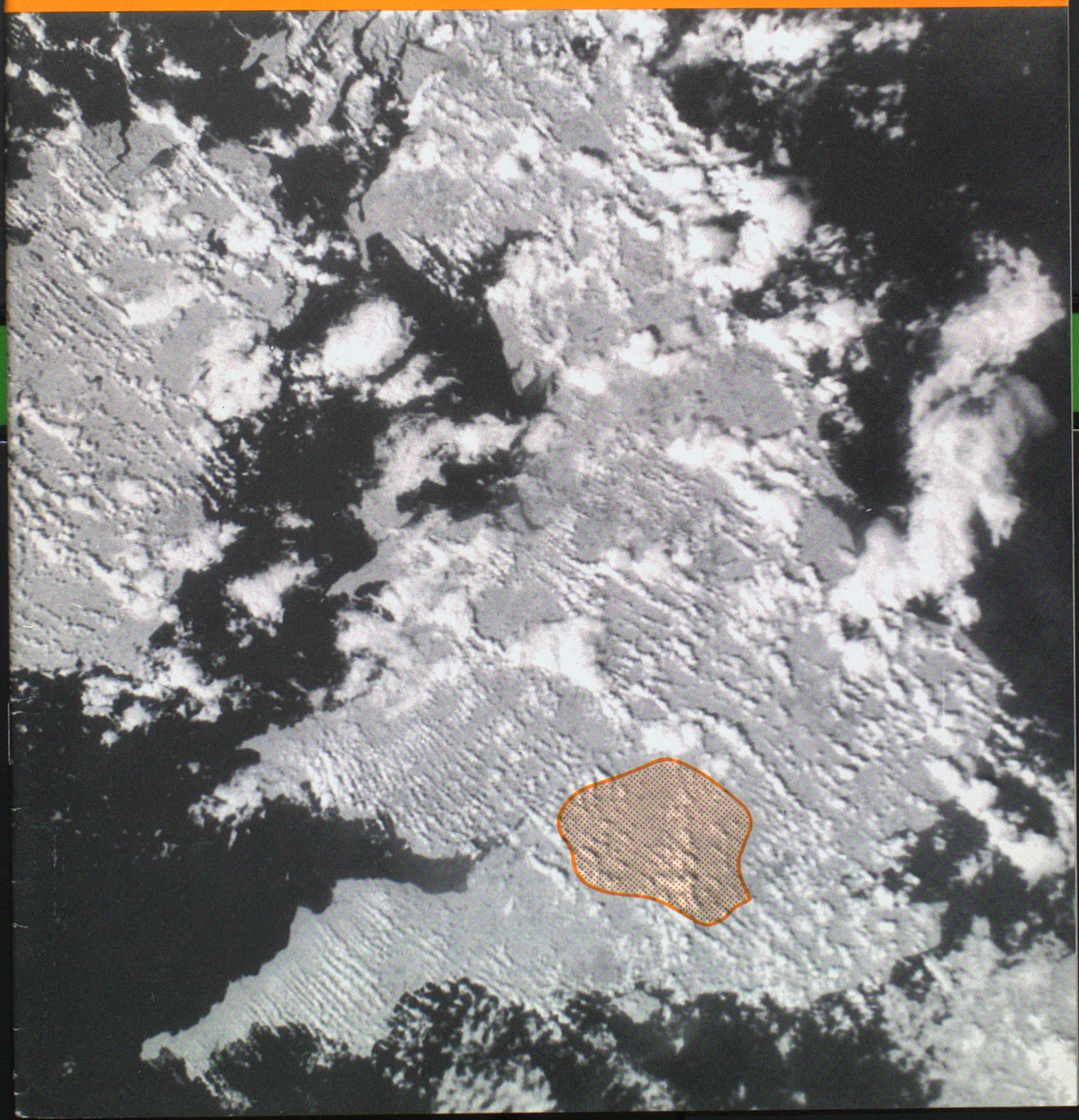
THE CLIMATE OF GREAT BRITAIN

THE THAMES VALLEY

Climatological Memorandum 134



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The front cover shows a view of England and Wales from the satellite Tiros N taken at 1518 GMT on Wednesday 2 April 1980 – photograph by courtesy of the Department of Electrical Engineering and Electronics, University of Dundee.

An anticyclone was positioned to the south-west of the British Isles and a showery north-westerly airstream covered Britain. The cloud 'streets' of cumulus cloud are well seen, with larger cumulonimbus clouds in places. The Thames Valley enjoyed long sunny periods (more than 10 hours) with scattered showers in the late afternoon and isolated thunderstorms over the Chilterns.

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Climatological Memorandum 134

The Thames Valley

INTRODUCTION

This memorandum is one of a series which will cover the whole of Great Britain and seeks to present the main features of the climate of the area in a form suitable for use in schools and by members of the general public.

There is an Introduction to the series (Climatological Memorandum 113) which explains how the various weather elements are measured and defines some of the more common terms.

Industrial and commercial interests who are concerned with meteorological information for planning and design will probably require more complex analyses of the available data, and details of the services offered by the Meteorological Office to meet those needs are given on page 16.

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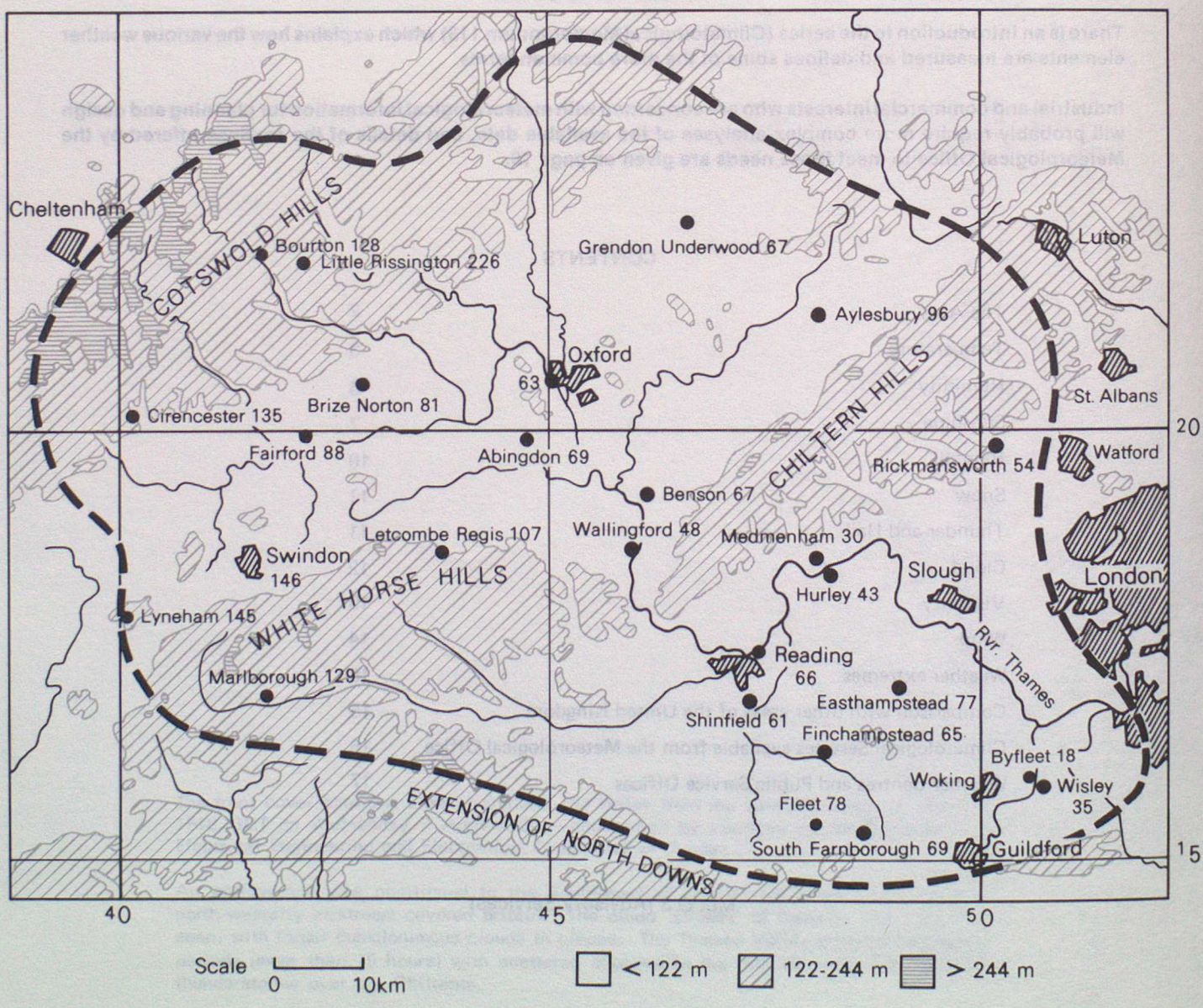
THE AREA

This memorandum describes the main features of the climate of the Thames Valley to the west of London. The area is contained between the chalk or limestone uplands of the Cotswold Hills to the west and north and the extension of the North Downs to the south. The high ground of the Chilterns and the White Horse Hills on either side of the Goring Gap divides the area into two parts. The upper basin centred round Oxford and extending westward to about Cirencester consists mostly of clay soils and is largely agriculturally based, although some industry has been established in Oxford and Swindon. The lower basin east of Goring to the borders of Greater London and including the Kennet Valley is mainly clay with gravel overlaid with river alluvium in places. This area which traditionally provided London with its market garden produce is now becoming increasingly urbanized. It includes the towns of Reading, Bracknell, Slough and Aldershot and the overspill from London.

The Cotswolds rise to about 300 m but on the eastern side are broken up by numerous small valleys. The upper basin is mainly about 60–100 m above sea level. The Chilterns rise in a steep escarpment on their western side to about 250 m, while the North Downs extension into the White Horse Hills has more rounded slopes and rise to about 300 m at Inkpen Beacon, south of Newbury and in the west. The altitude of the lower basin varies from about 25 m to 75 m. The map below shows the topography of this area and the locations and altitudes of the weather reporting stations used in this report.

Tables for Abingdon given in this memorandum include data from Benson (a few miles to the east) from 1975 to complete a period of record where necessary.

