Tree lines
- Interpretation of such actions as wildflower meadow

The involvement of IFI is an important element towards environmental education in Louisburgh. Perhaps IFI can assist in such aspects of signage along the river as an interpretation of their work, the fish counters, diagrams of the life-cycle of the salmon, and potentially the negative consequences of poaching salmon.

Action 3.6. Leaflets and Posters

Leaflets and posters should be produced in a manner that is environmentally-friendly. In particular, the informative products should not contribute to litter in the town, rather just raise awareness about particular habitats, species or on-going management practices. Private gardens can form an important part of the biodiversity complement of the town, and householders should be encouraged to leave some wild areas in their gardens. Garden hedgerows (WL1) and treelines (WL2) can form important corridors for wildlife and should be encouraged.

The following are suggestions for educational leaflets and posters (see Appendix 3 for some guidelines):

- Louisburgh habitat map with information on the habitats
- Invasive species in the west of Ireland
- Gardening for wildlife
- Wildlife trail for Louisburgh including "check-list" of the plants, birds and mammals.

Action 3.7. Community Clean-ups

An annual “fun” event could be organised to clean up or tidy the town, or plant flowers, as an awareness-raising exercise. The benefits of using manual gardening skills to trim the edges of lawns *etc.* could be demonstrated and used, to show an alternative to using herbicide.

Action 3.8. Insect Hotel

One or two “insect hotels” could be built, perhaps one in the primary school and one at Scot's Island. These are not expensive items and the community could be encouraged to take ownership by supplying the wood and other items. A sign acknowledging the involvement of donors would be appropriate. Since many invertebrates thrive in damp conditions such as stacks of rotting wood, laid horizontally, the “hotel” should have a very porous roof (a to encourage rotting. As its primary function is educational, it should try to accurately mimic the habitat of invertebrates. Signage should accompany the “insect hotel” to provide information on the reasons for its construction and supposed benefits

Action 3.9. School Projects

Some of the suggested actions, such as the hedgerow and tree planting, could be performed as school projects in which the pupils are involved (Table 6). They could even be run as part of a scheme such as the Crann School Trees Project or the Crann Hedgerow Project. A “wild corner” or a school-maintained “insect hotel” would also be valuable media for environmental education. The cultivation of seed plots for birds (Action 4.3) may also involve the schools.

Local TY students could be involved in organising and scheduling a talk or two on nature during the year, as part of their TY experience. As the school year excludes the best months for identifying flowering plants (the summer), students could be introduced to non-flowering plants, *e.g.* lichens and bryophytes (including mosses), and over-wintering birds. The TY students may also be involved in surveying for bats, or as part of a science project, possibly even a Young Scientist project. This would involve some training and the purchase of some bat-detectors. A survey of the old buildings in the town would provide information on possible bat roosts, and may be an appropriate project for interested students. They could also get involved in monitoring the occurrence of invasive alien species, by mapping its spread in grid squares (see Figure 27 and Action 1.3).

Table 6. List of suggested projects for primary and secondary schools. Transition Year students may be appropriate for a number of these projects

1	Tree and hedgerow planting
2	Creation of a wildflower area

3	Planting of a seed plot for birds
4	Erection of an insect hotel and monitoring the invertebrates using it
5	Yearly mapping of invasive alien species
6	Lichen and bryophyte identification
7	Survey of old buildings in town for bats and general bat surveys
8	Carry out bat detection and monitoring surveys and facilitate relevant activities for younger children
9	Organise and run talks by nature experts

Action 3.10. National Parks and Wildlife Service involvement

This involvement could be signage and/or resources such as offering invited speakers at talks, and supplying seeds for seed plots (see Action 4.3).

Objective 4 – To Implement Biological Group-specific Conservation Methods

Action 4.1. Erect Bird Boxes

Bird boxes may be renewed at Scot's Island, and other bird boxes erected in areas of interest around the town, *e.g.* at the schools and possibly the church. The community should be encouraged to erect boxes on trees in gardens, and the possibility of erecting boxes near the GAA pitch should be considered as part of the hedgerow-treeline -planting project there. The N59 bridge over the Bunowen should be targeted with a view to providing nesting opportunity for nesting dipper.

