Milton Keynes Natural History Society

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Acknowledgements

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Instructions for Contributors

Articles for publication in the Journal should be submitted to The Editor, Milton Keynes Natural History Society Journal, c/o Wildfowl Centre, Great Linford, Milton Keynes. Papers will be accepted on any natural history subject in North Buckinghamshire. Publication is at the discretion of the Editor. Papers from non-members may be accepted, but members' papers will receive preference. Publication of the Journal is irregular but never more frequently than annually.

Manuscripts should be typed, double spaced, on one side of the page only. Machine readable (IBM PC) versions of documents can also be accepted but please contact the Editor for information on the form these should take. References cited in the text should be in the form '(Bailey, 1987)' or ' . . . as noted by Bailey (1987)'. All references cited in the text should be noted alphabetically at the end of the article in the form:

Baily, B.1987. *Churchyard Memorials.* Robert Hale Ltd. pp 67-71.

All diagrams and figures should be prepared in black ink,submitted on separate sheets of paper and be clearly labelled. Lettering should be neat and uniform. Please only submit originals of diagrams. Please indicate the approximate position of each figure or table in the text of the article.

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CONTENTS

FOREWORD

by Gordon Osborn, F.L.S. - President MKNHS

It has been eight years since Milton Keynes Natural History Society published a journal but it has not been inactive in the meantime.

The Society has maintained its membership and it continues to record and study natural history in North Buckinghamshire.

The venue for indoor meetings has been changed from Bradwell Abbey to the A.R.C. Wildfowl Centre at Linford. This has proved to be a good move as there are excellent facilities for the lectures and demonstrations held regularly during the winter months on Wednesday evenings. Priority is given to local conservation and work has continued in Howe Park Wood. The Society is carrying out an invertebrate survey of North Buckinghamshire as well as many other aspects of recording which are reflected in the following papers.

Although the Society concentrates its activities locally, it thinks globally. As well as several day and weekend field trips to various parts of Britain there have been two visits to Crete and a visit to Turkey to observe plants and animals. A visit is planned to explore the natural history of Israel in 1992.

My thanks go to all those who support the Society and have made this Journal possible.

MANAGEMENT AND DIVERSITY: A STUDY OF THE GROUND FLORA IN HOWE PARK WOOD.

By Linda Murphy

Background

Milton Keynes Natural History Society (MKNHS) manages one compartment of Howe Park Wood as a nature reserve for the Milton Keynes Development Corporation (MKDC). The wood is 59 acres in total, the Society's compartment is approximately 23.5 acres. It lies in the west of the designated area of the new city of Milton Keynes (OS 152, SP 834 384). Over the next few years, the surrounding land will be developed as residential areas, a shopping centre and major roads, bringing a large increase in the population and growing public pressures on the wood.

Aims

The Society's long-term aim, as stated in its Management Plans (1976, 1986), is 'to retain as much diversity of habitat and its attendant diversity of wildlife as possible within the constraints of size, recreational function and changing geographical situation of the woodland.' The management regimes applied by the Society in the wood are a 12 year coppice cycle, glade clearance, limited management (where natural degeneration is allowed while regenerative assistance is given by opening the canopy and clearing scrub around Oak, Hornbeam and Crab Apple saplings) and non-intervention (areas allowed to degenerate and regenerate naturally, closed to public access by hedging, dry hedging or scrub). Previous studies of the ground flora have been carried out by MKNHS and MKDC (J. Kelsey for MKDC in 1974, R. Maycock for MKNHS in 1975 and M. Slatter for MKDC in 1984). In view of the Society's aims and the increasing pressures on the wood, the aims of this study were (i) to assess the trends in diversity of ground flora in relation to the management regimes applied; (ii) to compare species diversity within areas subjected to different management regimes, especially the effects of coppicing over time and (iii) to assess the effects of management regimes on the distribution and abundance of individual species and groups of species in this compartment of the wood.

Methods

The field work was carried out between February and June 1988. The ground flora (plants < 1m) at 20 representative sites was sampled on four visits in a large scale survey by 6 x 2m quadrats in which

species presence and percentage cover were recorded. 9 of these sites were sampled again on four further visits in a small scale survey by 50 x 50cm quadrats recording the same data. The density of trees, shrubs, stools and the degree of canopy closure were measured for these 9 sites. In each survey, a number of other categories were recorded besides ground flora species, ie. bare earth, dead stems, dead wood, stools, leaf litter and water. Fig. 1 shows the location of the sample sites. Table 1 shows the key to individual sites.

The field data was put onto computer using the spreadsheet program SUPERCALC 3.1. For each sample site in both large and small scale surveys the following were calculated; (i) the number of quadrats in which a species was found on each visit and the total for all four visits, (ii) the mean percentage cover for each species recorded at a site on each visit and for the four visits combined. From this data, the Shannon Index of Diversity was calculate using the formula

$$-\sum_{i=1}^{x} Pi \log_e Pi$$

This provided a general assessment of the trends in diversity of the ground flora through the season in relation to the management techniques applied at each site. The 20 sites were then classified by Polar Ordination and Cluster Analysis using the programs PO. BAS and CLUSTER from a statistical ecology package (Ludwig and Reynolds 1988). It was anticipated that sites with similar management regimes would group together in such classification if management influences the ground flora. Only those species with >2% average mean percentage cover were included in the analyses so that rare species did not distort the picture.

Using the data from the small scale survey, Rank/Dominance curves were plotted in order to compare the diversity of individual sites. (The shallower the slope of these curves, the more diverse the site.) The proportions of a number of species groups and the other recorded categories were calculated for each of the 20 sites for the four visits combined. The species groups were bryophytes, ferns, woody plants, grasses, sedges, rushes and other herbaceous species. Finally, the presence and percentage cover on each visit were plotted for a range of individual species at each site.

Results and discussion

84 species of ground flora were recorded in the surveys. This is lower than the number recorded by Maycock (1975) but these surveys were made in a restricted number of sample sites within one compartment of the wood only. Table 2 shows the field list with scientific names. Table 3 shows the

species present at each of the 20 sites. The highest numbers of species were found in sites 1 and 6 (Coppice 85/86 and Glade 86/87). The lowest number of species was found in site 18 (Glade 85/86).

The Shannon Diversity Indices for each site showed that the sites with the highest numbers of species were indeed the more diverse and the site with the lowest number species was the least diverse. Fig. 2 shows the diversity indices for each site plotted as a percentage of the maximum possible index for that site. The broad trends in diversity through the season are evidently related to the management regimes at sample sites. In coppice sites, diversity increases through the season but levels off between the third and fourth visits as the canopy closes. In glades, generally diversity is still increasing by the fourth visit except at site 8. This glade is dominated by Urtica dioica and Heracleum sphondylium at this stage, the former indicative of high nutrient levels which are associated with low diversity. In the limited management and non-intervention sites the trends are mixed. This may be due to variations in the denseness of the canopy or other factors. The only site where diversity decreases during the season is the Hornbeam site which has a very dense canopy and a high mean percentage cover of wet leaf litter.

The Polar Ordination and Cluster Analysis did not group the sites clearly according to their management. Polar Ordination placed sites along a gradient from very light to densely shaded and to a lesser extent wetter sites to drier sites. This could be expected to relate to the age of coppice and clearing. However, very old coppice tended to have a more straggling, uneven canopy and some more recently coppiced and cleared sites were nevertheless heavily shaded by surrounding standards. In the Cluster Analysis, the majority of sites were linked in a broad group at the PS = 50% level (PS = Percentage Similarity). In both analyses, the two glades cleared in 86/87 (sites 6 and 11) and the site coppiced in 85/86 (site 1) grouped together. These were the sites with the highest number of species and levels of diversity. The closeness of site 1 to these glades seems to be related to the fact that this was a large coppice compartment and therefore not shaded to such a great extent by surrounding standards. Sites 16 and 18 were consistently different from all other sites. In the case of the Hornbeam stand (16) this is not surprising. Conditions here have already been commented on. Site 18 is unexpected in that it is a glade cleared in the same year as site 1. It has the lowest species count and is dominated by a few species, particularly Holcus lanatus, which is hardly found elsewhere in the wood, and Hyacinthoides non-scripta.

When the diversity of the 9 individual sites was compared using the data from the small scale survey, the site with the highest diversity through the season was site 6 (Glade 86/87). In the coppice sites, site 1 was the most diverse, as could be anticipated, being three-year old coppice. Earlier in the season, the least diverse sites were the most recently coppiced and cleared sites (3 and 4) presumably due to disturbance. There were similarities in diversity between older coppice sites and the limited management site. Diversity increased greatly at all sites to visit 3. By visit 4 (Fig. 3 and 4) the least diverse sites are the

limited management site and site 8 (Glade 85/86). The former, presumably due to the denseness of the canopy, the latter due to the high nutrient levels mentioned earlier.

When the proportions of groups of species present and other recorded categories were analysed, trends related to management were evident (Fig. 5, 6 and 7). In all coppice sites, apart from site 1, there were similar proportions of grasses to other herbaceous species. This was also true in the limited management and non-intervention sites. In all coppice sites, again with the exception of site 1, the proportion of leaf litter was generally higher than that of either grasses or other herbaceous species. As might be expected, this was also true of the limited management and non-intervention sites. Proportions of bryophytes were also higher in these sites than in glades except for in the two cleared most recently, sites 4 and 15. Here it appears that the conditions were still dark and damp enough to allow them to thrive despite the disturbance of clearance. Glade 4 still has a high level of canopy closure at 63% (Table 4) due to surrounding standards and those left in the glade itself. The position is similar in site 15. In the other glades, there are far higher proportions of grasses and other herbaceous species than anything else. Rushes are largely confined to the glades. Sedges are widespread in this wet wood. Their presence does not relate to the management at a particular site, but to the soil and water conditions.

The distribution and abundance of individual species naturally follows a similar trend. The increase in spring flowers following coppicing was disappointing, however. This may be due to the relative abundance of grasses in the coppice sites which in turn may be due to a reduction in grazing by rabbits and deer in recent years.

In each of the analyses carried out it was clear that certain sites did not follow anticipated trends or resemble sites which had been subjected to the same type of management in the same year. Management regimes were found to have an influence on diversity, but other factors were equally important, namely; the degree of shading (despite clearing), soil and water profiles, nutrient levels, the aspect and location of a site within the wood, the species present at time of clearance, the amount of leaf litter trapped at a site, the weather conditions at time of clearance, the level of human disturbance in coppicing/clearing and animal grazing.

Conclusion

The patterns of species presence and abundance and the diversity of the ground flora in Howe Park Wood are the result of a complex and constantly changing combination of all these factors. It is important that the Society continues to maintain its current management practices, but perhaps also gives some consideration to the size of coppice compartments and glades with respect to shading. The varied

age structure and varied conditions in the wood, produced by a coppice cycle and glade clearance maintain the diversity of the ground flora in the wood.

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Steve Waite: for supervising and guiding the study.

FIG. 1.

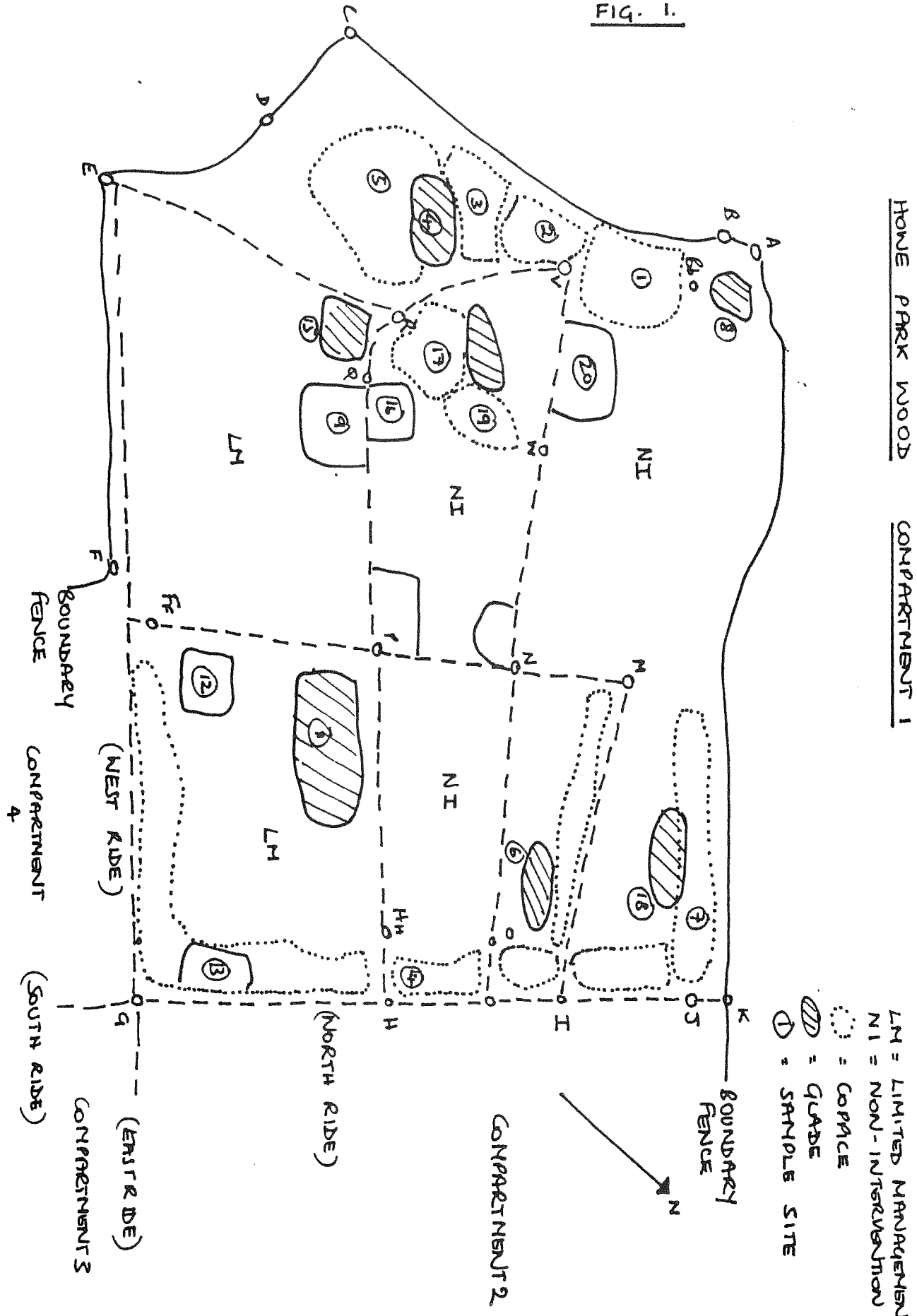

HOWE PARK WOOD
COMPARTMENT 1
LM = LIMITED MANAGEMENT
NI = NON-INTERVENTION
= COPPICE
= GLADE
= SAMPLE SITE
BOUNDARY FENCE
(WEST RIDE)
(NORTH RIDE)
(EAST RIDE)
(SOUTH RIDE)
COMPARTMENT 2
COMPARTMENT 3
COMPARTMENT 4
BOUNDARY FENCE
LM
NI
N

Table 1

Key to sample sites in Howe Park Wood.

Site	Management Regime
1	Coppiced 1985/6
2	Coppiced 1986/7
3	Coppiced 1987/8
4	Glade cleared 1987/8
5	Coppiced 1976/7
6	Glade cleared 1986/7
7	Coppiced 1980/1
8	Glade cleared 1985/6
9	Limited management area
10	Non-intervention area
11	Glade cleared 1986/7
12	Limited management area
13	Coppiced 1978/9
14	Coppiced 1979/80
15	Glade cleared 1985/6
16	Hornbeam stand
17	Coppiced 1977/8
18	Glade cleared 1985/6
19	Coppiced 1978/9
20	Non-intervention area

Sites 1 to 20	Large scale survey.
Sites 1 to 9	Small scale survey.

