

The Plants of Hull: a Millennium Atlas

Richard Middleton

Between 1998 and 2000 the members of the Hull Natural History Society made a systematic botanical survey of Kingston upon Hull and its immediate surroundings. The results of this work, in the form of lists and distribution maps, have been posted on the Internet at <http://www.hull.ac.uk/hullflora> and been made available in the form of a computer-readable compact disc (CD ROM). This resume is intended to complement the electronic versions of the data and examine the broader picture and issues.

For well over a century the Hull Natural History Society has been closely involved in recording the City's changing flora. It was thought fitting that the advent of a new millennium be marked with a document describing the current situation so that future generations of botanists would be able to make informed judgements on the way in which it is changing with time. From a purely local perspective, such an inventory will be useful as a background to the 'Local Biodiversity Action Plan' (LBAP) – a planning document that will provide a framework for the preservation and enhancement of the natural environment. It is hoped that the results may also have a wider significance as it is in towns that floristic changes seem to be the most rapid. It is usually here that alien species gain their first foot-hold, some later expanding outwards into the surrounding countryside. In recent years urban floras have been produced for both Nottingham (Shepherd 1998) and Belfast (Beesley & Wilde 1997) and it is hoped that a similar survey of Hull might help highlight national trends.

On a global scale, there is currently much debate concerning the increasing atmospheric concentration of CO₂ and its possible consequence of increasing global temperatures. There seems little doubt that the earth is currently experiencing an overall increase in temperature, whether due to natural or anthropogenic causes. Such a change, if sustained, will certainly precipitate changes in the distribution of plants. Because of the concentrated release of fossil energy, used to power machinery and heat buildings, towns are known to act as heat islands with temperatures within them generally exceeding those of the surrounding countryside by a few degrees. It may reasonably be expected that certain plants, restricted to towns at the northern limits of their distribution, may find it possible, in the future, to expand outwards into more open conditions. Using such an argument it is possible to suggest that it is within the urban flora that changes due to global warming may be detected earliest.

Previous work

One of the earliest systematic published works on the plants of the region was J Baines' Yorkshire flora, published in 1840. This volume, along with Baker and Nowell's supplement, published 14 years later, provides little more than 30 records that can be ascribed, with confidence, to the Hull study region. A bound collection of pressed plants made by James Freeland Young, of the Hull Mechanics Institute, in 1854 is preserved in the Hull Local Studies Library. Although it purports to be a collection from the neighbourhood of the city, it is clear from the nature of the specimens and the sparse annotation that many of the plants are from the Wolds and the Vale of York. With few exceptions the material adds little to our understanding of the flora of the area almost a century and a half ago. It is interesting, however, to see that Hemp Agrimony (*Eupatoria cannabinum*) is described as being found near ditches at Cottingham, a reasonable summary of its present distribution. A printed sheet at the front of the volume alludes to Young's "... list of 400 odd indigenous plants collected in the neighbourhood of this town ...", implying that the preserved

material is only a part of the original collection. This assumption is conformed by Robinson (1902) who records several volumes of Young's and notes that they represent "... almost the only examples of herbaria earlier than 1880 that are now accessible to us". Robinson's familiarity with this material is confirmed by his pencilled note on Young's inverted specimen of *Equisetum hyemale* asking "why upside down?". It may be that the other volumes were lost when the Hull Municipal Museum in Albion Street was bombed in 1943. The printed notes record Bog Pimpernel (*Anagallis tenella*) from Scott's Bog, Cottingham and Golden Saxifrage (*Chrysosplenium oppositifolium?*) from a "running stream near Cottingham".

Despite Fraser's note on the absence of early floras, there is still in existence a set of sheets prepared for the exhibition of 1864. In accordance with the rules of the competition, the sheets have no collector's name but all bear localities in the vicinity of Hull. This material is currently held in the Hull University Herbarium and seems to have arrived with the A K Wilson collection.

Another collection that has received little attention is currently preserved in the Hull Museum. This comprises sheets prepared by J R Waller which seem to have arrived in the museum fairly recently, originally being with the Willoughby-Smith Herbarium in Beverley. Most of the material is from 1886-91 and yet Robinson (1902) makes no mention of the collection or collector, despite recording several plants from identical localities.

The first flora exclusively devoted to the East Riding of Yorkshire was published by James Fraser Robinson in 1902. This work was the culmination of over 15 years research and collecting by the author and other members of the Hull Scientific and Field Naturalists' Club, the direct predecessor of the present Hull Natural History Society. Since Robinson and many of the other contributing members, particularly J W Boulton and later Charles Waterfall, lived in Hull, it was natural that there is a strong emphasis on the city's plants in the flora. Since Robinson himself records that "The area of investigation was at first confined to the district within 20 miles of the then Borough of Kingston-upon-Hull" it may be reasonable to assume that this work will present an accurate picture of the plants of Hull within their East Riding context.

A large body of information is provided by the publications and collections of A K Wilson. The Hull University Herbarium contains many local specimens prepared by Wilson, both in the main collection [HLU of Kent (1957)] and the "Wilson Collection" [HLL of Kent?]. In addition to these many specimens, he produced "*The adventive flora of the East Riding of Yorkshire*" in 1938. This work, published by the Hull Scientific and Field Naturalists' Club, gives a full account of the many alien species that were to be found on the Hull docks and seed warehouses.

Professor R D Good, author of a flora of Dorset, was appointed to the then University College at Hull in the late 1920s. He established a herbarium containing much of his Dorset material, supplemented with many sheets from other sources, most notably J Fraser's material from Staffordshire. Most interesting to this study, at this time he also collected material from the immediate area, particularly Cottingham. During the 1950s there was another large infusion of local material from Good and his students. This renewed interest in the local flora is considered by Crackles (1990) to be in anticipation of Perring and Walters 1962 Atlas of the British Flora. In all the University Herbarium collections contribute a little over a thousand records that may be safely ascribed to the Hull area under consideration here.

In 1990 Eva Crackles published her definitive flora of the East Riding of Yorkshire. The work for this project was commenced in 1970 with information being collected systematically on a tetrad (2km x 2km) grid. Much of the data collection in the area around Hull was performed by the

Botany Section of the Hull Natural History Society (Wear & Gardam 1977). Although the city of Hull was covered well, particularly in view of Crackles' extensive work on the post-war bomb-sites, the long acceptance period for mapped records (1950 – 1990) meant that the transient and changing nature of the city flora became blurred. The work does, however, provide an unrivalled source of information on the more static flora of the surrounding area.

In 1996 the author undertook a pilot study of the plants of Hull using the tetrad grid of Crackles' flora. The purpose of this was threefold.

- To investigate the feasibility of a "snapshot" survey.
- To make comparisons with Crackles' older Flora data.
- To ascertain the feasibility of distributing the information electronically via the Internet.

