

FRESHWATER BIOLOGICAL ASSOCIATION

SURFACE WATER  
TEMPERATURE OF  
WINDERMERE

Charlotte Kipling & M. E. Roscoe

OCCASIONAL PUBLICATION No. 2

**SURFACE WATER TEMPERATURE**

**OF WINDERMERE**

Monthly and yearly totals of degree-days centigrade  
and monthly mean temperatures,  
1933 to 1975

by

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*Freshwater Biological Association*

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1977

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*Introduction*

The surface water temperature of Windermere has been recorded by the staff of the Freshwater Biological Association on every weekday (with minor exceptions) since 11 January 1933.

The aim of this publication is to make this information more readily accessible, and to present it in a form which can easily be used by individual research workers for their particular needs.

The temperature regime of all depths of Windermere has been described by Jenkin (1942) for the north and south basins from November 1931 to October 1932, and by Lund, Mackereth and Mortimer (1963) for the north basin in 1947, and by Talling (1965) for the north basin in 1964. The lake becomes markedly stratified in May, and the thermocline is maintained until late October or early November in the south basin and until late November or early December in the north basin. From then until the following May the lake is usually fully mixed with virtually the same temperature from surface to bottom. However in cold winters temperature inversion can occur, with colder water ( $< 4^{\circ}\text{C}$ ) near the surface. Diurnal temperature changes in the surface waters are discussed by Mortimer (1952). These findings must be taken into consideration when using the present data, which consist entirely of surface temperatures recorded once a day at the same time each day.

In Tables 1 to 43 the data for each year from 1933 to 1975 are presented expressed as degree-days centigrade. The tables show for each month the number of degree-days above each temperature from  $0^{\circ}\text{C}$  to the highest recorded, at  $1^{\circ}\text{C}$  intervals.

The method of calculation can be explained by a simple example. If readings on four days were 6, 4, 7 and  $8^{\circ}\text{C}$ , the total above  $0^{\circ}\text{C}$  would be 25 degree-days and above  $5^{\circ}\text{C}$  would be  $1 + 0 + 2 + 3 = 6$  degree-days, and above  $6^{\circ}\text{C}$   $0 + 0 + 1 + 2 = 3$  degree-days. This is equivalent to plotting the daily temperatures and measuring the area of the graph above the required temperature. Mean temperatures are obtained by

dividing the number of degree-days over  $0^{\circ}$  C by the relevant number of days.

An advantage of using degree-days rather than mean temperatures is that degree-days are additive, so that data for any desired periods of time can be combined quickly and simply. Seasonal results for spring, summer, autumn and winter are shown in Table 44, and Table 45 shows certain selected totals for comparisons between years. These are given not only for the intrinsic interest of the results, but also as examples of how detailed specific information can be derived from Tables 1 to 43. Table 46 shows the mean temperature in each month of each year, and Table 47 shows frequency distributions of monthly mean temperatures.

The daily temperatures in 1954 and 1955 have been plotted in Figure 1, as an example of contrasting years. The summer was cool in 1954 and warm in 1955. Tables 22 and 23 show that in 1954 and 1955 there were respectively 68 and 399 degree-days over  $15^{\circ}$  C, and that there were no degree-days over  $20^{\circ}$  C in 1954 and 64 in 1955.

Some examples of correlations of degree-days with various biological data have been published. Le Cren (1958), studying perch (*Perca fluviatilis* L.) in Windermere, correlated weight increments in each year from 1934 to 1955 with degree-days over  $14^{\circ}$  C, and obtained very significant results. The degree-days were determined graphically, using the same data as in this paper. Frost and Kipling (1967) and Kipling and Frost (1970) studying pike (*Esox lucius* L.), correlated the mean weight of pike at age 4 years with a four year running total of degree-days over  $14^{\circ}$  C, calculated by adding the degree-days over  $14^{\circ}$  C in the first four years of life. The work covered pike hatched in each year from 1944 to 1962 and the results were very significant. They also correlated pike year-class strengths with degree-days over  $14^{\circ}$  C in the summer after hatching, and with degree-days over  $10^{\circ}$  C in each separate month from May to October in the year of hatching.