Table 2

FIELD LIST	SCIENTIFIC LIST
Ground-ivy	Glechoma hederacea
False Brome	Brachypodium sylvaticum
Hairy-brome	Bromus ramosus
Giant Fescue	Festuca gigantea
Wood Millet	Milium effusum
Cock's-foot	Dactylis glomerata
Yorkshire-fog	Holcus lanatus
Meadow-grass spp.	Poa spp.
Soft Rush	J. effusus
Hard Rush	J. inflexus
Wood-sedge	Carex sylvatica
False Fox-sedge	C. otrubae
Pendulous Sedge	C. pendula
Remote Sedge	C. remota
Male Fern	Dryopteris felix-mas
Broad Buckler-fern	D. dilatata
Tufted Hair-grass	Deschampsia cespitosa
Lesser Celandine	Ranunculus vicaria
Bluebell	Hyacinthoides non-scripta
Ragged-robin	Lychnis flos-cuculi
Meadowsweet	Filipendula ulmaria
Water Figwort	Scrophularia auriculata
Primrose	Primula vulgaris
Gooseberry	Ribes uva-crispa
Cleavers	Galium aparine
Common Marsh-bedstraw	G. palustre
Hogweed	Heracleum sphondylium
Common Nettle	Urtica dioica
Red Dock	Rumex sanguineus
Hairy St John's-wort	Hypericum hirsutum
Square-stalked St John's-wort	H. tetrapterum
Marsh Thistle	Cirsium palustre
Common Forget-me-not	Myosotis arvensis
Lords-and-Ladies	Arum maculatum
Mnium hornum	Mnium hornum
Thuidium tamariscinum	Thuidium tamariscinum
Plagiochila asplenoides	Plagiochila asplenoides
Plagiomnium undulatum	Plagiomnium undulatum
Amblystegium serpens	Amblystegium serpens
Bugle	Ajuga reptans
Bramble	Rubus fructicosus
Creeping Buttercup	R. repens
LEAF LITTER	LEAF LITTER
BARE EARTH	BARE EARTH
STOOLS AND TRUNKS	STOOLS AND TRUNKS
DEAD STEMS	DEAD STEMS
Barren Strawberry	Potentilla sterilis
Wavy Bitter-cress	Cardamine flexuosa
Cuckoo-flower	C. pratensis

DEAD WOOD	DEAD WOOD
Wood Avens	Geum urbanum
Lesser Burdock	Actium minus
Creeping Thistle	C. arvense
Hedge Woundwort	Stachys sylvatica
WATER	WATER
Germander Speedwell	Veronica chamaedrys
Enchanter's Nightshade	Circaea lutetiana
Hawthorn	Crataegus monogyna
Dandelion	Taraxacum officinale agg.
Willowherb sp.	Epilobium sp.
Spear Thistle	C. vulgare
Ivy	Hedera helix
Common Vetch	Vicia sativa
Mnium punctatum	Mnium punctatum
Black Bryony	Tamus communis
Common Dog-violet	Viola riviniana
Honeysuckle	Lonicera periclymenum
Common Spotted-orchid	Dactylorhiza fuchsii
Pellia epiphylla	Pellia epiphylla
Wild Angelica	Angelica sylvestris
Pignut	Conopodium majus
Creeping-jenny	Lysimachia nummularia
Field Maple	Acer campestre
Creeping Bent	Agrostis stolonifera
Wood Anenome	Anemone nemorosa
Common Figwort	S. nodosa
Greater Stitchwort	Stellaria holostea
Cow Parsley	Anthriscus sylvestris
Common Mouse-ear	Cerastium fontanum
False Oat-grass	Arrhenatherum elatius
Garlic Mustard	Alliaria petiolata
Wood Small-reed	Calamagrostis epigejos
Wild Strawberry	Fragaria vesca
Common Chickweed	S. medea
Elder	Sambucus nigra
Hairy Woodrush	Luzula pilosa
Meadow Vetchling	Lathyrus pratensis
White Clover	Trifolium repens
Compact Rush	Juncus conglomeratus
Common Couch	Elymus repens
Bush Vetch	V. sepium

TABLE 3

SAMPLE SITES

SPECIES PRESENCE	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Pellia epiphylla				x	x							x			x					
Plagiochila asplenoides	x	x	x	x	x	x	x		x	x		x	x	x		x	x		x	x
Amblystegium serpens	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Mnium hornum	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x
M.punctatum		x					x			x		x	x	x						
Plagiomnium undulatum	x	x	x	x	x	x	x		x	x			x	x	x	x	x		x	x
Thuidium tamariscinum	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x
Dryopteris dilatata	x	x		x	x	x	x		x	x	x	x	x	x	x		x		x	x
D.filix-mas	x	x		x	x		x		x	x	x	x	x		x		x		x	
Acer campestre					x				x	x										
Agrostis stolonifera						x					x							x		
Ajuga reptans	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x
Alliaria petiolata								x												
Anemone nemorosa	x		x				x		x			x	x	x						
Angelica sylvestris					x	x			x		x						x		x	
Anthriscus sylvestris								x												
Arctium minus	x		x	x		x	x	x	x		x	x								
Arrhenatherum elatius								x			x									
Arum maculatum	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
Brachypodium sylvaticum	x	x	x	x	x		x	x	x			x	x	x			x	x		x
Bromus ramosus	x	x	x	x	x		x	x	x								x	x		
Calamagrostis epigejos											x									
Cardamine flexuosa						x	x				x			x		x				
C.pratensis	x		x		x	x	x		x	x	x	x			x	x	x			x
Carex otrubae						x											x			
C.pendula			x	x	x	x			x		x	x	x			x	x			x
C.remota	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x
C.sylvatica	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x
Cerastium fontanum								x												
Circaea lutetiana	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
Cirsium arvense	x	x				x		x			x							x		
C.palustre	x		x		x	x					x	x					x		x	
C.vulgare	x					x		x												
Conopodium majus					x															
Crataegus monogyna	x	x	x	x	x			x	x			x	x	x	x	x	x		x	x
Dactylis glomerata	x			x				x										x		
Dactylorhiza fuchsii				x	x						x		x				x			
Deschampsia cespitosa	x	x	x	x	x	x	x	x	x			x		x			x	x		
Elymus repens								x												
Epilobium sp.	x	x	x	x		x		x			x	x	x	x		x				
Festuca gigantea	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Filipendula ulmaria	x	x		x	x	x	x	x	x		x	x		x	x		x		x	x
Fragaria vesca													x							
Galium aparine	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
G.palustre	x			x		x	x		x	x	x	x			x				x	x
Geum urbanum	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x		x	x
Glechoma hederacea	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Hedera helix		x														x				
Heracleum sphondylium						x		x												
Holcus lanatus	x	x	x	x	x	x		x	x		x		x			x	x	x		
Hyacinthoides non-scripta	x	x	x	x	x		x	x	x			x	x		x	x		x	x	x
Hypericum hirsutum	x		x						x		x				x		x			
H.tetrapterum	x			x		x								x			x		x	
Juncus conglomeratus						x					x									
J.effusus	x		x	x	x	x	x	x		x	x	x					x		x	
J.inflexus	x		x			x					x						x			

SPECIES PRESENCE	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Lathyrus pratensis						x														
Lonicera periclymenum			x	x	x												x			
Luzula pilosa												x								
Lychnis flos-cuculi	x	x	x	x	x	x	x	x	x		x	x		x		x			x	
Lysimachia nummularia					x	x					x									x
Milium effusum	x	x	x	x	x		x	x										x		
Myosotis arvensis	x					x	x	x			x			x		x			x	
Poa spp.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Potentilla sterilis	x		x	x	x		x				x	x	x	x			x		x	
Primula vulgaris	x	x	x	x	x	x	x		x		x	x	x	x						
Ranunculus ficaria	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
R.repens	x	x	x		x	x	x	x	x		x	x		x	x					x
Ribes uva-crispa	x					x														
Rubus fruticosus	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
Rumex sanguineus	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sambucus nigra										x		x				x				
Scrophularia auriculata	x					x														
S.nodosa							x			x	x	x	x							
Stachys sylvatica	x	x	x	x	x	x		x	x		x						x			
Stellaria holostea								x												
S.media	x																	x		
Tamus communis			x									x								
Taraxacum officinale agg.	x		x	x		x		x	x										x	
Trifolium repens																				
Urtica dioica	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x
Veronica chamaedrys	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
Vicia sativa					x	x		x				x					x			
V.sepium		x																		
Viola riviniana			x	x	x							x	x	x						

Figure 2

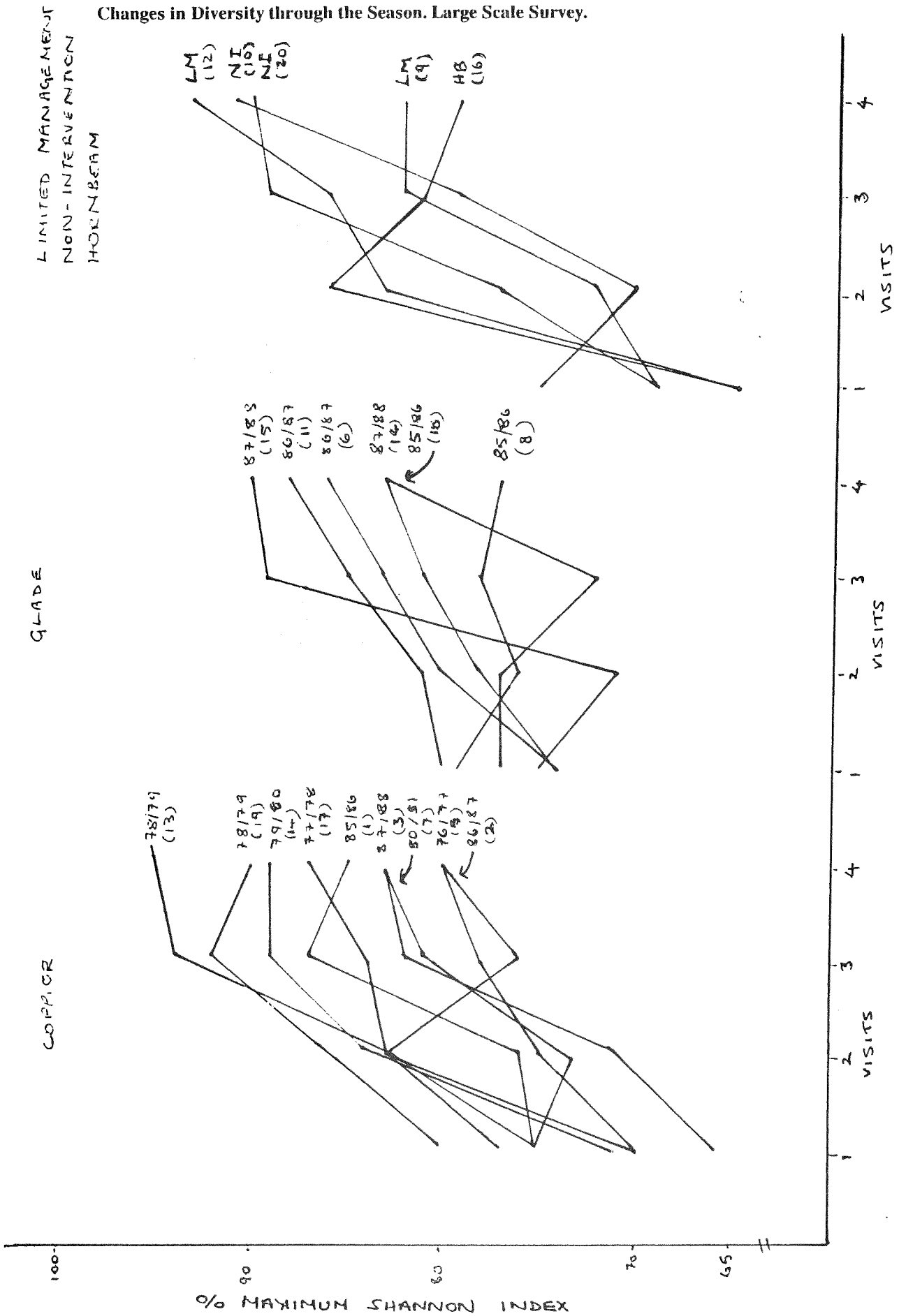
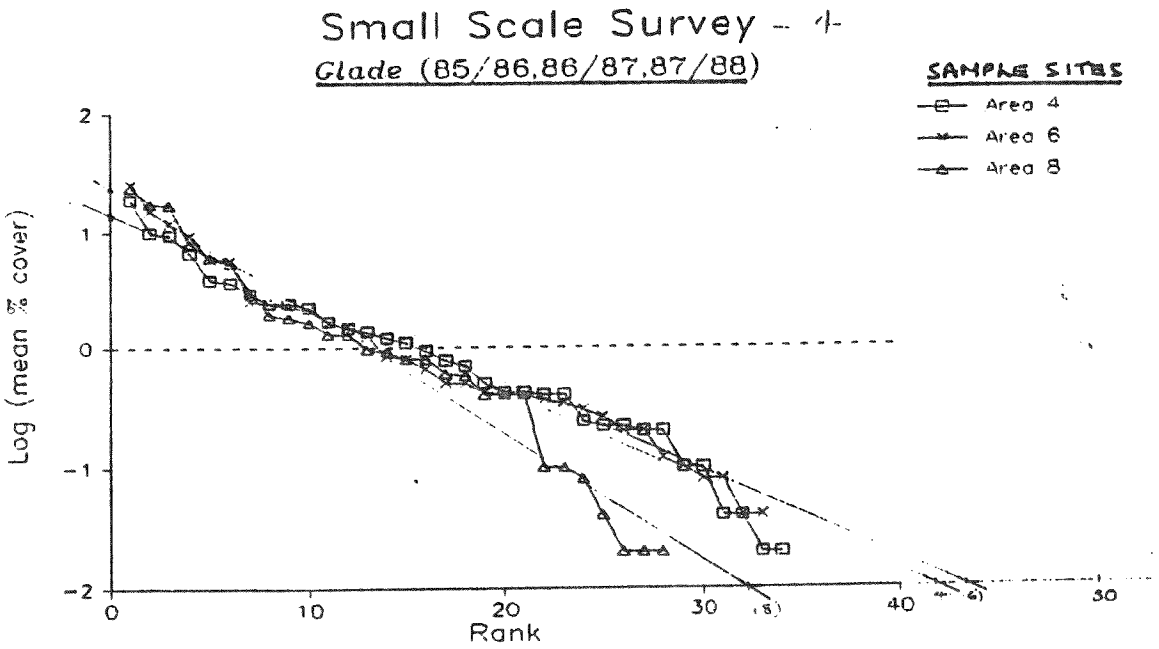

Changes in Diversity through the Season. Large Scale Survey.
LIMITED MANAGEMENT
NON-INTERVENTION
HOLNBEAM
LM (12)
NI (10)
NE (20)
LM (9)
HB (16)
GLADE
87/88 (15)
86/87 (11)
86/87 (6)
87/88 (14)
85/86 (18)
85/86 (8)
COPPICE
78/79 (13)
78/79 (9)
79/80 (14)
77/78 (12)
85/86 (1)
87/88 (3)
80/81 (7)
76/77 (9)
86/87 (2)
VISITS
VISITS
VISITS
% MAXIMUM SHANNON INDEX
100
90
80
70
65

Figure 3

Rank/Dominance Curves. Small Scale Survey - Visit 4



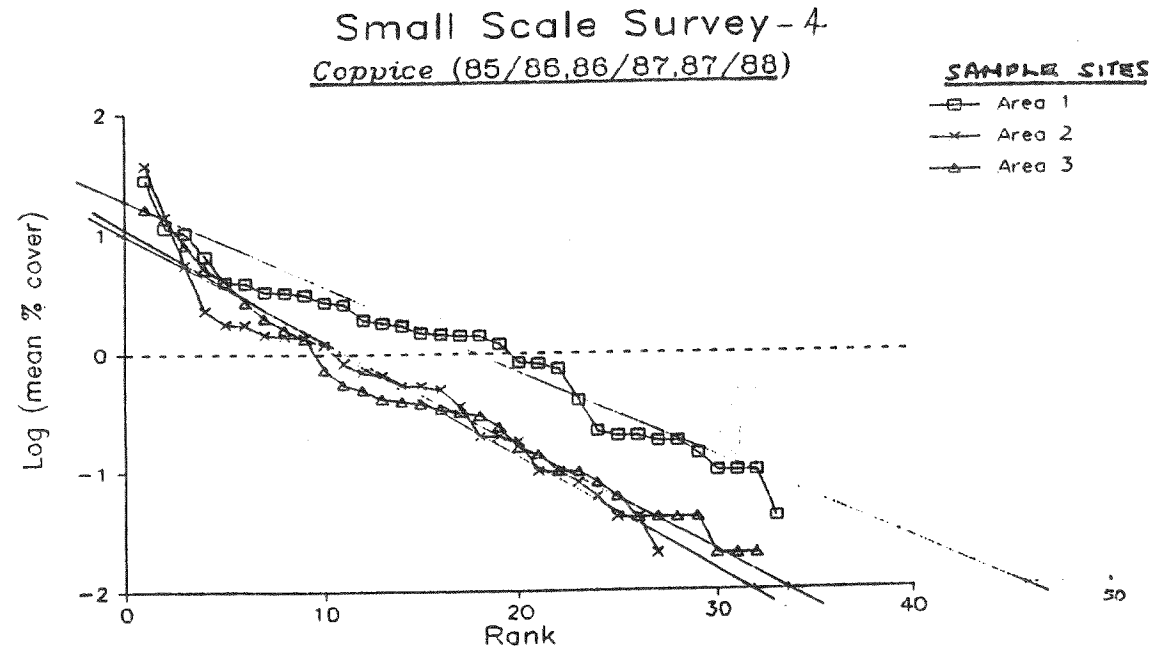
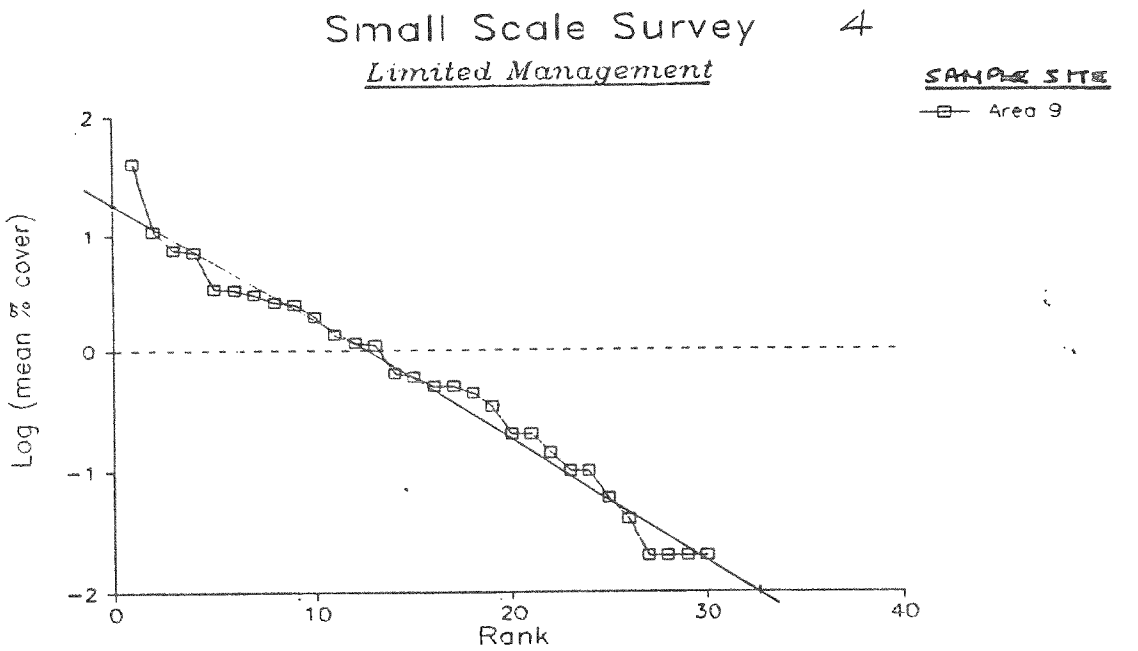