Particular target species for nest boxes would include blue tit, great tit, wren, house sparrow, and swift. Currently there is a swift nest box project that is coordinated by Lynda Huxley of GMIT⁴. Placement of the nest box is very important and it is advisable to consult with a bird expert prior to putting it up. Examples of recently-installed swift nest boxes are shown in Figure 30.

⁴ For further information on how to erect swift boxes, see <https://www.gmit.ie/sites/default/files/public/general/docs/swift-nest-project.pdf> and designs for more bird box types can be found at www.birdwatchireland.ie



Figure 30. A swift investigating nest boxes erected by Tubbercurry Tidy Towns [photo © Michael Casey with permission]

Action 4.2. Erect Bat Boxes

Bat boxes and hibernation boxes could be erected on any mature trees in the town and the new bridge in the town.

Old buildings should be surveyed for bats: this may be carried out as an on-going town survey in which students could become involved (see Action 3.8). It should be a target to facilitate roosting and hibernation sites for bats. Targeted species should comprise Daubenton's, Leisler's, and pipstrelle bats.

It is advised to consult with Bat Conservation Ireland, The Vincent Wildlife Trust (Ireland), or a bat expert to ensure the best placement of the boxes.

Action 4.3. Plant Seed Plots for Birds

"Sacrificial" seed crop plots have been incorporated into agri-environmental schemes, for the past number of years, and are successful at attracting small birds (passerines). These plots can vary in size from a number of square metres to several hectares depending on the area available. This provides the opportunity for the general public to see how seed plots act as an excellent means for attracting and feeding a range of bird species without daily topping-up of bird feeders. In addition, seed plots were a feature of every rural homestead in Ireland, and this could be a point of historical information and interpretation for the area.

The provisional suggested crops for the seed plot are as follows:
radish, mustard, turnip, quinoa, kale, triticale, linseed.

Cultivation should be as follows:

- Target area to be prepared (ploughed or hand-dug) in March through May and seeds sown.
- After sowing, the fields should be chain harrowed and rolled if the site is large. Otherwise, raking would be sufficient.
- The fields can be grazed from January if necessary.
- Kale should be used on the windward side of the plot to provide shelter. Turnip will provide structure to the crop itself.

This type of plot can be used in a number of areas, provided they are not too exposed. The plot should be rotated (two-yearly rotational) following best horticultural practice for these plants.

The school grounds, the bare areas where invasive plants have been cleared, or a section of amenity grassland along the river where space/aesthetics permit would provide a suitable area for such a plot. This recommendation could be managed and monitored (weekly bird counts *etc.*) by students from the school.

Action 4.4. Monitoring (Plant and Animal Surveys)

It is advised that annual or biennial surveys be carried out to assess whether any change in biodiversity is occurring within the different groups (*e.g.* birds, bats, plants, amphibians). If and as the opportunity arises, expertise within the community may be used to monitor biodiversity. These surveys could also be done as part of larger national monitoring surveys such as BirdWatch Ireland's Countryside Bird Survey (CBS) or the national Daubenton's bat survey

Where a recommendation such as the "grassland management" option is engaged, a number of monitoring points should be selected to assess the efficacy of the new management regime. Each monitoring patch would comprise a 2 x 2 metres quadrat in which all plant species and their cover should be recorded.