The choice of degree-days over  $14^{\circ}$  C to give a measure of summer temperatures was made after consideration of several factors. It was known from other evidence that perch did not start to grow before early June. In most years the surface temperature of the lake reaches  $14^{\circ}$  C in the last week of May or the first week of June and continues above this temperature usually until late September, occasionally until early October, although in some exceptional years it has fallen below  $14^{\circ}$  C in

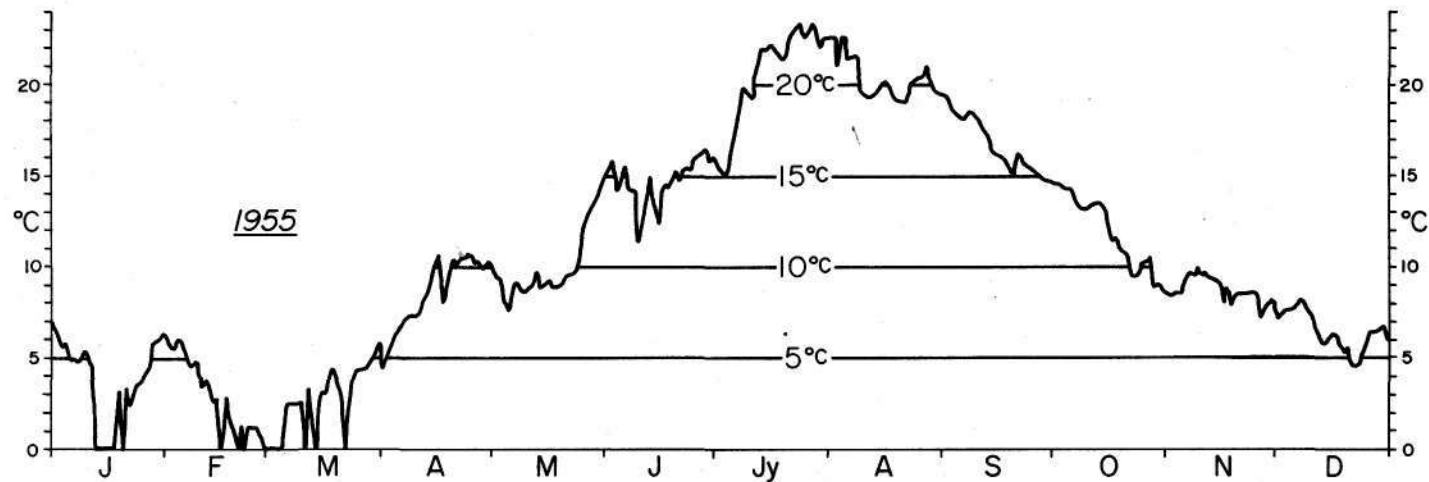
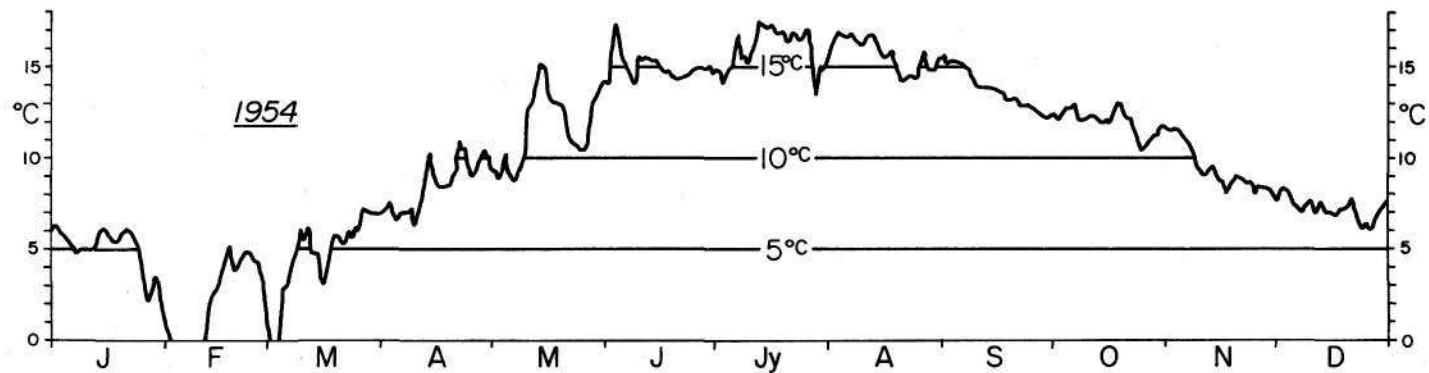