Figure 4

Rank/Dominance Curves. Small Scale Survey - Visit 4



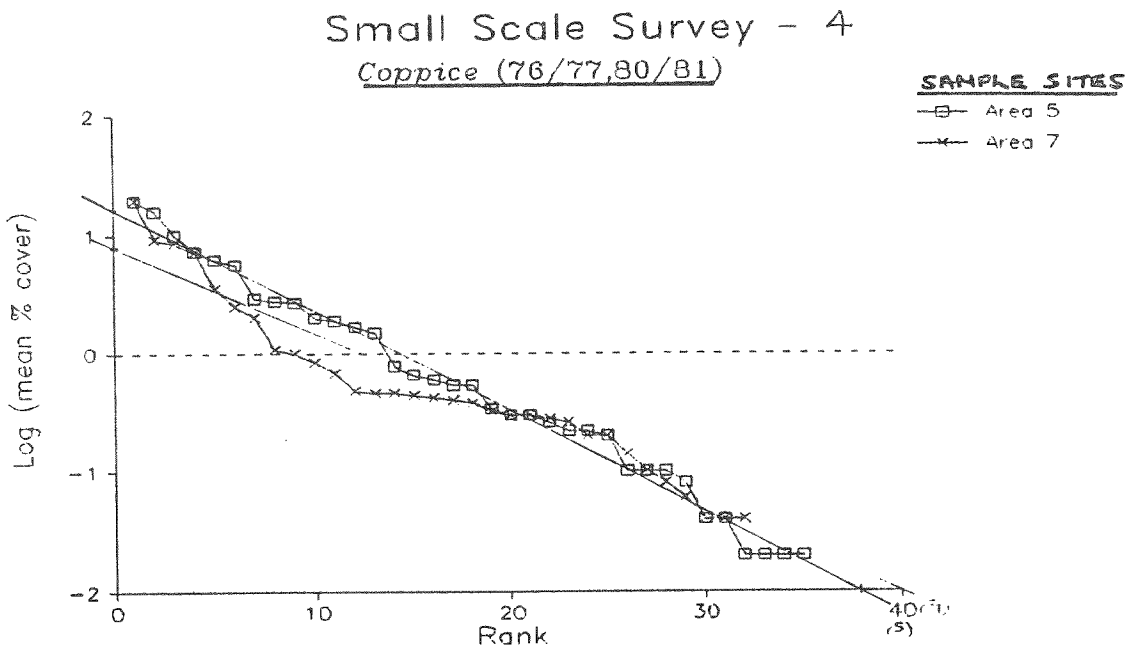


Figure 5

Proportion of Species Group or other category at Coppice Sites

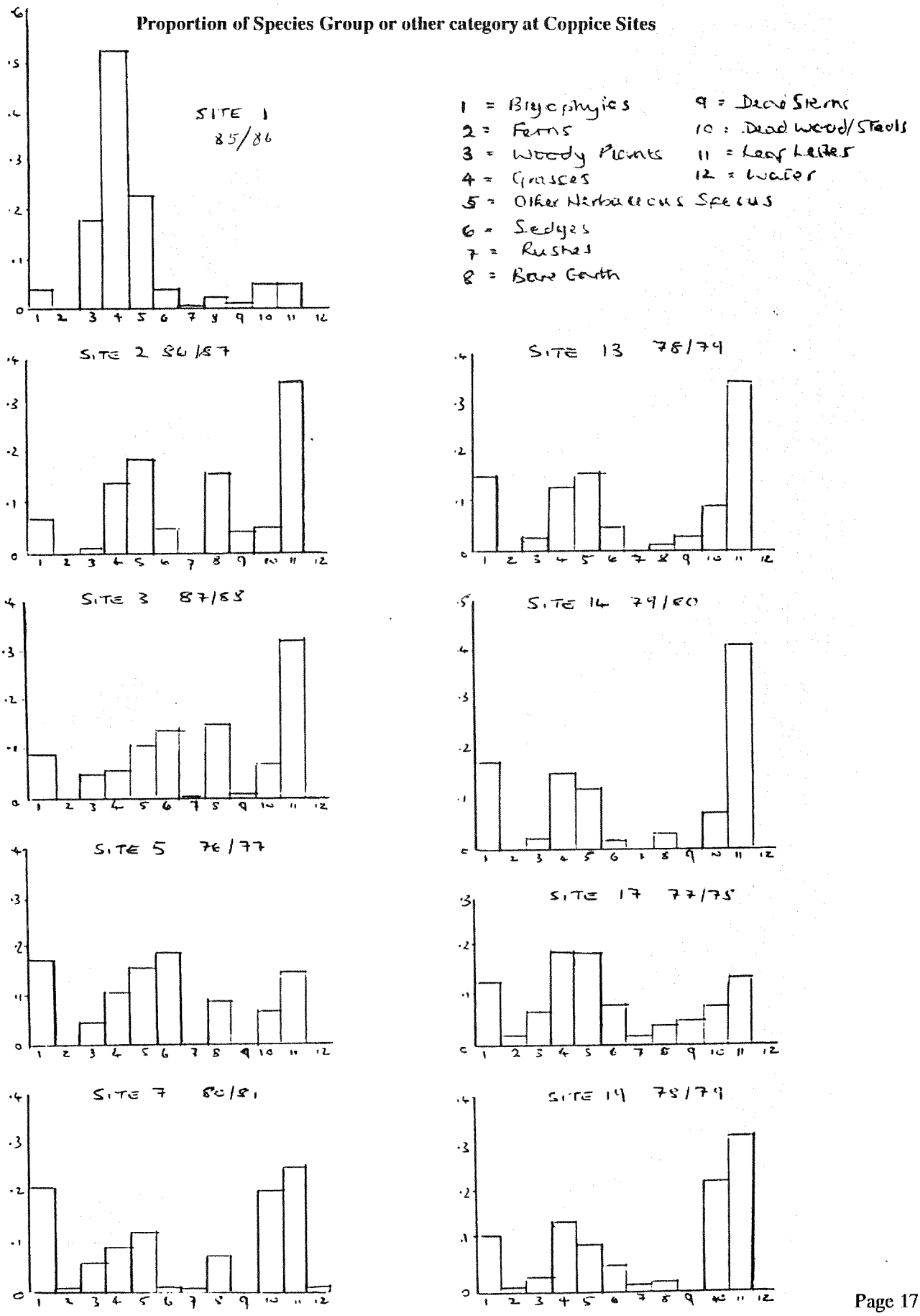


Figure 6

Proportion of Species Group or other category at Glade Sites

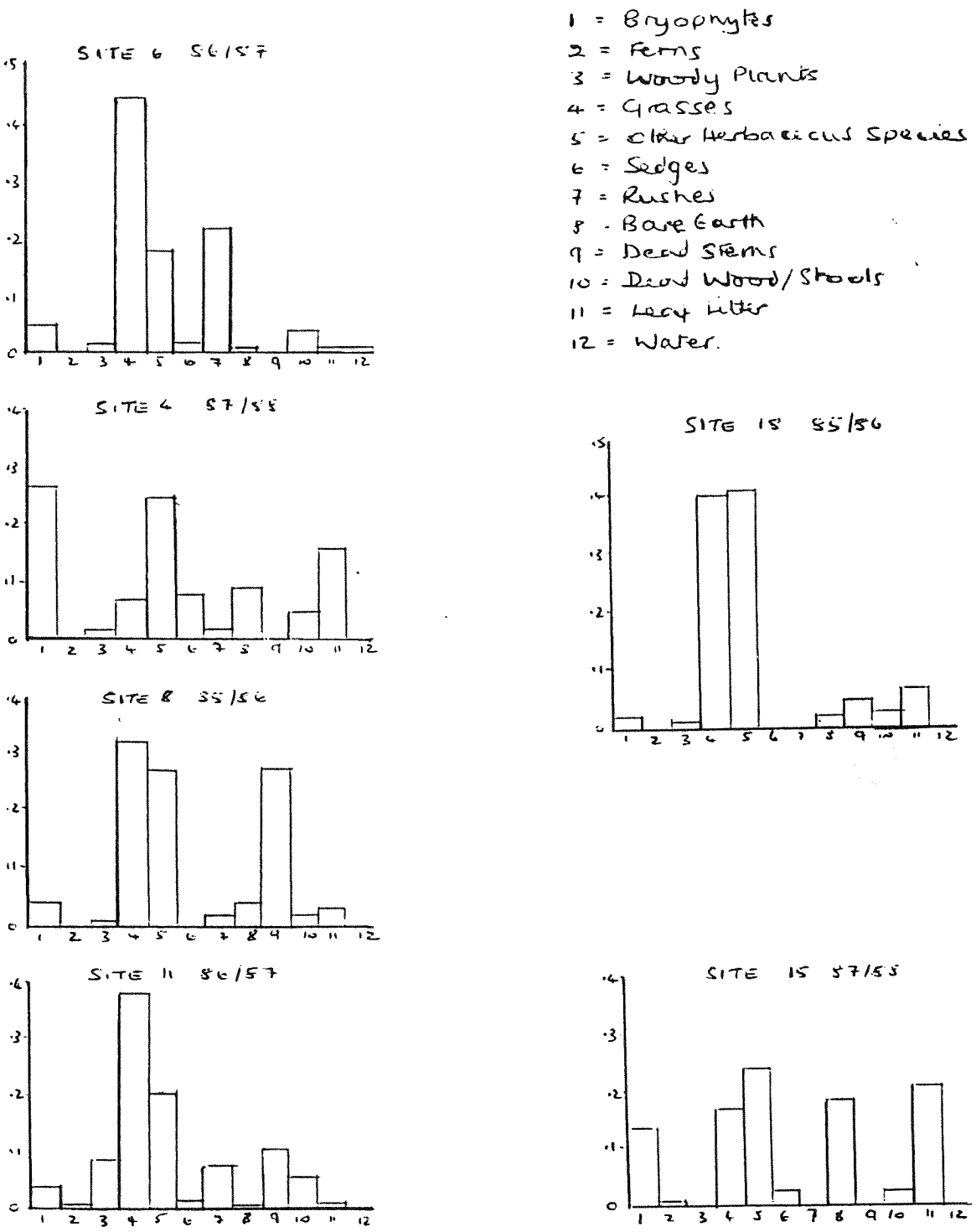
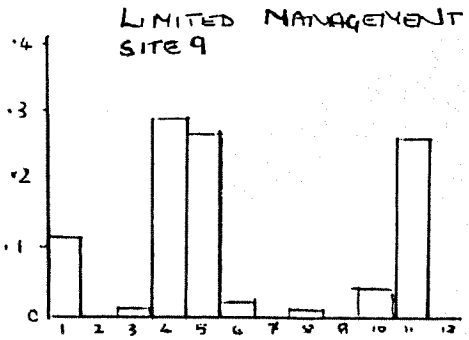
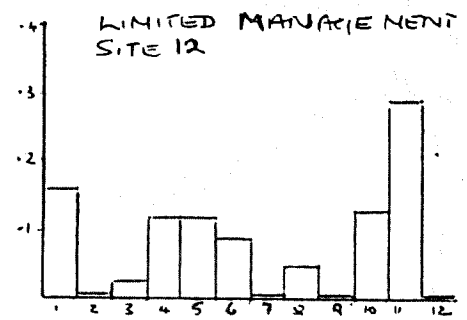


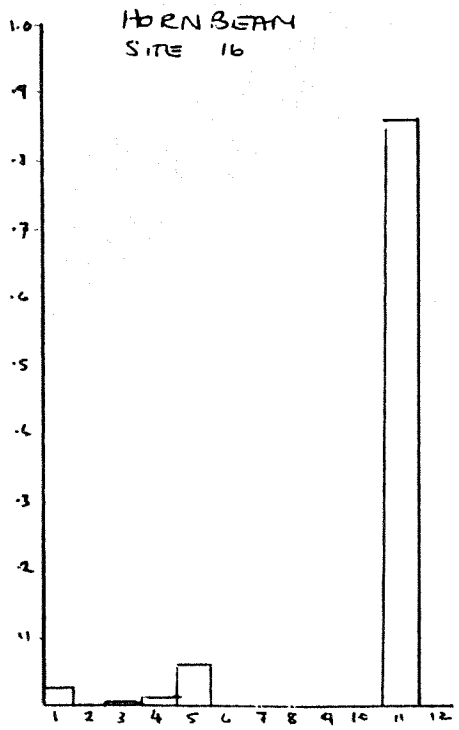
Figure 7

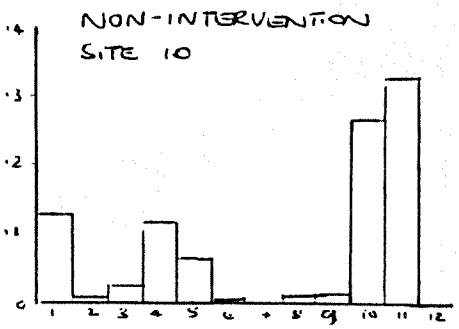
Proportion of Species Group or other category at Limited Management, Non-intervention and Hornbeam Sites

1 = Bryophytes
2 = Ferns
3 = Woody Plants
4 = Grasses
5 = Other Herbaceous Species
6 = Sedges
7 = Rushes
8 = Bare Earth
9 = Dead Stems
10 = Dead Wood / Stools
11 = Leaf Litter
12 = Water.









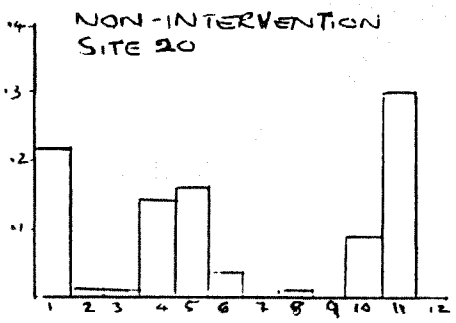


Table 4

Tree/shrub density per sample site in the small scale survey in Howe Park Wood.

Site	1	2	3	4	5	6	7	8	9
Area (m^2) approx.	304	300	240	224	400	300	240	225	400
No. of species	6	7	6	5	9	4	10	3	9
				Species density per sq. meter					
Fraxinus exelsior poles	-	.003	.042	.036	.038	.003	.033	.004	.043
Stools	-	-	-	-	.038	-	-	-	.003
Total	-	.003	.042	.036	.075	.003	.033	.004	.045
Corylus avellana	-	-	-	-	.065	-	.071	-	.043
Populus tremula	.046	.017	-	-	.013	.003	.025	-	.075
Acer campestre	.016	.013	.008	.009	.008	-	.008	-	.015
Malus sylvestris	.003	-	-	.005	-	-	-	-	-
Quercus rober	-	-	.004	-	-	-	-	.004	.002
Salix caprea	-	-	.008	.004	.005	-	-	-	-
Salix cinerea	-	-	.004	-	-	.05	.008	-	-
Vibernum opulus	-	-	.004	-	-	-	-	-	-
Cratageus monogyna	.007	.007	-	-	.025	-	.004	.004	.025
Prunus spinosa	.013	-	-	-	.015	.04	.108	-	.035
Sambucus nigra	.003	-	-	-	.003	-	.004	-	.015
Rosa canina	-	.003	-	-	-	-	.004	-	-
Rubus fructicosus	-	.003	-	.004	.01	-	.008	-	.01
Cornus sanguinea	-	-	.004	-	-	-	-	-	-
Cut stools	.118	.043	.113	.071	-	.02	-	.036	-
Total tree/ shrub density	.089	.05	.071	.058	.218	.097	.275	.013	.265

Percentage canopy cover at each site in the small scale survey in Howe Park Wood.

Measured from photograph	24	45	51	63	92	19	95	12	78
By sight	20	40	25	50	85	10	85	5	80

AN HYPOTHESIS ON THE REVERSED FLOW OF THE RIVER OUSEL

by Gordon Osborn

Some years ago the late Mr. H. Hitchon of the Northamptonshire Natural History Society brought out the idea that near Blisworth there was a glacial lake. The evidence for this can be seen when travelling to Blisworth from the turn on the A508 in Courteenhall. After passing over the main railway line, to the right there is a depression, so Mr. Hitchon could be correct. What worried him was: where did the water go from there? He suggested that much water must have come from Lake Harrison south of where Coventry is now. Also there was another lake where the Rugby Radio Station is situated. There is evidence that a vast volume of water came through the Watford Gap.

Mr. Hitchon assumed at that time the Wash was blocked by ice and there was no outlet to the North Sea. L.J. Wills in his book The Palaeogeography of the Midlands (Liverpool, 1950, p.113) indicates the main Eastern Ice covered the country to the south of Buckingham, covering the Great Ouse, the Welland and the Nene river systems. Later, on page 126, he indicates that there was a glacial lake called Lake Ouse and that the wash was blocked by the Hessle Ice. This is in line with Mr. Hitchon's reasoning.

Before that stage was reached the ice must have retreated slowly eastwards and it is quite possible that for a time the Nene valley could have been blocked to the west of Northampton where the new Ring Road crosses the valley to Upton. The valley could have received a large flow of water coming through the Watford Gap. Similarly, the Welland would be having problems in disposing of its water, just like the Great Ouse. At the same time the ice did not retreat in a straight line: the high ground of Yardley Chase and Salcey Forest would have had small ice caps after it had retreated from the lower valleys. The high ground to the north west of Northampton would be covered with ice. There is a glacial wash out near Yardley Hastings which indicates that water flowed down the north slope of the high ground of Yardley Chase to the Nene valley. This would be melt water from a small ice cap covering the area now occupied by The Chase. The thawing of the ice sheets was not a steady process. For some years the ice would re-advance while in other years there would be a bigger retreat and this would mean a lot of water had to be disposed of.

