1. Introduction

The Royal Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Termonbarry Co. Longford. The canal has been designated as an NHA which is generally comprised of the central channel and the banks on either side of it. This study was commissioned by Fingal County Council to survey the Royal Canal from the Fingal County boundary with County Kildare in the west to Ashtown station in the east. The study covered approximately 9 km of the canal and generally only areas within the boundary of the NHA were covered.

2. Methodology

The area was surveyed for vascular plant species with seven daily visits, six between 9/7/2004 and 11/8/2004 and one follow up visit on the 28/9/2004 to check for autumnal species. The area was divided up into eight 1:5000 maps and as each section was surveyed the habitats within the NHA boundary were mapped according to Fossitt (2000) and the species recorded as present in each habitat were listed.

3. Results

All areas along the Royal Canal (within the boundaries of the Royal Canal NHA) between the Fingal County boundary with Co. Kildare in the west and Ashtown station in the east were mapped on 1:5000 maps provided by Fingal County Council. Generally the NHA included the canal with a grass verge and tree line delineating its northern boundary and a grass verge and tree line between the canal and the railway line delineating its southern boundary. Fifteen habitats were recorded during the survey (Table 1).

Table 1: The fifteen Fossitt (2000) habitat types recorded during the Royal Canal survey and the mapping symbols used. Colours used are based on those listed for a Phase 1 habitat survey in the UK.

Habitat	**Symbol**
GA2: Amenity grassland	☐
GS1: Dry calcareous & neutral grassland	☐
GS2: Dry meadows & grass verges	☐
GM1: Marsh	☐
WN2: Oak-ash-hazel woodland	☐
WN5: Riparian woodland	☐
WD1: Mixed broadleaf woodland	☐
WL2: Treelines	☐
FW3: Canal	☐
FW4: Drainage ditches	☐
ED2: Bare ground (path without tarmac)	☐
ED3: Recolonising bare ground	☐
ER2: Exposed calcareous rock	☐
BL1: Stone walls	☐
BL3: Buildings & artificial surfaces	☐

The predominant linear habitats that were found along the whole of the survey area were the canal (FW3), grass verge (GS2), tree line (WL2), path (ED2 or BL3) and drainage ditch (FW4). The drainage ditch was often overgrown by the tree line and contained many grass verge species growing on its drier margins. For this reason only species that were found to be growing exclusively in the wetter part of the ditch were listed for this habitat type. In places the tree line was wider than 4 m at the base and taller than 4 m and was mapped as WD1 (mixed broadleaf woodland), WN5 (riparian woodland) or WN2 (oak-ash-hazel woodland). There were no hedgerows (WL1), as defined by Fossitt (2000), within the survey area. Habitat that could have been included within this category was always overgrown and dominated by tree species and therefore included within WL2 (tree lines).

Due to the difficulty of mapping thin linear feature on a 1:5000 scale a legend is listed below to accompany each of the eight maps. In general only features that covered an area greater than 10 x 10 m were mapped. Therefore where tree lines are sporadic this is stated in the map legend but to keep the mapping simple and prevent confusion the predominant habitat type is drawn on the map. Similarly there were small areas of recolonising bare ground throughout the survey area, but only where these covered an area greater than 10 x 10 m, such as on Map B, were they mapped. In sections along the southern bank of the NHA the site is broader due to the wider space between the canal and the railway line, and these areas often contain different features and habitats.

In total 221 vascular plant species were recorded from the 15 habitats (Appendix 1). Over half the recorded species (143 species) were located in the grass verge, representing the fact that this habitat bordered each of the others and often formed a gradient from the canal to the tree line.

4. Mapping Results

Map A (Fingal County boundary with Co. Kildare to east of Collins Bridge)

This area contained twelve of the thirteen species of vascular plants species that were found to be growing in the canal (FW3). Generally the linear habitats in this area were a tree line (WL2) marking the northern boundary of the survey area, with a drainage ditch (FW4) running directly alongside it and then a wide grass verge (GS2) between these habitats and the canal. The canal was in the centre of the site and this bordered a second grass verge and tree line on the southern bank. The only break in these linear habitats was at Collins Bridge where there was a small area of exposed path (ED2) and the stone walls of the bridge (BL1).