Fig.1. Daily surface temperatures 1954 and 1955.

early September. Therefore by taking degree-days over  $14^{\circ}\text{C}$  the period before perch growth commences is excluded, and the end of the summer season is determined by environmental conditions and not by a fixed date.

The same measure, degree-days over  $14^{\circ}\text{C}$ , was used for many of the correlations concerning pike. However, degree-days over  $10^{\circ}\text{C}$  were used when a longer period, earlier in the spring and later in the autumn, was being considered.

The examples show that degree-days provide a flexible method of considering water temperatures in biological studies.

Obviously, when the temperature remains above a selected figure throughout the period, identical results as regards correlations can be obtained by using degree-days above  $0^{\circ}\text{C}$  (or any intermediate value  $^{\circ}\text{C}$ ), or by using mean temperature, provided the period of time is the same. However even in these circumstances there are practical advantages in using degree-days over a selected temperature as the numbers are easier to handle arithmetically.

#### Methods

The readings are taken daily, except on Sundays, normally at 9 a.m., with a standard laboratory mercury thermometer. The temperature is recorded to the nearest  $0.1^{\circ}\text{C}$ .

From 11 January 1933 to 31 December 1950 the readings were taken at Wray Castle Boathouse (grid reference NY 37510132) and from 1 January 1951 onwards at The Ferry House (grid reference SD 39019563). At Wray Castle Boathouse the readings were taken from a pontoon, and the depth of water was never less than 1 m. At The Ferry House the readings are taken from the edge of a shingle shore in a sheltered west facing bay. The thermometer is placed on the lake bottom, parallel to the shore line so that it is just completely submerged; it is then left for several minutes before the temperature is noted.

To find out whether the readings from the two places were compatible, comparisons were made between surface temperature readings by thermistor resistance thermometer, taken weekly at a buoy in the north basin of Windermere, and the readings on the same dates at Wray Castle Boathouse in 1950 and at The Ferry House in 1951. The mean differences between

the shore and mid-water readings were  $-0.21^{\circ}\text{C}$  in 1950 and  $-0.17^{\circ}\text{C}$  in 1951; the difference between them was not significant. Therefore the readings before 1951 at Wray Castle Boathouse and in 1951 and later at The Ferry House have been considered as one series.

Exact agreement between readings taken from the shore and those in mid-water is not to be expected. Shallow surface water near the shore is subject to greater fluctuations in temperatures than surface water in the middle of the lake. This is partly because of the effect of the lake bottom, and also because the shore is often sheltered from wind effects, and, in the absence of water movements, temperature changes are more extreme. Thus in cold weather ice forms in the first instance round the edge of the lake, and has been recorded in many winters, whereas only very rarely, about once in twenty years, has the water in the middle of the lake become frozen.

#### Calculation of degree-days

The data, the daily temperature readings, were punched onto paper tape for each year separately. Two programs were written in Algol 60, one for leap years, the other for non-leap years. The programs are the same except that 29 February occurs in the leap year program. Each year is handled separately.

