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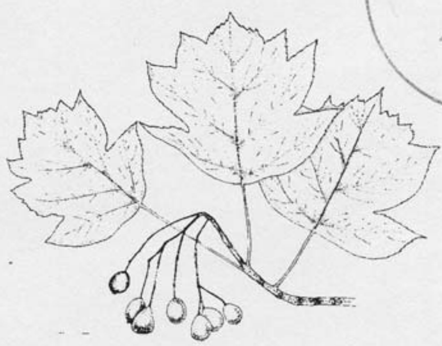

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John Bell
Rachel C Thomas

Lowlands Team

English Nature Research Reports

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Changes in abundance of six ground flora species in Wytham Woods (1974-1991)

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Summary

1. Data from 163 permanent 10 x 10m plots established in Wytham Woods were used to look for changes in abundance between 1974 and 1991 of six ground flora species: *Chamerion angustifolium, Hyacinthoides non-scriptus, Mercurialis perennis, Pteridium aquilinum, Rubus fruticosus* and *Urtica dioica*

2. *Chamerion angustifolium* had declined in both occurrence and mean cover across the whole wood. Throughout most of this period the wood has been relatively undisturbed so sites for this species of disturbed ground have become less.

3. *Rubus fruticosus* showed a major decline in cover, with little change in frequency, believed to be caused by increased deer browsing.

4. *Mercurialis perennis* remained frequent but there was a decrease in the number of plots where it formed dense carpets. This may also be a grazing effect.

5. *Pteridium aquilinum* declined mainly in plots where the canopy cover had increased, an effect of increased shade.

6. *Urtica dioica* and *Hyacinthoides* showed no significant changes in cover.

Acknowledgements

We wish to thank all those in the Oxford University and in our various conservation agencies who have helped with the recordings, maintenance of the plots and analysis of data. Particular thanks go to the late Colyear Dawkins whose foresight in devising and setting up the system in 1974 and subsequent enthusiastic support during the re-recordings made it all possible. The plots were established in 1974 under a Natural Environment Research Council research grant.

Contents

Introduction

Between 1973 and 1976 Dawkins and Field (1978) established a grid of permanent plots through Wytham Woods, Oxfordshire (National Grid Reference SP4608). Data relating to the tree and shrub layer, the ground flora and to soils were recorded. In 1984 27 plots were re-recorded and in 1991-92 all but one of the plots were re-examined (Horsfall & Kirby 1985; Kirby *et al.* 1995).

During the period 1974 to 1991 the deer population in the wood increased considerably; there have been changes in the treatment of the woodland; and changes to the soil through nutrient enrichment (Farmer 1994). All of these might be expected to affect the woodland ground flora. Results are presented here on changes in the abundance of six major ground flora species fireweed *Chamerion angustifolium*, bluebell *Hyacinthoides non-scriptus,* dog's mercury *Mercurialis perennis*, bracken *Pteridium aquilinum*, bramble *Rubus fruticosus*, and nettle *Urtica dioica*. All plant names follow Clapham *et al.* (1981).

Methods

Wytham Woods are a mix of ancient and recent woodland with both semi-natural stands and plantations. The main tree species are oak, mainly *Quercus robur*, ash *Fraxinus excelsior*, sycamore *Acer pseudoplatanus* and beech *Fagus sylvatica*. The 10 x 10m permanent plots are arranged at alternate intersections of a 100m grid across the site (Dawkins & Field 1978). The 27 plots re-recorded 1984-85 were spread through the north-west of the woodland; the one plot not recorded in 1991-92 was on the edge of the wood and could not be re-located at the time (Kirby *et al.* 1995).

For the six main ground flora species in the wood cover in the plot was estimated on a 6 point scale as follows:

0	=	species not present;	1	=	1-5% cover;
2	=	6-25% cover;	3	=	26-50% cover;
4	=	51-75% cover;	5	=	76-100% cover.

In the analysis the overall mean cover of each species was calculated using the mean value for each class weighted by the number of plots in that class.

Results

A summary of the changes in overall cover for each species based on weighted cover class values are presented in Table 1; subsequent figures illustrate the change in mean frequency of each cover class for each species and the distribution of the different cover values. Appendix 1 shows the actual values for each plot in 1974 and 1991. Patterns of change are discussed for each species in turn.

Table 1. Changes in cover and frequency for 6 major ground flora species (1974-1991)

		Cover score ([1]) (no of plots)						Weighted mean cover (standard error)	Significance of cover change ([2])
		0	1	2	3	4	5		
Bramble	1974	21	24	30	36	25	27	35.4 (2.4)	
(*Rubus fruticosus*)	1991	36	93	27	4	3	0	6.0 (0.8)	***
Bracken	1974	64	39	24	13	10	13	16.6 (2.0)	
(*Pteridium aquilinum*)	1991	85	27	33	11	3	4	9.3 (1.4)	***
Fireweed	1974	125	29	6	2	1	0	1.8 (0.5)	
(*Chamerion angustifolium*)	1991	151	11	1	0	0	0	0.3 (0.1)	***
Bluebell	1974	100	43	15	2	3	0	3.6 (0.8)	
(*Hyacinthoides non-scriptus*)	1991	100	38	16	5	4	0	4.7 (0.9)	NS
Dog's Mercury	1974	26	32	30	23	28	24	32.2 (2.5)	
(*Mercurialis perennis*)	1991	32	30	42	25	27	7	24.0 (2.0)	***
Nettle	1974	43	65	23	20	9	3	12.8 (1.6)	NS
	1991	34	65	42	18	2	2	10.8 (1.2)	