At times the river valleys that had been vacated by the ice must have been full of water, unable to release it because the valleys to the East were blocked by the ice. There must have been periods when they overflowed, possibly the Welland to the Nene and then to the Great Ouse. This water was probably

finally disposed of down the Tove valley, which must have received additional water from the ice cap on the high ground in the Blakesley area. This water then joined the Ouse and finally the Ousel Valley.

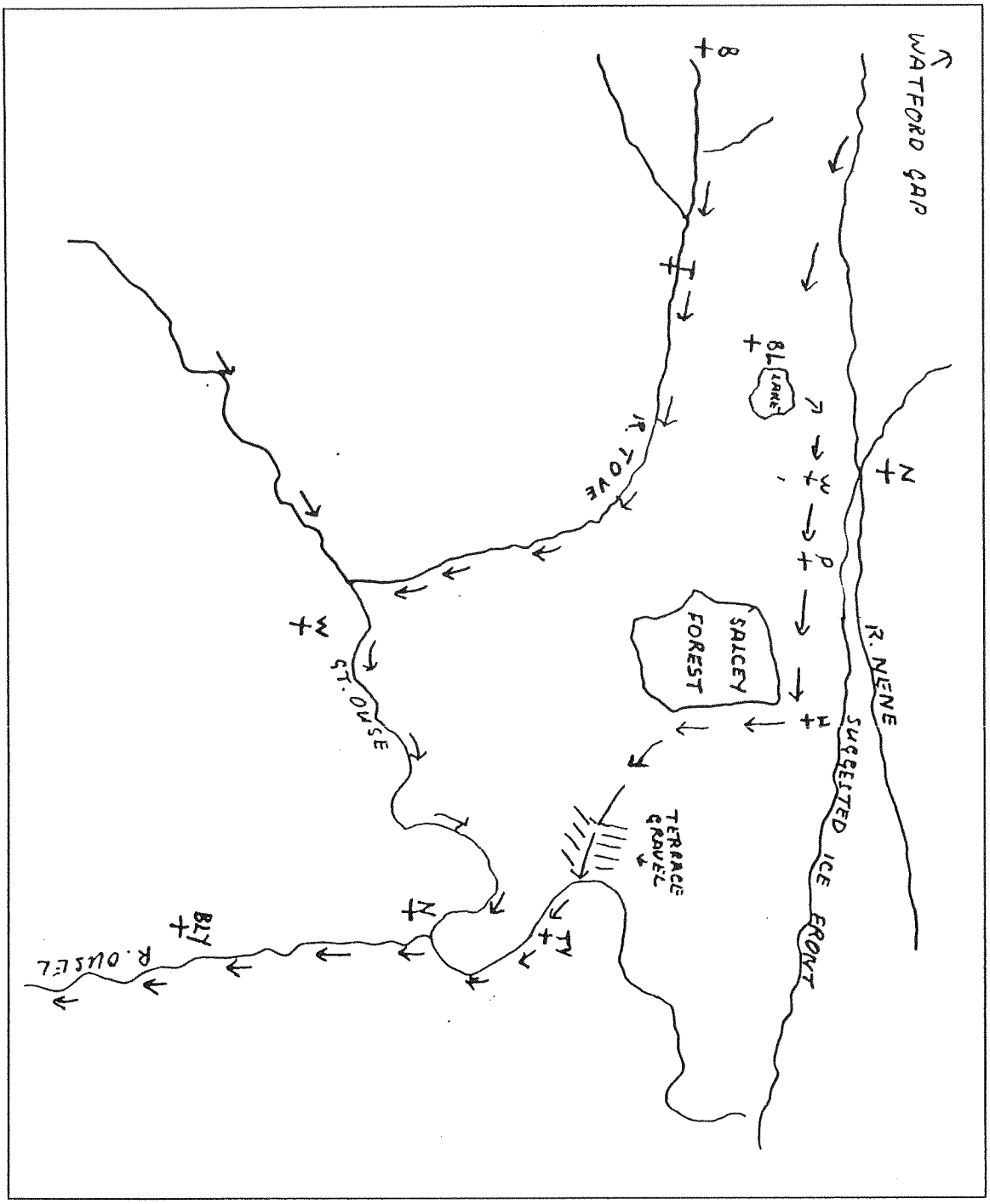
The evidence I have to offer for this hypothesis is twofold. First, the valley of the River Tove is wide and the topography of the valley running from the high ground of Salcey Forest past Eakley Lanes and down towards Ravenstone Mill indicates there was a large flow of water which deposited the terrace gravels when it reached the high water in the Ouse system. These gravels were deposited on each side of the valley due to the slowing of the current as it joined the Ouse System where the river takes a right-angle bend. On this bend is a wide river valley area with terrace gravels on the inside of the bend at Tyringham. The river gravels on each side of the stream from the forest are deposited on the outside of the river bend. These gravels contain very few erratics other than Bunter pebbles, flints and limestone of local origin, while the fine sand contains a small proportion of iron grains which must have come from the Nene valley.

The route the overflow water took from the Blisworth lake is difficult to determine. There is a possibility it drained along a shallow valley to the south of Wooton and Preston Deanery then on to Hackleton and Horton. it then turned south to the west of the A50 road and along the east side of the forest, coming across Bullshead Farm and then cutting the narrow channel at Eakley Lanes which crosses the road and then a valley to the east of Stoke Goldington to join the river at Ravenstone Mill as described above.

Secondly, the valley of the River Tove has carried an immense amount of water at some time as its wide valley and tiny misfit river shows. Where did this water go? I believe that after joining the Ouse system a series of lakes were formed due to the blocking of the Ouse by the then retreating ice sheet. This water then piled up to such an extent that the only outlet was back along the Ousel Valley, where it flowed south to join the waters held by the Chiltern Hills. There is geological evidence of a series of glacial lakes along the Ousel Valley. Northern ice- transported erratics such as Carboniferous limestone and olivine basalt are found in the Ousel Valley.

These waters when high enough broke over the escarpment of the Chiltern Hills and cut the Tring, Wendover and Princes Risborough gaps, then flowed down the dip slope of the Chilterns to join the River Thames. When the ice had finally retreated from the coast and the Ouse glacial lake had drained into the North Sea the three rivers, the Nene, Welland and Great Ouse, assumed the courses they occupy today.

These misfit rivers now meander in the flood plains of the wide valleys carved out by the melt waters of the ice ages, each successive ice age carving the valley to a greater degree. It was the Main Eastern ice sheet which created the effects discussed above.



Diagrammatic sketch of suggested water flow.

B - Blakesley; T - Towcester; N - Northampton; BL - Blisworth; W - Wootton; P - Preston Deancry; H - Horton; W - Wolverton; N - Newport Pagnell; TY - Tyringham; BLY - Bletchley; LB - Leighton Buzzard.

ERRATICS OF EMBERTON PARK

by Gordon Osborn

During the past one and a half million years the British Isles have suffered periods when the land has been covered with ice. From the evidence there were four main ice ages during that period. On the Continent it points to earlier glaciations going back to about three million years. There are many discussions about the cause of the ice cover.

The four main advances of the ice are called in order of the oldest first, the Gunz glaciation which commenced about 1,500,000 years ago. The next, the Mindel, a severe age, started about 1,200,000 years ago. The Riss glaciation covered much of Scandinavia, the North Sea and much of the British Isles, starting about 420,000 years ago. The last, the Wuerm, started about 110,000 years ago and finished about 10,000 years before the present. In between the advances of the ice there were warm periods when plants and animals inhabited the land only to be driven back by the next advance of the ice. During the period of glaciation there were warmer intervals almost dividing the ice coverage into two or more glaciations. This happened to such an extent during the Wuerm glaciation that the time has been divided into Wuerm 1 and Wuerm 2: about 40,000 years ago there was a warm period followed by the intensely cold Wuerm 2.

During the advance of the ice it travelled long distances and in doing so as it moved over the ground it gathered large amounts of soil and rock, which it carried from their place of origin to where the ice eventually melted. It must be remembered these ice sheets were very thick indeed. During severe periods they would be of the order of one mile thick. This immense weight of ice moving slowly over the ground scoured the surface, picking up all the loose material as well as cutting deep into the surface and absorbing all this material which was finally deposited at the edge of the ice sheet as a moraine. Here the vast amount of melt water from the ice flowed into the river valleys and enlarged them, at the same time carrying vast amounts of rocks and mud that was deposited by the melting ice. The muddy water flowed through the valleys and on the inside of the river valleys where the water current was less strong great quantities of gravel were deposited, where it remains to the present day to be extracted for the modern concrete world.

The gravels contain much of the material carried by the ice; the fine silt was carried down the river to be deposited out to sea. In these gravels was an assortment of rocks that had survived the journey; the soft material had been ground down and carried away as mud. The hard rocks left are called "Erratics" because they are not of that area, they have come from some distance away. A look at the map

will give an idea of the distance travelled by some of the local erratics described below that were found in Emberton Park in North Bucks (SP502883).

The park was made from the area excavated in the large gravel deposit in the valley of the river Great Ouse, which has many such deposits along its length. Many of the erratics found came over from Scandinavia, brought over during the Riss Glaciation.Similarly many erratics from the north of England were brought down the eastern side of the country by the flow of ice from the high ground in the north before being sorted finally by the melt waters.

A walk across a ploughed field in the district will yield an assortment of erratics. They have remained due to the fact that the melt waters did not flow over them and transport them down the river valley.

Here is a list of some of the erratics found at Emberton:

1 Granite with large pink feldspar crystals similar to Shap Granite. Source: Sweden.

2 Light coloured granite from Norway. Source: close to Oslo.

3 Porphyry, possibly the Oslo rhomb porphyry. Source: Norway.

4 Hornblende, possibly a metamorphic amphibolite. Contains a variety of minerals. Source: Scandinavia.

5 Quartzite, grains welded together and showing strained extinction. Source: Scandinavia.

6 Medium grained schist with sphene, actinolite and quartz. Source: Scandinavia.

7 Quartz feldspar gneiss. Source: Scandinavia.

8 Metamorphic sandstone - arkose, very strongly strained quartz, some microline feldspar and plagioclase. Source: Scandinavia.

9 Xenolith of ultrabasic rock in borolanite. Source: Scandinavia.

10 An amphibolite, a metamorphic hornblende - plagioclase. Source: Scandinavia.

11 Impure highly metamorphic quartzite. Source: Scandinavia.

12 Quartz porphyry, a dyke rock with phenocrysts of quartz and altered potassium feldspar. Source: Scandinavia.

13 Pink granite with large white phenocrysts. Source: Scandinavia.

14 Olivine basalt. The olivine crystals had weathered out on the surface leaving small pits. Source: probably Derbyshire.

15 Carboniferous limestone with *Sigillaria* and *Lithostrotion*. Source: Derbyshire.

16 Carboniferous gannister with plant remains. Source: Derbyshire.

17 Bunter pebbles of all sizes. Source: Nottinghamshire area.

18 Weathered quartzite nodules showing differentiation in hardness of the various layers. Source: the Nottinghamshire area.

19 Flint in large quantities. Source: Norfolk, Cambridgeshire and Lincolnshire.

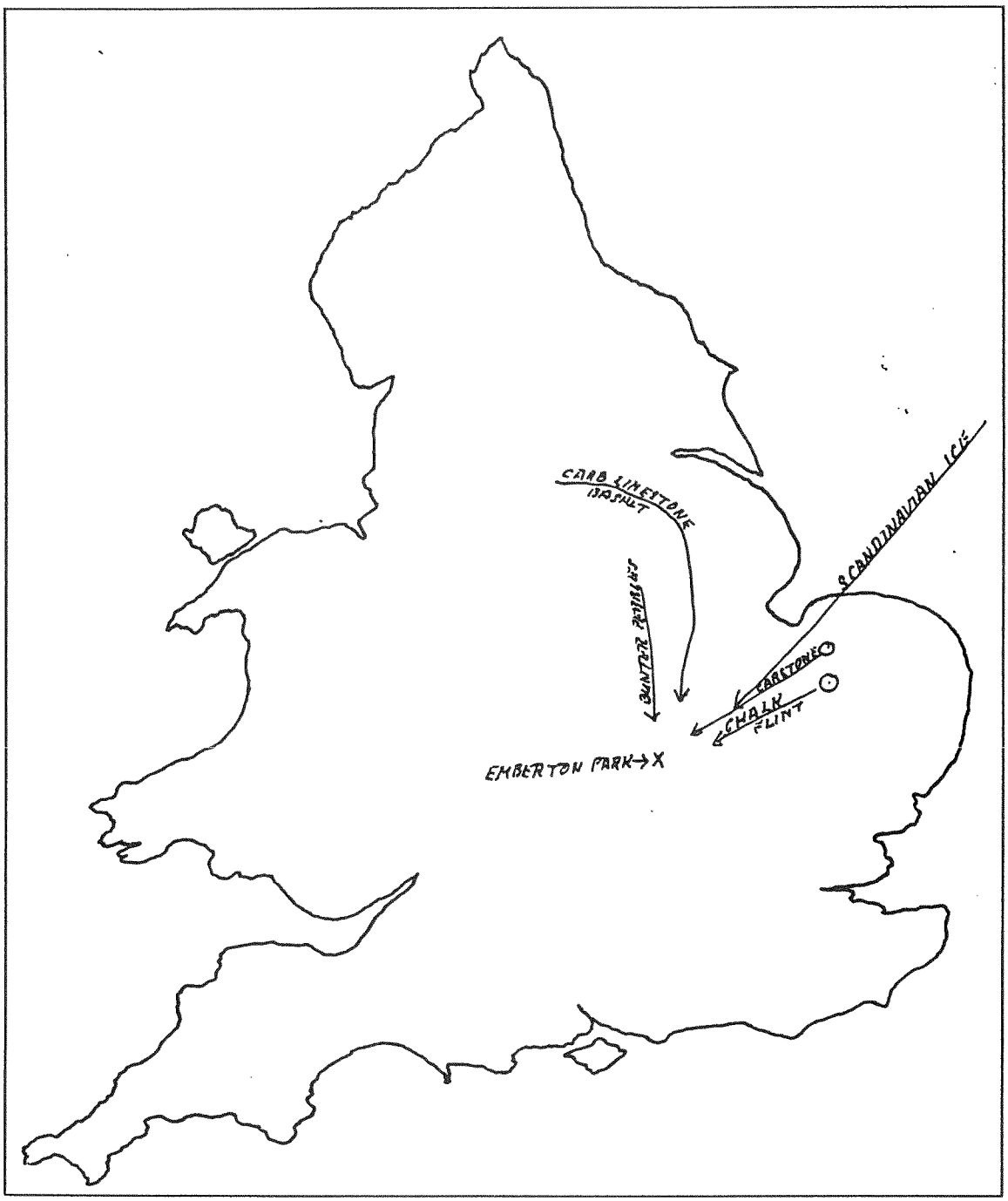
20 Hard chalk. This was from the chalk rock of the Upper Chalk. Source: East Anglia.

21 Pieces of fossilized wood now completely turned to silica. Source unknown. May be of Purbeckian age.

22 Carstone. Source: the Greensand areas of east England.

The erratics found over most of the northern part of the United Kingdom have a use in determining the direction of the ice flow and from where it originated. The ice drastically altered the topography of the countryside. The Boulder Clay, that is the material left by the ice, is 90 feet thick in Yardley Chase on the northern boundary of the county, while at Wooton, just on the Bucks-Northants border, the Boulder Clay is more than 120 feet thick. This thickness of material drastically alters the countryside. Not only does the work of the ice gouge out wide valleys, in other places it fills them in. Also the heavy clay supports a different flora than would otherwise be growing on the local limestone.

Many of these erratics can be seen in the Cowper Museum, Market Place, Olney.



Map showing main direction of flow of Emberton erratics.

WASP WATCHING

by Gordon Osborn, F.L.S.

This year (1989), my wife and I were fortunate enough to have a wasps nest, *Vespula vulgaris,* in our garden - a small area at the rear of our bungalow. The nest was in the rockery. The entrance was about 30cms above ground level and was between two large pieces of limestone forming part of the vertical wall of the rockery.

Wasps are more adaptable than bees and work in conditions that bees would shun, even working in light rain. On October 3rd they were flying at 7.10am in an air temperature of 48 F. Unfortunately the position of the nest made it difficult to see what the wasps were carrying when entering. Those wasps coming out paused for a moment at the entrance and sometimes it was possible to see that they were carrying something, probably material excavated to enlarge the nest.

They must have been able to find food while working in conditions in which no bee would be flying. Unlike bees, who are dependant on nectar, wasps are omnivorous. They eat an immense number of insects as well as fruit such as ripe pears and plums. They are fond of meat, especially heart which has a close and smooth texture from which they are able to cut pieces quite easily. I have known them to eat a whole sheep's heart in one morning leaving only the outside skin. They will also eat liver, in both cases taking lumps almost as big as their abdomen.

It was on October 10th that I noticed that many wasps were collecting nectar from the ivy flowers. This was late for them to be working but we had not had a frost. Watching the wasps flying from the entrance I noticed that the emerging wasps flew off in a straight line. When they were busy several would emerge together and fly off in the same direction. A moment later another group would come out and all fly off in a different direction. It seemed they were working in gangs.

On returning to the nest the wasps which were approaching from the right of the nest (looking out of the entrance) would take a wide sweep to the right in front of the entrance before going in. Wasps approaching from the left took a left hand sweep as did many approaching from directly in front. Some wasps approaching from the front did a zigzag flight before landing. (Figure 1).

A young wasp emerging for the first time would fly out and turn and face the entrance. It then did a figure of eight flight in front of the entrance several times to imprint the situation in its brain so that it would recognise it when coming home from foraging.