Topography of the Thames Valley and locations and altitudes (in metres) of the stations. Co-ordinates are national grid references.



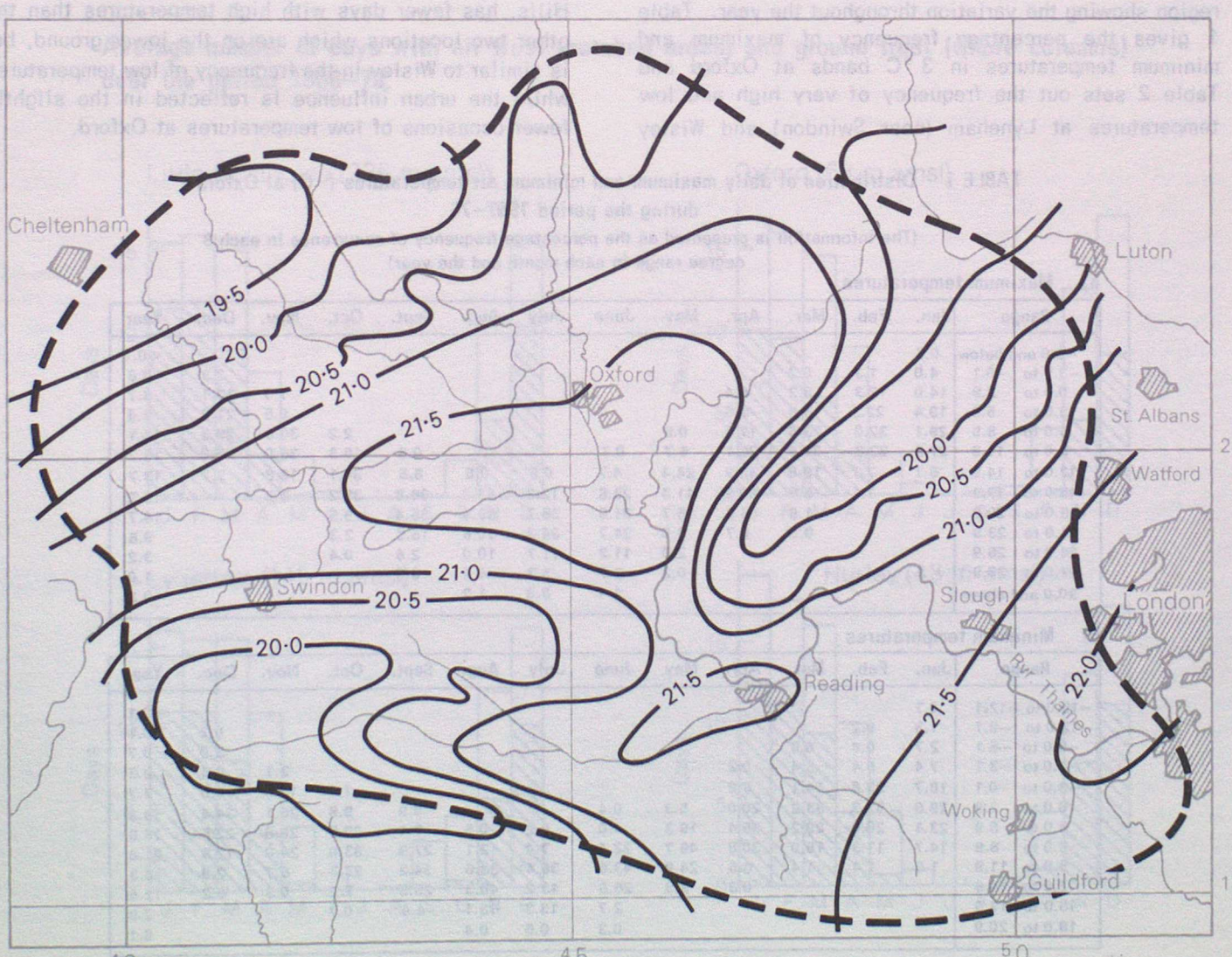
TEMPERATURE

This region in the centre of southern England is surrounded by hills which lessen the influence of the sea. However, south-west winds blowing up the Bristol Channel, although mostly diverted up the Severn valley, can penetrate directly over the southern tip of the Cotswolds bringing moist air into the western part of the region. Also the lower basin is to a certain extent open to the Thames estuary and can be affected by easterly winds from the North Sea, which often predominate for periods in the spring. All have their effect on the temperature.

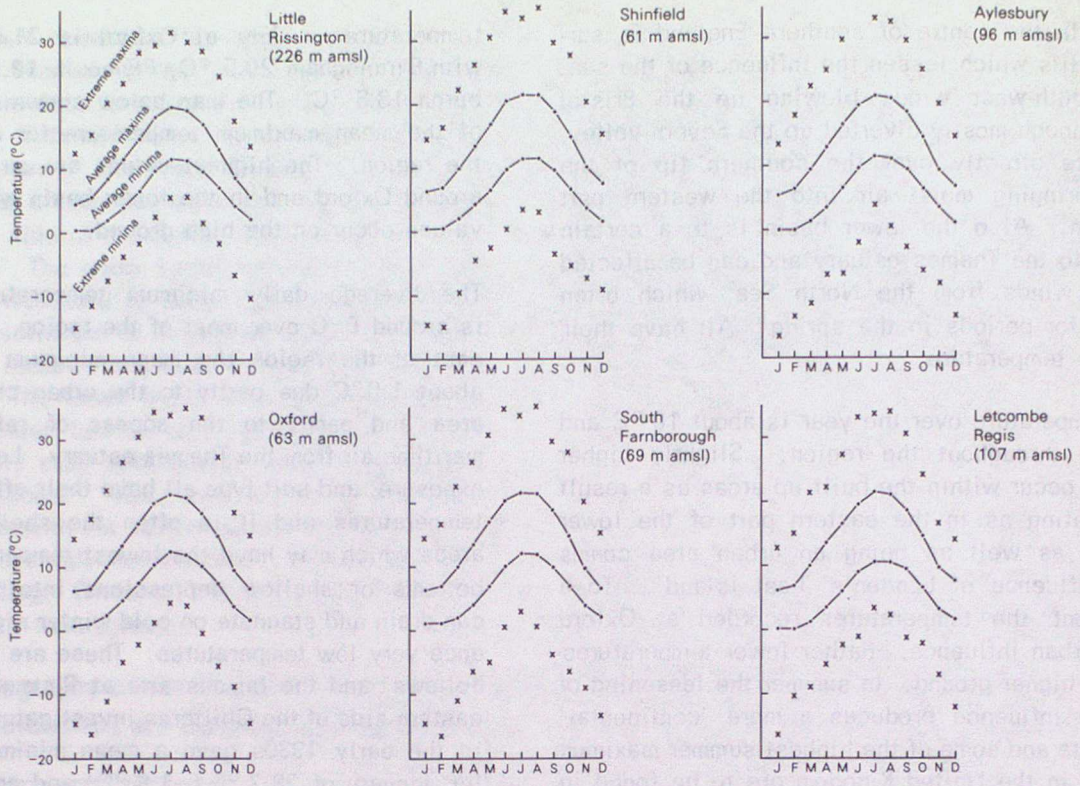
The mean temperature over the year is about 10 °C and varies little throughout the region. Slightly higher mean values occur within the built up areas as a result of urban heating as in the eastern part of the lower basin which as well as being an urban area comes under the influence of London's 'heat island'. To a smaller extent the temperatures recorded at Oxford reflect the urban influence. Rather lower temperatures occur on the higher ground. In summer the lessening of the maritime influence produces a more 'continental' type of climate and some of the highest summer maximum temperatures in the United Kingdom are to be found in this region. For example the mean daily maximum temperature in July at Oxford is 21.5 °C compared with Birmingham 20.5 °C, Plymouth 19.0 °C and Edinburgh 18.5 °C. The map below shows the distribution of the mean maximum temperature for July throughout the region. The highest values are on the low ground around Oxford and in the lower basin while the lowest values occur on the high ground.

The average daily minimum temperature in January is around 0°C over most of the region. In the extreme east of the region the mean minimum temperature is about 1.0°C due partly to the urban character of this area and partly to the access of relatively warmer maritime air from the Thames estuary. Local topography, exposure, and soil type all have their effect on minimum temperatures and it is often the sheltered low-lying areas which may have the lowest temperatures. Valley bottoms or shallow depressions into which cold air can drain and stagnate on cold winter nights can experience very low temperatures. These are known as 'frost hollows' and the famous site at Rickmansworth on the eastern side of the Chilterns investigated by E.L. Hawke in the early 1930s gave a mean minimum temperature for January of 28.7 °F (–1.8 °C) and an extreme value of 15 °F (–9.5 °C).

Average daily maximum temperature (°C) in July over the period 1941–70.



Annual variation of maximum and minimum temperature over the period 1941–70 with extreme temperatures for periods up to 1979.



The diagram above gives the monthly mean and extreme temperatures for a selection of places throughout the region showing the variation throughout the year. Table 1 gives the percentage frequency of maximum and minimum temperatures in 3 °C bands at Oxford and Table 2 sets out the frequency of very high and low temperatures at Lyneham (near Swindon) and Wisley (near Guildford) compared with Oxford. Lyneham, which is high on the western spur of the White Horse Hills, has fewer days with high temperatures than the other two locations which are on the lower ground, but is similar to Wisley in the frequency of low temperatures while the urban influence is reflected in the slightly fewer occasions of low temperatures at Oxford.