In addition to the linear features there is a field on the southern bank that is located within the NHA, in an area where there is a wider gap between the canal and the railway line. No access point was found for the field, but from the adjacent farmland south of the railway line the field appeared not to have been cut or grazed during 2004 and the habitat seemed to be semi-natural grassland.

To the north of the NHA there is a wide area of marsh (GM1) and wet willow-alder-ash woodland (WN6) that although not currently within the NHA would be a possible semi-natural area that could be added to the site.

Map B (East of Collins Bridge to Barberstown Crossing)

The pattern of the linear habitats is exactly as for Map A except that the southern bank now consists of a tree line that runs intermittently along the southern bank between the canal and the railway line. Where there are breaks in the tree line there are areas of overgrown grass verge that are often dominated by bramble (*Rubus fruticosus* agg.). At Barberstown Crossing the site widens on its southern bank to include an area of recolonising bare ground. Although it was not possible to access this area notable species that could be seen growing in the area were recorded.

Map C (Barberstown Crossing to Callaghan Bridge)

The most significant habitat in this section is the large area of semi-natural calcareous grassland that has been included within the NHA boundary. The linear feature of the wet drainage ditch running along the north bank of the canal finishes in this section of the map.

Map D (Callaghan Bridge to Kennan Bridge)

This section of the canal is one of the most shaded with two tree lines running along the northern bank of the canal separated by a path (ED2). On the southern bank of the canal there is also a thick tree line. As a result of building work that has been carried out around Keenan bridge there is an area of recolonising bare ground. Moving east from Callaghan Bridge the path rises above the canal as the canal runs through a cutting, creating a narrow gorge. This landscape feature continues for approximately 3 km until half way between Kirkpatrick and Granard bridge. Along the 3 km length of the cutting there were occasional small areas of exposed natural rock (areas too small to map individually).

Map E (Kennan Bridge to Kirkpatrick Bridge)

The path switches to the southern bank of the canal at the start of this section. The dominant habitat on the northern bank of the canal is semi-natural woodland (WN2). The woodland is in an early successional stage with few large trees and hawthorn (*Crataegus monogyna*) still dominant in areas. The tallest native tree species in the woodland is ash (*Fraxinus excelsior*) and this section of the woodland, more than the next section from Kirkpatrick bridge, is often dominated by the non-native tree species beech (*Fagus sylvatica*) and sycamore (*Acer pseudoplatanus*). The mapping of the NHA boundary on the northern bank is slightly confusing with some sections of the NHA quite wide and others much narrower. This has been reflected in the mapping of this area with only those sections that are currently within the NHA being shown. It may prove useful to simplify the northern boundary of the NHA if possible. Also it should be noted that in the vicinity of Kirkpatrick bridge dumping is frequent throughout the woodland on the northern bank of the NHA. Along the southern bank of the canal there is a thin line of trees growing up from the bottom of the cutting and shading a thin grass verge and the path. The majority of the southern boundary is delineated by another tree line. Due to the lack of space to map these feature on the 1:5000 map on the southern bank only the two tree lines could be mapped.

Map F (Kirkpatrick Bridge to Granard Bridge)

This section of the canal continues to run through the cutting for much of its length. This results in the path on the southern side of the canal rising to approximately 10 m above the surface of the canal along some of its length. The largest area of woodland in the NHA is found in this section on the northern bank of the canal. The woodland is on a steep south-south-east facing slope with ash (*F. excelsior*), hawthorn (*C. monogyna*) and alder (*Alnus glutinosa*) the dominant tree species. The flora in this area of semi-natural woodland was most closely aligned with the Fossitt category WN2 (Oak-ash-hazel woodland). An active badger (*Meles meles*) sett was recorded in the woodland and its location has been marked on the map. The badger is a protected species in Ireland (Wildlife Act 2000). This section of the canal also has an improved diversity of vascular plant species growing within the canal, compared with the two most eastern section (Maps G and H), with *Scirpus lacustris*, *Myriophyllum* sp. and *Nuphar lutea* all occasional. For part of this section the southern boundary is delineated by a stone wall that is almost completely grown over by ivy (*Hedera helix*) and bramble (*Rubus fruitcosus*), due to spatial constraints this wall was not mapped.