Notes

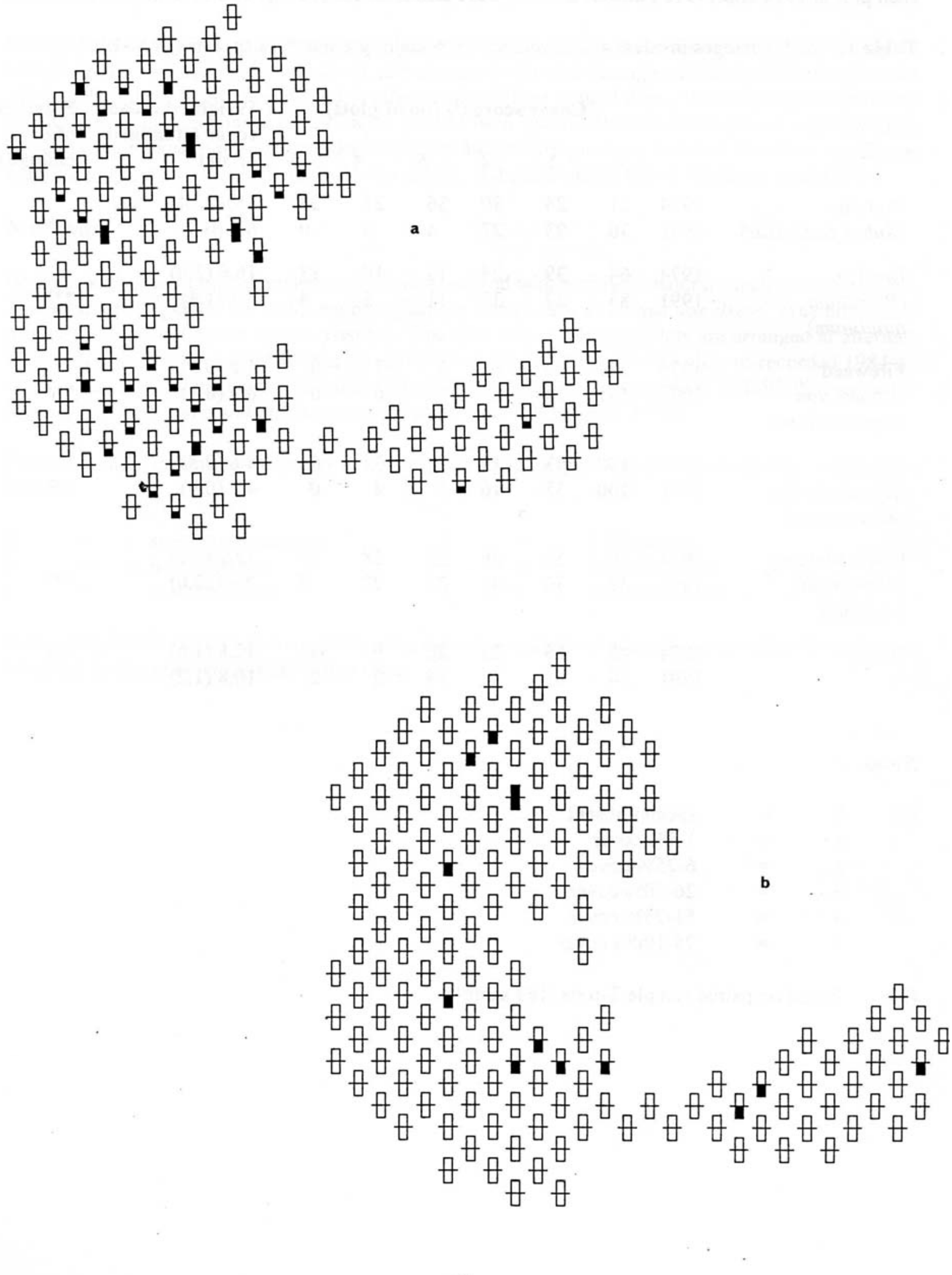
(1)
0 = species absent
1 = 1-5% cover
2 = 6-25% cover
3 = 26-50% cover
4 = 51-75% cover
5 = 75-100% cover

(2) Based on paired sample T-tests, 163 samples

Chamerion angustifolium

Fireweed was not particularly abundant in 1974 but since then it has declined even further (Figure 1).

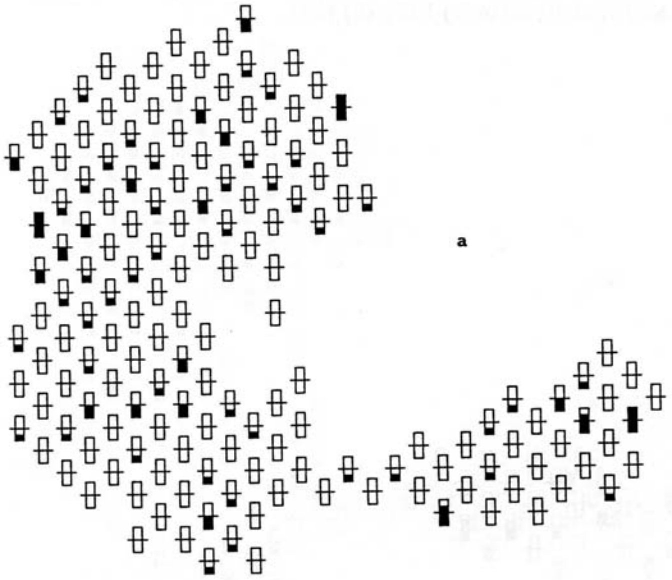
Figure 1. Cover (indicated by filled bars) in each plot in (a) 1974, (b) 1991.



Hyacinthoides non-scriptus

Bluebell is thinly scattered through the woods, forming dense carpets only locally. There were no significant changes in overall cover between 1974 and 1991 (Figure 2).

Figure 2. Cover (indicated by filled bars) in each plot in (a) 1974, (b) 1991.