TABLE 1 Distribution of daily maximum and minimum air temperatures (° C) at Oxford during the period 1957–76

(The information is presented as the percentage frequency of occurrence in each 3 degree range in each month and the year)

a) **Maximum temperatures**

Range	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
−3.0 and below	0.5												<0.1
−3.0 to −0.1	4.0	1.3	0.2									2.3	0.6
0.0 to 2.9	14.0	12.3	3.2	0.4							1.9	13.1	3.7
3.0 to 5.9	19.4	22.3	13.8	2.5							9.5	21.8	7.4
6.0 to 8.9	29.1	32.0	23.6	11.2	0.6					2.2	30.6	29.3	13.1
9.0 to 11.9	27.9	23.3	31.6	25.1	6.7	0.7			0.9	16.3	36.0	25.8	16.2
12.0 to 14.9	5.1	7.7	19.8	32.9	24.4	4.7	0.5	0.5	8.5	34.1	18.8	7.7	13.7
15.0 to 17.9		1.1	5.8	20.9	41.4	23.8	12.3	13.2	36.8	35.2	3.2		16.2
18.0 to 20.9			1.5	6.3	15.7	31.0	35.7	39.9	35.4	9.5			14.7
21.0 to 23.9			0.5	0.7	9.0	24.7	34.2	30.8	15.3	2.3			9.8
24.0 to 26.9					2.0	11.2	11.7	10.0	2.6	0.4			3.2
27.0 to 29.9					0.2	2.7	3.3	4.4	0.8				1.0
30.0 and above						1.4	2.3	1.2					0.3

b) **Minimum temperatures**

Range	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
−15.0 to −12.1	0.7												<0.1
−12.0 to −9.1	1.3	0.2										0.2	0.1
−9.0 to −6.1	2.7	0.8	0.6									2.9	0.7
−6.0 to −3.1	7.4	5.4	5.4	0.2							2.1	8.4	2.3
−3.0 to −0.1	18.7	23.6	14.1	6.8						1.1	13.0	15.9	7.7
0.0 to 2.9	29.6	37.3	33.2	20.0	5.3	0.4			0.9	9.8	26.1	34.4	16.3
3.0 to 5.9	23.4	20.0	29.2	35.4	19.3	4.0	0.2	0.5	7.1	20.5	28.8	22.5	17.6
6.0 to 8.9	14.7	11.3	15.9	30.8	46.7	22.4	7.4	12.1	27.9	33.0	24.0	12.6	21.6
9.0 to 11.9	1.5	1.4	1.4	6.5	24.9	43.6	35.4	33.6	34.2	27.7	5.7	2.9	18.3
12.0 to 14.9				0.3	3.8	26.6	43.2	40.3	25.5	7.2	0.3	0.2	12.4
15.0 to 17.9						2.7	13.3	13.1	4.4	0.7			2.9
18.0 to 20.9						0.3	0.5	0.4					0.1

TABLE 2 Average number of days (1957–76) with maximum and minimum temperatures exceeding certain limits at selected sites in the Thames Valley

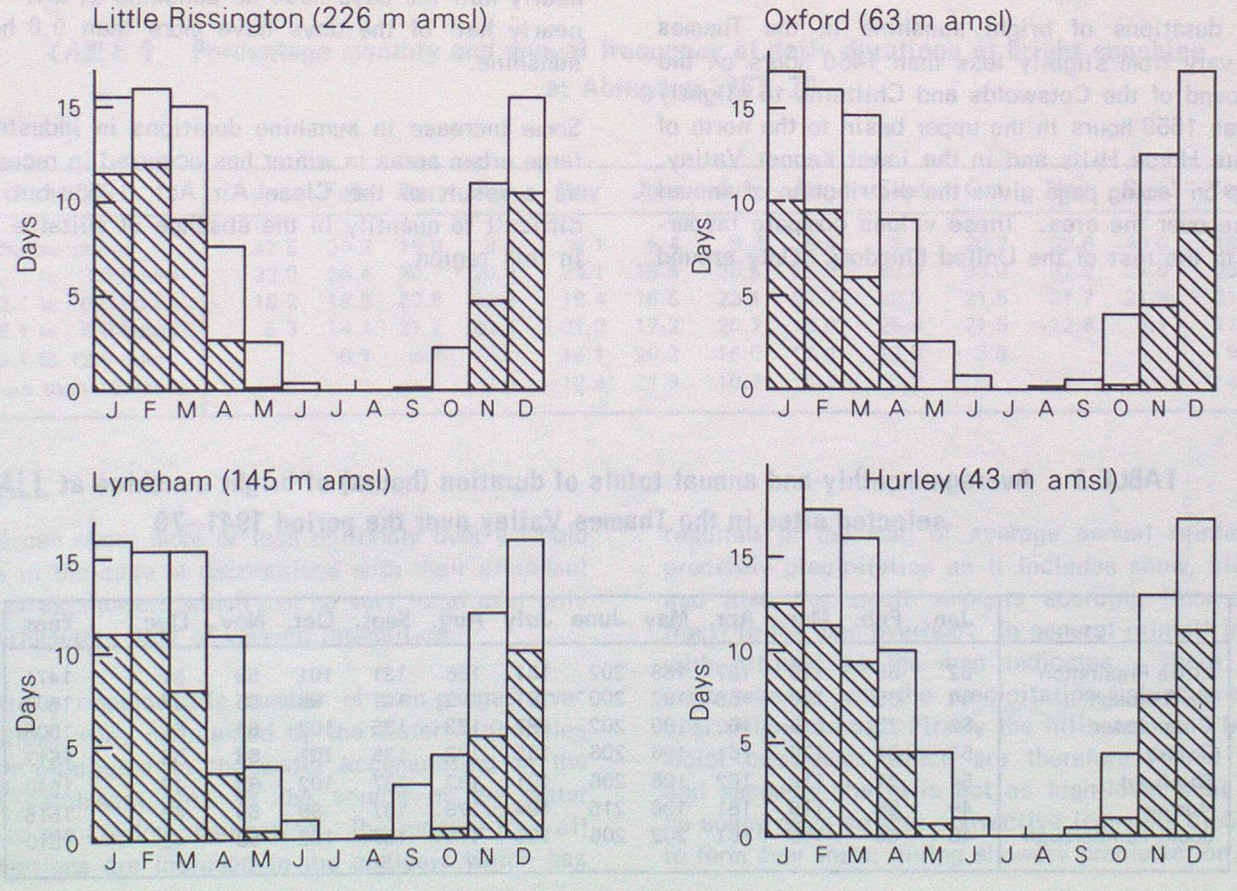
Maximum temperature	25.0 °C or more						30.0 °C or more		
	May	June	July	Aug.	Sept.	Oct.	June	July	Aug.
Wisley	0.7	4.0	5.1	4.2	1.1	0.1	0.3	0.8	0.5
Oxford	0.5	3.3	4.3	3.9	0.8	0.1	0.4	0.7	0.3
Lyneham	0.1	1.9	2.7	2.5	0.5	0.1	0.3	0.3	0.2

Minimum temperature	less than –5.0 °C					less than –10.0 °C
	Nov.	Dec.	Jan.	Feb.	Mar.	Jan.
Wisley	0.3	1.9	2.0	0.7	0.6	0.2
Oxford	0.1	1.3	1.9	0.3	0.5	0.3
Lyneham	0.1	1.7	2.2	1.2	0.8	0.3

The diagram below gives the average number of occasions of air frost (a minimum air temperature of less than 0 °C) and ground frost (a minimum temperature on a grass surface of less than 0 °C) over a 23-year period.

Generally over the whole valley there are between 50 and 60 days a year with air frost. Urban areas will have rather fewer frosts than the surrounding countryside; for example Oxford has 42 days with frost compared with Abingdon 52 days. The frequency of frosts can vary over short distances, local variations in topography and shelter having considerable effect. Sites in valley bottoms or at the bottom of slopes, as for example Aylesbury below the Chiltern escarpment, will have a greater frequency of frost than open well-ventilated sites on the tops of the hills. Medmenham which has on average 73 days with frost and is situated at the bottom of the Chiltern slopes is in marked contrast to Hurley (53 days/year) on the opposite side of the river in a more open level area.

Average number of days with air frost (hatched areas) and ground frost (whole columns) over the period 1956–78.



Ground frosts occur on about 80–120 days a year generally over the region. However, as with air frost there can be considerable variation locally. These figures refer to conditions over a grass-covered surface, but in recent years observations have also been made of minimum temperatures on a concrete slab. These minimum temperatures are normally higher than those over grass and in the Thames Valley region it is estimated that on average there are rather less than twice the number of frosts over grass than on a concrete or tarmacadam surface.

Temperatures below the ground surface depend on the nature of the soil. The diurnal variations can be discerned down to about 60 cm in summer months. Sandy soils have relatively low thermal capacity and conductivity but clay soils which retain more moisture than most other soils have higher thermal capacities and conductivities. As a result temperature changes near the surface are larger on sandy soils but long-term temperature changes penetrate more deeply in clay soil. In cold weather freezing temperatures are rarely found below 30 cm. However, a temperature of –1.6 °C was recorded at 30 cm depth at Hurley in 1963.

SUNSHINE

The duration of bright sunshine shows a marked seasonal variation partly because the length of day increases from winter to summer. In the Thames Valley sunshine varies from about 1.5 hours a day on average in December, which is about 18 per cent of the possible amount, to about 7 hours a day on average in June, about 42 per cent of the possible amount. Table 3 gives the average monthly durations of sunshine for a selection of places throughout the region.

Annual durations of bright sunshine in the Thames Valley vary from slightly less than 1450 hours on the high ground of the Cotswolds and Chilterns to slightly more than 1550 hours in the upper basin to the north of the White Horse Hills and in the lower Kennet Valley. The map on facing page gives the distribution of annual sunshine over the area. These values compare favourably with the rest of the United Kingdom. Only around the coasts of southern England and Wales do appreciably higher durations occur; for example Bournemouth has 1747 hours a year on average. Figures for other parts of Britain include Edinburgh 1370 hours, Manchester 1334 hours and Exeter 1554 hours.

Table 4 gives the percentage frequency of various ranges of sunshine duration at Abingdon, south of Oxford. In the winter months of December and January nearly half the days have no sunshine at all. In June nearly half of the days have more than 9.0 hours of sunshine.

Some increase in sunshine durations in industrial and large urban areas in winter has occurred in recent years as a result of the Clean Air Act, 1956, but this is difficult to quantify in the absence of suitable records in this region.

TABLE 3 Average monthly and annual totals of duration (hours) of bright sunshine at selected sites in the Thames Valley over the period 1941–70

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Little Rissington	52	68	116	157	188	202	181	166	131	101	58	51	1471
Marlborough	44	65	120	168	192	200	191	182	141	98	55	47	1503
Cirencester	52	75	117	162	190	202	187	173	135	102	63	51	1509
Oxford	53	71	120	161	196	206	185	173	135	101	63	53	1517
Shinfield	54	71	115	162	198	206	191	182	137	102	63	49	1540
Hurley	49	68	115	161	196	215	194	179	137	99	59	43	1515
South Farnborough	48	66	116	161	202	206	193	179	137	102	58	42	1510

Average annual sunshine duration (hours) over the period 1941–70.