Each of these objectives was met with some degree of success (Middleton 1998) but several lessons were learned in the process. It became clear that the tetrad is too large to provide a meaningful snapshot of plant distributions within an urban context. It was also obvious that distribution data would be more meaningful if the study area could be extended to include the immediately adjacent rural areas. The downside of this was that the 22 tetrads of the original survey became 119 km squares of the new study region. The third research question, however, provided very positive information. Indexed distribution maps for over 400 species were published, at little cost, for international consumption within a few weeks of completion of the survey. It has also been possible to correct minor errors as they become apparent, a luxury not normally available after publication of printed material.

Methods

The pilot study of 1996/97 did help elucidate some of the potential problems that might be encountered on such an ambitious project. It was recognised that the bulk of the survey work would be carried out by only a hand-full of amateur botanists, all working in their spare time. Three field seasons, 1998, 1999 & 2000, would not be adequate to ensure that every part of the area could be visited at the optimal time of the year, the spring flora being the most difficult to cover. Despite this it was decided that the advantages of completing the survey within a short period to give a "snap-shot" would outweigh any disadvantages of possible omission.

One of the most taxing problems with botanical mapping, for which there does not seem to be a satisfactory answer, is that of which plants should be recorded and which should not. For the purposes of this study there has been a presumption towards inclusion rather than exclusion. Since the programme has been regarded as that of a botanical "audit" with a view to assessing the biodiversity of the city, there seems little point in differentiating between a presumed natural occurrence of say Ivy (*Hedera helix*) and a likely introduction. Since both plants are likely to harbour similar insect communities and support the same birds with their berries in the winter, their significance in the local ecosystem is identical. Plants growing under continued conditions of cultivation have, in general, been ignored for practical rather than ideological reasons.

- Native plants have been recorded even if known or suspected introductions.
- Well-established or naturally regenerating non-native introductions have been recorded.
- If in doubt it has been recorded - it is possible to ignore records but not to interpolate them.

The boundaries of Kingston upon Hull are rather curious in that they are so closely drawn that a significant proportion of the effective urban area lies, administratively, within the East Riding of Yorkshire. This is particularly noticeable to the west where the villages of Hessle, Anlaby, Kirk Ella, Willerby and Cottingham are more or less contiguous with Hull. As noted earlier, it was decided that the region to be surveyed should be expanded to include these areas and a small amount of the surrounding countryside. The final study area, a compromise between the ideal and the practical, comprised 119 kilometre squares (see central map). The complete region is now covered by sheet 293 of the 1:25 000 Ordnance Survey Explorer Series (2000). During the survey it was necessary to use the older Pathfinder Series Sheets 687 and 696. At times the use of old maps within a rapidly changing urban situation made it difficult to locate square boundaries. In May 2000 the American Government abandoned the “selective availability”, a system which degraded the accuracy of their navigation satellite constellation for non-military users, and it became possible to use a cheap hand-held global positioning system (GPS) receiver to establish position to within 10 metres. This resolved the problems of locating boundaries even in changing or featureless areas and alleviated the need for accurate base maps.

Recording sheets were prepared, based on the nomenclature of Stace (1991), using the cumulative list of the pilot survey as a basis. So far as it was possible, recorders were encouraged to make a complete examination of the square, visiting all of the major habitats. It was recognised that recorders have different degrees of experience and so the practice of workers “adopting” individual squares was discouraged as far as possible (Rich and Smith 1996). The effects of the systematic working of a specific area by a single individual can be seen in many published floras, resulting in misleading artefacts in the distribution maps. With so few recorders working on the project this aspiration has not been entirely achieved but the great majority of squares have been visited by more than one person. In addition to the more structured surveys, casual records and lists for individual sites have been incorporated whenever they became available.

The data collected on these sheets were transferred to a PC-based database which enabled cumulative lists for each square to be constructed. Data entry was considered an integral part of the project and lists were generally updated within a few days (or hours) of the survey work, particularly within the latter two years. This presented great advantages, as it was then possible to examine the data set as a whole and revise sampling strategies.

A suite of computer programs was especially written for the project. Although this is largely a reflection on the interests of the author, it was a great advantage to have complete integration of all of the processes from data entry to web site generation. It is not intended to expand on this aspect of the project here.

Classification of the environments

A large part of the city of Hull has been built on wet low-lying grassland, much of which was seasonally flooded either by the waters of the River Hull or the salty Humber. Many of the street and area names provide evidence of this largely vanished environment, although little physical evidence now remains. The original name of the town, before its Royal Charter in 1392, was Wyke – usually considered to denote the tidal creek of the River Hull. The term carr, derived from the Old Norse *kjarr* meaning marsh (Markham 1987), is particularly common in the vicinity – Carr Lane, East Carr, West Carr, Willerby Carr, Wold Carr, etc. The element “ings” seems to bear similar (although possibly drier?) connotations and is particularly frequent – Ings Road, Sutton Ings, New Ings, Ings Plantation, etc. The element “dale” is also found to the east of the river in names such as Midmerdales and Ennerdale. This is a corruption of the word ‘dole’, signifying an

allocation of pasture land. Associated with these areas are many occurrences of the element “holm”, in some parts of the country assumed to be cognate with the Old Norse *holmr* – a water-meadow or stream-side meadow (Field 1993). In this region, however, the word is invariably used to signify a slightly higher island of land, usually surrounded by marsh – Bransholme, Risholme, Holmgarth and many others. The seasonal use of some land, because of winter flooding, is still preserved in the still used field names Summergangs and Summergroves. Within the city boundary, to the east of the River Hull are the old villages of Drypool and Marfleet, both of which bear elements suggesting areas of open water. Although place names preserve much evidence of the marshy and grassy nature of the area, there are some examples, particularly in the west that suggest other environments. There are several places to the north of Cottingham incorporating the element “moor”. This area is particularly peaty and has, in the past, supported a diverse and distinct flora, now unfortunately almost completely lost. South of Cottingham is Wood Lane, a narrow green lane still supporting a good woodland flora. This is one of the few reminders of the extensive South Wood that once covered this area.

As described earlier, there is a considerable body of information available which can be used to chart changes in the flora of Hull over the last 150 years. It must be borne in mind, however, that the data preserved are only a part of the whole story, there is much missing and this problem becomes more acute with the passage of time. The early records for the Hull area presented by Baines (1840) and by Baker (1852) are almost a random selection from what may have been presented. It has been filtered through nineteenth century eyes and only records considered noteworthy would even have been considered for presentation. The same is also true, although to a lesser extent, for the records given by Robinson (1902). It is clear that many plants were considered too common-place to warrant a particular location although we would now welcome more detailed information. Robinson’s dismissal of the Green-winged Orchid (*Orchis morio*) as “Very common in pastures in Holderness ...”, and of Tubular Water-dropwort (*Oenanthe fistulosa*) as “Very common in wet places, especially in the dykes of Holderness ...” are not helpful in charting the changes. Herbarium specimens offer a different kind of evidence. If accurately located and dated they do give positive evidence that a particular plant was growing in a particular place at a particular time. What they rarely indicate is whether the plant was part of a large and vigorous colony or a single rarity. The amount of herbarium material that has survived is also only a small part and with the possible exception of the material collected for the 1864 Botanical Competition, rarely systematic. In this section an attempt will be made to review the present distribution of plants within the Hull area in the context of published and preserved historical records.