Mr. George Higgs, a lepidopterist, has told me that he has often caught wasps in his moth trap during the night. On one occasion they were so numerous that he had to abandon his trapping. A recent observation by Mr. Paul Lund has confirmed that they do fly at night although I have not personally observed this. A watch must be kept on summer nights.

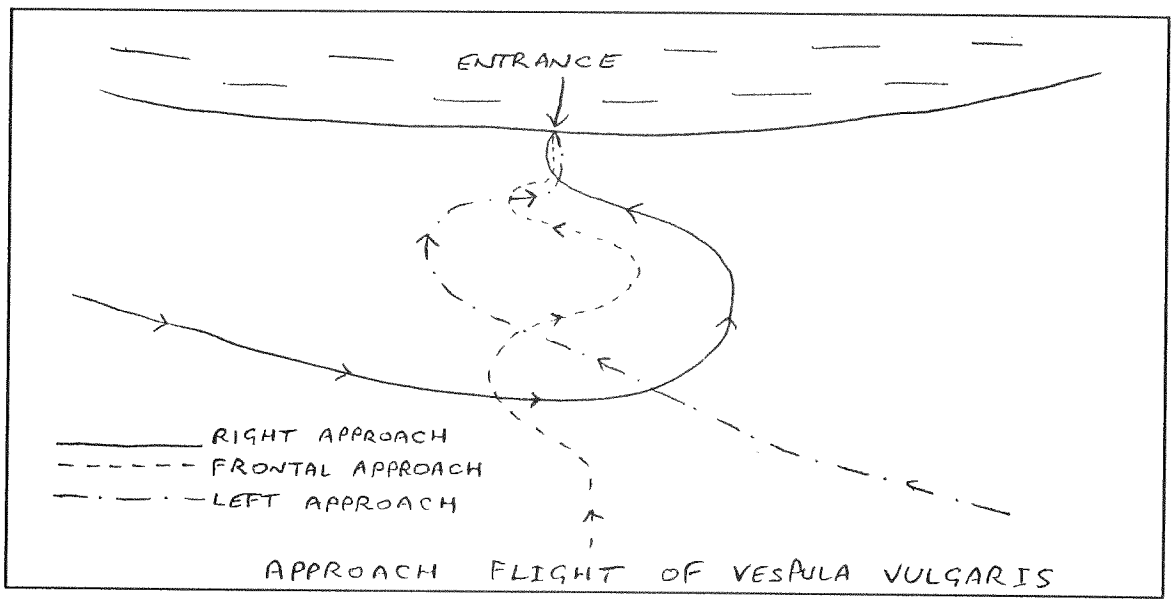


Figure 1

While wasps can annoy us by eating the fruit or stinging when we interfere with them, they do an immense amount of good by keeping down insect populations. Life would be less pleasant if insects did not have natural controls.

The nest has given my wife and I immense enjoyment during the summer months and we are sorry that the winter frosts will kill off the workers. We hope the queens will survive and grace us with their presence next year.

CHANGES IN BIRD WATCHING SITES AND HABITATS IN THE MILTON KEYNES AREA DURING THE 1980S

by Andy Harding

If future researchers compare the 1980 editions of the monthly North Bucks Bird Report or the annual Buckinghamshire Bird Report with those of 1990, they will find many of the same locations prominent within their pages. Yet to treat these as a constant would in some cases be most misleading, since the character of many has changed, in some cases drastically. The apparent significance of others has waxed or waned, or both, during the decade.

I, for my pains, have been a constant, involved in one guise or another in the production of both of the above publications throughout. Unfortunately it was only after the end of the decade that I realized the potential value of a review such as this. Thus what follows is both unsystematic and unscientific.

All the public bird records for our area have passed through my hands. On the other hand I have no information about other biological or ecological monitoring of any site. Therefore my observations are on the macro level: of the obvious changes which have taken place. The sites and habitats selected are those which have been identified by local bird watchers as being of interest, such as is reflected by the submission of reasonable numbers of records. Of course some interesting areas may have attracted little or no attention. Naturally a geographical limit has also had to be set on what constitutes the Milton Keynes area. So important sites such as Hyde Lane, Foxcote Reservoir, Wicken and Leckhampstead Woods have been deemed not to qualify. Coincidentally changes of either habitat or bird community at all of these are not known to have been significant.

Blue Lagoon/Bletchley Brickpits

Blue Lagoon itself remained virtually unchanged, but the area just to the south has been landscaped in a manner not entirely inimical to wildlife. Stonechat in winter has been the most frequently occurring scarce visitor, but midst the small numbers of Meadow Pipits, buntings and finches a superb Richard's Pipit remained for three days in October 1990. The lake itself has recorded Red-necked Grebe, Shag and a Long-tailed Duck during the decade, so remains worth watching.

However the area which has become increasingly attractive to observers are the brickpits to the east or more particularly the infill site which has been operative for about twenty years, but has only recently been actively watched. This attracts vast flocks of gulls which occasionally contains rarer individuals among the five commoner species. Although viewing of all parts of the site is not possible, the birds which are viewable can be observed at length and in full daylight. Prior to its discovery, only roosts with their inherent difficulties, afforded the chance to find Glaucous and Iceland Gulls. An alternative occupation in the same area is to search the damp spots which provide the best chance locally to find Jack Snipe.

Caldecotte Lake

This site perhaps more than any other epitomizes the opportunities and problems which the New City has brought. It didn't exist at the start of the decade. By 1984 it was the second most important site in Buckinghamshire in respect of scarce species. A status which is rapidly being eroded by developments around the lake in the early part of the next decade. While any sizeable stretch of water is attractive to birds, the southerly half has proved the most alluring. A housing estate appeared almost immediately on the north-eastern shore and the whole of the northern half has always borne a rather more manicured look. A small plantation and old hedges at the northern tip are however attractive and Pied Flycatcher and numbers of Whinchats have been noted with commoner migrants. The eastern side of the South basin has been equally attractive to passerines with a caravan park and factory site becoming derelict at the start of the decade. Both of these and much old hedgerow are in the process of development (ie destruction) in early 1991. The same can be said for the one really productive wader bay on the eastern side. Bar-tailed Godwits and Sanderling are not likely to be tempted by it much longer. Between these two lies what was a area of grass in which a maximum of 5 Short-eared Owls spent the winter of 1987/8. 'Improvement' of the banks at several points in anticipation of water sports facilities has not helped. A tiny 'nature area' at the southernmost tip provides laughable compensation!

All of which leaves the water and its wildfowl. Caldecotte clearly holds a lot of fish since it is much liked by Grebes, including a number of records of the three rarer species. From 1986-8 Goosander numbers had reached impressive proportions, but these are fairly shy birds and the provision of paths the whole length of the lake has produced a level of disturbance which clearly they found unacceptable. Wildfowl counts, though declining, are still reasonable at the time of writing, but will no doubt continue on a downward trend.

Campbell Park

This might seem a surprising inclusion given its proximity to the John Lewis end of the central shopping centre. The western end of the park is the highest point in the city, which is no doubt the key to the interest is has generated.

It was 'discovered' by bird-watchers as recently as spring 1989. In the short time subsequently 2 Firecrests, 2 Ring Ouzels, 3 Pied Flycatchers, 1 Nightingale, 1 Wood Warbler and several Redstarts have been discovered along with many commoner migrants at peak spring or autumn passage times.

Much of the new planting in the park is quick-growing, non-native species. These appear to hold fewer insects and are essentially unattractive to holding migrants, but birds grounded by showers or mist when moving over the city at night are always likely to be attracted to the highest point, and will in the first instance just sit and attempt to feed almost anywhere. If forced to remain, they subsequently gravitate to the older elements among the formal gardens - Hawthorn, Bramble and the few mature Oaks.

Deanshanger GPs

Since these pits are just in Northants, they do not appear in the Bucks Annual Report, but they are much closer to Milton Keynes than any other centre of population. Through most of the decade they have figured modestly but significantly in the wildfowl counts for the area and provided rough habitat for smallish flocks of finches and larks. Given their position in the Ouse valley it is not surprising that migrants found the site attractive. Wheatears and Whinchat appeared annually and rarer wanderers such as Black-necked Grebe were not unknown. A Fulmar was an astonishing turn-up. The pits were not entirely undisturbed, but the fishing and even occasional clay pigeon shooting was held in an almost informal fashion and to an extent which allowed the site to remain a useful one for both birds and observers.

Unfortunately in just the last few years the commercial potential of the site has been more fully exploited with the establishment of a full-blown country club which supports the previously offered facilities in a much more efficient fashion with a golf course under construction. Sadly, as a result the whole site has become completely uninteresting to observers and one assumes of considerably less interest to birds. This example should be a salutary one to all those concerned for the long-term future of all the waterside sites in and around the city.

Linford GPs

This is the generic name for this very extensive site and some brief description is required. It covers all of the waters from both of the New Bradwell pits on either side of the R. Ouse in the west to Dovecote Lake which abuts the M1 motorway in the east. There have been some important structural changes to the site through the decade. Until 1984 some parts of these pits were still being worked, and it was consequent on its closure as an active pit that most of these changes occurred. One sizeable reedbed disappeared, as did the 'washings' - some modest mud/sand banks which were attractive to waders. Dovecote Lake has had sailing as its prime activity throughout, but Black Horse Lake has been turned over to windsurfing more recently. Fishing activity has also increased to allow bank fishing from nearly every lake. On the plus side all the hardware of gravel extraction disappeared and the ARC Research Centre for Wildfowl was established. In conjunction with the latter a managed reserve, including two excellent hides, has been created based on a series of shrub-surrounded pools, small reedbeds and much of what was Stanton Low Lake. [As a result of restructuring there is a considerable problem of nomenclature of the various lakes in the reserve area. I will refer to the largest of these as the (Reserve) Main Lake]. By most criteria that one can frame this must be the best nature reserve in Buckinghamshire, holding as it does a very important waterside breeding community and providing a varied and attractive enough habitat to produce an interesting series of passage and wintering birds.

Bittern has wintered regularly, Marsh Harrier and Osprey have been noted in spring, and passerines have included Ring Ouzel and Great Grey Shrike. A variety of locally scarce passage waders have been noted round the edge of the lakes, but the best spot is known as the 'wader-hole', a small shallow lake just to the east of the Main Lake. One autumn the water level was managed just to attract this group with considerable success. Redshank, Ringed and Little Ringed Plovers all breed successfully.

Most groups of birds have benefited from the Main Lake subsequently being split by a bund for loafing and nesting. Also important was the removal, in 1987, of most of the coarse fish from this lake, which has greatly increased the amount of invertebrate prey available to be taken by many wildfowl. This is probably the most important lake now, but Haversham Lake and the original trout lakes both remain extremely important for wintering wildfowl. Velvet Scoter and Red-breasted Merganser are among the rarer ducks found in recent years, while Bewick's Swans drop in almost annually. Nevertheless increased disturbance has affected some species. Sawbills are the most obvious examples: during the winters from late 1984 to early 1987 Smew (peaking at a quite exceptional 15) and Goosander (30+) found the Bradwell lakes in particular much to their liking. Subsequently both have become much scarcer.

The Linford complex bears most of the responsibility for the introduction into the area of Greylag Geese (20 in 1972). Subsequently, and particularly in the 1980's, very large flocks of these and Canada Geese, which arrived independently, have become established in North Bucks. Many of these breed all over the Linford complex. Other escaped geese and occasionally genuine wild wanderers join up with these flocks.

Local woodlands

In terms of variety of breeding species woods are arguably our most important habitat. However the species to be found are much more predictable than at gravel pits, for instance, so comparatively they are much underwatched. Understandably the records received tend to consist of just the scarcest breeders and a very few passage birds. Therefore without special surveys there is normally little opportunity for relating changes to the bird community resulting from changes to the habitat.

The coppicing regime, surfaced paths, and trim trail were established in Linford Wood just before and around the start of the decade. Opening up some areas has increased the list of breeding species, which is already most impressive considering the proximity of the city centre and other surrounding developments. As something of an island of vegetation Linford has some potential as a migrant spot. Indeed, Hawfinch, Golden Oriole, Pied Flycatcher, Ring Ouzel and Firecrest have been found in or around the outskirts of the wood.

Shenley and Howe Park Woods are less open and disturbed, but the encroachment of surrounding development will no doubt start to impact on the bird community. That is the province of more detailed study such as the Common Bird Census.

Those parts of the Brickhills which we might legitimately consider within our ambit cannot be said to have changed significantly, but they contain breeding species not found elsewhere in the area. The mature broad-leaved parts are the only places where Redstart and Wood Warblers breed. The mature pines and larches have attracted Crossbills in numbers in several years and they may also have bred. Cyclical cropping of plantation conifers provides suitable habitat for the less rare Grasshopper Warbler. The whole area is large enough to ensure that when the young trees grow too high in one place another is available elsewhere. The same regime can also be important for the even rarer Nightjar.

Milton Keynes Estates before development

Most of Milton Keynes has been built on 'green-field' sites, which were previously agricultural land. Frequently various parcels of land have been abandoned for several years before real development commenced. This 'left-alone' (rather than 'set-aside') land rapidly reverts to weed and light shrub. Generally low levels of disturbance are also helpful to the bird community at all seasons. Winter has been the only season when such sites have been sought out and regularly watched. The attraction has been large finch, sparrow and bunting flocks, sometimes of locally record numbers.

Thus sites such as Tilbrook and Emerson Valley come into prominence for a winter or two, subsequently to become either a housing or industrial estate.

Greenfinch, Linnet, Tree Sparrow, Yellowhammer and Corn Bunting might be numerically the most significant but Chaffinch, Goldfinch, House Sparrow and Reed Bunting also figure. These large flocks occasionally contain individuals of slightly rarer species such as Brambling and Siskin and inevitably attract predators - usually Sparrowhawks, but in a few instances Merlin have been seen.

Newport Pagnell GPs

Like Linford, this complex of gravel pits lies both north and south of the River Ouse: the former area being by far the larger and more important. It has probably been much more ornithologically productive than would be guaged from local bird reports since for much of the decade access has been highly restricted or denied entirely .Only the monthly winter wildlife counts have been permitted throughout.

One of the pits is large enough to be significant for flocks of wildfowl, while another much smaller lake interacts continuously with the River Ouse through a sluice mechanism which makes it far less prone to freezing even in the coldest weather. At such times Smew and even Scaup have been noted. In the second half of the decade reed beds have been less extensive so that regular Bittern and records of Night and Purple Heron, such as occurred in the seventies, seem less likely to recur. Cormorants have been increasing throughout the period, and although this species appears in numbers at all the waters in N. Bucks, it appears that most, if not all, of our local population roost in those trees inundated in the largest Newport Pagnell lake.

'Setaside' fields

Though not found within the New City boundary, this has proved to be an interesting new local habitat created in just the last few years. Those setaside areas which have been most watched are in the Drayton Parslow and Mursley area. The first to take advantage are wintering seedeating passerines, so large flocks of Yellowhammers, Greenfinches, Linnets, Chaffinches and Skylarks etc will be found depending on the precise nature of the habitat. With them may be seen smaller flocks of all our regular finches, buntings and sparrows. The rather scarcer species such as Corn Bunting or Tree Sparrow may be found in locally significant numbers.

Picking out an inconspicuous, but different individual among these large flocks which spend most of their time out of view in the vegetation is not easy, but the effort has proved worthwhile. Twite has been suspected but unproven, and up to 5 Lapland Buntings spent much of the winter of 1990/1 in three adjoining fields.

Large numbers of pigeons - Wood, feral and Stock Doves - also enjoy the fare, and it is clear that small mammals rapidly reoccupy this type of land. With this abundance of prey, predators which specialize in each type of prey have been seen. A Merlin regularly in three winters, a Peregrine in two, Short-eared Owl by day, and given the presence of a roost in nearby hedgerows, presumably Long-eared Owls by night, two sightings of male Hen Harriers and an occasional Barn Owl add up to a most impressive list of scarce birds of prey to supplement a healthy local population of Kestrels and Sparrowhawks.

Stony Stratford Nature Reserve

This site simply didn't exist at the start of the decade. Plans for its creation awaited the completion of gravel extraction used in the construction of the A5 dual carriageway which now bounds its eastern edge. Indeed, permission for extraction was contingent on a restoration of the site as a 'conservation area'. A series of small lakes with islands are the central feature along with the retention of some water meadows close to the R.Ouse. For the observer a public hide and two BBONT members hides have been provided.

Two colonial species are much in evidence during the summer. A substantial Phragmites bed is well patronised by Reed Warblers. Artificial Sand Martin banks have acted as a partial replacement for a colonial site about half a mile north at Old Stratford, which has now disappeared. Both Ringed Plovers breed, or attempt to, on the islands and one or two pairs of Redshank exploit the water meadows. In

winter large flocks of feral (mainly Canada) geese and Lapwing are the most obvious inhabitants, but a decent variety of wildfowl is usually in evidence in small numbers. Less obvious may be good numbers of wintering Snipe.

Willen Lake

The county's, let alone Milton Keynes', premier site retained its reputation throughout. However, by 1990 what could be construed as the whole site was somewhat reduced in size, and the variety of habitat considerably reduced. The construction of the H5, Portway between the two basins and the V11, Tongwell Street, start of work on the next phase of Cotton Valley STW, housing developments in Willen village and the Prime Computers building, (now occupied by Mercury Communications) are the main elements of this overall constriction. Nevertheless, the key features of the site remain: the large island in the north basin and the shallower sections of the north basin itself.

Thus when water levels either dropped naturally or were lowered for work purposes or by request at appropriate times passage waders were attracted in some numbers. Commoner species such as Dunlin and Ringed Plover might regularly reach 20 or 30 or more. Willen maintained a near monopoly of a number of species regarded as rare in Buckinghamshire, and some of these were very occasionally seen in modest flocks. For example 9 Grey Plover, 11 Knot, 11 Sanderling and 13 Spotted Redshank (albeit in 1990!) were county records. 6 single Temminck's Stints were seen throughout the decade: the only Buckinghamshire records, along with both Grey (2) and Red-necked Phalaropes. Other 80's wader highlights were 24 Avocets in March 1983 and 2 Black-winged Stilts in June 1988. If water levels remained low both Ringed and Little Ringed Plovers took advantage of the newly exposed breeding habitat, though both were occasionally successful on the island.