This is the first section surveyed where there are tarmac paths and other large tarmac areas (such as Castleknock Station that should be excluded from the NHA). Also the northern boundary of the NHA currently includes private gardens, these areas were not surveyed and are delineated on the map. Similarly to map E along the southern bank of the canal there is a thin line of trees growing up above the path from the bottom of the cutting. There is then a thin shaded grass verge, a path and the majority of the southern boundary is delineated by another treeline. This arrangement of linear habitats continues until approximately the point marked by the red arrow on the map. From this point the canal comes out of the cutting and the southern bank is dominated by a grass verge with only occasional trees growing alongside the canal.

Map G (Granard Bridge to Lock 11)

This section of the site contains the most man-made habitats with artificial surfaces (BL3), such as tarmac paths a common feature. Also this section contains the largest areas of improved amenity grassland (GA2). Another notable feature of this area is that the original boundary of the NHA was extended to include the old mill buildings on the 'margarine factory' site. These buildings and the surrounding area have now been developed for housing and this area should no longer be included within the NHA.
A population of approximately ten broad-leaved helleborine (*Epipactis helleborine*) plants covering a 2 x 2 m area were recorded in this section of the site, a species that has been listed as rare in the Dublin region. The location of this population has been marked on the map. It should be noted that due to the fact that only the canal and a tarmac path pass across the M50 the function of the canal as a terrestrial wildlife corridor could be limited in this section.

Map H (Lock 11 to Ashtown Station)

The aquatic vascular plant flora growing in the canal was poor in this area with no *Myriophyllum*, *Nuphar* or *Potamogeton* recorded. The northern bank of the canal is dominated by a thin strip of mixed broadleaf woodland (WD1) in which *Fagus sylvatica* often dominates, although for much of this map the canal marks the northern limit of the NHA. The southern bank is dominated by a grass verge that has a path (ED2) running down the middle and a tree line and ditch marking much of the southern boundary.
Map H contains the largest area of marsh in the site. The common frog (*Rana temporaria*), a protected species in Ireland, was seen in the marsh. At either end of the marsh there are small areas of woodland. A path (ED2) runs the length of the canal, but could only be shown on the western edge of the map due to a lack of mapping space. Also either side of the marsh there are tree lines mapped but it should be noted that these areas are intermittent, with patches of grass verge or bramble (*Rubus fruticosus* agg.) dominating in places.

5. Description of the habitats located during the 2004 survey of the Royal Canal

Fifteen Fossitt (2000) habitats were recorded during the survey. These fifteen habitats can be grouped into five broader habitat types, grassland and marsh, woodland and scrub, freshwater, exposed rock and disturbed ground, and cultivated and built land. A description for each of the habitat types recorded during the survey is given below. The total number of vascular plant species within each habitat type was recorded. However, it should be noted when comparing between habitats that species richness can only be accurately assessed when it is expressed in relation to habitat area.

5.1 Grassland and marsh

This broad habitat group covered the largest area within the Royal Canal NHA. Four types of grassland were recorded, these were amenity grassland, dry calcareous and neutral grassland, dry meadows and grass verges, and marsh. In total 164 of the 221 vascular plant species recorded during the survey were located within a grassland habitat. Eight common species were recorded in all the grassland habitat types, these were *Ranunculus repens, Trifolium pratense, Trifolium repens, Urtica dioica, Arrhenatherum elatius, Holcus lanatus, Lolium perenne* and *Carex flacca.* Due to their rarity within the Fingal County Council region the most important of the grassland habitats in conservation terms are the areas of dry calcareous and neutral grassland and the one area of marsh (Visser pers. comm.).