Objective 5 – To Maintain and Enhance Natural Beauty

Action 5.1. Connecting Bunowen and Carrowmore

The lack of access from one side of the mouth of the Bunowen to the other is an impediment to the enjoyment of the coastal area. The provision of a crossing point between the mouth of the Bunowen and Carrowmore beach would improve the amenity and accessibility of these areas for the community and draw visitors to use a wonderful circular walk. We suggest that a ford (or footbridge further upstream) could be provided,

connecting the mouth of the Bunowen (Figure 31) to Carrowmore strand, depending on a full environmental assessment of the effects of such a structure. So many excellent natural habitats accessible to Louisburgh are on this route including sand dune systems (CD), salt marshes (CM), depositing/lowland rivers (FW2), estuaries (MW4), machair (CD6), dry calcareous and neutral grassland (GS1), wet grassland (GS4). These habitats are a fantastic resource for wildlife and habitats, but are under-utilised due to their lack of connectivity. A crossing point between these areas would open up the whole beach to being accessed from both sides, and create a circular walk that could begin and end in Louisburgh. Interpretation and signage would help in the appreciation of the nature in this area, and would attract more activity in the form of school projects, photography, and recreation.

It would be of the utmost importance that the highly sensitive habitats in this area not damaged in any way as a direct, or indirect, result of such a project. In addition, such a construction would need to be sensitive to the landscape, and constructed with consideration for the dynamic nature of these coastal habitats.



Figure 31. Mouth of Bunowen river. A footbridge across the river at this point would join the road at the river mouth to the beach at Carrowmore.

Action 5.2. Woodland Conservation

Although it has some old trees in private gardens, Louisburgh only has a very small area of woodland. However, the woodland is a good example of native wet willow-alder-ash woodland (WN6), and efforts should be made to conserve it - and if possible, to expand it. There are other patches of wet woodland or scrub (WS1) near to it, and these should be left to grow into more mature woodlands, if possible. This type of woodland thrives in sites that are wet, so any drainage in that area should be avoided.

Action 5.3. Nomadic Display Lake

The lake at Nomadic Display (Figure 32) is a good example of how to increase habitat diversity on a site, at the same time improving the aesthetic value. This could be maintained and possibly enhanced by further expansion of the display of diverse habitats, for example the development of a woodland area nearby. This may develop on the site without much intervention, just vigilance for the encouragement of native species.



Figure 32. Lake at Nomadic Display

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APPENDICES

Appendix 1. Species lists showing common and scientific names

Seed plants

Alder	<i>Alnus glutinosa</i>
Angelica	<i>Angelica sylvestris</i>
Bird's-foot Trefoil	<i>Lotus corniculatus</i>
Black Sedge	<i>Carex nigra</i>
Blackthorn	<i>Prunus spinosa</i>
Bog Pimpernel	<i>Anagallis tenella</i>
Borrer's Salt-marsh Grass	<i>Puccinellia fasciculata</i>
Bramble	<i>Rubus fruticosus</i> agg.
Cat's Ear	<i>Hypochaeris radicata</i>
Centaury	<i>Centaurea erythrea</i>
Cherry Species	<i>Prunus</i> sp.
Cock's Foot Grass	<i>Dactylis glomerata</i>
Coltsfoot	<i>Tussilago farfara</i>
Common Cottongrass	<i>Eriophorum angustifolium</i>
Common Dogwood	<i>Cornus sanguinea</i>
Common Marsh Bedstraw	<i>Galium palustre</i>
Common Rush	<i>Juncus effusus</i>
Common Scurvy Grass	<i>Cochlearia officinalis</i>
Common Spike-rush	<i>Eleocharis palustris</i>
Common Valerian	<i>Valeriana officinalis</i>
Compact Rush	<i>Juncus conglomeratus</i>
Creeping Bent	<i>Agrostis stolonifera</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Creeping Thistle	<i>Cirsium arvense</i>
Crested Dog's Tail	<i>Cynosurus cristatus</i>
Curlew	<i>Numenius arquata</i>