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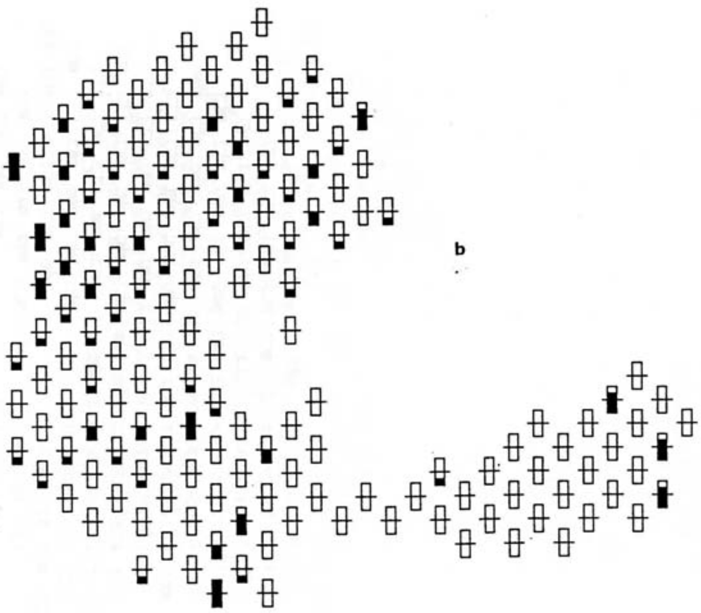
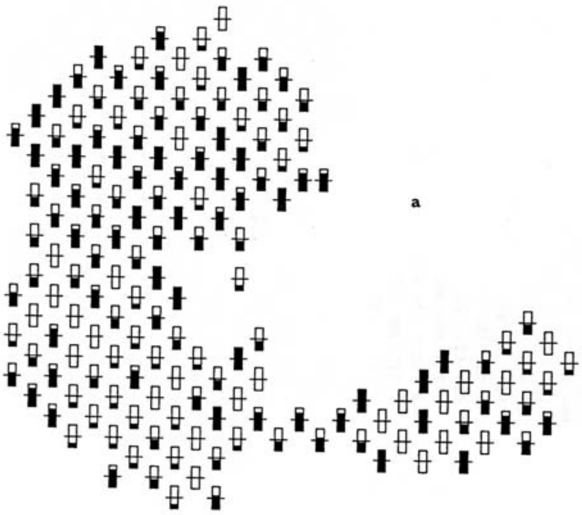


b

Mercurialis perennis

Dog's mercury is the second most widespread species overall when both year's data are combined, being beaten only by bramble. Mean cover decreased significantly between 1974 and 1991, but the change was small and largely due to a reduction in the number of plots with very high cover (>75%) of the plant (Figure 3).

Figure 3. Cover (indicated by filled bars) in each plot in (a) 1974, (b) 1991.



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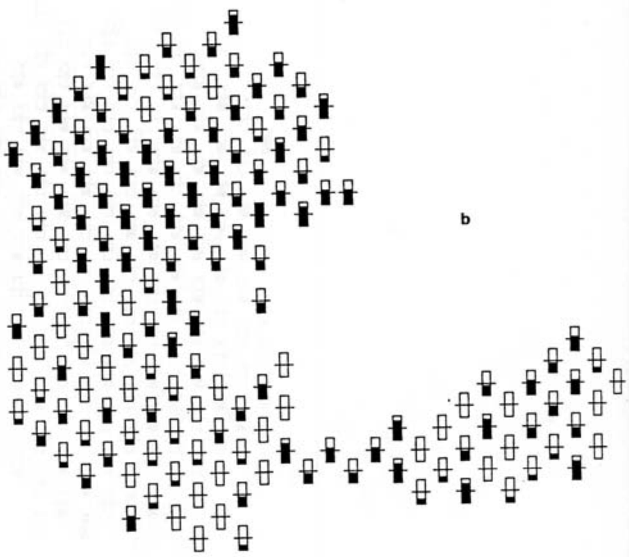
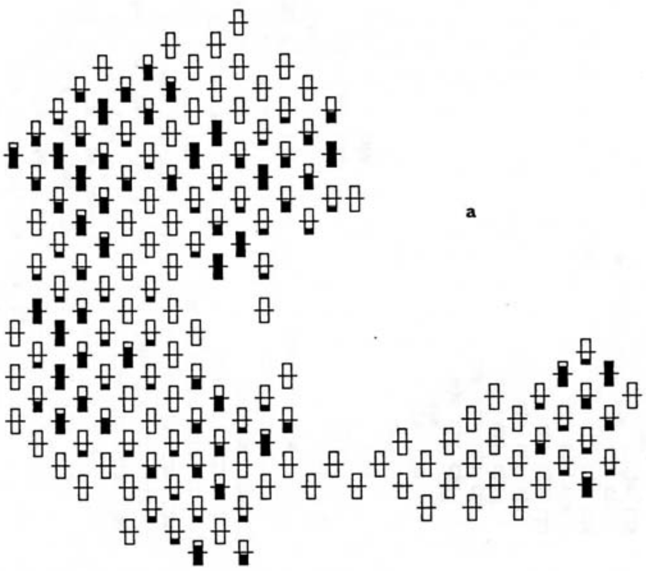


b

Pteridium aquilinum

Bracken was moderately widespread on both sampling occasions. The decrease in mean cover was quite small but particularly noticeable amongst plots that had a lot of bracken in 1974. There was little change in its frequency or distribution through the wood (Figure 4).

Figure 4. Cover (indicated by filled bars) in each plot in (a) 1974, (b) 1991.