The environments now available for plant growth within the study area may be categorised, broadly, as :

1. **Relic** : semi-natural environments.
2. **Managed** : parks, gardens, cemeteries and allotments.
3. **Urban** : neglected ground in urban and commercial areas.
4. **Industrial** : factory sites, dockland and railways.

This is obviously a gross simplification of reality but does provide a workable structure for further discussion. Most of the plants encountered may be allocated with reasonable confidence to one (or sometimes more) of these categories.

As noted earlier, the city of Hull is very closely bounded and now contains little in the way of semi-natural environments. Barring the estuary itself, there is virtually nothing that could be termed natural. For this reason the survey was expanded into the adjacent areas of the East Riding of

Yorkshire to enable the semi-natural environments to be examined in more detail. This has provided information that will be of use when environmental enhancement is planned within the city.

1 Relic floras

The semi-natural environments encountered will be considered under the following categories:

- Wetland
- Grassland
- Woodland and hedges

Of these, woodland is of very minor significance and only becomes important in the west of the region, particularly around Cottingham. Over much of the area it is doubtful whether there has been much woodland cover in historical times. The absence of any natural building stone in the area has meant that field boundaries are almost invariably a hedge or a ditch. The great majority of hedges seem to have been planted during the period of enclosure, usually at the end of the 18th century but occasionally older hedges are encountered.

1.1 The relic wetlands

The wetland flora of Hull is probably the best preserved element although now rather restricted. The marginal, saltmarsh, flora of the Humber Estuary is now almost entirely confined to a 2km strip to the west of the St Andrew's Quay area. Although not as species rich as the saltmarshes further down the estuary, plants such as Sea Arrowgrass (*Triglochin maritimum*), Sea Milkwort (*Glaux maritima*) and Sea Purslane (*Atriplex portulacoides*) may still be found. The latter two plants, along with Sea Plantain (*Plantago maritima*), Scurveygrass (*Cochlearia spp.*) are also to be found at other scattered localities along the Humber shore. Sea Aster (*Aster tripolium*) and Wild celery (*Apium graveolens*) are also frequently met along the Humber shore but also extend well up the River Hull. There is a small group of these salt-tolerating plants that have managed to colonise the salt-spray zone of some of the major roads. This group includes Reflexed Saltmarsh-grass (*Puccinellia distans*), Grass-leaved Orache (*Atriplex littoralis*), Lesser Sand-spurrey (*Spergularia marina*) and Buck's-horn Plantain (*Plantago coronopus*).

Although the River Hull has been canalised for the lower four kilometres or so of its course, above Stoneferry the banks are more natural. Here there is a green flood bank that is regularly inundated by the brackish tidal waters. It is in the lower regions of this section that margins may be dominated by Sea Club-rush (*Bolboschoenus maritimus*). Among the less common plants seen here was a single specimen of Duke of Argyll's Teaplat (*Lycium barbarum*). Above Sutton Road bridge, five kilometres north of its confluence with the Humber, the river is still tidal but its vegetation assumes many of the aspects of the larger land drains. Of the plants confined to the upper river one of the more notable is probably Hemlock Water-dropwort (*Oenanthe crocata*) – discovered by Rob Atkinson in 2000 and at its only known station in Holderness. Another scarce Holderness plant, Water-pepper (*Persicaria hydropiper*), was only found on the Hull flood banks near to Wawne. The only other natural water-course of note is the Old Fleet which runs along the eastern boundary of the city, discharging into the Humber between King George Dock and Saltend. At one time this was an important conduit for the waters of the eastern side of the Hull valley but drainage works over many centuries have diverted much of its natural flow in other directions. It is now a much-reduced stream and has little of botanical note other than Curled Pondweed (*Potamogeton crispus*) and Branched Bur-reed (*Sparganium erectum*).

There are two large, active land-drains which flow through the city and which although having much in common with the higher reaches of the River Hull also have a distinct identity. The Holderness Drain takes water from the land to the east of the River Hull, passing to the east of Sutton, through Marfleet and with an outfall into the Humber between Alexandra and King George docks. The Barmston Drain, to the west of the River Hull, is of later date being constructed somewhere around 1802. Since both drains have served an important and unchanging function for over two centuries, it is hardly surprising that they have managed to retain much of their original floral diversity. Both drains support Fennel Pondweed (*Potamogeton pectinatus*), Curled Pondweed (*Potamogeton crispus*) and in the Barmston drain Shining Pondweed (*Potamogeton lucens*). Their emergent flora is also noteworthy with Arrowhead (*Sagittaria sagittifolia*) and Yellow Water-lily (*Nuphar lutea*) being particularly prominent. Characteristic marginal plants for these two large drains and the upper reaches of the River Hull are Common Meadow-rue (*Thalictrum flavum*), Purple Loosestrife (*Lythrum salicaria*), Common Valerian (*Valeriana officinalis*), Marsh Woundwort (*Stachys palustris*) and Water Forget-me-not (*Myosotis scorpioides*).

There are several smaller land-drains within the study area. In many cases their drainage function is now unnecessary and water flow is seasonal, low or non-existent. Because they are usually shallower than the Holderness and Barmston Drain they do tend to form a distinct habitat type with different plant associations. It is within these that Water Starwort (*Callitriche sp.*), Duckweed (*Lemna minor*) and Greater Pond-sedge (*Carex riparia*) are likely to be encountered. Of particular note are the drains to the south of Cottingham which take water from the spring-fed grassland. Here fine-leaved Water-dropwort (*Oenanthe aquatica*) is still reasonably abundant.

Another group of plants seems to be associated with wet or marshy places. Yellow Iris (*Iris pseudacorus*) is possibly foremost among these but Amphibious Bistort (*Persicaria amphibia*) is rather interesting as it was found persisting in many rather dry habitats as well. The grasses Reed Canary-grass (*Phalaris arundinacea*) and Common Reed (*Phragmites australis*) also seem to be able to survive well and are often to be found along the courses of long-since culverted drains. The native Hedge Bindweed (*Calystegia sepium*) was often encountered on drain banks, as was Bittersweet (*Solanum dulcamara*) although both also seem to be able to colonise drier areas as well.