(i)Amenity Grassland

These were areas of managed grassland in which grass species were abundant and the species *Taraxacum* agg., *Bellis perennis* and *Plantago lanceolata* were common elements. Amenity grassland is often species poor, but within the study area this was not the case with 41 vascular plant species recorded within the habitat, which was very similar to the numbers recorded in dry calcareous grassland and marsh. The slightly higher than expected species diversity was partly due to the relatively low intensity of the management regime. However, it was also due to the presence of ruderal and coastal species, such as *Geranium dissectum, Centaurium erythraea* and *Tripleurospermum maritimum,* within this habitat type.

(ii)Dry calcareous & neutral grassland

These were areas associated with low intensity agriculture occurring on free-draining mineral soils (Fossitt 2000). Grass species were abundant with *Alopecurus pratensis, Anthoxanthum odoratum, Briza media* and *Cynosurus cristatus* all common. Other common species definitive of this habitat were *Lotus corniculatus, Galium verum* and *Linum catharticum*. The orchid *Anacamptis pyramidalis* was only recorded within this habitat type. Due to the fact that a large area of this habitat type had only recently been cut (Map C) and the other large area of dry calcareous grassland was inaccessible (Map A) the number of species recorded for this habitat type was lower than expected. In total 36 vascular plant species were recorded within this habitat type.

(iii)Grass verges

This was the most abundant of the grassland habitats. It was also a linear feature that contained many species that were more indicative of the other habitat types that bordered it. Of the 221 vascular plant species recorded during the survey 143 were present in this habitat type. Common species of the grass verge were *Arrhenatherum elatius, Dactylis glomerata* and *Filipendula ulmaria*. However, the grass verge habitat within the study area was defined by the abundance of *Origanum vulgare* and the frequent occurrence of *Daucus carota*, *Hypericum tetrapterum, Lamium purpureum, Leucanthemum vulgare* and *Valeriana officinalis*. Two species that are rare in Ireland were only recorded from the grass verge within the study area. These were *Epipactis helleborine* and *Chaenorhinum minus*.

(iv)Marsh

Marsh was the second most species rich of the grassland habitats with 48 vascular plant species recorded within the one area of marsh within the site (Map H). *Juncus inflexus* and *Juncus effusus* were common in this habitat as were *Carex rostrata*, *Iris pseudacorus* and *Galium palustre*. Less common species that were only recorded within this habitat type were *Caltha palustris, Lychnis flos-cuculi* and *Menyanthes trifoliata*.

5.2 Woodland

This was the second most common terrestrial habitat group within the Royal Canal NHA. Four types of woodland were recorded, these were oak-ash-hazel woodland, riparian woodland, modified broadleaved woodland and treelines. In total 83 of the 221 vascular plant species recorded during the survey were located within a woodland habitat. Four common species were recorded in all the woodland habitat types, these were *Crataegus monogyna, Fraxinus excelsior, Rubus fruticosus agg.* and *Galium aparine*

Due to their rarity within the Fingal County Council region the most important of the woodland habitats in conservation terms are the areas of oak-ash-hazel woodland and riparian woodland (Visser pers. comm.). In common with many woodlands in Co. Dublin non-native tree species were frequent in even the areas of semi natural woodland. The most common non-native tree species were *Acer pseudoplatanus, Fagus sylvatica* and *Aesculus hippocastanum*. Oak was rare within the survey region with only a few *Quercus robur* individuals recorded.

(i) Oak-ash-hazel woodland

Apart from the treeline habitat oak-ash-hazel woodland was the most common of the semi-natural woodland types within the study area, which would be expected on the well drained calcareous soils found along the Royal Canal. In total 51 of the 83 vascular plant species recorded from woodland were found within this habitat type. In addition to the common woodland species already listed *Hedera helix, Lonicera periclymenum, Rosa canina, Arum maculatum, Geum urbanum* and *Dryopteris filix-mas* were also common within this habitat type. The woodland species *Carex sylvatica* and *Viola reichenbachiana* were only recorded within this woodland type.