While the trees planted on the island have grown somewhat, more significantly, ever increasing flocks of feral Geese have grazed there, creating different conditions from the early 80's. The most important consequence of the mainly short-cropped turf has been the establishment of a substantial colony of Common Terns, which numbered at least 20, and probably rather more, pairs by the end of the decade. Redshank continued to breed but with decreasing success. The island proved very important for breeding wildfowl: Tufted Duck bred at astonishingly high densities, up to three pairs of Shoveller were successful, as were single pairs of Gadwall (the first for the county). Both numbers of broods and survival rates unfortunately seemed to decline in the latter years of the period.

Away from the breeding season Willen remains a most important site for wildfowl. However, in general, numbers have dropped as the decade progressed. Increased disturbance, both on and off the

water, is the main reason, and in addition there is less peripheral habitat for grazers. However when weather conditions are unpleasant for human activities, exceptional numbers may still be seen.

Such an important site inevitably attracts good observer cover. This helps to guarantee a stream of interesting records. Waders apart, there is still a heavy bias towards non-passerines. A variety of scarce water-oriented species, gulls, such as Iceland and Mediterranean, terns, such as Sandwich and Little, and ducks, such as Garganey, have become nearly annual. Genuine rarities have been Glossy Ibis in May 1987 and Night Heron in October of the same year. While species such as these will continue to be recorded, the chance of interesting passerines has been considerably diminished: trees which attracted the only Pied Flycatcher no longer stand and the embankment which held a Lapland Bunting is now a dual carriageway.

SURVEY OF WESTON UNDERWOOD QUARRY SP/862515
May 21st, 1989

by Patricia Osborn

Site And Geology;

The quarry is situated some three-quarters of a mile north of the village of Weston Underwood, Bucks.

It is a site of Middle Jurassic White Limestone belonging to the Oolite series and exhibits blue hearted stone. The original colour of the limestone is thought to have been blue but the action of water seeping into joints changed it to white or buff, leaving only the core of the stone blue. The limestone, some 3 metres thick, lies above the Upper Lias Clay, making a clear demarcation between what was a deep sea deposit and the warm shallow sea deposit which formed the limestone some 170 million years ago. The limestone shows some evidence of cross bedding, iron staining and root marks, as well as dendritic markings of manganese oxide.

Some flints and hard chalk have fallen from the top of the quarry. The chalk stones show glacial scouring and are erratics from the eastern counties, probably Cambridgeshire or Norfolk.

Calcite is present but mainly as a microscopic matrix in shelly limestone or surface encrustation, although some fossil shells show small crystals on the inside of the shell. A part of a grey septarian nodule had its cracks filled with small calcite crystals.

FOSSILS:

All fossil remains found were of invertebrates as follows:

Brachiopods	2 species
Molluscs	4 species
Crustaceans	1 or 2 species

1	Phylum	Brachiopoda
	Class	Articulata
	Order	Terebratulida
	Genus	*Epithyris* Phillips 1841

2
Phylum ..... Brachiopoda
Class ..... Articulata
Order ..... Terebratulida
Genus ..... *Obovothyris* Buckman 1927

3
Phylum ..... Mollusca
Class ..... Bivalvia
Superfamily .. Pholadomyacea
Genus ..... *Pholadomya*
Species ..... *deltoidea* (J. Sowerby)

4
Phylum ..... Mollusca
Class ..... Bivalvia
Superfamily .. Mytilacea
Genus ..... *Modiolus*
Species ..... *imbricatus* (J. Sowerby)

5
Phylum ..... Mollusca
Class ..... Bivalvia
Superfamily .. Ostreacea
Genus ..... *Liostrea*
Species ..... *hebridica* (Forbes)

The site is noted for its "complete" oysters which are found with both right and left valves in situ.

6
Phylum ..... Mollusca
Class ..... Bivalvia
Genus ..... *Astarte*

7
Phylum ..... Arthropoda
Class ..... Crustacea

An excellent specimen of *Thalassinoides* (burrow), containing *Favreina* (faecal pellets) was found on a surface deposition of limestone. This is the trace fossil of the crustacean *Glyphaea*.

8 The trace fossil burrow *Diplocraterion* (crustacean or annelid) was found.

References:

McKerrow, W.S. (ed.)	Ecology of Fossils	London 1978
Murray, J.W. (ed.)	Atlas of Invertebrate Macrofossils	London 1985
British Museum	British Mesozoic Fossils	London 1962

Reflection:

What has been seen with wonder for the first time in 170 million years is now carted as hard core by an animal which too in time will become a trace with perhaps nothing left to remark its demise.

SURVEY OF ROCKS AND MINERALS USED AS MEMORIALS IN OLNEY CHURCHYARD

by Patricia and Gordon Osborn

INTRODUCTION

This study sets out to identify rocks and minerals used in Olney churchyard and to correlate their use with changes in transport, technology, cost and fashion from the seventeenth century to the present.

Olney is a North Buckinghamshire market town some 12 miles from both Northampton and Bedford. The upper parts of the town are built on the Great Oolite limestone of the Jurassic period. The church and older houses in the town are constructed of this limestone.

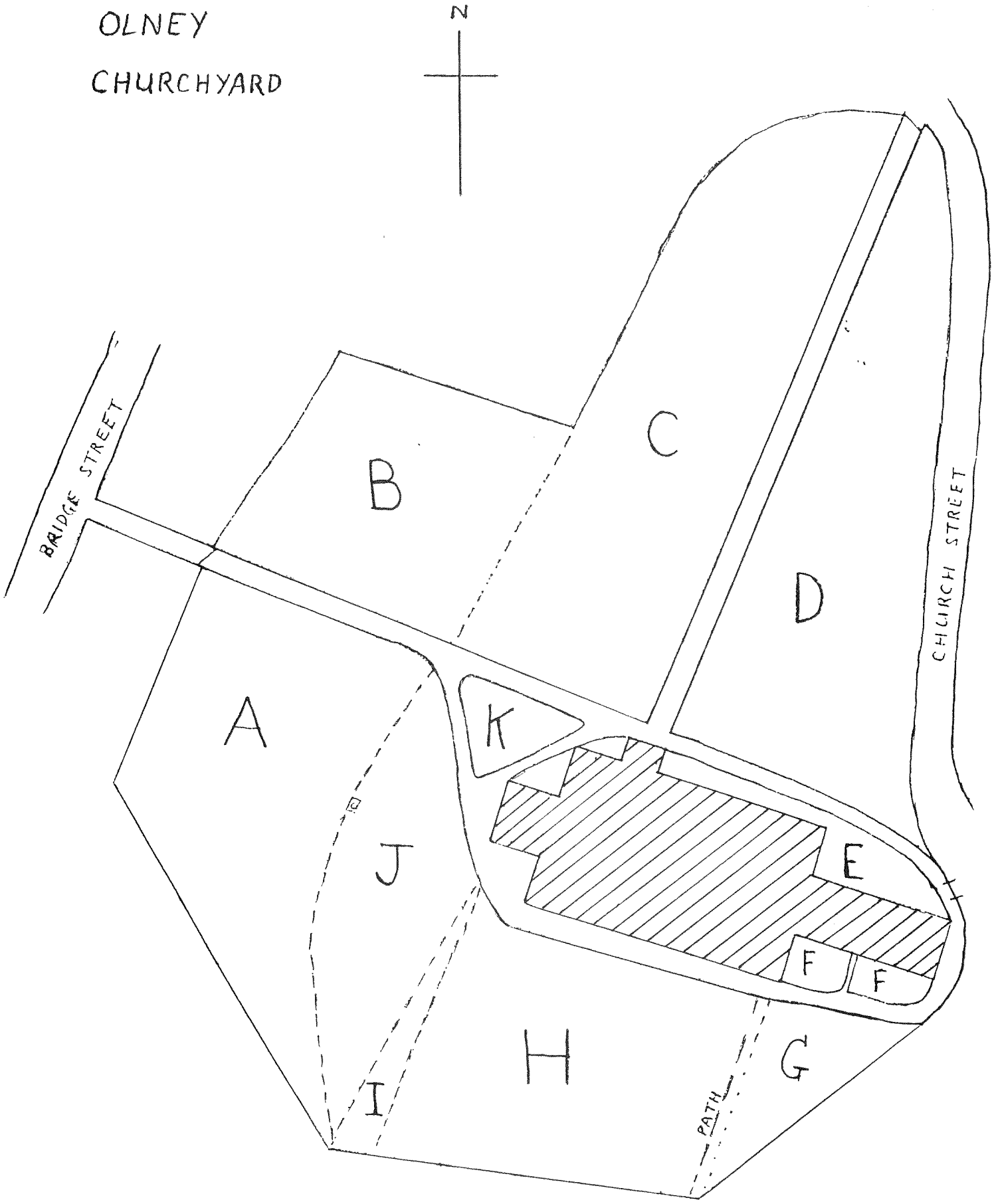
Numerous small quarries served Olney and the surrounding district in the past, such as those at the Dells, Warrington and Weston Underwood; the latter is still functioning.

The churchyard of some five acres incorporated an extension of 28 perches of land in 1865, given by Lord Dartmouth.

For the purposes of this study the churchyard has been divided into 11 sections, A-K, as shown on the plan.

A total of 637 memorials were examined comprising the following types: gravestones (head and foot), ledger slabs, table tops, obelisks, crosses and statues. Bases, usually of grit or cement, surrounds, infill chippings and additional flower vases were excluded. the oldest dated stone found was 1669 and the latest 1989. Numerous memorials have perished: some have been removed from their original site and erected elsewhere or lie broken, and a few have sunk into the earth where it was impossible to examine them.

The memorials were divided into the following main groups: limestones, sandstones, granites, slate, marble and artificial stone. Incidental minerals were also noted.


OLNEY
CHURCHYARD
N
BRIDGE STREET
CHURCH STREET
A
B
C
D
E
F
F
G
H
I
J
K
PATH

Our dwindling countryside renders churchyards increasingly important places for field work upon such various topics as bats, insects, lichens, small mammals, birds and plants. Buckinghamshire is not well endowed mineralogically so the local cemetery offers a place to study rocks without travelling to Norway, Aberdeen or Cornwall. Fortunately cemetery watchers are in the good company of J.C. Loudon who was one of the first amongst us to realise:

"Churchyards and cemeteries are scenes not only calculated to improve the morals and the taste and by their botanical riches to cultivate the intellect but they serve as historical records".

The Builder Vol. 1 (1843)

LIMESTONE:

For the purposes of this study all types of limestone, other than Portland stone, were counted under one heading. There are 75 limestone memorials to be found in all sections of the churchyard. Dates range from 1669 to 1978.

Olney is situated on the Great Oolite or Upper Jurassic series of sedimentary rocks which run from Dorset to Yorkshire. The limestone is white and marly with little oolitic structure. It is easier to cut than carve and Olney church is built of this stone (1325-1350). The earliest gravestones can be assumed to come from local stone pits such as the Dells in Olney, Warrington and Weston; the last is still working.

The oldest gravestone found is of this limestone and dated 1669. It had been incorporated at some time into the boundary wall of section A which helped to preserve it.

The local limestone exhibits a blue heart, thought to be the original colour which changed to buff on weathering. Matthew Marryot in 1731 desired to be buried in the parish church of Olney "with one large hard blue stone out of one of the stone pits of Olney...to cover his whole grave"[1].

Apart from the local limestone there are examples of Lincolnshire limestone which form part of the Inferior Oolite series of Jurassic rocks. These may have been derived from quarries at Weldon near Corby. Lincolnshire limestone is mostly oolitic and, being easier to carve, takes relief work well.

Lincolnshire limestone was formed when calcium carbonate was deposited by chemical precipitation during the Jurassic period (144-208 m.y. B.P.). This happened in very shallow seas; tiny spherical ooliths were formed, which grew as accretions round a nucleus of silt or tiny shell fragment. Acidity in lakes and rivers is too high for the precipitation of calcium carbonate, therefore it is assumed

these were marine deposits. The formation of these ooliths depends upon the nuclei being constantly agitated so the calcareous material is uniformly deposited. This acts as a sorting mechanism and in consequence beds are often well graded. Vigorous current actions often result in limestone displaying cross bedding.

The local Olney limestone is largely biostromal, i.e. built up from fossil remains, and contains many shells and a high proportion of detrital matter, which can be seen in the church building stone and some of the memorials. Limestone is porous and lends itself to lichen, moss and other plant growth, and many of the older memorials are weathered smooth with no hint of inscription or carving.

SANDSTONE:

Memorials made of sandstone have been divided into three groups: various grits, 124 examples; Permo-Triassic sandstone, 70; and Northampton iron sandstone, 139. Together sandstones form the largest number of memorials.

The earliest example of a grit memorial is 1801 and the latest 1988. The earliest example of a Permo-Triassic sandstone memorial is 1807 and the latest 1934. The earliest example of a Northampton iron sandstone is 1726 and the latest 1877.

Sandstones are of sedimentary origin with quartz as the main component. The grains may be cemented with silica, iron oxide or feldspar. Bedding is usually apparent and graded bedding may occur. Grains which are subangular or rounded were subjected to abrasion before deposition and form sandstones. Angular grains form grits.

New Red sandstones of Permo-Triassic rocks laid down some 286-208 m.y. B.P. are 60-80 feet thick in parts of the Midlands. The colour is due to a deposition of iron oxide during formation. It is not known to occur in marine accumulations, thus it is assumed these sandstones formed in lacustrine areas in semi-desert conditions. As the matrix is less strong than the grains they weather out by wind and water erosion, and frost action can split the stone along the bedding plane.

The siliceous cement of grits makes them less likely to weather badly and they take carving in high relief which remains crisp decades later. A number of memorials in soft sandstone show large areas of weather damage, completely obliterating the inscription and returning the stone to individual sand grains.

The term Northampton iron sandstone is used for the formation which is above the ironstone or iron ore. It is a massive yellow to orange sandstone which has a maximum thickness of 70 feet. The main

area of extraction was Duston, to the West of Northampton. A soft stone, it is easily worked, and there are many examples of 17th and 18th Century gravestones carved in relief. These stones would have been taken to Olney by horse and cart from quarries at Duston and Harlestone. There are examples of box formation of iron in the stone due to the iron migrating to a fracture and concentrating in an iron enriched area. This redistribution of ferric oxide within the rock results in alternating iron rich and iron poor zones. Northampton iron sandstone weathers badly and provides ideal conditions for lichens and other plants, all of which have reduced many of the memorials in the churchyard to smooth slabs.

SLATE:

There are 10 Swithland slate headstones in the churchyard; the earliest dated 1816 and the latest 1899 (sections G,H,I,J).

Slate is a compact, non-porous rock formed from the dynamic metamorphism of shales and mudstones. It is fine-grained with perfect single cleavage. The chief minerals are mica and chlorite.

Swithland is in Leicestershire and is a part of a Pre-Cambrian largely volcanic area (1,000 m.y. B.P.). Volcanic activity died down and was replaced by sedimentation, resulting in the formation of slates from metamorphosed clays and shales, coloured mainly purple and green. Its cleavage does not produce slate as thin as from Wales nor is it so elastic but it is durable. An 1888 record states slates taken from the roof of Rothley Temple, where they had been exposed to weathering for 600 years, were found to be as perfect as the day they were taken from the quarry[2].

The Romans made use of Swithland slate for roofing and well-cladding, as did the Normans, but the earliest known slate gravestone appears in 1641. The heyday of Leicestershire slate was circa. 1833. Stone was transported south by the Grand Union Canal and offloaded to carts for local distribution. By 1840 the Midland Counties railway link with the London to Birmingham railway gave Leicestershire slate a wider market but by 1850 the effect of Welsh slate had depressed the Leicestershire quarries to a standstill. Work continued for a time on a small scale until 1908.

Easy to work but impervious to moisture and most weathering, the inscriptions on the Olney stones today are as sharp and clear as when first incised. Being fissible it cannot be carved but lends itself to minute and complicated script.

MARBLE:

There are 156 white Carrarra marble memorials in the churchyard. The earliest recorded is 1851 and the latest 1980. Marble is essentially calcite but may contain dolomite. It is formed by the metamorphism of sedimentary limestones around igneous intrusions. Initially plastic, marble may show folds of a highly contorted nature. The stone is found in a wide range of colours but is usually white. Medium to coarse grained and granular types occur and sedimentary structure such as bedding may be preserved although cleavage is rarely present.

Marble is a soft stone easily scratched with a knife and has long been used for statuary work. The largest example of a carved white marble figure in Olney churchyard is an angel some four feet high (Section B., 1924).

Influenced by a long tradition of white marble church memorials, reaching heights of sublimity in the 18th Century with examples such as those of Flaxman and Westmacott, the middle classes in the 1850's purchased marble tombstones in increasing numbers when ease of transport and greater affluence put them within their reach. White Carrera and veined white Sicilian marble were imported in large quantities after 1850, much preserved in Italy.

White has an association of purity. In the 17th Century gravestones were painted white and the inscription black. White marble, which takes a high polish, therefore became most desirable, giving an appearance of incorruptibility and high sculptural worth. Unfortunately, marble weathers badly: it dissolves in acid rain, soon loses its polish and gives a purchase for lichens which discolour its surface, as can be seen in many of the churchyard memorials. Restoration work on some of the older stones has, however, brought them back to their pristine condition.

BLACK 'MARBLE':

There are two memorials of what is sometimes called black "marble". One is dated 1928 and the other 1934. It seems they are almost undoubtedly granite, which is perhaps from Sweden, India or South Africa. The memorials are highly polished and have weathered well. Swedish granite is known as ebony black and the intensity of the colour of the memorials makes it likely the stones were derived from that country. It is a granite much less likely to be used now.