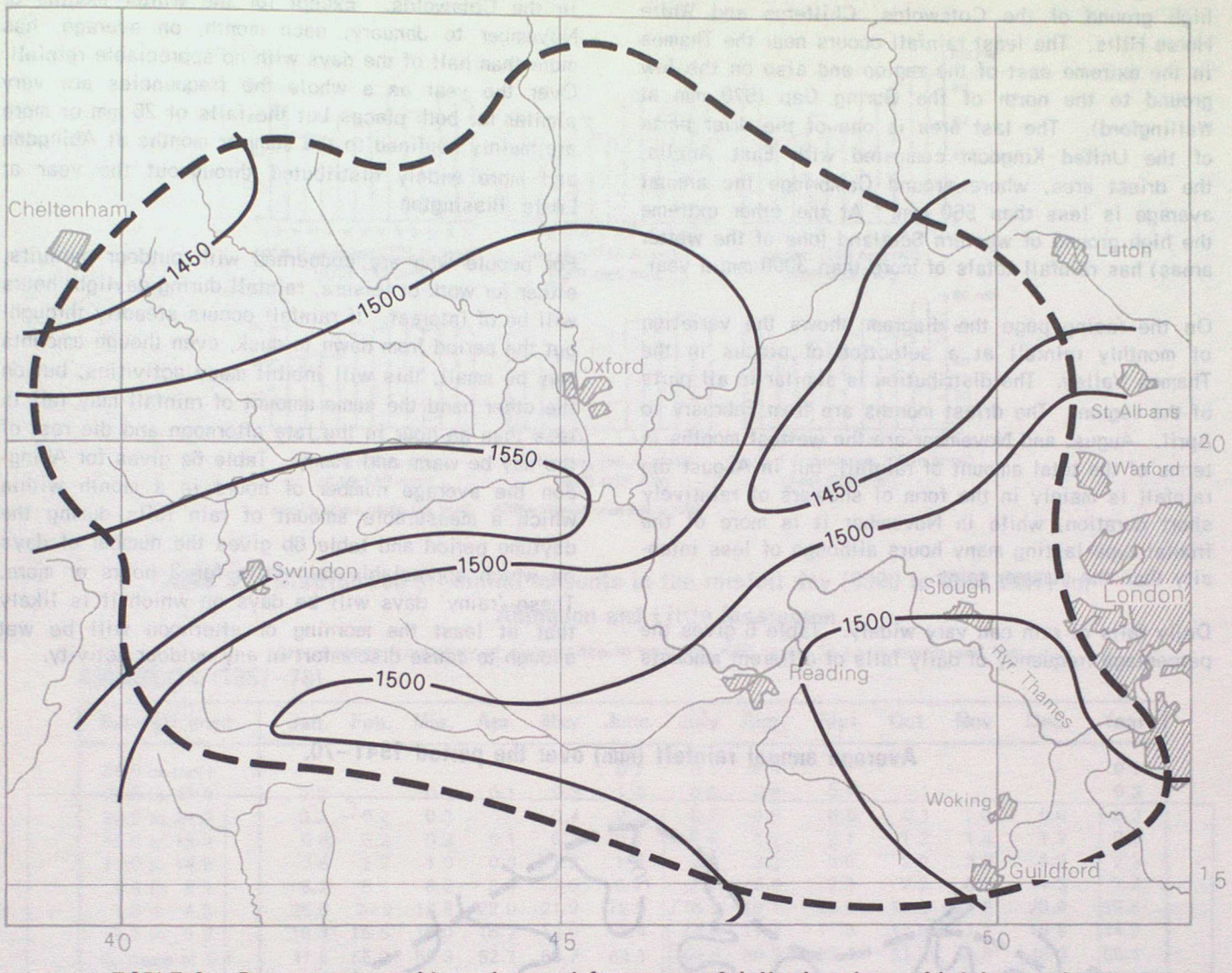


TABLE 4 Percentage monthly and annual frequency of daily durations of bright sunshine at Abingdon 1957–76

Duration	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
No sunshine	42.5	30.2	19.0	9.8	6.1	5.4	3.7	5.4	8.3	20.2	32.6	40.0	18.5
0.1 to 3.0 hours	33.0	36.4	30.7	30.9	24.1	18.8	25.8	25.0	30.0	33.0	32.9	34.0	29.5
3.1 to 6.0 hours	18.2	18.3	20.9	22.3	19.4	16.5	23.1	27.7	22.6	21.5	21.7	21.9	21.2
6.1 to 9.0 hours	6.3	14.4	21.2	20.2	21.9	17.2	20.7	18.0	25.9	21.5	12.8	4.1	17.0
9.1 to 12.0 hours		0.7	8.2	13.8	16.1	20.2	16.0	17.8	13.0	3.8			9.2
More than 12 hours				3.0	12.4	21.9	10.7	6.1	0.2				4.6

RAINFALL

Rainfall can occur more or less uniformly over a whole area as in the case of depressions with their attendant fronts, or as showers which can be very local over only a few kilometres, and of varying intensities.

There are a considerable number of rain-gauges over this region, many maintained by the Water Authorities who are interested in the water accumulating in the Thames catchment area as the source of the water supply to the London conurbation. The records from all these stations are included in the analysis which has resulted in the map of average annual rainfall (more precisely precipitation as it includes snow, sleet, hail and also the small amounts accruing from dew and frost) in the map overleaf. In general rainfall increases with altitude as the map indicates. There are two main reasons why the precipitation values are greater over upland areas. Firstly the hills act as a barrier to moist airstreams which are therefore forced to rise, and secondly the hills act as high-level heat sources on sunny days so that convective (cumulus clouds) tend to form over them, giving showery precipitation.

The highest values in excess of 800 mm occur on the high ground of the Cotswolds, Chilterns and White Horse Hills. The least rainfall occurs near the Thames in the extreme east of the region and also on the low ground to the north of the Goring Gap (570 mm at Wallingford). The last area is one of the drier parts of the United Kingdom compared with East Anglia, the driest area, where around Cambridge the annual average is less than 550 mm. At the other extreme the high ground of western Scotland (one of the wetter areas) has rainfall totals of more than 3000 mm a year.

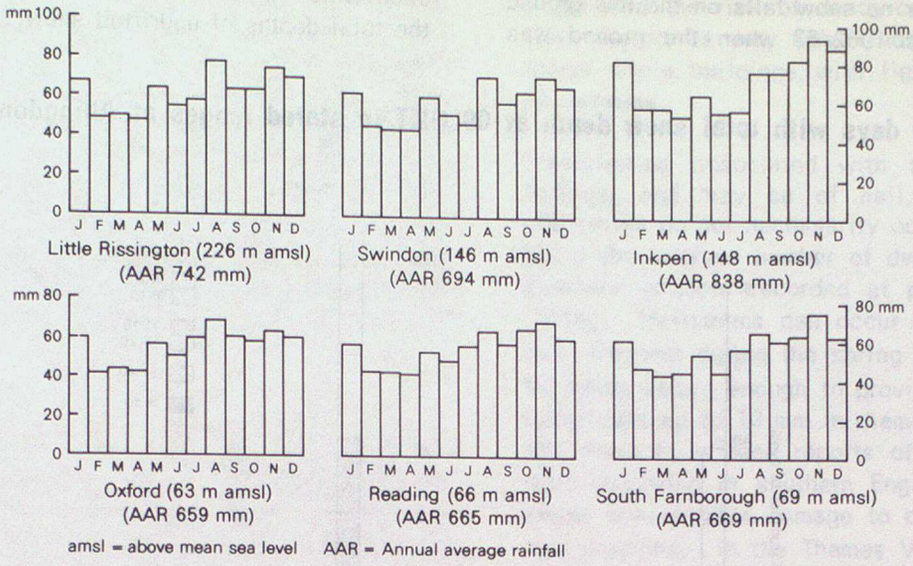
On the facing page the diagram shows the variation of monthly rainfall at a selection of places in the Thames Valley. The distribution is similar in all parts of the region. The driest months are from February to April. August and November are the wettest months in terms of the total amount of rainfall, but in August the rainfall is mainly in the form of showers of relatively short duration, while in November it is more of the frontal type lasting many hours although of less intensity than the summer rains.

Daily falls of rain can vary widely. Table 5 gives the percentage frequency of daily falls of different amounts at Abingdon on the low ground and at Little Rissington in the Cotswolds. Except for the winter months of November to January, each month, on average, has more than half of the days with no appreciable rainfall. Over the year as a whole the frequencies are very similar for both places but the falls of 25 mm or more are mainly confined to the summer months at Abingdon and more widely distributed throughout the year at Little Rissington.

For people who are concerned with outdoor pursuits, either for work or leisure, rainfall during daylight hours will be of interest. If rainfall occurs steadily throughout the period from dawn to dusk, even though amounts may be small, this will inhibit many activities; but on the other hand the same amount of rainfall may fall in less than an hour in the late afternoon and the rest of the day be warm and sunny. Table 6a gives for Abingdon the average number of hours in a month within which a measurable amount of rain falls during the daytime period and table 6b gives the number of days on which appreciable rain falls for 2 hours or more. These 'rainy' days will be days on which it is likely that at least the morning or afternoon will be wet enough to cause discomfort in any outdoor activity.

Average annual rainfall (mm) over the period 1941–70.