This woodland habitat was mostly located in areas on Maps E and F. Generally the woodland was in an early successional stage with few large trees and *Crataegus monogyna* still dominant in areas. The tallest native tree species in the woodland was *Fraxinus excelsior*. It should be noted that the tree species *Quercus robur* and *Corylus avellana* would be expected to be found within this habitat type, but they were not recorded, thus reinforcing the fact that the areas of this habitat within the survey area are not good examples of the type.

(ii) Riparian woodland

Only a small area, approximately 200 m^2, of this habitat type was recorded and 15 species of vascular plant were located in the small area. *Salix fragilis, Populus tremula* and *Angelica sylvestris* were common and this was the only woodland type where *Iris pseudacorus* was seen. *Rubus idaeus, Urtica urens* and the non-native *Lonicera nitida* were only recorded within this habitat type.

(iii) Modified broadleaved woodland

These were areas of broadleaved woodland where over 25% of the woodland area was taken up by non-native tree species. The two most common non-native tree species were *Acer pseudoplatanus* and *Fagus sylvatica*. In total 24 species were located within this habitat type and although non-native species were abundant in the canopy most of the field layer was the same as that recorded in the semi-natural woodland habitats. The non-native species *Laburnum anagyroides* and *Ligustrum ovalifolium* were only found in this habitat as was the fern *Dryopteris dilatata*.

(iv) Treeline

The linear woodland habitat of treeline was the most common of the woodland habitats found along the whole length of the canal. In total, 50 of the 83 species recorded within woodland were located within the treeline. All but one (*Laburnum anagyroides*) of the 28 tree species recorded in the study area were recorded in the treeline.

In addition to the four common woodland species, *Acer pseudoplatanus, Fagus sylvatica* and *Sambucus nigra* were also frequently recorded in the treeline as were *Hedera helix, Brachypodium sylvaticum* and *Phyllitis scolopendrium*. The native species *Prunus spinosa, Sorbus aucuparia, Torilis japonica* and *Stachys sylvatica* were only recorded within the treeline habitat.

5.3 Freshwater

There were two freshwater habitats recorded within the survey area. These were the canal that runs throughout the length of the NHA, and the drainage ditch that was only located on Maps A to C and H. In total only 19 of the 221 vascular plant species recorded during the survey were located within a freshwater habitat, but seven of these species were unique to these habitats. Due to its rarity within the Fingal County Council region the most important of the freshwater habitats is the canal (Visser pers. comm.).

(i) Canal

The canal was the most common of the freshwater habitats and 5 of the 13 vascular plant species recorded within the canal were only recorded within this habitat. Most of the species recorded within the canal were located towards its banks, however *Myriophyllum spicatum, Nuphar lutea* and *Potamogeton natans* were also recorded in the open water towards the centre of the canal. In addition to these three species *Callitriche stagnalis* and *Scirpus lacustris* were also only recorded within the canal. The most common canal species recorded within the study area were *Persicaria amphibia, Ranunculus lingua, Glyceria maxima, Phalaris arundinacea, Juncus inflexus, Carex rostrata* and *Iris pseudacorus*, all species recorded along the bank of the canal. In general the vascular plant species diversity was highest in the western sections of the canal with *Scirpus lacustris, Myriophyllum spicatum, Potamogeton natans* and *Nuphar lutea* all rarer in the eastern sections, especially Maps G and H.

(ii) Drainage ditch

This habitat either contained water or was wet enough to support wetland vegetation (Fossitt 2000). The drainage ditch was often overgrown by the tree line and contained many grass verge species growing on its drier margins. However, because of the definition of this habitat only species that were found to be growing exclusively in the wetter part of the ditch were listed. In total only 6 species were recorded within this habitat type and of these two native species, *Lemna minor* and *Apium nodiflorum* were only recorded within this habitat type. *Rorippa nasturtium-aquaticum* and *Veronica beccabunga* were two of the commonest species located within this habitat type.

5.4 Exposed rock and disturbed ground

This broad habitat group only covered a small area within the Royal Canal NHA. Three habitat types within this group were recorded, these were exposed calcareous rock, bare ground (paths without tarmac) and recolonising bare ground. Of these the bare ground that made up the unpaved paths alongside the canal was the most common of this habitat group. In total 21 of the 221 vascular plant species recorded during the survey were located within exposed rock and disturbed ground.