Although there has been a huge loss of habitat, much has remained intact for at least two centuries. The gross features of the Humber, the River Hull and the larger land drains are similar although many small ponds (a habitat now almost completely lost) and drains will have been reduced. There has undoubtedly been a great loss of saltmarsh along the Humber shore as most of the dock frontage was constructed on made-up land, the original shore line being several hundred metres north. Robinson records Thrift (*Armeria maritima*) as growing commonly between Hull and Hessle. By Frasers time, the lower part of the River Hull would have been industrialised as far north as Sculcoates and within another 20 years to beyond Stoneferry. There is no evidence to suggest that the flora of the river was significantly different above here than it is at the present day. Indeed the levels of pollution in the water may well have been much higher. The flora of the larger land drains seems to have remained somewhat similar over the last century, the main documented exception seeming to be the loss of the Flowering Rush (*Butomus umbellatus*). This is first recorded by Baines as occurring in "ditches near Hull". A sheet in the Hull University Herbarium, dated 15th June 1901 gives a remarkable picture of the state of the Foredyke (Forth Dike) at the point where it crosses the Sutton to Wawne Road [TA 10 34].

'Great masses of Butomus ("Flowering Rush") – not in flower and beds at bottom of the 2ft of crystal water of Potamogeton lucidum and great clumps of the perennial underwater leaves rooted in the bed of Nymphaea lutea and masses of the floating green ovate leaves and flowers.

Also Oxeyes and Vetch on top terrace – Lotus corniculatus and clovers on the next terrace – Sedges Rushes mints and Valerian (?marsh?) on the lowest terrace and edge of the water. In all for 100 yards each side of the bridge.'

Crackles records that Flowering Rush was seen in the Holderness Drain as recently as 1957 and notes that it may be under-recorded as it does not always flower.

Starfruit (*Damasonium alisma*) was recorded from a pond near Stoneferry in the 1870s (Robinson 1902), but it seems unlikely that this scarce, southern species will have survived. There are many plants recorded from the smaller drains that were not found in this survey. Some may have been overlooked but it is almost certain that the prediction made by Robinson almost a century ago that Frogbit (*Hydrocharis morsus-ranae*), growing near Salt-ings lane (Sutton?) in 1898, was “doomed to extinction in the not far distant future” was entirely correct. This plant has not been seen in the vice-county since 1956 although Baines gives Hull as a locality, it appears on George Norman's lists as occurring in Inglemire Lane and there is a specimen in the J R Waller collection dated 1889 from “Salters Lane, Hull”. Undoubtedly many other less conspicuous plants have suffered a similar fate. On a positive note, the alien Water Fern (*Azolla filiculoides*) has been much in evidence on the Barmston Drain in recent years, almost completely covering the surface for several kilometres in 1998. The alien Least Duckweed (*Lemna minuta*) was found on the Barmston Drain by John Dews in 2000.

Among the marsh plants that are now lost, the earliest recorded and probably the most spectacular must be the Marsh Helleborine (*Epipactis palustris*). There is a clearly labelled, although unattributed, specimen in the University Herbarium for “Cottingham, near Hull”, bearing the date of 1834. Bog Pimpernel (*Anagallis tenella*) was also long known from the Cottingham area but Robinson notes that it was gone by 1900. Grass of Parnassus (*Parnassia palustris*) is recorded from Cottingham Common by George Norman (Robinson 1902), but this area has long been drained and covered by North Hull housing estate. Brookweed (*Samolus valerandi*), a specimen of which is present in the 1864 Botanical Competition material and regarded by Robinson as “frequent in watery places near Hull” is not now known. More recent losses may include Opposite-leaved Golden-saxifrage (*Chrysosplenium oppositifolium*), for which there are many 20th century records from Cottingham, and Water Dock (*Rumex hydrolapathum*) which was collected by A K Wilson near Cottingham as recently as 1953. Water Violet (*Hottonia palustris*), which was collected by J R Waller from Dunswell Lane and from Cottingham in 1929, was seen by the author in the ditches near Priory Road in the early 1990s but has not been observed there since.

1.2 Relic grassland

The grassland elements of the relict flora seem to be more localised than those of the wetlands. This probably reflects the fact that much of the, once extensive, grassland became redundant long ago and was drained and either ploughed up or built over. Although not widespread, there are still some important semi-natural grasslands which have a diverse and unusual flora. Foremost among these must be the fields to the south-east of Cottingham where there is still almost 120 ha of more-or-less contiguous grassland. These fields probably owe their survival to the fact that although they are within the East Riding of Yorkshire, they are largely in the ownership of the City of Hull. Although Hull never had an officially designated “green belt”, the land helped form a strategically

important “green wedge” between the city and its adjoining villages. The fields, which lie either side of Priory Road, form a rather complex environment. There are diverse influences on the plants, the most important of which is probably base-rich spring water, which may stand on some of the fields until late spring. Many plants were only recorded from this area, some of the more notable of which are Adder's-tongue (*Ophioglossum vulgatum*), Great Burnet (*Sanguisorba officinalis*), Betony (*Stachys officinalis*), Tubular Water-dropwort (*Oenanthe fistulosa*), Bugle (*Ajuga reptans*), Devil's-bit Scabious (*Succisa pratensis*) and Quaking-grass (*Briza media*). It is here that the only remaining local colonies of Green-winged Orchid (*Orchis morio*) and Heath Spotted Orchid (*Dactylorhiza maculata*) may be found. It seems certain that this area represents an important relic of the distinctive grasslands that were once common in the lower Hull Valley.

Of slightly wider distribution is Pepper-saxifrage (*Silaum silaus*), another good indicator of old grassland. This plant has two other known stations, one in a paddock in Wawne village and the other on Tweendykes fields, adjacent to the old railway and to the west of Sutton. These latter fields, although not as diverse as those alongside Priory Road, still have an interesting flora including Brown Sedge (*Carex disticha*) and are probably a reasonable representation of the original Sutton Ings flora, most of which is now lost to residential development.

Other plants which seem to survive as grassland relics include Cuckooflower (*Cardamine pratensis*) which seems to be very persistent. It may be even more widely distributed in the city than the map would suggest as it is capable of surviving close mowing for many years without flowering. The lawns of the now sadly developed, Tilworth Grange [TA 13 32] were turned pink with the flower on only one occasion in the author's 25 year monitoring of the area. On all other occasions the plant was totally inconspicuous. Other persistent plants of grassland include Lesser Stitchwort (*Stellaria graminea*), which is still reasonably well distributed, Cowslip (*Primula veris*), Field Wood-Rush (*Luzula campestris*) and Hairy Sedge (*Carex hirta*) which is rather more scarce. To the west of the River Hull Lesser Spearwort (*Ranunculus flammula*), Tormentil (*Potentilla erecta*) and the now very scarce Lady's-mantle (*Alchemilla vulgaris* agg.) may also be included in this category. The graceful grass, Meadow Barley (*Hordeum secalinum*), may also be a candidate for indicating grassland relic although its presence in Costello Park may suggest that it is being introduced in some commercial seed mixes as well.