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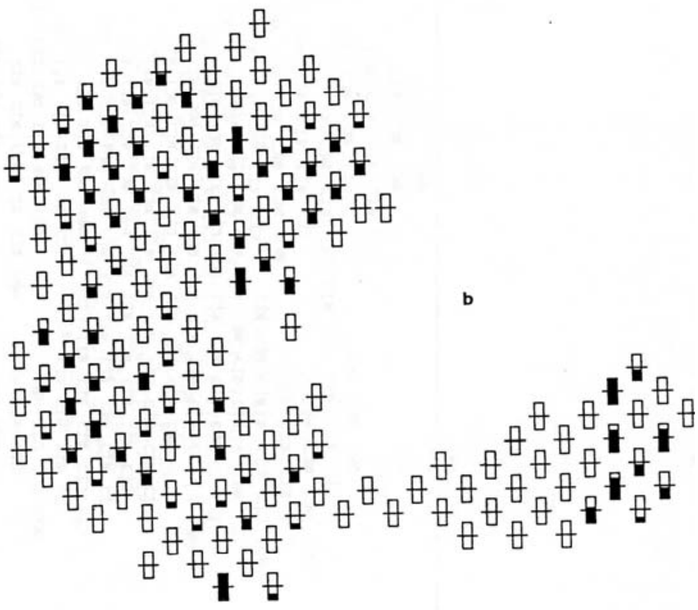
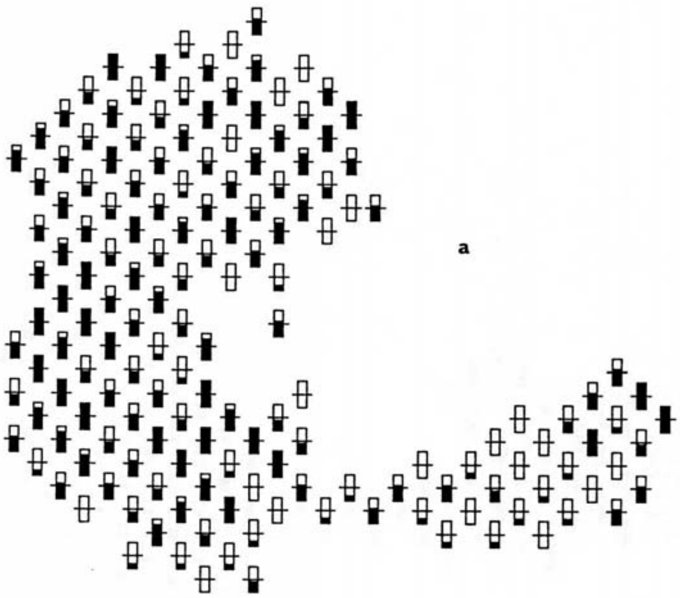


b

Rubus fruticosus

Bramble was the species recorded most often through the woods. However although still widespread in 1991 its mean cover had declined very greatly. Whereas in 1974 thickets up to 2m high were not uncommon, in 1991 bramble leaves and stems were frequently found at the same level as and among the other ground flora plants (Figure 5).

Figure 5. Cover (indicated by filled bars) in each plot in (a) 1974, (b) 1991.



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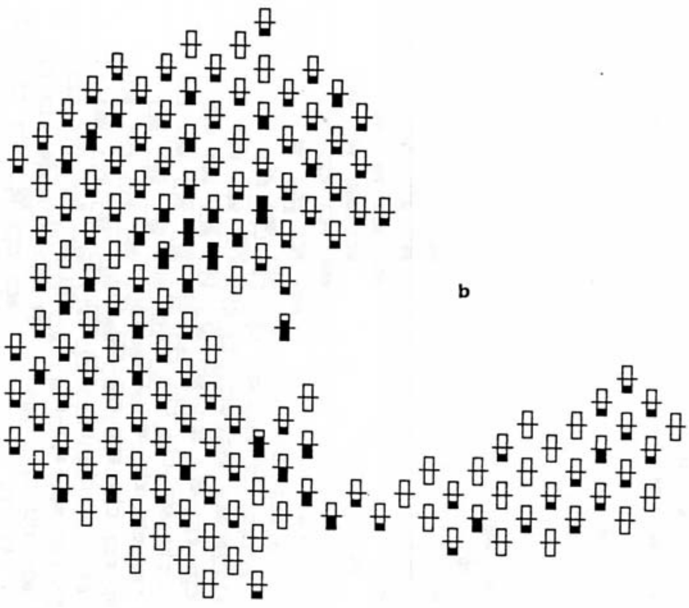
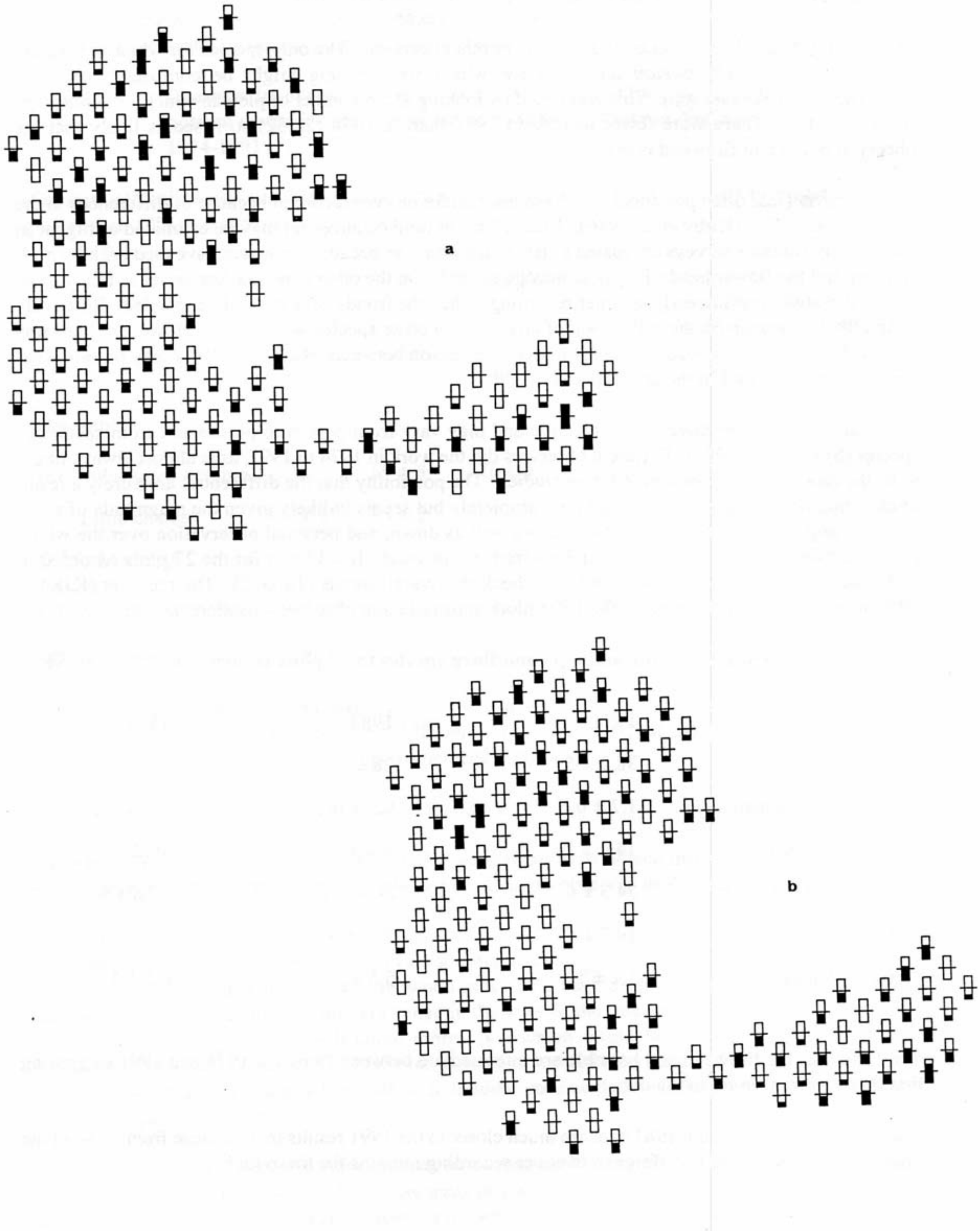