The first part of each program prints out the temperature for each day, month by month. In the first column the data is given, in the second column a number of asterisks equal to the recorded number of degrees centigrade, rounded off as follows:

$2.1 \equiv 2$  i.e.  $< 0.5$  round down

$2.5 \equiv 3$  i.e.  $\geq 0.5$  round up,

and in the third column the actual reading to  $0.1^{\circ}\text{C}$ , for example

March

1 \*\*\*\*\* 6.2

2 \*\*\*\*\* 6.7

When there was no reading NO READING TAKEN is printed, and when there was ice at the place where the reading is taken ICE ICE ICE is printed.

The second part of each program is concerned with calculating the

degree-days above each temperature from 0° C to 22° C at 1° C intervals, and printing the results for each month and each year. (The one degree-day over 23° C was entered by hand). As a preliminary to the calculations the data are scanned and all entries of ICE changed to 0.0° C, and estimates substituted for entries of NO READING TAKEN. One, two or three such consecutive entries are replaced by a simple mean of the readings for the day before and the day after the blank or blanks. If more than three consecutive no readings are encountered in the data scan, the program terminates and MORE THAN THREE NO READINGS HAVE OCCURRED is printed; estimates for one or more of the blanks must then be inserted in the data tape. This happened in 1933 in January and April, and in December in eight of the years, on account of the Christmas holiday. Estimates were made of the missing readings, usually after consulting records of air temperatures for the relevant dates to find out if there had been any violent changes of weather during the period.

The daily temperatures are then printed out again with substituted values for all non-numerical entries in the original data. The format is the same as in the first part of the program. After printing the temperature for a particular day, the degree-days are calculated for that day and added to a monthly running total. At the end of each month the degree-days for the month (rounded off as before) are printed out with the following format:

Temperature ° C	Number of degree-days above this temperature
0	165
1	134
⋮	⋮
22	0

The degree-days running total for the year is formed, and at the end of the year the degree-days yearly totals are printed out with the format shown above.

The original data and the computer print-outs are lodged in the library of the Freshwater Biological Association and may be consulted on the premises.

#### Acknowledgements

This work is entirely dependent on the many people who have been responsible over the years for taking the daily temperature readings, in particular Mrs M. Hogg. Others who have been involved are too numerous to mention individually.

We are grateful to Mr P. Bulmer for punching the data-tapes, to Mr E.A. Ramsbottom for preparing the figure and to Mrs J. Hawksford for typing the camera copy.

We thank Dr J.F. Talling and other colleagues for advice and helpful comments on the manuscript.

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## TABLES

Tables 1 - 43. Each table covers one year and shows for each month and year the degree-days above each temperature from  $0^{\circ}$  C, at  $1^{\circ}$  intervals, to the highest recorded in the particular year.



Table 1

1933	Number of degree-days above :																						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 °C
Jan*	163	133	103	73	43	17																	
Feb	139	111	83	55	32	14	3																
Mar	166	135	104	73	42	12																	
Apr	205	175	145	115	85	55	25	8	1														
May	334	303	272	241	210	179	148	117	86	58	37	23	11	2									
Jun	502	472	442	412	382	352	322	292	262	232	202	172	142	112	82	53	28	10	4	2			
Jul	593	562	531	500	469	438	407	376	345	314	283	252	221	190	159	128	97	66	36	16	6	1	
Aug	564	533	502	471	440	409	378	347	316	285	254	223	192	161	130	99	68	37	15	5	1		
Sept	492	462	432	402	372	342	312	282	252	222	192	162	132	102	72	43	21	9	1				
Oct	394	363	332	301	270	239	208	177	146	115	86	60	34	17	5								
Nov	239	209	179	149	119	89	59	29	8														
Dec	170	139	108	77	46	17	2																
Total																							
for 1933	3961	3597	3233	2869	2520	2163	1864	1628	1416	1226	1054	892	732	584	448	323	214	122	56	23	7	1	