Average monthly rainfall (mm) over the period 1941–70.



amsl = above mean sea level AAR = Annual average rainfall

TABLE 5 Distribution of rainfall amounts in the rainfall day (0900 to 0900 GMT) for Abingdon and Little Rissington

(percentage frequency of occurrence in each rainfall range in each month and the year)

ABINGDON (1957–78)

Rainfall (mm)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
50.0 or more						0.2	0.1	0.4					0.1
25.0 to 49.9	0.2		0.1	0.1	0.2	1.4	0.6	0.4	0.1				0.3
20.0 to 24.9	0.2	0.2	0.3		0.4	0.3	0.2	0.6	0.5	0.1	1.0	0.6	0.3
15.0 to 19.9	0.5	0.2	0.3	0.1	0.7	0.6	0.6	1.2	2.1	1.2	1.4	1.2	0.9
10.0 to 14.9	2.6	2.2	1.0	0.3	1.5	1.4	2.9	3.2	3.0	2.9	3.2	1.9	2.3
5.0 to 9.9	8.2	5.9	6.2	8.6	7.6	6.7	7.0	5.4	7.3	7.3	6.7	11.3	7.2
1.0 to 4.9	25.0	20.8	19.8	22.0	21.9	12.9	16.0	18.1	15.8	18.5	21.8	20.9	19.5
0.2 to 0.9	16.3	15.5	16.0	16.2	12.0	12.4	12.0	11.4	11.5	12.8	17.1	15.8	14.0
0, trace or 0.1	47.0	55.2	56.3	52.7	55.7	64.1	60.6	59.3	59.7	57.2	48.8	48.3	55.4

LITTLE RISSINGTON (1957–75)

Rainfall (mm)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
50.0 or more						0.3	0.2	0.2					0.1
25.0 to 49.9	0.3	0.3		0.2	0.3	1.1	0.4	1.1	0.3	0.2	0.3	0.7	0.4
20.0 to 24.9	0.5	0.4	0.5	0.3	0.3	0.5	0.5	0.3	1.2	0.2	0.7	0.7	0.5
15.0 to 19.9	1.6	1.1	1.0	0.2	0.9	0.9	0.9	1.4	1.1	0.8	1.8	1.7	1.1
10.0 to 14.9	4.2	2.3	2.4	1.8	1.2	1.8	3.9	3.2	3.0	3.4	3.7	3.4	2.9
5.0 to 9.9	10.2	7.8	7.1	9.7	9.7	7.7	8.2	7.5	9.3	8.0	7.9	9.3	8.5
1.0 to 4.9	24.2	20.5	17.4	22.2	19.7	15.8	16.8	18.9	16.5	19.4	22.6	20.5	19.6
0.2 to 0.9	12.9	15.6	16.3	11.8	15.1	9.8	10.7	11.4	13.0	15.8	18.1	16.1	13.9
0, trace or 0.1	46.1	52.0	55.3	53.8	52.8	62.1	58.4	56.0	55.6	52.2	44.9	47.6	53.0

TABLE 6a Average number of hours in a month in which measurable rain fell at Abingdon 1970–78 within the period 0700–1700 GMT

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
42	33	32	29	28	22	16	26	24	30	32	30	344

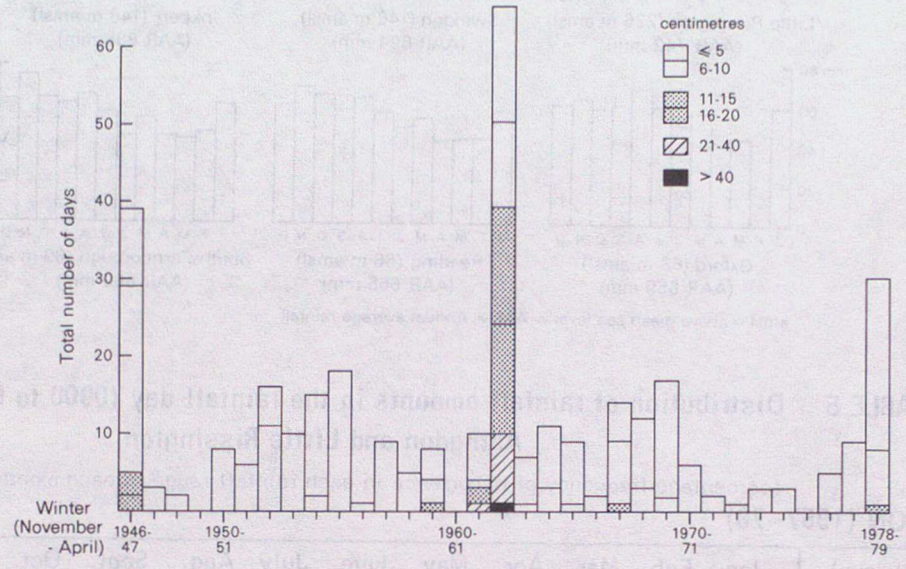
TABLE 6b Average number of 'rainy' days at Abingdon 1970–78 (days with accumulated rainfall duration of at least 2 hours, ignoring hours with less than 0.2 mm of rain, within the period 0700–1700 GMT)

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
4.6	2.3	3.0	2.5	2.3	1.9	1.4	2.0	2.3	2.7	3.1	2.8	30.9

SNOW

Snowfall is one of the most variable of meteorological elements both in amount and in duration. There can be winters when little or no snow falls on the low ground and others, such as 1962/63 when the ground was covered by snow for more than 2 months. The diagram below shows the variation of snow cover at Abingdon each winter since 1946/47 and also the frequency of the total depths of undrifted snow.

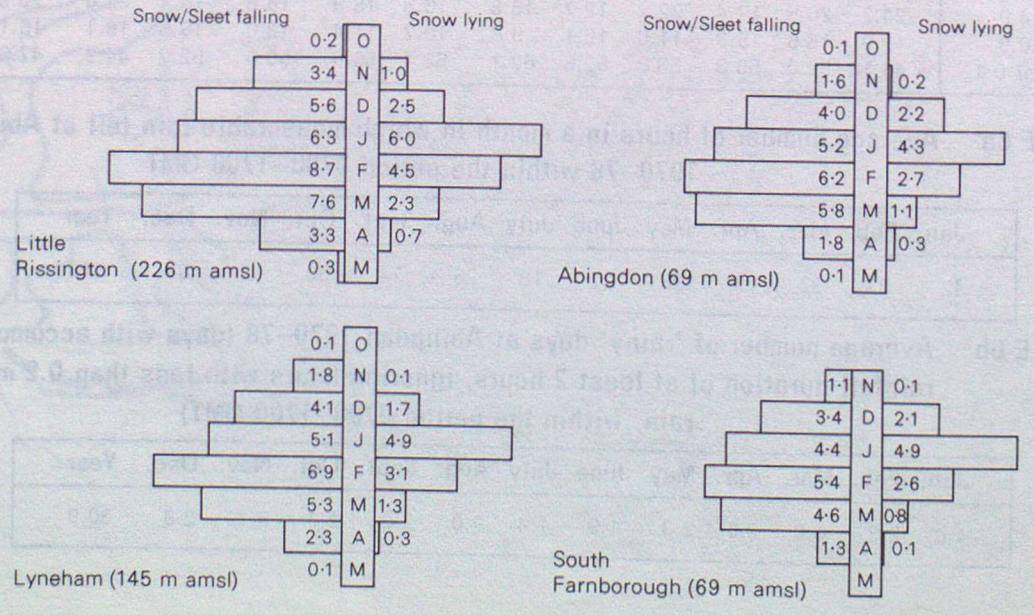
Number of days with total snow depth at 09 GMT in stated ranges at Abingdon/Benson.



In most years snow is not a great problem in the Thames Valley but on occasions a heavy fall accompanied by strong winds which cause drifting can seriously hamper transport and communications for a short time.

The altitude is an important factor governing where the precipitation will turn to sleet or snow and also the persistence of the snow cover. In the Thames Valley there are, on average, about 25 days a year when snow or sleet falls on the low ground and this rises to 35–40 days on the high ground. Snowfall is normally confined to November to April, but in about 2 years in 10 snow occurs in May. Snow remains lying on the ground for about 12 days a year on average in the lower basin and on about 15 days in the upper basin. On the hills snow lies for more than 20 days in an average winter. The diagram below shows the number of days a month when snow or sleet falls and when snow lies on the ground at 09 GMT at a selection of places. A day of snow lying is defined as one when more than half of the ground is covered by snow.

Average number of days per month with (a) snow/sleet falling, and (b) snow/sleet lying, over the period 1961–75 at selected sites.



THUNDER AND HAIL

Thunderstorms can occur in the Thames Valley area at any time of the year, but they are more frequent during May to September. The incidence varies considerably from year to year but on average there are about 10–15 days a year with thunder, although over the north Chilterns as many as 20 days a year may occur. This region together with parts of north Staffordshire and north Norfolk has a high frequency of thunder. The most frequent occur in the summer months over the Trent river basin, the southern parts of the Vale of York and East Anglia. Places which have the least number of thunderstorms are the extreme south-west of England and Wales and the coastal areas of west and north Scotland.

In this region thunderstorms are most likely to occur during the afternoon or just after midnight, and are least frequent in the early morning. Night-time thunderstorms are most frequent in July. Table 7 gives the average number of days on which thunder is heard at a selection of places in the Thames Valley.

Although there is danger from lightning flashes which strike to the earth, damage to buildings is usually slight and the risk of death caused by lightning in open country is very small indeed, and even less in towns where buildings with lightning conductors act as screens.

Precipitation associated with thunderstorms can be intense, and may be of hail, although these two phenomena do not necessarily occur together. Table 8 gives the average number of days with hail of 5 mm diameter or more recorded at places in the Thames Valley. Hailstorms can occur in any month but are most frequent during the spring when solar heating is becoming strong enough to provide enough convection. Hailstones up to 10 mm in diameter are not uncommon and there have been reports of stones of 50 mm or more occurring in southern England. Large hail can cause considerable damage to crops and glasshouses on occasions; in the Thames Valley region it is estimated that there are 1 or 2 damaging hailstorms per 100 square miles per 100 years.

TABLE 7 Average number of days in each month and the year with thunder 1961–75 for selected sites in the Thames Valley

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Little Rissington	0.2	0.1	0.1	0.7	2.3	1.7	2.5	2.3	0.8	0.3	0.4	0.2	11.6
Abingdon	0.3	0.3	0.4	0.9	2.4	2.3	2.4	2.2	1.1	0.5	0.3	0.1	13.2
Lyneham	0.5	0.3	0.3	0.9	1.4	2.1	2.5	1.8	0.8	0.3	0.5	0.2	11.6

TABLE 8 Average number of days in each month and the year with hail of 5 mm diameter or more 1961–75 for selected sites in the Thames valley

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Little Rissington	0.7	0.8	1.2	1.6	0.7	0.4	0.3	0.1	0.1	0.3	0.3	0.5	7.0
Abingdon	0.6	1.1	1.2	1.7	0.8	0.3	0.1		0.1	0.1	0.2	0.2	6.4
South Farnborough	0.2	0.1	1.3	1.0	0.6	0.3	0.1	0.1	0.1	0.3	0.1	0.1	4.3

CLOUD

Cloud amount is the estimated fraction of the sky covered by cloud and is reported in eighths. In general the frequency distribution of total cloud amount follows roughly a J-shaped curve, i.e. the most frequent occurrences are at the ends of the distribution (0/8, clear skies and 8/8, total cloud cover) and the lowest frequency is in the middle where the mean value occurs. The diagram alongside showing total cloud amount at Abingdon in December is a good example of this type of distribution.