b

Urtica dioica

Nettles showed no change in cover over the period (Figure 6).

Figure 6. Cover (indicated by filled bars) in each plot in (a) 1975, (b) 1991.



Discussion

Methodological biasses

There are several potential biasses in the methods which must be considered before trying to interpret the changes that have been noted above.

Species might have been misidentified on one or other occasion. The only species for which this seems likely is fireweed *Chamerion angustifolium* which when young might be confused with other willowherbs (*Epilobium* spp). This was tested by looking at the number of plots in which *Epilobium* spp were recorded. There were fewer records in 1991 than in 1974 (23:52) so it seems likely that the observed decline in fireweed is real.

Species cover (less often presence) may have been under or over recorded because of differences in the season of recording (Kirby *et al.* 1986). Bluebell cover (and occurrence) may be estimated as higher in spring/early summer surveys compared to late season surveys because the leaves have died back by mid-summer and the flower heads, if sparse, may be missed. On the other hand bracken cover is likely to be underestimated in spring/early summer recordings when the fronds have not fully expanded. Relatively little effect of season on the estimation of cover of the other species is expected. However, there was little difference in the spread of recording over the season between 1974 and 1991 so any time-of-year effect should be small in those comparison.

Estimations of species cover are subjective and may vary from person to person and from species to species (Sykes *et al.* 1983). Different observers did the work in 1974 to 1991, as is almost always likely to be the case with long-term monitoring studies. The possibility that the differences are purely a result of changing observers cannot be ruled out completely but seems unlikely given the magnitude of some of the changes; that some species went up as well as down; and personal observation over the whole period confirming loss of bramble thickets from some areas. In addition for the 27 plots recorded in 1984 there is an intermediate data point to check the overall trends (Table 2). The recorder (KJK) in 1984 was the same as for most of the 1991 plots, thus reducing observer variation effects.

Table 2 Mean cover for main ground flora species in 27 plots recorded in 1984/5 (± SE)

	1974	1984	1991
Rubus fruticosus	38.7 ± 5	28 ± 5	7.5 ± 3
Chamerion angustifolium	1.2 ± 0.6	0.3 ± 0.1	0.1 ± 0.1
Pteridium aquilinum	14.4 ± 5	8 ± 3	10.2 ± 3
Mercurialis perennis	34.3 ± 6	24.9 ± 5	27.6 ± 6
Urtica dioica	19.7 ± 5	7.6 ± 3	11.4 ± 4
Hyacinthoides no-scriptus	3.2 ± 1	5.5 ± 3	6.2 ± 3

The 1984 data for fireweed and bramble are intermediate between those for 1974 and 1991 suggesting that there is a real trend in the data.

For all the other species the 1984 data are much closer to the 1991 results than to those from 1974 so the possibility of a systematic difference in cover recording remains for these four.

Individual plot records were examined therefore where bracken and dog's mercury scores had gone from more than 75% cover in 1974 (scores 5) to less than 50% cover (scores 0-3) in 1991, or from more than 50% cover in 1974 (score 4) to less than 25% (score 0-2) in 1991. Fifteen plots fitted this condition. Many were young plantations or scrub in 1974 and appear to have become more shaded since; in several instances the 1991 notes specifically state that the ground flora was sparse. One open plot had just been mown at the time of the 1991 record so the bracken decline may be only temporary. These relatively few large plot changes contribute disproportionately to the overall mean cover decline for bracken. They suggest that recording differences are not a major factor.

Table 3 Changes in overall cover of canopy cover (>2.5m), mid-cover (0.5-2.5m) and bottom cover for plots showing substantial declines in dog's mercury or bracken 1974-1991

(Substantial decline was set at from greater than 75% to less than 50% cover for the species, or from greater than 50% to less than 25%).

		Mean % cover (± SE) for					
	No of plots	**Canopy layer**		**Mid-layer**		**Bottom layer**	
		1974	**1991**	**1974**	**1991**	**1974**	**1991**
Bracken							
(a) Substantial decline	15	59 ± 8	70 ± 9	70 ± 9	27 ± 6	90 ± 4	64 ± 9
(b) Little change	14.8	83 ± 2	68 ± 3	41 ± 3	25 ± 3	79 ± 2	64 ± 2
Dog's Mercury							
(c) Substantial decline	17	90 ± 4	57 ± 7	43 ± 8	34 ± 6	92 ± 2	66 ± 7
(d) Little change	146	80 ± 2	70 ± 3	44 ± 3	24 ± 2	79 ± 2	64 ±3

The use of the mid-point of each cover class to calculate an overall mean cover for each species may be criticised. This helps to emphasise the differences in the records but these are also clear from the histograms showing the number of plots in each cover class.

Interpretation of the differences in species abundance

There have been relatively few long-term studies of changes to woodland ground flora using permanent plots (Barkham 1992) so we cannot say whether the changes observed in Wytham are typical for British woodland or not.