It is clear from the Land Utilisation Survey maps produced by Stamp in the 1930s, that there has been a huge loss of grassland in the last 70 years. These maps show a large swathe of permanent grass extending up the Hull valley from the urban area, particularly to the east of the river. Rather surprisingly, with a few exceptions, the published records and herbarium material do not seem to paint a picture of extensive species loss. This may be at least in part due to the preservation of the grassland around Priory Road, to the south-east of Cottingham. As previously noted, these fields support an amazing variety of plant life, many of which are only known from this area. It may be speculated that many of these plants were once more widespread but that a good proportion of the original floral diversity has been preserved. Of the once extensive grassland to the east of the River Hull there are still a few relics which seem, between them, to adequately represent the original flora. It is certainly less diverse than that encountered further west but this may be a true reflection of the natural state.

There are two possible exceptions to this general retention of the grassland flora and both must be viewed with some caution. There are some calcicole plants, including Wild Basil (*Clinopodium vulgare*), Pyramidal Orchid (*Anacamptis pyramidalis*) and Autumn Gentian (*Gentianella amarella*) recorded from Hessle. Similarly there are other more heathland types such as Moonwort (*Botrychium lunaria*), Heath Milkwort (*Polygala serpyllifolia*) and Purple Moor-grass (*Molinia*

caerulea), which were recorded by Robinson from Hall Ings, Cottingham at the turn of the 19th century. Both of these localities are on the very edge of the region and although these areas are undoubtedly much degraded, it may be that the plants never occurred within the recording area.

1.3 Relic woodland & hedgerow

The woodland relics are more difficult to define but in the main part they seem to be largely restricted to the area to the around Cottingham. Wood Lane, to the south-east of Cottingham, is still bordered with native specimens of Guelder Rose (*Viburnum opulus*), Dogwood (*Cornus sanguinea*), Field Rose (*Rosa arvensis*) and Field Maple (*Acer campestre*). There are still a few clumps of native Bluebell (*Hyacinthoides non-scripta*) and the rare tuft of Wood Melick (*Melica uniflora*) in the hedges there. To the north and west of Cottingham Ramsons (*Allium ursinum*) and Wood anemone (*Anemone nemorosa*) were recorded, both good woodland indicator species. Another possible woodland indicator is Woodruff (*Galium odoratum*) but as it is frequently cultivated in gardens, the plants recorded may not be true natives.

There are several plants which may be regarded as relics of old hedges. In many cases the actual shrubs are preserved as linear features in modern housing estates – Longhill, Greatfield and Bransholme Estates all incorporate rows of Hawthorn (*Crataegus monogyna*). In other cases a more sinuous feature can still be seen, usually representing a hedge planted alongside an old water course. An example of this may be seen alongside Bellfield Avenue [TA 13 31] where other species including Ash (*Fraxinus excelsior*) and Oak (*Quercus robur*) accompany the Hawthorn. Garlic Mustard (*Alliaria petiolata*) is widely distributed within the region, many occurrences being associated with old hedge lines. Although Ground Ivy (*Glechoma hederacea*) is an almost ubiquitous component of the hedge-bottom flora in the outskirts of the urban area, it does not seem to be able to survive for long periods and, unlike Garlic Mustard, it is largely absent from the more central area. A similar pattern may be seen for Red Campion (*Silene dioica*) and, to a lesser extent, Hedge Woundwort (*Stachys sylvatica*). Ivy (*Hedera helix*) is well distributed and, although some will have been deliberate introductions, there is no doubt that some of it is a relic of hedgerow or woodland.

Although there is only a slight woodland element to Hull's flora, it has already been noted that it is strongly localised in the Cottingham area. There are consistent records for woodland plants including Wood Sorrel (*Oxalis acetosella*), Goldilocks Buttercup (*Ranunculus auricomus*), Sanicle (*Sanicula europaea*) and Wood Millet (*Milium effusum*) in the literature and various herbaria. Although there has undoubtedly been some loss of woodland species within this north-western fringe of the recording area, it may be that some records are actually from woods to the north of Cottingham and outside the region under consideration. The undated Cottingham specimen of Herb Paris (*Paris quadrifolia*) in the Hull University Herbarium and perhaps the Wood Speedwell (*Veronica montana*), may well be from the nearby Birkhill Wood where they are both known to have occurred.

2 Managed land

This is a very broad category but it will be interpreted as the plants likely to be encountered in land in which the vegetation is managed in some way. The management may be cultivation – either arable, horticultural or gardening, or the simple mowing of grassland as occurs on lawns, verges and amenity grassland. Hull is reasonably well furnished with green open space in the guise of public parks, school and sports fields, cemeteries and golf courses. Most houses in the suburbs have a reasonable sized garden but as building land within the city becomes increasingly scarce, there is a

distinct tendency for recently built houses to have much smaller gardens. Until relatively recently the city was well provided with allotment gardens. Many of these still survive but there is an increasing tendency to develop these sites for housing.

There seem to be many plants, particularly those with a well developed basal rosette of leaves, that can survive the rigorous mowing regime of managed grassland. The familiar Daisy (*Bellis perennis*), Greater Plantain (*Plantago major*) and Dandelion (*Taraxacum officinale*) are good examples of this and as a consequence were encountered in most of the squares examined. Other plants common in such situations include Creeping Buttercup (*Ranunculus repens*), White Clover (*Trifolium repens*), Small Yellow Clover (*Trifolium dubium*) and the recent arrival Slender Speedwell (*Veronica filiformis*) which although first noted in Hull as recently as 1967 (Crackles 1990) was recorded in 57% of the squares examined. A less expected plant that seemed to be associated with this environment was Field Madder (*Sherardia arvensis*), which seemed to be almost entirely associated with mown grass. It was noted that the turfed lawns, which seem to form an essential part of new residential developments, often contain Hop Trefoil (*Trifolium campestre*) and Common Stork's-bill (*Erodium cicutarium*). These plants may originate in the Vale of York where lawn turf is grown extensively on the light sandy soils.

Swine-cress (*Coronopus squamatus*) has been very noticeable in Hull over the last few years. It seems either to survive in, or rapidly colonise, the areas around lampposts and near kerbs, that have been sprayed with herbicide. In some places it may become the dominant ground cover. This may be a new phenomenon as Crackles (1990) regards it as 'somewhat infrequent'. Interestingly it is noted in Baines (1840) as occurring on the streets of Beverley. It is becoming increasingly common to find Lesser Swine-cress (*Coronopus didymus*) growing in similar situations – a good example being along the northern approach road to the Humber bridge. It is quite usual to find that the outer edge of grass verges along trunk roads has been strongly contaminated with salt spray from winter de-icing precautions. These places have been colonised by a group of halophytic plants, the most easily noticed of which is probably Danish Scurveygrass (*Cochlearia danica*). This plant was found in 12% of squares examined and yet as recently as 1990, Crackles recorded it as rare, citing only three records in the vice-county. Other plants commonly found in this situation include Reflexed Saltmarsh-grass (*Puccinellia distans*), Grass-leaved Orache (*Atriplex littoralis*), Lesser Sand-spurrey (*Spergularia marina*) and more rarely Buck's-horn Plantain (*Plantago coronopus*). This roadside flora has received some attention in the Society's literature of late (e.g. Cook 1997, Eades 1996).