(i) Exposed calcareous rock

Only small areas of exposed calcareous rock were recorded during the survey and none covered a large enough horizontal area to be mapped. However, where the canal enters the cutting (Maps D – F) areas of exposed calcareous rock were occasionally located among the other habitats. The only vascular plant species that was recorded on these rocks was *Sedum album*.

(ii) Bare ground
The most frequent bare ground habitat was the unpaved path that ran within the grass verge for most of the length of the canal and was maintained by regular trampling by the members of the public who use the canal. Ten species were recorded in this habitat and the most common were *Lolium perenne, Poa annua, Taraxacum agg.* and *Trifolium repens.* The species *Euphorbia helioscopia* and *Geranium molle* were only recorded within this habitat type.

(iii) Recolonising bare ground
There were three main areas of recolonising bare ground on Maps B, D and E. In total only 12 species were recorded from this habitat. This was partly due to the inaccessibility of one of the areas of this habitat and partly because only small parts of the survey area were actually being recolonised. No vascular plant species were unique to this habitat type demonstrating that only local species are recolonising the bare ground. *Buddleja davidii* was the only tree recorded in the habitat and common species recorded in this habitat were *Epilobium palustre, Lapsana communis, Reseda lutea, Senecio jacobaea* and *Taraxacum agg*.

5.5 Built land
This group included the two habitats of stone walls and buildings and artificial surfaces. In total 27 of the 221 vascular plant species recorded during the survey were located within these habitats.

(i) Stone walls
This habitat was mostly made up of the stone bridges across the canal and the three stone locks within the survey area. Seven vascular plant species were recorded on the stone walls the most common of which was *Hedera helix*. The species *Cymbalaria muralis, Asplenium ruta-muraria* and *Asplenium trichomanes* were only recorded on stone walls.

(ii) Buildings and artificial surface
This habitat was found in one small area on Map H where the ruined concrete base of an old building had been partially recolonised. Twenty vascular plant species were recorded in this one area. The most frequent species were *Rubus fruticosus agg , Senecio jacobaea, Cirsium* sp. *and Sonchus* sp. The species *Epilobium parviflorum* and *Myosotis arvensis* were only recorded from within this habitat type.

6. General Discussion

The Royal Canal area that was surveyed represents an important natural and amenity resource in the Fingal County area. The dominant habitat types found in the survey area are the canal (FW3), grass verge (GS2), tree line (WL2), path (ED2 or BL3) and drainage ditch (FW4), all of which are linear features. In addition to the linear habitats there are three wider areas of semi-natural habitat found within the NHA. Two of these areas are semi-natural grassland (GS1), there is one area of marsh (GM1) and one area of semi-natural woodland (WN2).

The area surveyed seems to have changed very little since it was last surveyed in 1991. One noteable species that was not located during this survey was the aquatic *Ranunculus scleranthus* at Lock 11. However, the rare *Epipactis helleborine* was found in this section of the survey area and this species was not recorded in the 1991 survey.

It appears that the area of semi-natural woodland (Maps E and F) has developed from a scrub community over the last 13 years; the 1991 survey often referred to the habitat in this region as scrub. The development of this woodland area has increased the habitat and structural diversity in the study area and resulted in an increase in species diversity, for example the woodland species *Carex sylvatica* was recorded along the canal for the first time. This area of semi-natural woodland also contained a badger (*Meles meles*) sett.

The protected vascular plant species the opposite-leaved pondweed (*Groenlandia densa*) has been recorded along the Royal Canal, from Lock 5, which is outside the survey area. The species was not recorded from within the survey area during this study or the 1991 study. The protected species *Tolypella intricata*, a rare charophyte (a group of algae like plants) has also been recorded in the Royal Canal but it was not searched for during this survey.