At the plot level species cover will often vary greatly according to what stage the tree crop is at, being lowest during the thicket stage. Over the wood as a whole such changes might be expected to cancel each other out, provided there is no net change in the state of the tree and shrub layers. Between 1974 and 1991 the wood has in fact become more open which might favour the ground flora species considered here (Kirby *et al.* 1995). However, competition within the ground flora is also important so overall cover might increase, while that of individual species decline. Against this background the individual species are considered in turn.

Bramble is a preferred winter food for deer and its decline in Wytham Woods in believed to be primarily a response to increased browsing. Enclosure trials in a wide range of other woodland types have shown that bramble thrives given protection from large herbivores.

The bracken decline was not expected, but appears to be related to the increased canopy shading. The fifteen plots which showed a major bracken change between 1974 and 1991 had significantly more open canopies in 1974 than the rest, with higher mid-cover and bottom cover values (this would include the bracken itself) (Table 3). By 1991 although the wood overall has become more open the major bracken decline plots show an increase in canopy cover, a reduction in the mid-cover range (growth of shrubs or young trees to above 2.5m, decline in bracken cover) and decline in bottom cover (loss of bracken). Thus shading out of the bracken is probably the main factor involved.

Dog's mercury may also decline under heavy deer grazing, particularly by muntjac (*Muntiacus reevesi*) (Cooke *et al.* 1995). The effect would be expected to show first as a decline in cover rather than frequency, particularly as it is also sensitive to trampling. However plots where major decline occurred had also become more open with possibly increased competition from greater grass or bramble growth (two of the plots showing a decline in dog's mercury were among the few to have dense bramble cover in 1991) under the more open conditions.

Nettle is associated particularly with eutrophic sites and the Wytham soils now have higher nitrogen contents than previously, perhaps from increased atmospheric inputs (Farmer 1994). While there has been a small increase in its frequency, particularly in the mid-cover range there are fewer dense nettle plots so overall its cover stayed the same.

Fireweed is characteristically associated with recently disturbed conditions within woodland, for example post-coppice floras, new clear fells, disturbed ground following thinning. Part of the north-west of the wood was burnt in the 1960's and this may still have been an influence on the flora in 1974. Less forestry management occurred in the woods from 1974 to 1985. Although there has been some increase in activity over the last 10 years it has not affected many of the plots so the current low frequencies for fireweed are not surprising.

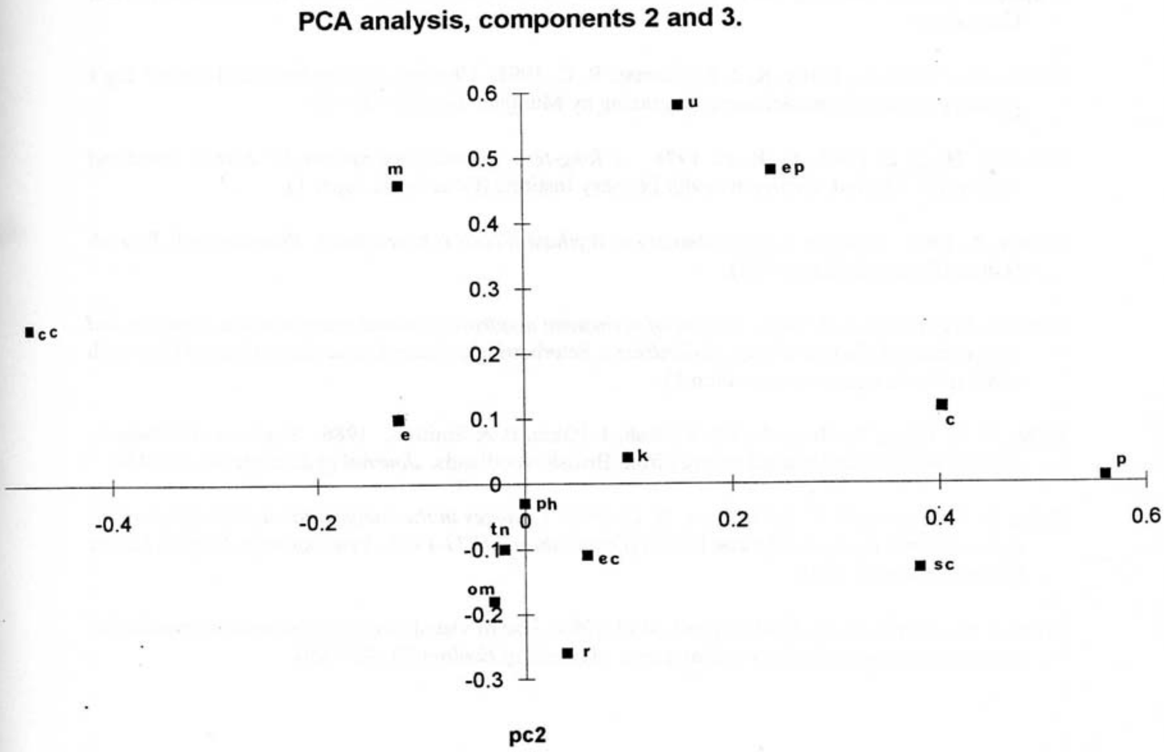
A principal components analysis was carried out using the 1974 cover values for the six species, canopy and mid-cover values and selected soil parameters (Figure 7). Axis 1 (PC 2) picks out the tree cover effect. Canopy cover and the shade-tolerant/avoiding species (bluebell and dog's mercury) are at one end while bracken, fireweed and shrub cover are at the other. The second axis (PC 3) relates to soil conditions with the association between phosphorus and nettle cover being picked out.

Conclusions

Dawkins and Field (1978) only estimated percentage cover for the six ground flora species because they were concerned about the subjective nature of such estimates at the plot level (subsequently confirmed by Sykes *et al.* 1983). However where a large number of plots are recorded some of the subjective variation might be expected to be evened out and the distribution of plots across cover classes becomes a potentially valuable way of estimating change. If only presence-absence data were available for example no distinction could be made between the decline of bramble and of bracken, indeed the latter might have been judged to have the greater biological significance. In the 1984 and 1991 recordings therefore all ground flora species have been allocated a cover score on the Domin scale.