In amenity grassland with a less rigorous mowing regime it is quite usual to find Yarrow (*Achillea millefolium*) and even Common Bird's-foot Trefoil (*Lotus corniculatus*) managing to develop well enough to flower. The sports field at Ennerdale [TA 08 33] seems to occupy an area of old grassland. The ill-defined outer edges, near to the River Hull, have produced a wide range of unusual plants including Lesser Hawkbit (*Leontodon saxatilis*) and Corky-fruited Water-dropwort (*Oenanthe pimpinelloides*) – way north of its usual range (Middleton 1998).

It is convenient to consider the fragments of arable land that are to be found on the margins of the study area along with allotments sites and gardens. Although not floristically identical, they do share management regimes that involve frequent disturbance and leave bare soil suitable for colonisation by annual plants. In most of Hull's gardens it would be possible to discover Petty Spurge (*Euphorbia peplus*), Procumbent Pearlwort (*Sagina procumbens*), Chickweed (*Stellaria media*), Common Field Speedwell (*Veronica persica*), Shepherd's Purse (*Capsella bursa-pastoris*) and Groundsel (*Senecio vulgaris*). Some arable weeds less commonly seen in gardens are Black-bindweed (*Fallopia convolvulus*), Scarlet Pimpernel (*Anagallis arvensis*) and Field Forget-me-not

(*Myosotis arvensis*). Two plants that occur largely as plants of shady gardens are Enchanter's-nightshade (*Circaea lutetiana*) and, to the west of the River Hull only, Wall Lettuce (*Mycelis muralis*).

In the less controlled areas of gardens there are some plants which can become rampant. Ground-elder (*Aegopodium podagraria*) and Creeping Thistle (*Cirsium arvense*) are very often encountered in such a situation but Japanese Knotweed (*Fallopia japonica*) is also frequent, particularly in neglected parks and cemeteries.

Some plants are encountered as relics of old cultivation. In the outskirts there have been many grand residences in once extensive grounds that have been re-developed for other purposes. Along Saltshouse Road in East Hull are specimens of Pine (*Pinus sylvestris*) and Yew (*Taxus baccata*) that were once a part of landscaped gardens. Leopard's-bane (*Doronicum pardalianches*) and Spanish Bluebell (*Hyacinthoides hispanica*) still grow there amongst an isolated avenue of trees. Horseradish (*Armoracia rusticana*) is frequently encountered in waste places and is very often a relic of old cultivation.

The area examined is well provided with mature trees, particularly in the parks, western suburbs and the Sutton area. It is doubtful that any significant proportion of these has arisen under completely natural circumstances. The most commonly encountered large street trees are Hybrid Lime (*Tilia x vulgaris*) and London Plane (*Platanus x hispanica*). In the newer suburbs Rowan (*Sorbus aucuparia*) and various "Whitebeams" (*Sorbus spp.*) are particularly frequent. In parks and mature gardens there is a greater variety with various Oaks (*Quercus spp.*), Sycamore (*Acer pseudoplatanus*) and Horse Chestnut (*Aesculus hippocastanum*) being particularly common.

There has been extensive planting of native British shrubs over the last few years, particularly along the major roads. Many of the species used are those that also occur naturally within the region and will no-doubt become fully naturalised in time. Shrubs falling into this category include Dogwood (*Cornus sanguinea*), which is found in a native state near Cottingham and Bilton, Hazel (*Corylus avellana*) common to the west and north and Guelder Rose (*Viburnum opulus*) known in a native state to the south of Cottingham. Spindle (*Euonymus europaeus*) seems to be increasingly popular in municipal shrubberies but one or two of the records to the north of the region seem to be native. Alder (*Alnus glutinosa*) was found to be relatively common but no native specimens were found. Sea Buckthorn (*Hippophae rhamnoides*) falls into the same category but birds seem to be dispersing the seed well and seedlings are often encountered.

Municipal plantings around retail developments often provide a great deal of botanical interest. The soil used to create these features seems to be obtained on an opportunistic basis and often contains a rich seed bank. It is quite usual for a new flower-bed to produce a rich variety of "weeds" during its first year but the variety generally decreases rapidly. A common source of sandy topsoil seems to be the washings from vegetables or sugar-beet. This almost invariably produces a fine crop of Common Fiddleneck (*Amsinckia micrantha*), Long-headed Poppy (*Papaver dubium*) and Field Pansy (*Viola arvensis*). During the 1980s this type of material also produced spectacular golden displays of Corn Marigold (*Chrysanthemum segetum*) but for some reason this is now scarce. Other less conspicuous components of this association may be Bugloss (*Anchusa arvensis*), Henbit Dead-nettle (*Lamium amplexicaule*) and, more rarely, Corn Spurrey (*Spergula arvensis*). Other strange imported topsoils have produced Black Nightshade (*Solanum nigrum*), Shaggy Soldier (*Galinsoga quadriradiata*) and, rather surprisingly, Toad Rush (*Juncus bufonius*). The latter is usually found in places where a dressing of bark chippings has been applied.

3 Urban Areas

In Hull, as any other modern city, there is constant change. As areas are re-developed patches of land often remain untended for a season or so allowing ephemeral weeds to take advantage of the habitat. There seems to be a marked difference between the flora of neglected city centre sites and those of the suburbs. The plants seen on inner-city sites usually have an efficient dispersal system and arise from blown seed. Oxford Ragwort (*Senecio squalidus*), arguably the best known urban alien, arrived on the Hull docks in 1926 (Wilson 1938) and is now common and well distributed in Hull. In recent years Canadian Fleabane (*Conyza canadensis*) has become a common plant of open sites near the city centre. If moss is allowed to build up on a hard surface it frequently traps the seeds of small Crucifers. The mossy edge of a neglected car park is one of the most usual places to find Common Whitlowgrass (*Erophila verna*), often accompanied by Hairy Bitter-cress (*Cardamine hirsuta*), Blue Fleabane (*Erigeron acer*) and frequently Thale Cress (*Arabidopsis thaliana*). If the neglect continues the site will eventually be colonised by other slower-growing species. The Butterfly-bush (*Buddleja davidii*) may now be found on most neglected sites near the centre of Hull. The plant was only introduced to the country a little over a century ago and the first local record was by Wilson (1938) at Hessle chalk pits. Another recent arrival on urban waste ground is Prickly Lettuce (*Lactuca serriola*). Although recorded on King George Dock in 1935 (Wilson 1938), Crackles (1990) still regards it as "uncommon" and cites only a few recent records. There is no doubt that this plant has increased very rapidly in the last few years.