ARTIFICIAL STONE: TERRA COTTA:

Terra cotta is a hard, unglazed earthenware made by baking clay. It is a type of metamorphic rock manufactured long before the Italian 18th Century term was invented for this yellow or red baked earth.

There are two examples of terra cotta gravestones, both in the form of a cross, in Olney churchyard. They have been discarded against the boundary wall in sections A and J. One dated 1858 bears the manufacturer's name, Grimsley, Oxford. The other is dated only: 1868.

Terra cotta has a long history of use for memorials. The Etruscans used it for their sarcophagi. In Britain Johnathan Harmer of Heathfield, East Sussex, produced terra cotta plaques for tombs in the early 19th Century. Later the architect Alfred Waterhouse used terra cotta extensively on buildings and helped create a vogue for it. However, although the potter Henry Dolton had a fine terra cotta tomb made for him in 1897 in Norwood Cemetery, the fashion for this ware as a memorial was never widespread. In part it may have been inadequately fired pieces weathering badly which lessened the taste for this lightweight, practical and decorative stone.

GRANITES:

Granite memorials in the churchyard have been divided into grey and red stones. Although varieties could be seen only one has been identified with certainty, i.e. the Aberdeen granite (grey) of John Newton's tomb (Section G, 1893).

There are 17 examples of red granite, the earliest dated 1887 and the latest 1969. There are 39 examples of grey granite, the earliest dated 1887 and the latest 1989.

Granite is an igneous coarse-textured rock of quartz, feldspar and mica. Sometimes it exhibits coarse phenocrysts of feldspar which are relatively large crystals in the ground mass and may be aligned to the flow of the granite magma. Xenoliths, portions of the pre-existing country rock in the igneous material and having a different composition from the granite, are common.

A large source of grey granite in Britain is the West Country, i.e. Devon and Cornwall, and judging by the white porphyritic crystals of orthoclase feldspar it can be assumed a number of these memorials are worked from this granite.

Large sources of granite in Britain are in Scotland, although it is not though all the granite memorials in the Olney churchyard are from Britain. Scandinavia provides much pink and red granite and some memorials in Olney are likely to be from this source. The red granites with bluish quartz are likely to be Scandinavian.

Canals followed by the railways made transportation of granite easier and cheaper in the 19th century but it was also the improved techniques of cutting and polishing that made these stones more readily available to those who could afford to buy them. Granite was much used on banks and civic buildings from the mid 19th Century, creating a sense of integrity, respectability and solid worth. This, together with the high status which attaches to the appearance of wealth made it sought after for memorials. Granite takes a high polish and weathers well although lichens are able to find areas for growth on unpolished surfaces.

LARVIKITE:

There is one memorial made of the Norwegian rock Larvikite (section B, 1912). This is a coarse-grained rock consisting largely of anorthoclase feldspar which shows a characteristic effect (Schiller) when polished; a play of light is seen when the crystal or cleavage faces are at a certain angle to the incident illumination. Larvikite is a syenite which is an igneous rock characterised by the presence of alkali feldspars. It is associated with or grades into granite.

It would have been an innovation in 1912 to purchase such a memorial and must have been relatively expensive. It has weathered slightly and lost its polish.

PORTLAND STONE:

Two Portland stone memorials are in the churchyard (sections A and C). Both are Imperial War Graves Commission stones dated 1920 and 1940. Portland stone is Upper Jurassic white shelly limestone (140 m.y. B.P.) quarried in the Portland Beds of Dorset, where it attains a thickness of 60 feet. it is fine-grained and easily worked with a high-quality uniform oolitic structure and contains shell debris. these memorials are cleaned and kept in order by the Commission.

MINERALS:

Three minerals used as part of some memorials were noted in the churchyard: iron, gold and lead.

A low cast iron fence surrounds the grave of William Gee (Section J, 1833). Cages of iron were made in the late 18th and early 19th Centuries to deter grave robbers, but here the use is purely ornamental. The iron has rusted but is still intact.

Gilded letters are to be found on some memorials. Gold leaf and gold size were used.

A large number of gravestones have incised inscriptions filled with lead letters. In the 18th Century letters were often blackened with paint and the practice continued but the use of lead became widespread from the mid-19th Century onwards. An advertisement of 1881 notes the Kensal Green undertaker, Edward Lander, offering a new technique of imperishable inscriptions in solid lead, adding "Painted names soon fade away"[3]. Unfortunately, as the stone weathers around the lead letters they tend to roll up and become dislodged.

Masons

Seventeen masons and sculptors were identified.

Mason	Dates on stones	Locality	Section	Stone Used
Andrews	1735-1817	Olney	C, D, E, H	Limestone, iron sandstone
Holt	1827		G	Slate
	1829	see text	H, I, J	
	1832		H, I, J	
Grimsley	1858	Oxford	A	Terra cotta
Jarvis	1863	Bedford	D	White marble
Revitt	1863	Possibly Lavendon	H, I, J	Sandstone
Wilford	1874	Olney	B	Sandstone
	1878	Olney	H, I, J	Sandstone
	1893	Olney	B	Sandstone
	1896	Olney	B	Sandstone
	1897	Olney	B	White marble
	1899	Olney	C	Slate
Garlick	1881	Bedford	B	Sandstone
Lomas	1883	Derby	H, I, J	Red granite
Harris	1884	Bristol	C	White marble

White, H	1883	Olney	B	Sandstone
	1885	Olney	B	Sandstone
	?	Olney	F	Sandstone
Higgins	1885	Wellingborough	C	Slate
Cattell	1897	Olney	H, I, J	Sandstone
	1901	Olney	B	White marble
	1901	Olney	H, I, J	White marble
	1901	Olney	C	Sandstone
	1905	Olney	A	White marble
	1905	Olney	H, I, J	White marble
	1906	Olney	K	White marble
	1910	Olney	A	White marble
	1913	Olney	A	Sandstone
	1922	Olney	C	White marble
	1922	Olney	C	White marble
	1931	Olney	A	White marble
	1934	Olney	A	Black 'marble'
Wrighton	1904	Bedford	B	White marble
Pullen	1907	Northampton	A	White marble
	1910	Northampton	J	Gray granite
White	1920	Denton	C	White marble
Styles	1920	?	C	Gray granite
Bateman	1926	Northampton	C	Red granite

The earliest stone carvers of churchyard memorials were usually local stone masons many of whom were ill-lettered. Monumental masonry as a trade probably originated only in the late 17th and early 18th centuries, Churchyard tombstones came into widespread use in the 18th century; the more affluent middle classes imitating the wealthy who commemorated their dead within the church.

In Olney churchyard the earliest memorial identified is to Francis Stanton and shows words broken up simply when space on the stone ran out. The mason incised the inscription without reference to aesthetic effect. (section A)

HEARE LYETH
THE BODY OF
FRANCIS STAN
TON LATE HVSBA
ND OF SARAH
STANTON DIED
THE 10 OF MARCH
1669

The earliest known mason who carved gravestones in Olney churchyard was James Andrews (1735-1817). He lived in Olney High Street and gave drawing lessons to the poet William Cowper. His carvings on limestone and Northamptonshire iron sandstone are known by repute and many have vanished including his so called farmyard headstone depicting a rural scene and another showing Death, the fell destroyer, cutting the thread of life on a stone erected to the memory of George Gee. Both stones were described by Oliver Ratcliff in 1907[4]. A much worn head stone carved by Andrews still stands in Sherington churchyard, a village some three miles from Olney. It is a memorial to John Campion and was described in 1962. It shows the dying man upon his curtained bed, a bureau at the bedside and a clock upon the wall. Death as a skeleton throws his dart at the recumbent figure and extinguishes with his snuffer a candle, while Father Time, with scythe and fallen hour glass, starts back from the scene. Rays of consoling light descend upon the bedhead and the triangle of the Divinity completes the scene. This mixture of domestic veracity and macabre symbolism much used at the time was derived by Andrews from an engraving made to illustrate poetry by Francis Quarles popular with country people until the early 19th century. The stone is placed against the south wall of Sherington church but its soft stone is still exposed to weathering which will render it as smooth as the lost Olney carvings. By contrast the grit memorial to Andrews himself (Section C, 1817) depicts a weeping willow and is in good condition due to the better weathering quality of the stone.

The name Holt (Sculp) appears on three of the Olney Swithland slate gravestones for 1827, 1829 and 1832. It was the habit of Swithland slate workers to sign their products. Thomas Holt and his son George worked in Grantham as builders, stonemasons, plasterers and slaters c 1821-1842. John Holt of Spratton, Northamptonshire, signed slates 1821-1838 and other Holts worked in the county. It is difficult, therefore, to say which Holt was the sculptor of the Olney memorials.

Thomas Grimsley was a well known sculptor in Oxford; he appears in local directories between 1846 and 1876. Although little is known about his business, examples of his terra cotta gravestones dating from 1839 to the 1880s have been found in an area extending from Gloucestershire to Surrey and from Hampshire to Northamptonshire. It is assumed the stones were transported from Oxford by railway but no records survive to give details. The cross he moulded which was used for Emma Daniel in 1858 at Olney is fine and crisply done and has weathered well; less so the stone insertion that bears her inscription. The two terra cotta headstones in Olney deserve a more suitable site and better treatment than they have received.

The spread of the canal system and later the railways - Olney station was opened in 1871 - made stone from long distances and overseas available more easily. Coasters brought granite from Scotland to

London where wholesale stone merchants and memorial manufacturers were contracted by provincial masons.

T. H. Higgins, monumental masons of Wellingborough, notes in a contract book for July 24th 1916 an order involving a granite headstone from Scotland costing £9.10.0 (£9.50p) coming via Limehouse Wharf, London and the railway to Wellingborough station.

Horse transport was used locally although mention is made of motor deliveries from the 1920s. The gravestones in Olney churchyard provided by Garlick of Bedford in 1881 (Section B) was delivered by horse and cart. Local stone was obtained for many years into the 20th century by this method. Higgins' notes on September 21st 1910 to cost of 10 shillings (50p) for a horse and man fetching stone from Duston to Wellingborough. Higgins' contract book also notes a marble memorial angel purchased pre-carved in Italy costing £43 coming to Wellingborough by railway in 1923.

Customers of Higgins were provided with pattern books and later photographs to choose memorials. One such was the S. A. M. catalogue of S. A. McFarland Ltd. (later Frank Watts) Statuary Monuments and Marble of Bishopsgate Street, London. Clients could order by number such as 454 which provided a marble cross and base 4'x1'10"x1'4" for £7 in 1920.

Messrs. R. Cattell and Son of Olney were supplied with imported marble by W. T. Cox monumental masons of Kettering who obtained it from wholesale merchants in London.

During the period studied there is evidence of increasing specialisation in trades associated with burials and growing professionalism of monumental masons. Various bodies spoke for the profession, one being the National Association of Master Monumental Masons, and there were journals such as 'Commemorative Art' and the 'Monumental Journal'.

The firm of T. H. Higgins of Wellingborough was founded in 1866 as a general builder's merchant and monumental mason. T. H. Higgins visited local public houses on market days to take orders for the provision of various items from stone sinks to gravestones. Later clients were offered brochures and pattern books. W. H. Cave and Son of Bozeat established in 1909 as undertakers carpenters and joiners had by 1956 become funeral and cremation directors, carpenters and joinery manufacturers. There were also during the period various threats and restrictions to the mason's craft. One seeming threat was the rise in the number of cremations which could have lessened demand for memorials but such is human need for expressions of grief and remembrance that commemorative stones for the ashes of the deceased are a common feature of most cemeteries. Masons in the 18th century often put their names on gravestones. usually these were painted and have long since gone. Later masons carved their names and occasionally addresses at the base of a memorial although sometimes in a more

prominent position. In the 1960s local councils objected to this practice and introduced bye-laws forbidding it. Correspondence in 'Commemorative Art', May 1965, debated this matter and found it desirable for master craftsmen to sign stones of artistic merit while agreeing mass produced articles unworthy of signature[5].

Yet another and more serious threat to the mason's craft came with the introduction of lawn cemeteries and the drive to clear churchyards of kerbing or any memorial seen as an obstruction to grass cutters and general maintenance. In part this move was to save money but was associated with a rise in fashion for the uniformity of modern architecture following the second World War. It may also be linked with death becoming a taboo in a time when death at an early age became less frequent. This resulted in large scale destruction of memorials in many churchyards where stones deemed redundant were used as paving and others removed to be broken up at boundary walls as in Olney churchyard.

At a time of world wide choice of stone with masons offering a higher standard of skills and advanced technology for sawing, grinding and polishing, the result for the majority of clients has been a narrowing of alternatives in commemorative art.

The cost of stone memorials has always been relatively high although becoming less so for mass produced stones in the period studied. Comparisons of expenditure are fraught with difficulties but a rough set of examples has been made. A bill in a book of inscriptions and accounts for lettering, 1744-1824, lists a journey to Horton in Northamptonshire, stone carriage, laying and expenses for £5.7.6 (£5.38p) This price would be beyond labourers in East Anglia who struck in 1816 for a minimum wage of 2 shillings (10p) per day[6].

A sandstone gravestone some 3'x2' in Olney churchyard (section B) form Garlick, masons of Bedford, cost some £5.0.0 in 1881. Garlick Bros. quoted a price of £450 for a similar headstone in 1990. The wages of skilled labourers in and around Olney at the turn of the century was about a pound a week.

An estimate sent out from T. H. Higgins on 25th March 1910 gave three alternative prices for a rustic memorial;

4' x 2'6" x 1'6" with polished panel		
in red or grey granite at	£15/0/0d	
Stone slab under same	13/2d	
Fixing in new cemetery with materials	£1/10/0d	
Fee	10/6d	
Total	£17/13/8d	(£17.69p)
Lettering in granite cut and gilded at 5/6d doz.		(28p doz.)

For the above in Hopton Wood Fossil or White Portland Stone	£12/0/0d	
Lettering cut and gilded at 3/- doz.		(15p doz.)
and cut in and painted black at 2/6 doz.		(13p doz.)
all other costs the same.		
For the above in Blue Yorkshire stone	£6/15/0d	(£6.75p)
Lettering cut and painted black at 2/- doz.		(10p doz.)
all other costs the same		

A mason working for T. H. Higgins was paid for a weeks work of 56 hours in 1912 £1/19/6d (£1.98p).

A study of the income and outgoings of labourers in the London Borough of Lambeth was undertaken in 1909-1913. It highlights insurance paid for funeral expenses, often very high in comparison with food and basic needs. An abhorrence of pauper funerals at this time, coupled with a tradition of elaborate Victorian funeral customs made insurance companies and trades associated with death prosperous. The poorest of families saved to have a decent funeral rather than suffer the disgrace of a charity burial and paid in 1d a week burial insurance. Some £11,000,000 a year was said to have been paid in weekly pennies by the poor to burial insurance companies at the turn of the century. Two examples from the Lambeth study are given although neither family aspired to more than unmarked common graves.

In November 1910 a printers labourer, wife and six children, average wage £1/4/0d (£1.20p) allowed his wife £1 per week[8].

Rent	£0/8/0d	£0.40p
Burial insurance	1/8d	9p
Boot club	1/0d	5p
Soap, soda, blue	4½d	2p
Wood	3d	1p
Gas	8d	4p
Coal	1/0d	5p
	£0/12/11½	65p
Left for food	7s0½d	(35p)

Funeral of a child of six months in August 1911. The parents paid 2d (1p) a week insurance and received £2 from the insurance company.[9]

Funeral	£1/12/0d	£1.60p
Death Certificate	1/3d	7p
Grave diggers	2/0d	10p
Hearse attendants	2/0d	10p
Woman to lay out	2/0d	10p
Insurance agent	1/0d	5p
Flowers	6d	3p
Black tie for father	1/0d	5p
	£2/1/9d	2.10p

The aftermath of the first World War brought an increase in trade for masons associated with orders from war memorial committees and from the Imperial War Graves Commission. The Higgins' papers give many examples such as the one in Irchester churchyard for 2nd November 1922;

Standard layout No 1		
Blue York stone	£3/4/0d	£3.20p
86 letters at 2½d	17/11d	90p
Fixing and delivery	17/6d	88p
	£4/19/5d	£4.98p

At the same time the Higgins' papers notes in red ink 3 government increases in wages paid to labourers in 1920 amounting to an extra 6d per hour. So masons earning 8½d per hour in 1910 and 11d in 1918 had 1/5d (7p) in 1920.

The work of masons by the 20th century consisted largely of assembly jobs but there were instances of commissions when the worker is aware he is handling materials requiring special skill and ability. An example is that of January 10th 1922 in a Higgins order book for a £200 headstone for Irthlingborough cemetery of best Sicilian marble with fluted circular columns worked to a design by Mr. W. Talbot-Brown, Architect.

There is evidence that choice of stone for memorials was to some extent determined by the clergy. Three letters in the W. T. Cox papers (Monumental Masons, Kettering) point to this in recent times. It is inferred that certain restrictions were widespread and influential over a considerable period. A letter dated 30th January 1970 form a Rector at Bulwick, Corby gave permission for Portland limestone to be used as a memorial provided it was unpolished. A letter from Woodford Rectory, Kettering, dated 1973 contained a refusal for an all polished black granite memorial to be erected. A response to the suggestion that the Reverend concerned might settle for a part polished finish was not recorded.

The incumbent at the Rectory, Great Catworth, Huntingdon was perplexed by a request for Hopton Wood (limestone) to be used as a memorial but gave permission in a letter dated 22nd March

1967 explaining "The actual material of the headstone proposed has been the subject of enquiry and I am happy to be able to write that I have 'the green light' regarding Hopton Wood which you did not mention is a type of stone; Not a composition made from wood which its name seemed to imply"

Conclusion

Twelve types of memorial stone were identified including igneous, sedimentary and metamorphic rock. The object of a memorial is to preserve the memory of the dead and in this respect slate was the best stone followed by granite, hard grit sandstone and terra cotta. Marble and soft sandstone weathered badly.