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Daisy	<i>Bellis perennis</i>
Dandelion	<i>Taraxacum officinale</i>
Devil's Bit Scabious	<i>Succisa pratensis</i>
Dock Species	<i>Rumex</i> spp.
Downy Birch	<i>Betula pubescens</i>
Eared Willow	<i>Salix aurita</i>
False Fox-sedge	<i>Carex otrubae</i>
False Oat Grass	<i>Arrhenatherum elatius</i>
Floating Sweet-grass	<i>Glyceria fluitans</i>
Fool's Watercress	<i>Apium nodiflorum</i>
Germander Speedwell	<i>Veronica chamaedrys</i>
Giant Rhubarb	<i>Gunnera tinctoria</i>
Glaucous Sedge	<i>Carex flacca</i>
Gorse	<i>Ulex europaeus</i>
Grass	<i>Poaceae</i>
Greater Plantain	<i>Plantago major</i>
Groundsel	<i>Senecio vulgaris</i>
Hawthorn	<i>Crataegus monogyna</i>
Heath Wood-rush	<i>Luzula multiflora</i>
Hedge Bindweed	<i>Calystegia sepium</i>
Herb Robert	<i>Geranium robertianum</i>
Hogweed	<i>Heracleum sphondylium</i>
Holly	<i>Ilex aquifolium</i>
Honeysuckle	<i>Lonicera periclymenum</i>
Ivy	<i>Hedera helix</i>
Japanese Knotweed	<i>Fallopia japonica</i>
Jointed Rush	<i>Juncus articulatus</i>
Knapweed	<i>Centaurea nigra</i>
Knotgrass	<i>Polygonum aviculare</i>
Lesser Sea Spurrey	<i>Spergularia marina</i>
Lesser Spearwort	<i>Ranunculus flammula</i>

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Ling Heather	<i>Calluna vulgaris</i>
Marsh Cudweed	<i>Gnaphalium uliginosum</i>
Marsh Foxtail	<i>Alopecurus geniculatus</i>
Marsh Ragwort	<i>Senecio aquatica</i>
Marsh Stitchwort	<i>Stellaria palustris</i>
Marsh Thistle	<i>Cirsium palustre</i>
Meadow Buttercup	<i>Ranunculus acris</i>
Meadow Foxtail	<i>Alopecurus pratensis</i>
Meadow Vetchling	<i>Lathyrus pratensis</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Montbretia	<i>Crocsmia x crocosmiflora</i>
Mouse-ear Chickweed	<i>Cerastium fontanum</i>
Oval Sedge	<i>Carex leporina</i>
Pale Persicaria	<i>Persicaria lapanthifolia</i>
Perennial Rye Grass	<i>Lolium perenne</i>
Poplar	<i>Populus sp.</i>
Privet	<i>Ligustrum ovalifolium</i>
Procumbent Pearlwort	<i>Sagina procumbens</i>
Purple Loosestrife	<i>Lythrum salicaria</i>
Purple Moor Grass	<i>Molinia caerulea</i>
Ragwort	<i>Senecio jacobaea</i>
Red Clover	<i>Trifolium pratense</i>
Red Fescue	<i>Festuca rubra</i>
Red Goosefoot	<i>Chenopodium rubrum</i>
Red Horse-chestnut	<i>Aesculus x carnea</i>
Redshank	<i>Persicaria maculosa</i>
Remote Sedge	<i>Carex remota</i>
Ribwort	<i>Plantago lanceolata</i>
Sally	<i>Salix cinerea ssp. oleifolia</i>
Saltmarsh Rush	<i>Juncus gerardii</i>
Scot's Pine	<i>Pinus sylvestris</i>