After a while, most waste sites will support bird-sown Elder (*Sambucus nigra*) bushes and saplings of Sycamore (*Acer pseudoplatanus*) and Ash (*Fraxinus excelsior*) brought in as seeds on the wind. Although waste sites everywhere will attract their share of Sow Thistles (*Sonchus asper*, *S. oleraceus*), Mugwort (*Artemisia vulgaris*) and Wall-barley (*Hordeum murinum*), sites in the suburbs seem to develop a slightly different flora. Hemlock (*Conium maculatum*), Bristly Oxtongue (*Picris echioides*), Teasel (*Dipsacus fullonum*), Common Vetch (*Vicia sativa*) and Large Bindweed (*Calystegia silvatica*) are more likely to be encountered here.

The walls of buildings and those surrounding gardens provide a niche that is readily colonised by a distinct group of plants. It is probably in such situations that ferns attain their greatest frequency and abundance. The dry climate and air-pollution of Hull have made the environment generally unsuitable for ferns with Male Fern (*Dryopteris filix-mas*) being one of the few species that would be expected with any regularity. This survey has shown that several fern taxa are much more widely distributed within the urban area than had originally been supposed. Hart's-tongue (*Phyllitis scolopendrium*) was found as small tufts on many urban walls and even on the swing-bridge at the Marina [TA 09 28]. Maidenhair Spleenwort (*Asplenium trichomanes*), Black Spleenwort (*Asplenium adiantum-nigrum*) and Wall Rue (*Asplenium ruta-muraria*) were all found in scattered urban situations, often in quantity. A flourishing colony of Rustyback (*Ceterach officinarum*) was found on a garden wall in [TA 06 31] despite being considered as extinct within the vice-county by Crackles in 1990. It may be that improving urban air quality is allowing a re-colonisation of the city by ferns, a hypothesis supported by the decidedly western distribution of urban ferns in Hull. Since the prevailing wind direction is from the west, air quality will be lowest on the eastern side.

The streets of Hull are also host to a number of casual plants. Some of these, such as Flax (*Linum usitatissimum*), Rape (*Brassica napus oleifera*) and Wheat (*Triticum aestivum*) may arise from seed spilt from lorries during transportation. Others like Tomato (*Lycopersicon esculentum*) have grown from discarded fruit. Many deliberately cultivated ornamental plants manage to escape from gardens and, although some will not persist, there are many that seem to become established to varying degrees. Several plants are to be found near to their garden parents but have obviously

arisen from blown seed, runners or other vegetative means. Yellow Corydalis (*Pseudofumaria lutea*) is a rather noticeable example, but the Yellow Sorrels (*Oxalis spp.*) also seem to be increasing but are less conspicuous. In one instance, Lily-of-the-valley (*Convallaria majalis*) was found to have grown under a garden wall and sprouted through the tarmac cover of the pavement outside. The most persistent garden plants seem to be those derived from deliberately discarded material, presumably because they are vigorous and need to be controlled. Canadian Goldenrod (*Solidago canadensis*) was found to have become naturalised in more than 12% of the squares examined. The most usual places was on ditch and drain sides or even roadside verges. Spotted Dead-nettle (*Lamium maculatum*) also falls into this category, usually being found in more sheltered positions. It is interesting to note that although Robinson comments that the plant is found as an "Outcast or straggler from gardens near Cottingham", it is now more widespread. As new garden plants become fashionable there will undoubtedly be those that can successfully colonise the surroundings. A suitable candidate for future expansion is Mexican Fleabane (*Erigeron karvinskianus*) which has recently become popular in gardens. Only one escaped plant was found in this survey but James Middleton reports that it is now rather commonly encountered in York.

4 Industrial areas

This category is regarded as encompassing railway land, dockland and the larger factory sites. Although they seem to have little in common, they do share several significant environmental factors.

- Most of these areas are covered with some artificial substrate. Most commonly this will be concrete, limestone ballast or blast-furnace slag, all of which are strongly basic.
- There is frequent opportunity for the inadvertent introduction of plant material from other places.
- The vegetation on these sites has not usually been managed for any aesthetic purposes and low-growing plants are often tolerated. Public access is usually restricted and plants may be left undisturbed for long periods.

Historically the dockland areas of Hull have furnished many interesting plant records. By the 1920s the dockland area of Hull extended almost unbroken along the Humber shoreline for a distance of approximately 8km. There was a considerable trade in bulk commodities with large volumes of Yorkshire coal being exported, particularly from Alexandra Dock, and timber, grain, oil-seeds and wool imported. Before containerisation, cargo loading was a much slower process and there was a need to store the large quantities of bulk materials while in transit. Even in 1902 Robinson makes special mention of the flora of the dockland estates describing it as "a perfect wilderness of exotics from many lands" and notes that the study of these plants had been undertaken by himself, Charles Waterfall and Samuel Mason. This study was continued by A K Wilson who extended his investigations to the newer eastern docks. Wilson's 1938 publication summarises his own and the earlier investigators' work. In more recent years there has been a fundamental change in the way in which cargos are handled and there is less need for onsite storage. At the beginning of the 21st century only three docks remain in commercial operation. The Albert & William Wright Dock, Alexandra Dock and King George Dock. All of the other docks have suffered various fates. By the mid 1930s the Queen's Dock had been filled in and replaced with an ornamental garden. Victoria dock fell into disuse in the early 1970s and has recently been filled and developed as a housing estate. The westernmost St Andrews Dock is now largely filled and developed as a retail park, Princes Dock remains as a land-locked ornamental lake and the Humber and Railway Docks were

converted into a marina. The area of dockland “waste” has decreased drastically and little of this habitat now remains.

The area around Albert Dock still supports a varied, though transitory, population of aliens. During this study many plants have been found from this area alone, some of the more notable being False Cleavers (*Galium spurium*), Small Mallow (*Malva pusilla*), Stink-grass (*Eragrostis cilianensis*), Common Millet (*Panicum miliaceum*) and Witch-grass (*P. capillare*). Others are recorded in Wilmore’s (2000) “Alien plants of Yorkshire”. Access to the active eastern docks is now difficult but it is clear from the records of Ray Eades that aliens such as Flixweed (*Descurania sophia*) still occur. Another plant that is usually found in the general dockland vicinity is Summer-cypress (*Bassia scoparia*). During the study period it was only encountered in small quantities but during the mid 1990s it was somewhat more widespread, particularly along the roadsides in the dockland area. Common Amaranth (*Amaranthus retroflexus*) is not infrequent at the roadsides near the docks and on the Albert Dock estate may be joined by other species of the same genus. Canary-grass (*Phalaris canariensis*) and Yellow Bristle-grass (*Setaria pumila*) are often encountered in the dockland area although both may be seen throughout the city as bird-seed aliens.