During the period studied transportation of stone became easier and this, together with improved techniques of sawing and polishing rock, led to the availability of a greater variety of stone for memorials. Emphasis during the 19th century upon complex funeral and mourning requirements together with the institution of burial insurance resulted in a demand fro memorials from more people. The status of monumental masons rose and they increasingly regarded themselves as a distinct profession.

Paradoxically these changes led, in the 20th century, to growing uniformity of memorials and the demise of many local masons. There are no masons left in Olney and only one stone quarry is working. Some masons were taken over by larger firms and wholesale merchants producing stock stones. Increasing controls in graveyards tended to suppress individually designed memorials and masons were disallowed to sign the stones they provided..

The cost of materials remains high in proportion to wages but they are within the reach of more people. Doubtless for the fortunate few there will always be workmen like the unnamed mason who wrote in T. H. Higgins' order book on January 10th 1922 concerning a £200 headstone he was to make for Irthlingborough cemetery, he would "make a thoroughly first class job in each and every respect". He was too modest to add that he would be using the floors of the oceans and the fires of the earth.

As for memorials, on reflection it seems imperishability lies not in the stones themselves but in their perpetual dissolution and restitution on a scale beyond our understanding.

Table A. Frequency of stones used in Olney churchyard.

Stone	Number identified	Earliest use	Sectn	Latest use	Sectn
White marble	156	1851	H,I,J	1980	B
Northamptonshire iron sdst	139	1726	D	1877	E,F,G
Sandstones	124	1801	H,I,J	1988	K
Limestones	75	1669	A	1978	C
Permo-Triassic sandstone	70	1807	C	1934	A
Granite - grey	39	1887	E,F,G	1989	D
Granite - red	17	1887	E,F,G	1962	D
Slate	10	1816	H,I,J	1899	C
Terra cotta	2	1858	A	1868	H,I,J
Portland limestone	2	1920	A	1944	C
Black marble	2	1928	E,F,G	1934	A
Larvikite	1	1912	B		

Table B. Siting of stones used in Olney churchyard

Sectn	Wht mbl	Nptn sds	Snd stn	Lst	Per Tri	Gran grey	Gran red	Slate	Terra cotta	Ptld stn	Blk mbl	Lvk ite	Total
A	55		6	1	7	7	4		1	1	1		83
B	32		16	2	22	3	3	2				1	81
C	42	40	50	29	14	13	2	2		1			193
D	5	36	12	18	4	8	2						85
EFG	2	13	4	2	7	2	3	1			1		35
HIJ	17	50	30	13	14	5	3	5	1				138
K	3		6	10	2	1							22
Total	**156**	**139**	**124**	**75**	**70**	**39**	**17**	**10**	**2**	**2**	**2**	**1**	**637**

Footnotes

1 Gough, H. Records of Bucks, c 1860 p.3.
2 Watts, W. W. Geology of the Ancient Rocks of Charnwood Forest, 1947 pp 52-53
3 Meller, H London Cemeteries, 1981 p 38
4 Ratcliffe, O Olney, 1907 p 45
5 'Commemorative Art' Vol XXXII No 5, May 1965
6 Thompson, E. P. The Making of the English Working Class, 1977
7 Advertisement in Ratcliffe,). Op. Cit. p 90.
8 Pember Reeves, M. Round About a Pound a Week, 1988 p 80.
9 Ibid. p 47.

The papers of:- W. H. Cave and Son, Undertakers, Bozeat.
W. T. Cox, Monumental Masons, Kettering.
T. H. Higgins, Monumental Masons, Wellingborough.

and a book of inscriptions and accounts for lettering 1744-1824 cited in the study are held at the Northampton Records Office.

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Lichens found growing on gravestones in Olney churchyard.

Survey by Tom Chester and Gordon Osborn, 28th June 1990.

The total number of species is 54; several species occur on more than one substrate. This may not be a complete list. A more detailed survey may reveal several more species.

Table C Lichens found and the type of stone on which they occurred.

Ns = Northamptonshire iron sandstone, M = Marble, G = Grit, PT = Permo-Trias, S = Slate, Gr = Granite, L = Lead, Ls = Local sandstone, LL = Lincolnshire Limestone, T = Terra cotta.

	Ns	M	G	PT	S	Gr	L	Ls	LL	T
Acarospora fuscata						#	#			
Aspiellia calcarea		#						#		
Aspiellia contorta	#								#	
Aspiellia subcircinata	#									
Buellia aethalea					#	#				
Buellia ocellata							#			
Caloplaca aurantia	#							#	#	
Caloplaca citrina	#	#								
Caloplaca flavescens	#	#						#	#	
Caloplaca holocarpa		#								
Caloplaca saxicola		#								
Caloplaca teicholyta	#	#						#	#	
Candelariella aurella		#					#			
Candelariella medians		#						#		
Candelariella vitellina	#		#	#						
Catillaria lenticularis		#								
Collema auriforme									#	
Diploicia canescans	#			#		#		#		#
Haematomma ochroleucum	#									
Lecania erysibe	#									
Lecania erysibe f,sored	#									
Lecanora albascens		#						#	#	
Lecanora atra	#		#					#		
Lecanora campestris	#	#		#		#			#	
Lecanora conizaeoides					#	#				
Lecanora crenulata		#						#		
Lecanora dispersa	#	#						#		
Lecanora muralis	#									
Lecanora polytropa						#				
Lecanora orosthea	#									
Lecanora sulphurea	#									
Lecidella carpathica	#									
Lecidella stigmatea	#								#	
Leprania incana	#									
Parmelia glabratula			#		#		#			
Parmelia sulcata	#									
Phacophyscia orbicularis	#	#		#		#		#		
Physcia adsc endens		#						#		
Physcia caesia	#	#		#			#			

	Ns	M	G	PT	S	Gr	L	Ls	LL	T
Physconia grisea	#			#						
Porpidia tuberculosa						#				
Protoblastenia rupestris									#	
Psilolechia lucida	#			#						#
Rhizocarpon obscuratum						#				
Rinodina gennarii		#					#			
Rinodina teichophila	#			#						
Scoliciosporum umbrinum						#				
Verrucaria glauna	#	#						#		
Verrucaria muralis		#								
Verrucaria nigrenscens	#	#						#	#	
Verrucaria viridula	#									
Xanthoria calcicola	#	#								
Xanthoria coralligera						#				
Xanthoria parietina	#									

The record of *Buellia ocellata* on lead is thought to be the first record of this species on lead in England.

THE FLORA OF OLNEY CHURCHYARD

by Roy Maycock

It was in the autumn of 1981 that the Botanical Society of the British Isles suggested to its members that studies should be made of the flora of churchyards within their counties. Being the Buckinghamshire recorder for the Society and already interested in churchyards I decided to look at all of those within the county. This enabled the 10% best churchyards to be picked out - another suggestion put forward by the BSBI scheme.

Taking Olney as an example, the method of surveying, the results obtained and their interpretation can be demonstrated. Surveys were made in 1982 (brief), August 12th 1984 and June 9th 1985. It was important that more than one visit was made in order to cover more than one season. This helped to ensure that a good selection/sample of plants was obtained. On each visit the same routine was followed; an anti-clockwise walk around the inside of the boundary, a similar walk around the church and a zigzag trail between these two, covering as much of the rest of the churchyard as possible. A further excursion around the outside of the boundary walls was necessary at Olney. Species of vascular plant only were noted; identification being made in the field or at home where necessary. Brief notes of habitats or other significant features were made on site.

One of the reasons for churchyards being good for vascular plant variety is that they usually contain a wide range of habitats. At Olney there are the boundary and church walls, the stone of grave markers, the grassland, hedges and trees and the graves themselves.

The characteristics of the soil of a churchyard are dependant, in part at least, on the underlying rock. At Olney the church itself stands on river gravels and the oolitic limestone is not far away, as witnessed by its use for building. The alkaline nature imparted to the soil is reflected in its flora.

Similarly the limestone used in the making of the walls is important. Not only does it impart an alkaline nature, but its rough surface and soft lime mortar infill ensure that soil accumulates allowing plants to grow. Some of the most interesting plants of the churchyard grow on the boundary walls.

For example:

Arenaria serpyllifolia	Thyme-leaved Sandwort
Cheiranthus cheiri	Wallflower
Cymbalaria muralis	Ivy-leaved Toadflax

Desmazeria rigida	Fern-grass
Erophila verna	Common Whitlowgrass
Parietaria judaica	Pellitory-of-the-wall
Poa compressa	Flattened Meadow-grass
Saxifraga tridactylites	Rue-leaved Saxifrage
Sedum acre	Biting Stonecrop
Veronica arvensis	Wall Speedwell

A wide range of stone has been used in the production of grave markers, but probably more important to the vascular plants is the completeness, or otherwise, of the graves themselves. Those with a complete boundary (i.e. head, foot and kerb stones) often have wild plants growing in them. Where the base is solid there may only be a few small plants e.g. *Veronica arvensis, Geranium robertianum* (Herb Robert); Where it is planted up, garden weeds may appear e.g. *Senecio vulgaris* (Groundsel), *Euphorbia peplus* (Petty Spurge); where it is not cared for perennials may appear and look quite splendid e.g. *Leucanthemum vulgare* (Oxeye Daisy), *Galium verum* (Lady's Bedstraw). At Olney there is a good range of 'grave-types' and these encourage a good range of plant species. The variety of minerals used for the stones is probably more important for increasing the variety of lichens growing on them, as is witnessed by the recording of fifty four species on one visit by Tom Chester and Gordon Osborn.

The presence of graves, of course, makes a churchyard different from most other sites. That graves have to be dug means disturbance to the area, but for plants it provides another habitat, similar only to the flower-bed areas which are now appearing in some churchyards. Weedy species find their niche in such open areas, and some recorded at Olney are:

Capsella bursa-pastoris	Shepherd's purse
Cardamine hirsuta	Hairy Bitter-cress
Epilobium ciliatum	American Willowherb
Euphorbia pepius	Petty Spurge
Lactuca serriola	Prickly Lettuce
Lapsana communis	Nipplewort
Papaver dubium	Long-headed Poppy
Plantago major	Greater Plantain
Poa annua	Annual Meadow-grass
Senecio vulgaris	Groundsel

The management of a churchyard is very variable - both between churchyards and within one churchyard! Much of what is done nowadays is dependant upon voluntary labour. At Olney, many areas are regularly mown though there are places where taller herbs are allowed to grow. Again, variety of management encourages variety of species. However, it is surprising how many species exist in a closely mown turf. The grasses are an obvious example, where their strange ability of being able to 'grow from the nodes' makes them ideal in turf. The more showy flowering plants may survive for many years without actually flowering and, although this is not good in the long run as no seeds will be produced, by varying

the management over the whole site some seeds may well be produced. Mat or rosette forming species fare particularly well in churchyard turf. For example:

Achillea millefolium	Yarrow
Bellis perennis	Daisy
Crepis capillaris	Smooth Hawk's-beard
Medicago lupulina	Black Medick
Plantago lanceolata	Ribwort Plantain
Potentilla reptans	Creeping Cinquefoil
Taraxacum officinale	Dandelion
Trifolium repens	White Clover

The mix of grass and broad-leaved species normally found is much more akin to grazed grassland than to a hay meadow, reflecting the similarity in effect of mowing to grazing.

Trees in churchyards invariably have been planted. For example:

Acer pseudoplanatus	Sycamore
Aesculus hippocastanum	Horse Chestnut
Betula pendula	Silver Birch
Fraxinus excelsior	Ash
Sorbus aucuparia	Rowan

Occasionally some, such as sycamore or horse chestnut, may grow from locally released seed. Shrubs may or may not have been planted. The hawthorn hedge at Olney will almost certainly not be 'natural', but the elder growing up through the yew is most likely to have been bird sown - when a blackbird or thrush was perching in the tree. The holly and box will also have been planted.

Apart from the geology, habitats and management, the size of the churchyard is also important in determining the number of species present. The ' growing area' at Olney was estimated at 0.6ha. This is quite large for a churchyard so the total of 104 recorded species is high. Assessment of the floral richness of all churchyards in the county was done by using a numerical method. The frequency of the species in the county was known, so each was assigned a value. By totalling the values a score was obtained. The top score was 35.542; Olney's score was 19.417, placing it 35th out of a total of 231.

Olney, like so much of the rest of Buckinghamshire, has soils which are neutral/alkaline. Acid soils, which are common over much of the British Isles, are rare in Bucks, so it is in those parts of the county where many of the best (i.e. floristically rich or rare) churchyards occur. Five of the species recorded from Olney are county-rare species. Most of them grow on the walls but the rarest is, in fact, a species of the turf. Before listing all the species recorded, it may be worth noting the county rarities found.

Rumex pulcher - a dock, flowering and fruiting later in the year and characterised by the fiddle-shaped leaves which give the plant its common name. A few plants are found near the town end of the east west path through the churchyard.

Desmazeria rigida and Poa compressa are a couple of grasses which are found on the tops of the walls.

Saxifraga tridactylites, the fingered saxifrage, is a small plant characteristically found on limestone rocks or walls. At Olney and most of the other churchyards within Buckinghamshire north of the River Great Ouse it is on the tops and faces of the boundary walls.

Parietaria diffusa - pellitory-of-the-wall. The name suggests the habitat where the species is found. It is not as dependant on limestone as some other species found here, but it is truly a wall species. This is further illustrated by the fact that it is commoner as a churchyard species in Buckinghamshire than it is in the county as a whole.

SPECIES LIST

Acer pseudoplanatus	Sycamore
Achillea millefolium	Yarrow
Aesculus hippocastanum	Horse Chestnut
Agrostis stolonifera	Creeping Bent
Alopecurus pratensis	Meadow Foxtail
Anthriscus sylvestris	Cow Parsley
Arenaria serpyllifolia	Thyme-leaved Sandwort
Arrhenatherum eliatus	False Oat-grass
Artemisia vulgaris	Mugwort
Bellis perennis	Daisy
Betula pendula	Silver Birch
Bromus sterilis	Barren Brome
Bryonia dioica	White Briony
Buxus sempervirens	Box
Campanula rapunculus	Rampion Bellflower
Capsella bursa-pastoris	Shepherd's purse
Cardamine hirsuta	Hairy Bitter-cress
Cardamine pratensis	Cuckooflower
Cerastium fontanum	Common Mouse-ear
Chamerion angustifolium	Rosebay Willowherb
Cheiranthus cheiri	Wallflower
Cirium vulgare	Spear Thistle
Cirsium arvense	Creeping Thistle
Convolvulus arvensis	Field Bindweed

Crataegus monogyna	Hawthorn
Crepis capillaris	Smooth Hawksbeard
Crepis vesicaria	Beaked Hawksbeard
Cymbalaria muralis	Ivy-leaved Toadflax
Dactylis glomerata	Cocksfoot
Desmazeria rigida	Fern-grass
Elymus repens	Common Couch
Epilobium ciliatum	American Willowherb
Epilobium hirsutum	Great Willowherb
Erophila verna	Common Whitlowgrass
Euphorbia pepius	Petty Spurge
Festuca arundinacea	Tall Fescue
Festuca rubra	Red Fescue
Fraxinus excelsior	Ash
Galium aparine	Cleavers
Geranium dissectum	Cut-leaved Crane's-bill
Geum urbanum	Wood Avens
Glechoma hederacea	Ground Ivy
Hedera helix	Ivy
Heracleum sphondylium	Hogweed
Holcu lanatus	Yorkshire Fog
Hordium murinum	Wall Barley
Hyacinthoides non-scripta	Bluebell
Ilex aquifolium	Holly
Lactuca serriola	Prickly Lettuce
Lamium album	White Deadnettle
Lamium purpureum	Red Deadnettle
Lapsana communis	Nipplewort
Leucanthemum vulgare	Ox-eye Daisy
Lolium perenne	Perennial Ryegrass
Malva neglecta	Dwarf Mallow
Malva sylvestris	Common Mallow
Medicago lupulina	Black Medick
Myosotis arvensis	Field Forget-me-not
Papaver dubium	Long-headed Poppy
Parietaria judaica	Pellitory-of-the-wall
Phleum pratense	Timothy
Pimpinella saxifraga	Burnet Saxifrage
Plantago lanceolata	Ribwort Plantain
Plantago major	Greater Plantain
Poa annua	Annual Meadow-grass
Poa compressa	Flattened Meadow-grass
Poa pratensis	Smooth Meadow-grass
Poa trivialis	Rough Meadow-grass
Potentilla reptans	Creeping Cinquefoil
Primula vulgaris	Primrose
Prunella vulgaris	Self-heal
Ranunculus bulbosus	Bulbous buttercup
Ranunculus ficaria	Lesser Celandine
Ranunculus repens	Creeping buttercup
Rosa canina	Dog Rose
Rubus fructiosus	Bramble
Rumex acetosa	Common Sorrel

Rumex crispus	Curled Dock
Rumex obtusifolius	Broad-leaved Dock
Rumex pulcher	Fiddle Dock
Rumex sanguineus	Wood Dock
Sambucus nigra	Elder
Saxifraga tridactylites	Rue-leaved Saxifrage
Sedum acre	Biting Stonecrop
Senecio vulgaris	Groundsel
Solanum dulcamara	Bittersweet
Sonchus asper	Prickly Sow-thistle
Sonchus oleraceus	Smooth Sow-thistle
Sorbus aucuparia	Rowan
Stellaria media	Common Chickweed
Taraxacum officinale	Dandelion
Taxus baccata	Yew
Tilia vulgaris	Lime
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Trisetum flavescens	Yellow Oat-grass
Urtica dioica	Common Nettle
Valerianella locusta	Common Cornsalad
Verbascum thapsus	Great Mullein
Veronica agrestis	Green Field-speedwell
Veronica arvensis	Wall Speedwell
Veronica chamaedrys	Germander Speedwell
Veronica filiformis	Slender Speedwell
Viola odorata	Sweet Violet