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Sea Arrow-grass	<i>Triglochin maritima</i>
Sea Plantain	<i>Plantago maritima</i>
Self-heal	<i>Prunella vulgaris</i>
Sheep's Fescue	<i>Festuca ovina</i>
Silverweed	<i>Potentilla anserina</i> (Argentina <i>anserina</i>)
Sitka Spruce	<i>Picea sitchensis</i>
Snowberry	<i>Symphoricarpus albus</i>
Sorrel	<i>Rumex acetosa</i>
Springy Turf-moss	<i>Rhytidiadelphus squarrosus</i>
Spruce Species	<i>Picea</i> sp.
Star Sedge	<i>Carex echinata</i>
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>
Sycamore	<i>Acer pseudoplatanus</i>
Thyme-leaved Speedwell	<i>Veronica serpyllifolia</i>
Toad Rush	<i>Juncus bufonius</i>
Tormentil	<i>Potentilla erecta</i>
Tufted Vetch	<i>Vicia cracca</i>
Tutsan	<i>Hypericum androsaemum</i>
Viola	<i>Viola</i> sp.
Water-pepper	<i>Persicaria hydropiper</i>
White Clover	<i>Trifolium repens</i>
Whitebeam	<i>Sorbus aria</i>
Wild Angelica	<i>Angelica sylvestris</i>
Willowherb sp.	<i>Epilobium</i> sp.
Woundwort	<i>Stachys sylvatica</i>
Wych Elm	<i>Ulmus glabra</i>
Yellow Clover, Shamrock	<i>Trifolium dubium</i>
Yellow Flag Iris	<i>Iris pseudacorus</i>
Yellow Sedge	<i>Carex viridula</i>
Yorkshire Fog	<i>Holcus lanatus</i>

Pteridophytes

Broad Buckler Fern	<i>Dryopteris dilatata</i>
Hard Fern	<i>Blechnum spicant</i>
Lady Fern	<i>Athyrium filix-femina</i>
Male Fern	<i>Dryopteris filix-mas</i>
Scaly Male Fern	<i>Dryopteris pseudomas</i>

Bryophytes

Pointed Spear-moss	<i>Calliergonella cuspidata</i>
Glittering Woodmoss	<i>Hylocomium splendens</i>
Liverwort	<i>Marchantia polymorpha</i>

Mammals (non-flying)

Otter	<i>Lutra lutra</i>
Badger	<i>Meles meles</i>
Fox	<i>Vulpes vulpes</i>
Irish Hare	<i>Lepus timidus hibericus</i>

Bats

Soprano Pipistrelle	<i>Pipistrelle Pipistrellus pygmaeus</i>
Daubenton's Bat	<i>Myotis daubentonii</i>
Leisler's Bat	<i>Nyctalus leisleri</i>

Fish

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Salmon	<i>Salmo salar</i>
Sea Trout	<i>Salmo trutta</i>

Birds

Fulmar	<i>Fulmarus glacialis</i>
Herring Gull	<i>Larus argentatus</i>
Black-headed Gull	<i>Chroicocephalus ridibundus</i>
Sanderling	<i>Calidris alba</i>
Dunlin	<i>Calidris alpina</i>
Redshank	<i>Tringa totanus</i>
Turnstone	<i>Arenaria interpres</i>
Ringed Plover	<i>Charadrius hiaticula</i>
Curlew	<i>Numenius arquata</i>
Common Snipe	<i>Gallinago gallinago</i>
Grey Heron	<i>Ardea cinerea</i>
Corncrake	<i>Crex crex</i>
Kestrel	<i>Falco tinnunculus</i>
Long-eared Owl	<i>Asio otus</i>
Hen Harrier	<i>Circus cyaneus</i>
Rook	<i>Corvus frugilegus</i>
Jackdaw	<i>Corvus monedula</i>
Hooded Crow	<i>Corvus corone cornix</i>
Raven	<i>Corvus corax</i>
Swallow	<i>Hirundo rustica</i>
Swift	<i>Apus apus</i>
Kingfisher	<i>Alcedo atthis</i>
Skylark	<i>Alauda arvensis</i>