These particular six species were chosen by Dawkins and Field (1978) because they are relatively straightforward to assess, were among the commonest species in the woods and were "ecologically significant" - that is it was believed that changes were likely to be indicative of factors that would affect many species in the wood. We suggest that notwithstanding the inherent problems of assessing changes in species abundance at the whole wood scale their methods and choice of species have been justified.

Figure 7. Principal components analysis using cover values for dog's mercury (m). bluebell (e), bramble (r) , bracken (p), fireweed (c) and nettle (u) and plot values for canopy cover (cc), shrub cover (sc), soil pH (ph), organic matter (om), total soil nitrogen (tn), extractable phosphorus (ep), extractable potassium (ek), and extractable calcium (ec).



References

Barkham, J. 1992. The effects of management on the ground flora of an ancient woodland, Brugsteer Park Wood, Cumbria, England. *Biological Conservation* **60**, 167-188.

Clapham, Tutin & Warburg 1981. *Excursion flora of the British Isles*. Cambridge University Press, Cambridge.

Cooke, A., Farrell, L., Kirby, K. J. & Thomas, R. C. 1995. Changes in abundance and size of dog's mercury apparently associated with grazing by Muntjac. *Deer* 9, 429-433.

Dawkins, H. C. & Field, D. R. B. 1978. *A long-term surveillance system for British woodland vegetation*. Oxford, Commonwealth Forestry Institute (Occasional Paper 1).

Farmer, A. 1994. *Changes in soil chemistry at Wytham Woods (Oxfordshire)*. Peterborough, English Nature (Research Report 108).

Horsfall, A. & Kirby, K. J. 1985. *The use of permanent quadrats to record changes in the structure and composition of Wytham Woods, Oxfordshire*. Peterborough, Nature Conservancy Council (Research and Survey in nature conservation 1).

Kirby, K. J., Bines, T., Burn, A., Mackintosh, J. Pitkin, P. & Smith, I. 1986. Seasonal and observer differences in vascular plant records from British woodlands. *Journal of Ecology* 74, 123-131.

Kirby, K. J., Thomas, R. C. & Dawkins, H. C. 1995. *Changes in the composition and structure of the tree and shrub layers in Wytham Woods (Oxfordshire), 1974-1991*. Peterborough, English Nature (Research Report 143).

Sykes, J. M., Horrill, A. D., & Mountford, M.D. 1983. Use of visual cover assessments as quantitative estimators in some British woodland taxa. *Journal of Ecology* 71, 437-450.

Appendix 1. Individual Species Scores

Bramble74	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											3																	
94								1		0																		
93					5		5		3		4		0															
92				2		1		1		3		0		3														
91			3		4		2		5		5		2		5													
90		4		2		2		4		0		4		5														
89	4		3		5		3		2		4		4		3													
88		3		2		3		1		3		2		2														
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86		3		3		5		4		5		4		0														
85			4		2		2		2		3																	
84		4		5		4		2		0		1																
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76		1		4		3		5		1		5						0		1		0		1		0		
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74				0		2		4		5		0		1		3		1		0		1		1		3		
73							4		2		1								1		1		0					
72						1		1		1																		
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Bram91	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
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93					1		1		1		0		1															
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73							0		0		0								1		0		0					
72						0		0		0																		
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Bracken:74

	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											0																	
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76		0		1		1		1		2		4						0		0		0		2		1		
75			0		0		2		2		0		0		0		0		0		0		0		1		1	
74				0		0		1		3		0		0		0		0		0		0		0		4		
73							1		1		1								0		0		0					
72						0		1		0																		
71									4		2																	

Brack91

	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											0																	
94								0		0																		
93					0		2		0		0		0															
92				2		2		3		0		0		0														
91			1		3		0		0		0		1		1													
90		1		3		2		0		5		1		2														
89	1		3		2		1		3		2		2		2													
88		0		2		2		2		1		2		2														
87			1		2		0		2		0		2		0	0												
86		0		1		0		0		2		1		0														
85			0		1		0		0		2																	
84		0		2		0		0		5		3																
83			0		0		1																					
82		3		2		0		0				0																
81	0		2		0		1		0																			
80		1		2		3		0																		2		
79	0		3		0		1		2				0												5		0	
78		1		3		1		0		0		0										0		0		0		0
77	0		2		2		0		2		0		1								0		0		4		4	
76		0		1		2		0		1		2						0		0		0		0		2		
75			0		0		1		1		0		0		0		0		0		0		0		4		2	
74				0		0		1		2		1		0		0		0		0		0		3		1		
73							0		0		0								0		0		0					
72						0		0		0																		
71									5		1																	

K

Bluebell 74

	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											2																	
94								0		0																		
93					0		0		0		1		0															
92				1		0		0		0		1		0														
91			1		0		0		2		0		0		4													
90		0		0		1		0		2		0		0														
89	2		0		1		1		0		1		1		0													
88		0		1		2		0		1		1		0														
87			1		0		1		2		0		1		0	1												
86		4		2		0		0		1		0		1														
85			2		0		1		0		0																	
84		2		1		1		0		0		0																
83			1		1		0																					
82		0		1		0		0				0																
81	1		0		0		0		0																			
80		0		1		0		2																		0		
79	0		0		0		1		0				0												1		0	
78		0		2		2		2		1		0										1		2		0		0
77	1		1		0		0		0		1		0								1		0		3		4	
76		0		0		1		0		0		0						0		0		0		0		0		
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74				0		0		0		1		0		0		0		0		0		0		0		1		
73							0		2		0								3		0		0					
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71									1		0																	

Blue91	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											0																	
94								0		0																		
93					0		0		0		0		1															
92				1		0		0		0		1		0														
91			2		1		0		2		0		0		3													
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89	4		2		1		1		1		1		2		0													
88		0		1		1		0		2		1		0														
87			2		0		0		1		0		2		0	1												
86		4		2		2		0		1		1		1														
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84		3		2		1		0		0		1																
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82		1		1		0		0				0																
81	1		0		0		0		0																			
80		0		1		0		1																		0		
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76		1		0		1		0		0		0						1		0		0		0		0		
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74				0		0		0		3		0		0		0		0		0		0		0		0		
73							0		2		0								0		0		0					
72						1		0		1																		
71									4		0																	