The mean cloud amount in this region is between 5/8 and 6/8, though these amounts occur for only 8 per cent of the time. There is rather more cloud during daylight hours than by night owing to the solar heating which gives rise to the development of convective (cumulus) cloud. Table 9 overleaf shows the frequency of different categories of cloud amount throughout the year at Abingdon. Generally there are cloudy skies (7–8/8) for more than half of the time both by day and by night, with cloudy conditions being more frequent in the winter months than in the summer. Clear skies (0–2/8) are about twice as frequent at night as by day, though June is particularly outstanding for clear skies during daylight hours. The figures for Abingdon will be broadly applicable to the low-lying areas of the Thames Valley. The higher ground will have a slightly higher frequency of cloudy conditions which is also reflected in the lower sunshine figures in these areas as discussed in an earlier section.

Frequency of total cloud amount at Abingdon for December over the period 1957–76.

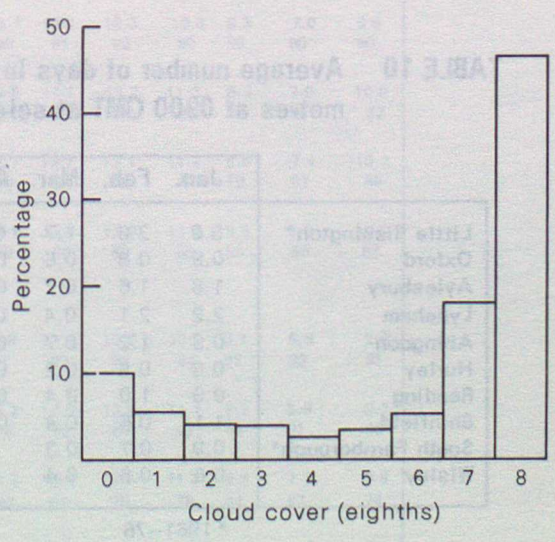


TABLE 9 Percentage monthly and annual frequency of total cloud amount in selected bands at Abingdon 1957–76

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
	Daylight hours												
Eighths													
0–2	11.5	11.0	14.1	12.2	11.0	16.5	12.5	14.7	15.2	13.0	13.1	13.1	13.3
3–6	17.9	19.1	24.9	26.6	33.8	33.0	30.9	31.0	30.8	23.7	21.4	18.4	27.2
7–8	70.7	69.8	61.1	61.2	55.2	50.5	56.7	54.3	54.0	63.4	65.5	68.5	59.6
	Hours of darkness												
Eighths													
0–2	20.6	23.8	29.7	31.4	31.6	32.2	28.4	33.8	34.8	26.4	27.0	23.5	27.8
3–6	13.5	14.9	16.4	19.0	24.6	25.8	29.2	24.8	21.6	17.5	16.7	14.0	18.9
7–8	66.0	61.3	53.9	49.5	43.8	42.1	42.4	41.4	43.7	56.0	56.4	62.5	53.4

VISIBILITY

Visibility can range from a few metres in very thick fog to upwards of 50 km on very clear days. However, this section is largely concerned with the occurrence of thick fog with a visibility of less than 200 metres, roughly the limit below which disruption can be caused to road and rail traffic.

Fog is formed when air is cooled below its dew-point and water droplets remain suspended in the atmosphere in sufficient concentration. This cooling can occur when air is forced to rise over hills thereby causing cloud at ground level, especially on windward slopes, or with the loss of heat by radiation from the land surface, as on clear calm winter nights when fog can form in low-lying areas. Near industrial areas the visibility can also be reduced by solid particles suspended in the air producing smoke haze.

In general there are in the Thames Valley about 6–8 days a year with thick fog, although occurrences are more numerous on the high ground. For example the frequency at Little Rissington, high on the Cotswolds, is more than three times that at Oxford. Table 10 gives the average number of days when thick fog was reported at 09 GMT at a selection of places. There can be considerable local variation in the density of fogs due to the configurations of the topography and the source of water surfaces or pollution. These fogs are most frequent in the winter months October to February and at periods around dawn, when the frequency can be greater than at 09 GMT. For example, in October at dawn there was thick fog at Lyneham (on the western spur of the White Horse Hills) for 3.2 days and at Abingdon for 2.0 days. During an 8-year period, when hourly records were kept, visibilities of less than 50 m occurred at Lyneham only twice but at Abingdon there were 37 hours, mostly in October.

TABLE 10 Average number of days in each month and the year with visibility of less than 200 metres at 0900 GMT at selected sites in the Thames Valley over the period 1961–78

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Little Rissington*	5.0	3.8	1.7	0.9	0.2	0.1	0.1	0.3	1.2	3.5	3.5	3.1	23.4
Oxford	0.9	0.8	0.6	0.1					0.2	1.8	1.1	1.1	6.6
Aylesbury	1.8	1.6	0.7	0.3	0.3		0.1	0.1	0.4	1.3	1.3	2.5	10.6
Lyneham	2.2	2.1	0.4	0.6			0.1	0.1	0.6	2.3	1.5	1.5	11.4
Abingdon	0.9	1.2	0.7	0.1	0.1				0.3	1.9	1.2	1.4	7.8
Hurley	0.8	0.5	0.2	0.1					0.2	1.8	1.0	1.0	5.6
Reading	0.9	1.0	0.4	0.1					0.2	1.8	0.8	1.4	6.6
Shinfield	1.1	0.6	0.4	0.1					0.4	1.7	0.9	1.0	6.3
South Farnborough*	0.9	0.7	0.3							1.6	0.5	1.4	5.4
Wisley	0.6	0.8	0.4					0.1	0.2	1.9	1.0	1.3	6.3

*1961–75

HUMIDITY

The humidity is a measure of the amount of moisture in the atmosphere. It can be expressed in absolute terms as the vapour pressure (that is, the part of the total atmospheric pressure exerted by the water vapour), or as the vapour concentration (that is, the mass of water vapour per unit volume of moist air). Changes in vapour concentration are brought about largely by changes of air mass, those of maritime origin being moister than those of continental origin. The relative humidity of the air is the ratio of the actual vapour pressure to the saturation vapour pressure (i.e. the pressure of the maximum amount of vapour which the air can contain). The higher the temperature the more water vapour the air is capable of holding, so the relative humidity has a diurnal variation with a maximum in the early morning and a minimum in the afternoon directly opposite to the temperature variation. This is clearly seen in the diagram below which shows the average variation of both temperature and relative humidity at Abingdon in January and July.

Table 11 gives the average monthly values of vapour pressure and relative humidity at different times of the day at Abingdon and Little Rissington. The largest values of vapour pressure occur in summer, particularly on a warm muggy day.

The Thames Valley, especially the upper basin, is sheltered by the surrounding hills from most of the moist winds from the sea and has a comparatively low frequency of high humidities. Relative humidity values of 90 per cent or more occur for less than 35 per cent of the time in the upper basin and for a slightly longer time in the lower basin. Over the high ground of the Cotswolds the frequency is, however, more than 45 per cent.

The variability of relative humidity from day to day is large and values can reach 100 per cent (saturation) at any time of the day during fog or persistent rain or drizzle.

High humidities can occur at times on the hill tops when low cloud may reach the ground; also on cold nights mist or fog can form in sheltered valley bottoms, especially if there is open water, with a consequent rise in relative humidities.

Average diurnal variation of temperature and relative humidity at Abingdon for January and July over the period 1957–79.

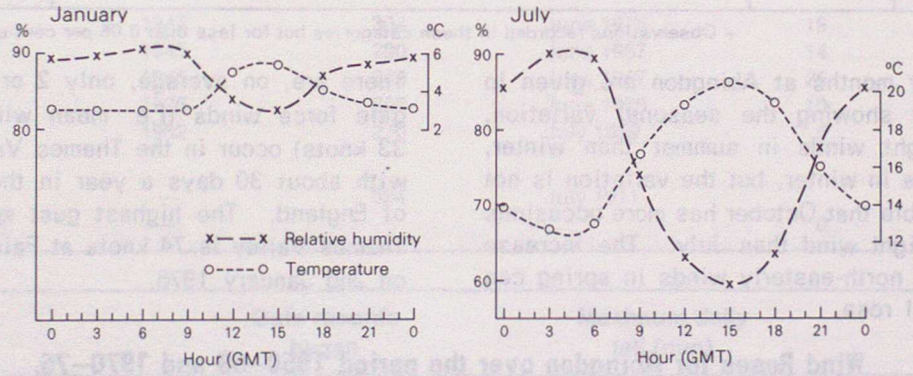


TABLE 11 Monthly and annual averages of vapour pressure (millibars) and relative humidity (percentage) at Abingdon and Little Rissington 1961–70