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Meadow Pipit	<i>Anthus pratensis</i>
Grey Wagtail	<i>Motacilla cinerea</i>
Wren	<i>Troglodytes troglodytes</i>
Robin	<i>Erithacus rubecula</i>
Blackbird	<i>Turdus merula</i>
Song Thrush	<i>Turdus philomelos</i>
Starling	<i>Sturnus vulgaris</i>
Dipper	<i>Cinclus cinclus</i>
Goldcrest	<i>Regulus regulus</i>
Whitethroat	<i>Sylvia communis</i>
Chiffchaff	<i>Phylloscopus collybita</i>
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>
Willow Warbler	<i>Phyllocopus trochilus</i>
Grasshopper Warbler	<i>Locustella naevia</i>
Goldcrest	<i>Regulus regulus</i>
Great Tit	<i>Parus major</i>
Coal Tit	<i>Parus ater</i>
Blue Tit	<i>Parus caeruleus</i>
Long-tailed Tit	<i>Regulus regulus</i>
Magpie	<i>Pica pica</i>
Rook	<i>Corvus frugilegus</i>
House Sparrow	<i>Passer domesticus</i>
Chaffinch	<i>Fringilla coelebs</i>
Linnet	<i>Carduelis cannabina</i>
Goldfinch	<i>Carduelis carduelis</i>
Siskin	<i>Carduelis spinus</i>
Lesser Redpoll	<i>Carduelis caberet</i>
Bullfinch	<i>Pyrrhula pyrrhula</i>
Reed Bunting	<i>Emberiza schoeniclus</i>

Butterflies

Green-veined White	<i>Pieris napi</i>
Small White	<i>Pieris rapae</i>
Large White	<i>Pieris brassicae</i>
Small Copper	<i>Lycasena phlaeas</i>
Small Tortoiseshell	<i>Aglais urticae</i>
Peacock	<i>Inachis io</i>

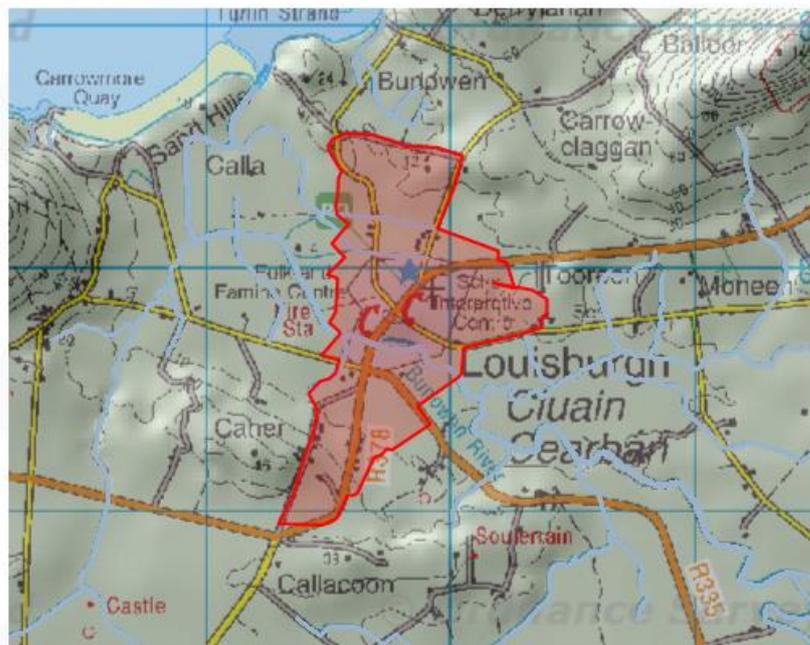
Freshwater invertebrate

Freshwater Pearl Mussel	<i>Margaritifera margaritifera</i>
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Appendix 2. Biodiversity Data Centre records for Louisburgh



Species list for a User-Defined Polygon



Feature Name	Species group	Scientific name	Common name	Designation
Custom	annelid	Eiseniella tetraedra		
Custom	annelid	Glossiphonia complanata		
Custom	bony fish (Actinopterygii)	Gasterosteus aculeatus	Three-spined Stickleback	
Custom	crustacean	Gammarus duebeni		
Custom	flowering plant	Acer pseudoplatanus	Sycamore	Invasive Species: Invasive Species >> Medium Impact Invasive Species
Custom	flowering plant	Crataegus monogyna	Hawthorn	
Custom	flowering plant	Crocsmia pottsii x aurea = C. x crocosmiiflora	Montbretia	
Custom	flowering plant	Fallopia japonica	Japanese Knotweed	Invasive Species: Invasive Species >> High Impact