Fireweed 74	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											0																	
94								0		0																		
93					0		0		0		0		0															
92				2		1		2		0		0		0														
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90		0		1		0		1		0		0		0														
89	1		1		0		0		4		0		0		0													
88		0		0		0		0		0		1		1														
87			1		0		0		0		0		1		0	0												
86		0		1		0		0		0		0		0														
85			0		3		0		0		3																	
84		0		0		0		0		0		2																
83			0		0		0																					
82		0		0		0		0				0																
81	0		0		0		0		0																			
80		0		1		0		0																		0		
79	0		0		0		1		1				0												0		0	
78		0		2		1		1		1		0										0		0		0		0
77	0		0		1		0		1		0		0								0		0		0		0	
76		0		0		1		0		1		2						0		0		0		1		0		
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74				0		0		1		0		0		0		0		0		0		0		0		0		
73							1		0		0								0		1		0					
72						0		1		0																		
71									0		0																	

Fire91	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											0																	
94								0		0																		
93					0		0		0		0		0															
92				0		0		1		0		0		0														
91			0		0		1		0		0		0		0													
90		0		0		0		0		0		0		0														
89	0		0		0		0		2		0		0		0													
88		0		0		0		0		0		0		0														
87			0		0		0		0		0		0		0	0												
86		0		0		1		0		0		0		0														
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84		0		0		0		0		0		0																
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82		0		0		0		0				0																
81	0		0		0		0		0																			
80		0		0		1		0																		0		
79	0		0		0		0		0				0												0		0	
78		0		0		0		0		1		0										0		0		0		0
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76		0		0		0		0		0		0						0		1		0		0		0		
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74				0		0		0		0		0		0		0		0		0		0		0		0		
73							0		0		0								0		0		0					
72						0		0		0																		
71									0		0																	

Nettle;74

	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	47
95											3																	
94								4		1																		
93					1		5		0		3		2															
92				1		3		1		0		1		3														
91			1		1		2		1		2		1		0													
90		2		1		1		4		3		3		1														
89	2		1		2		4		1		2		1		4													
88		0		3		1		1		5		3		1														
87			3		4		0		0		0		1		3	4												
86		1		4		0		3		1		2		1														
85			1		4		0		1		2																	
84		1		2		0		1		4		1																
83			0		1		0																					
82		1		0		0		0				0																
81	1		0		1		0		2																			
80		0		1		1		1																		1		
79	0		1		1		2		1				3												0		0	
78		1		1		2		0		1		1										0		0		1		[illegible]
77	2		1		1		1		1		2		1								1		0		1		3	
76		0		0		0		1		1		0						1		0		0		3		5		
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74				1		1		2		1		0		1		1		2		1		0		0		1		
73							1		0		2								3		0		3					
72						2		2		0																		
71									1		2																	

Nett91	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											2																	
94								2		2																		
93					2		4		1		3		1															
92				1		2		2		1		1		2														
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90		1		1		2		3		2		1		1														
89	1		1		0		2		3		1		2		2													
88		1		2		0		3		3		2		1														
87			2		5		1		1		1		0		2	2												
86		0		5		0		1		2		1		1														
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84		1		2		0		1		3		0																
83			0		1		0																					
82		0		0		0		0				1																
81	1		0		1		0		1																			
80		0		1		1		1																		3		
79	0		1		0		1		1				2												3		0	
78		1		1		2		0		1		3										2		2		1		1
77	3		1		1		1		1		3		2								2		0		2		1	
76		0		0		0		1		1		1						2		1		0		1		3		
75			0		1		0		0		2		2		1		3		2		2		2		3		2	
74				1		0		3		1		0		1		2		1		1		1		2		4		
73							1		0		3								1		2		3					
72						3		0		0																		
71									2		2																	

Dog's mercury

74

	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											0																	
94								4		1																		
93					5		1		0		3		3															
92				3		4		4		1		5		3														
91			5		2		2		2		2		2		2													
90		5		1		1		3		3		1		2														
89	4		2		4		3		0		5		2		1													
88		5		5		5		5		4		5		1														
87			4		1		4		4		5		3		4	4												
86		2		4		2		3		1		4		5														
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84		2		4		4		3		3		2																
83			0		3		2																					
82		2		2		0		5				1																
81	3		0		4		1		5																			
80		0		0		2		3																		2		
79	1		4		0		1		2				2												1		0	
78		2		0		1		1		1		5										5		3		1		1
77	3		4		2		4		0		2		0								5		0		0		1	
76		4		1		1		0		3		0						5		0		0		3		2		
75			4		1		1		1		5		4		4		4		0		5		2		4		4	
74				1		1		2		0		1		2		3		2		0		0		0		3		
73							1		1		2								5		0		5					
72						4		2		0																		
71									1		3																	

Dogs91

	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
95											4																	
94								2		2																		
93					5		1		1		2		3															
92				2		1		1		0		3		2														
91			4		2		0		2		3		2		4													
90		4		2		2		3		3		1		3														
89	4		2		4		4		0		2		4		1													
88		3		4		5		4		4		3		2														
87			3		3		4		5		2		3		3	3												
86		1		3		4		4		3		5		4														
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84		2		4		4		2		2		2																
83			0		5		1																					
82		2		2		0		5				2																
81	3		0		5		2		4																			
80		0		0		2		4																		3		
79	0		3		0		1		2				0												2		1	
78		1		0		0		1		0		3										2		3		3		0
77	1		2		3		2		0		2		0								0		0		2		0	
76		2		1		1		1		2		0						4		0		4		2		2		
75			1		2		1		1		1		4		3		3		0		2		0		1		0	
74				2		0		1		0		0		2		2		4		1		0		1		4		
73							1		0		2								1		4		1					
72						3		0		0																		
71									0		1																	