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
ABINGDON													
03 GMT													
Vapour Pressure (mb)	6.9	6.7	6.9	8.2	9.7	11.8	13.1	13.2	12.3	10.8	8.3	7.0	9.6
Relative Humidity (%)	90	89	88	89	89	90	90	91	92	92	90	90	90
09 GMT													
Vapour Pressure (mb)	6.9	6.8	7.2	8.7	10.4	12.7	13.8	14.1	13.2	11.3	8.3	7.0	10.0
Relative Humidity (%)	90	87	82	79	74	72	74	78	84	88	89	90	82
15 GMT													
Vapour Pressure (mb)	7.3	7.0	7.3	8.7	10.5	12.7	13.7	13.7	13.1	11.7	8.9	7.4	10.2
Relative Humidity (%)	81	74	65	64	61	58	60	61	65	72	79	83	69
21 GMT													
Vapour Pressure (mb)	7.0	6.9	7.2	8.6	10.4	12.9	14.1	13.8	12.9	11.2	8.5	7.0	10.0
Relative Humidity (%)	88	86	81	80	78	76	79	80	85	88	88	89	83
LITTLE RISSINGTON													
03 GMT													
Vapour Pressure (mb)	6.8	6.5	6.8	8.1	9.6	11.6	12.9	13.0	12.2	10.9	8.1	6.9	7.5
Relative Humidity (%)	92	91	89	91	90	90	91	92	93	94	92	90	91
09 GMT													
Vapour Pressure (mb)	6.7	6.5	7.1	8.5	10.0	12.1	13.2	13.6	12.8	11.1	8.2	6.9	9.7
Relative Humidity (%)	92	90	86	84	79	77	79	83	88	92	92	91	86
15 GMT													
Vapour Pressure (mb)	7.0	6.7	7.0	8.4	10.1	12.3	13.3	13.4	12.6	11.3	8.5	7.1	9.8
Relative Humidity (%)	86	80	70	69	66	63	66	67	70	78	84	87	74
21 GMT													
Vapour Pressure (mb)	6.9	6.6	7.0	8.4	10.0	12.3	13.5	13.5	12.5	11.1	8.2	6.6	9.8
Relative Humidity (%)	91	89	83	83	81	79	82	84	87	91	91	91	86

WIND

The Thames Valley is on the whole a fairly sheltered area and wind speeds are not usually very high. The most frequent direction from which the wind blows is south-west to west, as for the whole of Britain; however, the wind can blow from any direction and there are periods, especially in the spring, when north-easterly winds can predominate. The topography and the nature of an area can cause local variations.

Table 12 gives the annual percentage frequency of winds in certain ranges of speed and direction at Abingdon. The directions are given in degrees from true north (30° sectors), where 090° = East, 180° = South, 270° = West, 360° = North, and indicate the direction from which the wind is blowing. The speeds are grouped into the equivalents of the Beaufort Scale. While this table will be broadly representative of open situations in the Thames Valley, hills and local obstructions such as trees and buildings will have an effect on both wind speed and direction. For example, at Benson there appears to be a greater frequency of southerly winds due to the channelling of the wind through the Goring Gap. In towns the presence of high-rise blocks can cause an increase in wind speeds channelled between the buildings. Over the hills mean wind speeds are generally higher than on the low ground; in Table 12 it will be seen that Abingdon has winds of Beaufort force 6 or stronger for 0.7 per cent of the year. At Little Rissington, in the Cotswolds, the corresponding figure is about 3 per cent.

TABLE 12 Annual percentage frequencies of hourly mean wind speed and direction for Abingdon 1950–59, 1970–75

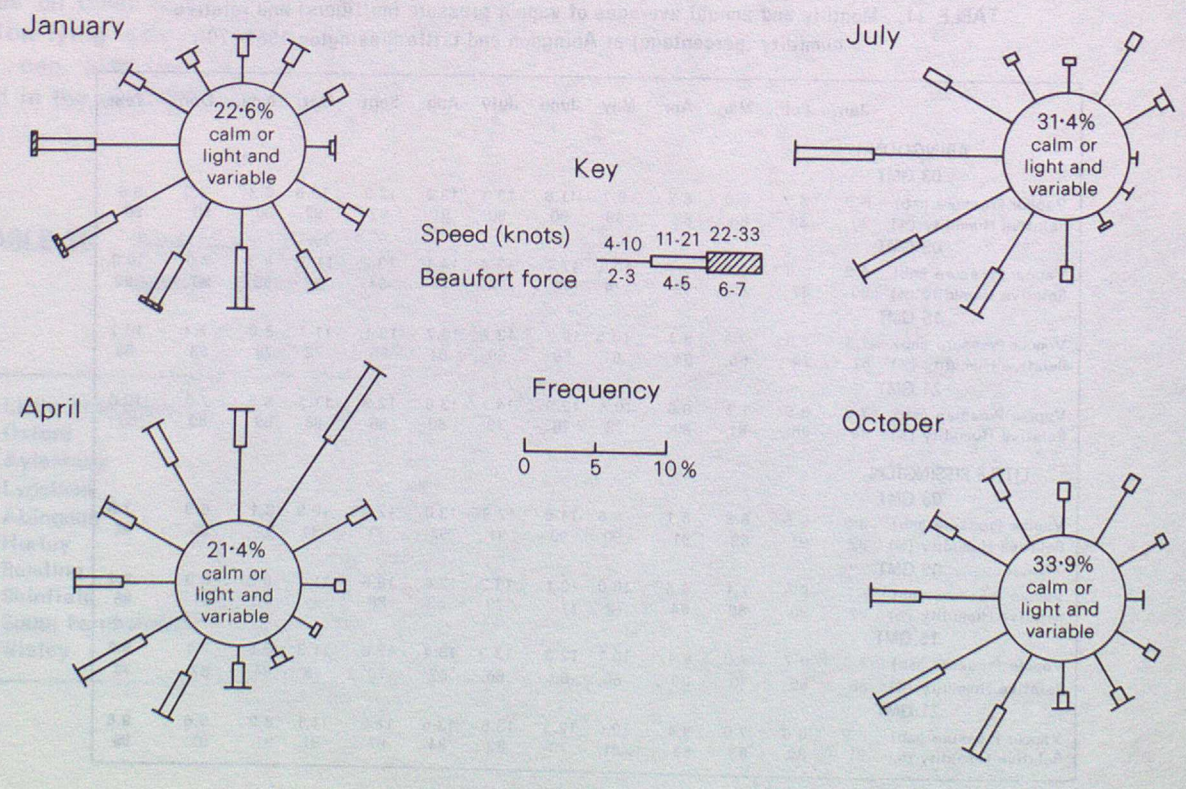
Knots	Beaufort force equivalent	30° sectors centred on 360°	030°	060°	090°	120°	150°	180°	210°	240°	270°	300°	330°	All directions
Calm	0													7.0
1–3	1													20.5
4–10	2–3	3.2	5.2	4.7	2.4	2.6	2.7	2.8	4.4	5.9	5.9	4.6	3.4	47.8
11–21	4–5	1.2	2.0	1.2	0.6	0.7	1.2	2.0	3.7	5.1	3.7	1.4	1.2	24.0
22–33	6–7	+	+	+	+	+	0.1	0.2	0.2	0.1	0.1	+		0.7
⩾ 34	⩾8								+					+
Total ⩾ 4		4.4	7.2	5.9	3.0	3.3	3.9	4.9	8.3	11.2	9.7	6.1	4.6	72.5

+ Observations recorded in these categories but for less than 0.05 per cent of the time

Wind roses for four months at Abingdon are given in the diagram below showing the seasonal variation. There are more light winds in summer than winter, and more high winds in winter, but the variation is not great. It is noticeable that October has more occasions of calm and very light wind than July. The increase in the frequency of north-easterly winds in spring can be seen in the April rose.

There are, on average, only 2 or 3 days a year when gale force winds (i.e. mean wind speeds exceeding 33 knots) occur in the Thames Valley. This compares with about 30 days a year in the extreme south-west of England. The highest gust speed recorded in the Thames Valley is 74 knots at Fairford, Gloucestershire on 2nd January 1976.

Wind Roses for Abingdon over the period 1950–59 and 1970–75.



WEATHER EXTREMES

Table 13 gives some extreme values of temperature, sunshine, rainfall and wind speed recorded in the Thames Valley region. Also included are the extreme values for the United Kingdom as a whole for comparison.

TABLE 13 Weather extremes

TEMPERATURE	Date records began	Maximum daily temperature (°C)	Date	Minimum daily temperature (°C)	Date
Thames Valley					
Marlborough	1901	35.6	9 August 1911	−19.0	13 December 1981
Abingdon/Benson	1944	34.7	27 June 1976	−18.9	25 February 1947
South Farnborough	1915	34.4	28 July 1948	−16.7	25 February 1947
Wallingford	1960	33.9	27 June 1976	−21.0	14 January 1982
Brize Norton	1968	33.5	27 June 1976	−20.9	13 December 1981
Grendon Underwood	1961	33.1	26 June 1976	−21.2	14 January 1982
United Kingdom					
Raunds, Epsom, Canterbury	—	36.7	9 August 1911		
Braemar	—			−27.2	11 February 1895 / 10 January 1982

SUNSHINE	Date records began	Maximum monthly duration (hours)	Date	Minimum monthly duration (hours)	Date
Thames Valley					
Abingdon	1947	304	June 1975	18	December 1956
Aylesbury	1945	290	June 1957	14	December 1956
Little Rissington	1945	309	June 1957	25	December 1971
South Farnborough	1936	306	June 1975	10	December 1968
Hurley	1952	270	July 1959	8	December 1956
United Kingdom					
Eastbourne	—	384	July 1911		
London (Westminster)	—			0	December 1890

RAINFALL	Date records began	Maximum daily fall (mm)	Date
Thames Valley			
Bourton	1889	141	28 June 1917
Fleet (Home Wood)	—	131	26 September 1933
Byfleet (Outfall Works)	—	128	16 July 1947
Wisley	1904	115	16 July 1947
United Kingdom			
Martinstown (Dorset)	—	279	18 July 1955

WIND	Date records began	Maximum hourly mean wind speed (knots)	Date	Maximum gust speed (knots)	Date
Thames Valley					
Abingdon	1944	36	11 January 1962	68	14 December 1956
Brize Norton	1968	35	24 December 1977	71	2 January 1976
South Farnborough	1945	43	30 January 1946	64	11 January 1962
Fairford	1969	48	2 January 1976	74	2 January 1976
United Kingdom					
(Low-level sites)					
Shoreham-by-Sea (East Sussex)	—	72	16 October 1987		
Fraserburgh (Grampian Region)	—			123	13 February 1989

TABLE 14 Climatological data for places in the United Kingdom based on the period 1941–70 except where indicated