7. Specific Habitat Management Recommendations

Four habitat types that are important due to their rarity within the Fingal County Council region were located during the survey. These habitats are the areas of dry calcareous and neutral grassland and the one area of marsh, the one large area of oak-ash-hazel woodland and the canal. It is important that comprehensive management plans are put in place for these priority areas to ensure that they continue to provide a habitat that can support a high diversity of species. In general it is important that these habitats are managed sensitively, for example no use of biocides (pesticides, insecticides and fungicides) or fertilizer. More specific recommendations for each of the priority habitats are listed below.

- Dry calcareous and neutral grassland

This habitat should not be overgrazed or cut too frequently. Also these areas of grassland should not be improved by the further addition of high productivity grassland species such as *Lolium perenne* or *Trifolium repens*. Ideally it should be mechanically cut only once a year in September, to allow plants to flower and set seed. After cutting the majority of the grass cuttings should be removed from the site, as cut grass forms a physical barrier preventing the growth of plants and light reaching the ground underneath the cuttings. Alternatively the calcareous grassland areas could also be lightly grazed with cattle in the autumn.

- Marsh

It is important that this habitat is not drained. Therefore no initiatives such as the digging of new drainage ditches should be carried out in the marsh areas.

- Oak-ash-hazel-woodland

As stated earlier there are a large number of non-native tree species, especially *Acer pseudoplatanus* and *Fagus sylvatica* in the woodland. These trees do have an amenity and wildlife value so it is not recommended that they are cut down. However, it is recommended that no more non-native tree and shrub species are planted within the survey area, especially in the important areas of natural habitat. Non-native species that were located within the oak-ash-hazel woodland were *Acer pseudoplatanus, Aesculus hippocastanum, Fagus sylvatica, Prunus laurocerasus, Cotoneaster sp., Ligustrum vulgare, Rhododendron ponticum,*and *Symphoricarpos albus.* Due to the negative effect that the non-native shrub species *Prunus laurocerasus, Cotoneaster sp., Ligustrum vulgare, Rhododendron ponticum* and *Symphoricarpos albus* have on the regeneration of native tree species, due to shading effects, it would be advisable to remove these species from the areas of semi-natural vegetation if possible. With these non-native shrub species removed it would be expected that a semi-natural oak-ash-hazel woodland could develop over time.

- Canal

Regular dredging of the canal is a necessary part of the management of this habitat. However, to reduce the impact of dredging it is recommended that work is carried out in small areas of approximately 250 m in length. If 250 m of the canal is left undisturbed either side of the dredged area this will aid the natural recolonisation of the dredged area. Also to allow the fauna in the dredged material to re-enter the canal it is advisable to deposit dredged material along the side of the canal at least on a temporary (1-2 weeks) basis.

8. General Recommendations

In addition to the habitat management recommendations there are three general recommendations.

- Mapping of the NHA boundary

In consultation with the National Parks and Wildlife Service the mapping of the northern boundary of the NHA needs to be refined. A particular area that needs to be addressed is the 'margarine factory' (Map G).

- Planting of non-native species

There were many non-native vascular plant species recorded along the Royal Canal, particularly non-native tree and shrub species. Although these plants often have a wildlife and amenity value it is recommended that any future planting should comprise of native species that are characteristic of the habitats recorded in the vicinity of the canal. Also wherever possible the planting material should be sourced from the locality to maintain any local adaptations found within the plant populations.

- Illegal dumping

Around Kirkpatrick Bridge the problem of dumping should be addressed. In places fences have been erected and this is one solution to the problem. Increasing the awareness of the importance of the canal as a wildlife and amenity area, through public education programmes, may help to reduce the amount of dumping.

- Wildlife corridor function of the canal

The canal is an important wildlife corridor in an increasingly urban landscape. As the wildlife corridor is such an important function action should be taken to improve it where the canal crosses the M50. Currently there are no semi-natural terrestrial habitats where the canal crosses the M50 and this may prevent the movement of animals e.g. badgers, through the area. It would be advisable to carry out research to investigate if this section of the canal is reducing the functionality of the site as a corridor for wildlife.

References

Fossitt, J. (2000) *A Guide to Habitats in Ireland* The Heritage Council, Kilkenny.