\* includes estimated temperatures 1-10 January

Table 2

1934	Number of degree-days above :																						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 °C
Jan	165	134	103	72	43	16																	
Feb	145	117	89	61	34	10																	
Mar	155	124	93	63	33	7																	
Apr	174	144	114	84	54	27	10																
May	273	242	211	180	149	118	87	56	27	9	3												
Jun	459	429	399	369	339	309	279	249	219	189	159	129	99	69	44	22	9	2					
Jul	596	565	534	503	472	441	410	379	348	317	286	255	224	193	162	131	100	71	46	26	15	8	3
Aug	505	474	443	412	381	350	319	288	257	226	195	164	133	102	71	40	17	3					
Sept	441	411	381	351	321	291	261	231	201	171	141	111	81	51	24	5	1						
Oct	348	317	286	255	224	193	162	131	100	69	40	16	4										
Nov	241	211	181	151	121	91	61	31	3														
Dec	243	212	181	150	119	88	57	26	2														
Total	for 3745	3380	3015	2651	2290	1941	1646	1391	1157	981	824	675	541	415	301	198	127	76	46	26	15	8	3

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1934

Table 3

1935	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C	
Jan	202	171	140	109	78	47	19	3														
Feb	166	138	110	82	54	26	4															
Mar	186	155	124	93	62	31	7															
Apr	207	177	147	117	87	57	30	13	4	1												
May	342	311	280	249	218	187	156	125	95	69	45	28	15	6	3	2	1					
Jun	447	417	387	357	327	297	267	237	207	177	147	117	87	57	35	23	15	8	2			
Jul	567	536	505	474	443	412	381	350	319	288	257	226	195	164	133	102	71	41	19	6	1	
Aug	554	523	492	461	430	399	368	337	306	275	244	213	182	151	120	89	58	29	6			
Sept	430	400	370	340	310	280	250	220	190	160	130	100	70	43	23	6	1					
Oct	326	295	264	233	202	171	140	109	78	47	25	7										
Nov	251	221	191	161	131	101	71	41	13	1												
Dec	187	156	125	94	64	37	16	2														
Total	for 3865	3500	3135	2770	2406	2045	1709	1437	1212	1018	848	691	549	421	314	222	146	78	27	6	1	

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1935

Table 4

1936	Number of degree-days above :																			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 °C
Jan	155	124	93	62	33	13	1													
Feb	74	49	28	12	4															
Mar	136	105	74	46	23	8														
Apr	179	149	119	89	59	29	9	1												
May	346	315	284	253	222	191	160	129	101	74	48	27	8	1						
Jun	443	413	383	353	323	293	263	233	203	173	143	113	86	65	46	33	21	11	6	2
Jul	535	504	473	442	411	380	349	318	287	256	225	194	163	132	101	70	42	20	9	
Aug	509	478	447	416	385	354	323	292	261	230	199	168	137	106	75	46	23	6	2	1
Sept	464	434	404	374	344	314	284	254	224	194	164	134	104	74	46	21	7	1		
Oct	349	318	287	256	225	194	163	132	101	70	41	17	4							
Nov	248	218	188	158	128	98	68	38	17	3										
Dec	205	174	143	112	81	50	20	1												
Total																				
for 1936	3643	3281	2923	2573	2238	1924	1640	1398	1194	1000	820	653	502	378	268	170	93	38	17	3