	Altitude (metres)	Average annual rainfall (mm)	Average daily temperatures (°C) # Minimum Jan.	Minimum July	Maximum Jan.	Maximum July	Average annual duration of bright sunshine (hours)	Average no. of days with* Air Frost	Snow lying
England									
Abingdon (Oxfordshire)	69	605	0.3	11.6	6.3	21.6	1544	57	13
Acklington (Northumberland)	42	644	0.0	10.3	5.5	17.9	1429	60	20
Birmingham Airport (W. Midlands)	96	679	0.1	11.2	5.7	20.5	1385	62	15
London (Kensington Palace)	25	640	1.7	13.3	6.6	22.2	1384 ×	35	7
Manchester Airport (Gr. Manchester)	75	819	0.5	11.7	5.8	19.6	1334	47	10
Plymouth-Mount Batten (Devon)	27	990	3.1	12.7	8.3	19.0	1678	25	3
Shawbury (Shropshire)	72	670	0.0	11.2	6.0	20.2	1368	63	17
Southsea (Hampshire)	2	702	2.4	13.9	7.1	20.7	1748	25	6
Waddington (Lincolnshire)	68	598	0.1	11.6	5.2	20.3	1503	54	18
Wales									
Cardiff (Wales) Airport (S. Glamorgan)	67	947	1.3	11.9	6.6	19.3	1571	36	8
Valley (Gwynedd)	10	871	2.5	12.0	7.5	18.1	1612	27	3
Northern Ireland									
Belfast Airport (Antrim)	68	912	0.6	10.7	6.1	18.1	1281	53	9
Scotland									
Aberdeen Airport (Grampian)	58	872	−0.9	9.6	5.0	17.5	1341	75	30
Balmoral (Grampian)	283	834	−2.8	8.1	3.7	17.4	1120 †	116	63
Edinburgh Airport (Lothian)	35	677	−0.6	10.3	5.7	18.5	1294	66	14
Lerwick (Shetland)	82	1172	0.6	9.3	5.0	14.0	1067	53	32
Stornoway (Western Isles)	3	1094	1.3	10.1	6.4	15.7	1244	49	11
Glasgow Airport (Strathclyde)	5	991	0.1	10.8	5.8	18.6	1266	58	6

* Based on 1956–70 only.

† For Braemar.

× For Regents Park.

\# Referring to 24-hour (09–09 GMT) extremes. Adjustments have been made to those stations normally recording night minimum (21–09 GMT) and day maximum (09–21 GMT). See Introduction to the series.

CLIMATOLOGICAL SERVICES AVAILABLE FROM THE METEOROLOGICAL OFFICE

The Meteorological Office collects and archives regular weather reports from a national network of observing stations, consisting of both Meteorological Offices manned by professional staff and co-operating stations operated by interested organizations or individuals. All these data are subjected to close scrutiny before being archived, to ensure consistency of standards, and are then available to meet the needs of the community.

Any undertaking which is at all weather-sensitive can benefit from a prior knowledge of the climate within which it is expected to operate. The building industry can use past weather statistics to estimate likely delays on contracts, architects and civil engineers need to know the likely extremes of weather which a design must withstand, and many industrial processes are dependent on atmospheric conditions for their success. The agricultural industry uses such information for a variety of purposes, many relating to the viability of new crops and the weather-related incidence and spread of pests and diseases.

In addition to special analyses of weather data for these purposes, the Meteorological Office can supply factual statements on weather conditions for legal or insurance purposes.

Enquiries related to aspects of past weather data should be directed to the appropriate address given on page 17 or, if more convenient, initially to your local weather centre (see back cover). Charges for the supply of information depend mainly on the staff time taken to meet the request.

Further information

Information leaflets and brochures describing in more detail the range of specialized services available from the Meteorological Office are available free from the same addresses. These leaflets and brochures also indicate the range of complex analyses that the Meteorological Office can undertake.

Forecasting services

For the day-to-day planning of outdoor work, special weather forecasts and warnings can be arranged to cover specific weather elements at agreed sites. Details may be obtained from:

The Director-General
Meteorological Office (Met O 7)
London Road
Bracknell
Berkshire RG12 2SZ

or from your local weather centre.

WEATHER CENTRES AND PUBLIC SERVICE OFFICES

Weather Centres

Aberdeen
Seaforth Centre
Lime Street
Aberdeen AB2 1BJ

Aberdeen (0224) 210571

Bristol
The Gaunts House
Denmark Street
Bristol BS1 5DH

Bristol (0272) 279272

Cardiff
Southgate House
Wood Street
Cardiff CF1 1EW

Cardiff (0222) 390420

Glasgow
33 Bothwell Street
Glasgow G2 6TS

041—248 7272

Leeds
Oak House
Park Lane
Leeds LS3 1EL

Leeds (0532) 457753

London
284–286 High Holborn
London WC1V 7HX

01—430 5627

Manchester
Applicon House
Exchange Street
Stockport SK3 0ER

061—477 1017

Newcastle
7th Floor
Newgate House
Newgate Street
Newcastle-upon-Tyne NE1 5UQ

091—232 3808

Norwich
Rouen House
Rouen Road
Norwich NR1 1RB

Norwich (0603) 630164

Nottingham
Main Road
Watnall
Nottingham NG16 1HT

Nottingham (0602) 384094

Plymouth
Royal Air Force Mount Batten
Plymouth
Devon PL9 9SH

Plymouth (0752) 493377

Southampton
160 High Street-below-bar
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THE CLIMATE OF GREAT BRITAIN

This memorandum is one of a series which will cover the whole of Great Britain in due course, published in the Climatological Memoranda range. The Introduction (CM 113) to the series explains how various weather elements are measured. The areas to be covered are:

SCOTLAND

114 Borders Region
115 Edinburgh, Lothian Region and Stirling
116 Fife, Dundee and Perth
117 Aberdeen and Buchan
118 Moray Firth coastal Region
119 Northern Isles
120 Western Isles
121 Skye and the North-west
122 Argyll and the Inner Hebrides
123 The Grampians and Perthshire Highlands
124 Glasgow and the Clyde valley
125 Ayrshire and the Firth of Clyde
126 Dumfries and Galloway Region

ENGLAND

127 North-east England
128 Pennines and Lake District
129 East Yorkshire and North Humberside
130 Lancashire and Cheshire and Isle of Man
131 Trent Valley
132 Midlands
133 East Anglia and Lincolnshire
134 Thames Valley
135 London
136 South-east England
137 South England
138 Somerset and Avon
139 South-west Peninsula and Channel Islands

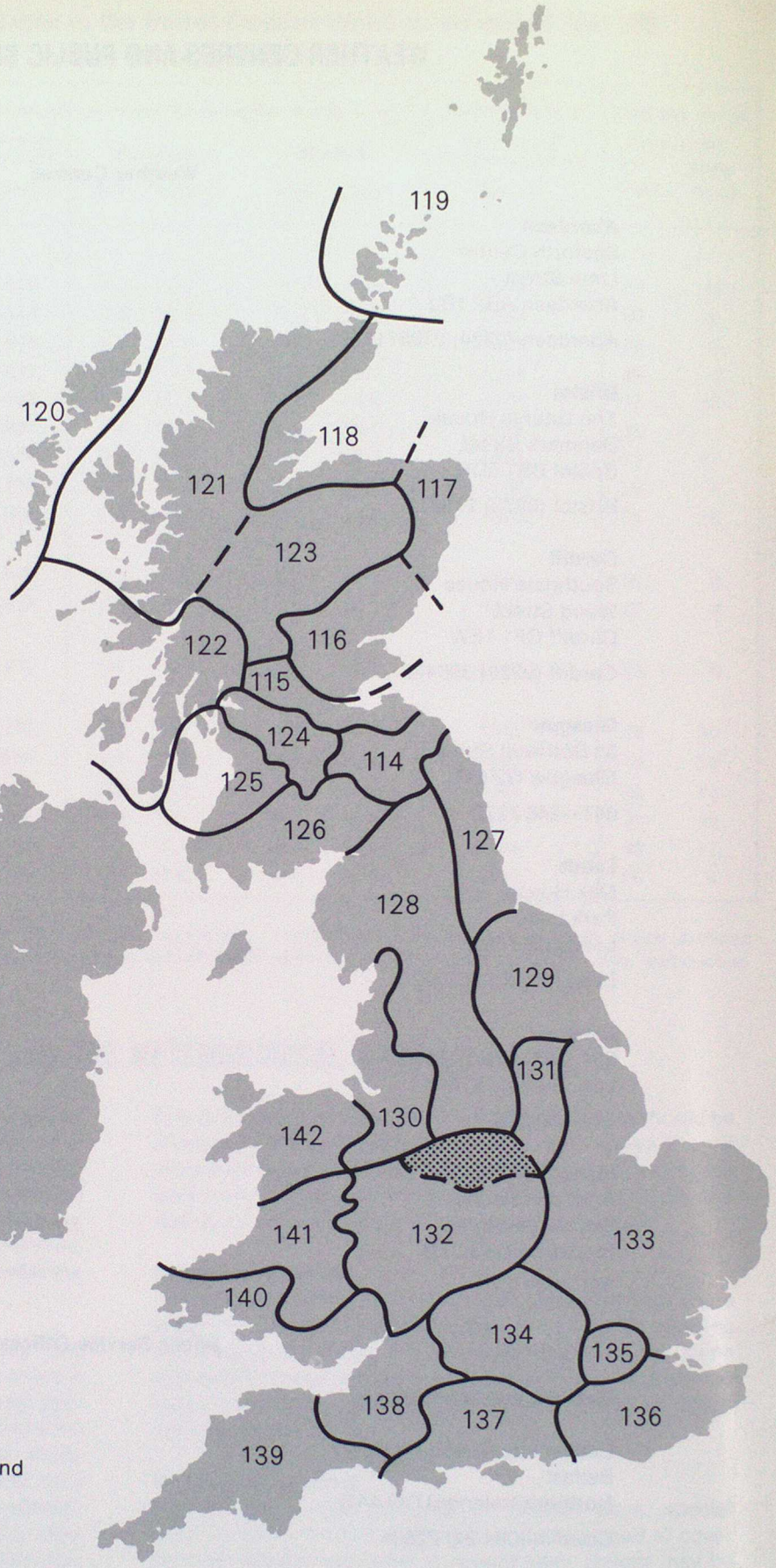
WALES

140 South Wales
141 Mid Wales
142 North Wales and Anglesey

} Now issued in one Volume No. 140 Wales

Also available 143 The Climate of Northern Ireland

Further details of these memoranda and of the services mentioned on page 16 can be obtained from:



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