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				Invasive Species
Custom	flowering plant	Fraxinus excelsior	Ash	
Custom	flowering plant	Ilex aquifolium	Holly	
Custom	flowering plant	Lythrum salicaria	Purple-loosestrife	
Custom	flowering plant	Potamogeton natans	Broad-leaved Pondweed	
Custom	flowering plant	Sparganium erectum	Branched Bur-reed	
Custom	insect - beetle (Coleoptera)	Elmis aenea		
Custom	insect - beetle (Coleoptera)	Esolus parallelepipedus		
Custom	insect - beetle (Coleoptera)	Limnius volckmari		
Custom	insect - dragonfly (Odonata)	Calopteryx virgo	Beautiful Demoiselle	
Custom	insect - dragonfly (Odonata)	Ischnura elegans	Blue-tailed Damselfly	
Custom	insect - mayfly (Ephemeroptera)	Baetis rhodani		
Custom	mollusc	Ancylus fluviatilis		
Custom	mollusc	Radix balthica	Wandering Snail	
Custom	terrestrial mammal	Erinaceus europaeus	West European Hedgehog	Protected Species: Wildlife Acts
Custom	terrestrial mammal	Lutra lutra	European Otter	Protected Species: EU Habitats Directive >> Annex II Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts

Appendix 3. Some suggested guidelines for interpretive display

Although interpretative displays conveying information on local information occur in almost every town in Ireland, very few are properly effective at engaging the reader and achieving their aim. This is primarily due to lack of proper planning and research into the content of the signage.

To ensure effective wildlife signage, the following steps should be considered:

- 1) Project planning
 - a) Estimating the nature and scale of the interpretation
 - b) Quality of signs required
 - c) Project costs
 - d) Set a timeframe and measurable goals towards meeting this timeframe

- 2) Creating partnerships
 - a) Consult with and meet local interested parties including local (or regional) wildlife groups, *e.g.* Mayo branch of BirdWatch Ireland.
 - b) Seek guidance of environmental and planning specialists that may have first-hand experience in such projects, *e.g.* Mayo County Council, National Parks and Wildlife. In addition to offer guidance, potentially contributing towards funding, they will inform you of planning/environmental assessment obligations that some projects may need.
 - c) Visit comparable site or interpretation projects such as the NPWS National Parks in Connemara or Ballycroy for ideas.

- 3) Site-specific research and decision-making
 - a) Identify the specific location for the trail or biodiversity station
 - b) Identify the points of interest
 - c) Confirm the list of target features and their location along the trail

- 4) Developing the sign content

- a) Research the topics carefully ensure accurate information for the content of the signage. Ensure text is clear and concise. Ask an ecologist or wildlife expert to proof-read the text.
 - b) Bear the following in mind when writing the content for interpretative signage:
 - i) Use succinct and catchy titles and straplines such as that in Figure 33, "*Beauty and death in the bog*".
 - ii) Remember, most people can only focus on the first 50 words and receive what they want from a sign in the first 10 seconds. They will not read the "fascinating facts" at the end of a long piece of text!
 - iii) For a general audience, the text should be readily understandable to an average 10 year-old child.
 - iv) Use coloured layers to allow the reader to easily distinguish between different points of interest, "fascinating facts", etc.
 - v) The main body text should be no more than 50-100 words.
 - vi) "Fascinating facts" should not be more than 20-30 words.
 - c) Consider using themed signs, *e.g.* Louisburgh through the eyes of an otter, fox, etc.
 - d) Associated guidebooks would be an excellent resource of the local schools for field trips. These guidebooks can provide expanded information from the signage and can contain potential age-specific worksheets from colour-in section of a local biodiversity scene for younger students to data recording forms for experiments for older students.
- 5) Creating the signs
- a) Graphics tips for signage:
 - i) Add graphics (photographs, drawings, etc.) to aid identification of animals, leaves, plants, etc.
 - ii) Maintain a consistency between all signs – this makes it easier for passersby to digest content.
 - iii) Don't mix fonts – where a single word should stand out use *italics* or **bold**.
 - iv) Do not use caps-lock, or if it is required, keep only to headings.