Railway land is scattered throughout the city. There are now only a few active lines but there is a considerable network of disused tracks and sidings. This railway land provides what is arguably the most varied and interesting element of the truly urban flora. At the present time there is considerable development pressure on the larger areas of sidings, particularly on the docklands and the large marshalling yards at Dairycoates. Fortunately the narrow linear nature of disused railway lines often makes them unsuitable for any use other than paths or cycle-ways. Much of the old Hull – Withernsea and the Hull-Hornsea lines, closed in the 1960s, are used in this way. In addition to the usual ground level railways, Hull has a series of elevated railway lines built on raised embankments. One of these is still active but others are now disused and variously treated. The embankments near Fountain Road and Foster Street [TA 10 30] are now only fragmentary but the remains carry a distinctly chalky flora including Greater Knapweed (*Centaurea scabiosa*) and Field Scabious (*Knautia arvensis*) at the former and Deadly Nightshade (*Atropa belladonna*) at the latter.

There is very often a narrow strip of grassland remaining at the side of the track, usually with abundant Common Knapweed (*Centaurea nigra*) and Common Bird’s-foot Trefoil (*Lotus corniculatus*). It is also common for a boundary hedge to remain, frequently containing Apple (*Malus domestica*), presumably growing from discarded apple cores. The track surfaces and siding have developed a distinctive flora and on this slaggy-ballast Perforate St John’s-wort (*Hypericum perforatum*), Mouse-ear Hawkweed (*Pilosella officinarum*) and Kidney Vetch (*Anthyllis vulneraria*) are most likely to be encountered, often in great abundance. Common Toadflax (*Linaria vulgaris*) is particularly abundant on railway land and when it occurs with the less frequent Pale Toadflax (*L. repens*), there will usually be varying degrees of hybridisation between the two. There were several records of Greater Burnet-saxifrage (*Pimpinella major*) during this survey, all of which were on railway ballast. It is also in this environment that Tall Rocket (*Sisymbrium altissimum*) is most likely to be encountered.

The extensive area of old railway sidings in TA 04 26 and TA 05 26 is worthy of particular note. Although the western end is currently under development, there is still an extensive area of wasteland with a very distinctive flora. Unlike much of the other railway land there are large wet areas, often with standing water, creating fen-like conditions in some places. These damp areas support colonies of Fleabane (*Pulicaria dysenterica*), False Fox-sedge (*Carex otrubae*) and even Marsh orchids (*Dactylorhiza praetermissa*) along with beds of Common Reed (*Phragmites australis*). On the dry areas Bladder Champion (*Silene vulgaris*) and Common Evening-primrose

(*Oenothera biennis?*) are usually abundant. Bee Orchids (*Ophrys apifera*) are occasionally found and Common Broomrape (*Orobanche minor*) may be locally abundant, apparently parasitising Kidney Vetch.

It is not always possible, or probably really necessary, to make a clear distinction between railway and industrial land. Many of the larger factory sites were served by railway and there is often ballast remaining. This survey has shown that Yellow-wort (*Blackstonia perfoliata*) is much more common than had been supposed. Although only recorded by Crackles at Alexandra and Victoria Docks, it was found in more than 20% of the squares examined, often in great abundance. This calcicole plant obviously finds industrial dereliction to its liking and is often accompanied by Common Centaury (*Centaureum erythraea*). Yellow-wort has a decidedly southern distribution both in Britain and on the continent and it may be that the mild climate of the 1990s has played a part in its marked increase in the area. Other plants most likely to be encountered in industrial areas are Eastern Rocket (*Sisymbrium orientale*) and Sticky Groundsel (*Senecio viscosus*), although both are found in other situations.

Conclusions

This study has been reasonably successful in attaining its objectives. All of the area has been examined within the target period and most of the major features of the flora have been determined. Certainly there are deficiencies and if more effort could have been afforded improvements could have been made. In retrospect, it would have been useful to collect more information on the frequency of occurrence of each plant within the kilometre square. Some of the taxa have not had the attention that they deserve, usually due a lack of expertise. Grasses have suffered particularly in this respect and it is accepted that some of the *Agrostis* and *Calamagrostis* species are not adequately mapped. In general aggregates such as *Taraxacum officinale* and *Rubus fruticosus* have not been examined in any detail. On the positive side, it is hoped that the level of errors due to incorrect data entry has been small.

Although the survey has been conducted with the intention of providing a benchmark of the state of the city's flora at the turn of the millennium, the data may be put to other uses. One of the most frequent and difficult questions asked of the urban botanist is "what should we plant to improve the environment"? There is an increasing awareness of the value of wildlife within urban areas and there are now many opportunities for improvement of the built environment. In rural and natural areas many botanists will, quite reasonably, shy away from the concept of making deliberate introductions to enhance the flora. In an urban area the situation is quite different and no amount of careful management will result in the natural colonisation of a site by "desirable" plant species.

Suggestions for the management of Hull's botanical resources

1 : Species-rich grassland

- Priory Road Fields
- Rockford & Tweendykes Fields
- Fields to the east of Thomas Clarkson Way

There are several areas of semi-natural grassland that should be sympathetically managed to improve the conditions for the taxa that are already there. There should be no further introductions.

2 : Aquatic habitats

There is currently a scheme under-way to improve the visual amenity of the Holderness Drain in the Preston Road area of the city. A similar scheme in Orchard Park on the Barmston Drain some years ago has resulted in a much improved aquatic flora. Since the Holderness Drain is still quite species rich, it is almost certain that there will be effective re-colonisation by many desirable water plants. Examination of historical data has shown that there has been considerable species loss amongst aquatic plants and there seems to be a strong case for the re-introduction of some of these. Foremost amongst these is the Flowering Rush (*Butomus umbellatus*) which was once common but seems to have become rare in the last century. Other candidates could include Greater Spearwort (*Ranunculus lingua*), White Water-lily (*Nymphaea alba*) and even Frogbit (*Hydrocharis morsus-ranae*).

3 : Regeneration of industrial areas

It has become clear during this survey that much disused industrial land, particularly that associated with old railways, has a diverse and unusual flora. There are very strong pressures to re-develop this land, most of which would result in the destruction of this important floristic asset. It would be unrealistic to suggest that large areas be preserved as urban nature reserves, there is too much pressure on land resources within the city. If the importance of the flora is recognised by planners it should be possible to retain an element of this within the landscaping scheme. Rather than bringing in soil and turf to create sterile grassland that requires a great deal of expensive maintenance, a simple regime of periodic surface scraping would retain a large proportion of the interesting and attractive species.

4 : Improvement of amenity grassland

Hull has, within its boundaries, a large amount of closely mown amenity grassland. With a little imagination, it would be possible to vary the cutting regime to encourage areas of more natural grassland in which a more varied and attractive flora could thrive. Although there would be some natural colonisation, the process could be speeded and controlled by the deliberate planting of "plugs" of species such as Knapweed (*Centaurea spp*) and Cowslip (*Primula veris*) that would improve the visual amenity. Seeding the area by the application of hay cut from some of the city's natural grassland would help increase the diversity of other less noticeable species although they would take much longer to become established.

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