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1936

Table 5

1937	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C
Jan	189	158	127	96	65	35	9														
Feb	155	127	99	71	43	16	2														
Mar	135	104	73	43	15	2															
Apr	196	166	136	106	76	47	22	5	2												
May	353	322	291	260	229	198	167	136	105	75	50	31	17	6	2						
Jun	454	424	394	364	334	304	274	244	214	184	154	124	94	64	36	16	2				
Jul	522	491	460	429	398	367	336	305	274	243	212	181	150	119	88	57	30	11	4	2	
Aug	581	550	519	487	456	425	395	363	332	301	270	239	208	178	146	116	85	54	28	12	1
Sept	451	421	391	361	331	301	271	241	211	181	151	121	91	61	33	18	9	2			
Oct	380	349	318	287	256	225	194	163	132	101	70	42	18	4							
Nov	251	221	191	161	131	101	71	42	23	11	2										
Dec	174	143	112	81	53	26	6	1													
Total																					
for 1937	3841	3476	3111	2746	2387	2047	1747	1500	1293	1096	909	738	578	432	305	207	126	67	32	14	1

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1937

Table 6

1938	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C	
Jan	168	137	106	75	44	16	1															
Feb	139	111	83	55	29	12	1															
Mar	198	167	136	105	74	43	14															
Apr	237	207	176	147	117	87	56	28	9	1												
May	329	298	267	236	205	174	143	112	81	52	30	13	2									
Jun	411	381	351	321	291	261	231	201	171	141	111	82	57	35	16	3						
Jul	483	452	421	390	359	328	297	266	235	204	173	142	111	80	49	23	12	4				
Aug	541	510	479	448	417	386	355	324	293	262	231	200	169	138	107	76	49	33	19	8	2	
Sept	440	410	380	350	320	290	260	230	200	170	140	110	80	50	20							
Oct	349	318	287	256	225	194	163	132	101	70	40	16	7	2								
Nov	295	265	235	205	175	145	115	85	55	27	7											
Dec	231	200	169	138	107	76	45	21	4													
Total																						
for 1938	3821	3456	3090	2726	2363	2012	1681	1399	1149	927	732	563	426	305	192	102	61	37	19	8	2	

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1938

Table 7

1939	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 °C		
Jan	179	148	117	86	55	26	5															
Feb	148	120	92	65	40	17	2															
Mar	184	153	122	91	60	29	4															
Apr	213	183	153	123	93	63	33	10														
May	336	305	274	243	212	181	150	119	88	62	41	27	15	9	5	3	1					
Jun	492	462	432	402	372	342	312	282	252	222	192	162	132	102	72	43	22	12	5	2		
Jul	502	471	440	409	378	347	316	285	254	223	192	161	130	99	68	37	15	4	1			
Aug	556	525	494	463	432	401	370	339	308	277	246	215	184	153	122	91	60	37	21	6		
Sept	488	458	428	398	368	338	308	278	248	218	188	158	128	98	69	46	30	17	6	1		
Oct	341	310	279	248	217	186	155	124	93	63	37	18	5	1								
Nov	265	235	205	175	145	115	85	55	25	3												
Dec	221	189	158	128	96	66	37	14	1													
Total																						
for 1939	3925	3559	3194	2831	2468	2111	1777	1506	1269	1068	896	741	594	462	336	220	128	70	33	9		

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1939

Table 8

1940	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21 °C
Jan	65	46	29	17	8	3																
Feb	74	48	24	7																		
Mar	129	98	68	41	18	5	1															
Apr	199	169	139	109	79	49	23	12	4													
May	391	360	329	298	267	236	205	174	143	112	83	58	38	24	12	4						
Jun	567	537	507	477	447	417	387	357	327	297	267	237	207	177	147	117	88	62	41	24	10	2
Jul	512	481	450	419	388	357	326	295	264	233	202	171	140	109	78	47	18	3				
Aug	509	478	447	416	385	354	323	292	261	230	199	168	137	106	75	48	27	15	7	3		
Sept	415	385	355	325	295	265	235	205	175	145	115	85	56	33	16	5						
Oct	327	296	265	234	203	172	141	110	79	48	23	5										
Nov	247	217	187	157	127	97	66	36	12	1												
Dec	197	166	135	104	73	42	16	3														
Total																						
for 1940	3632	3281	2935	2604	2290	1997	1723	1484	1265	1066	889	724	578	449	328	221	133	80	48	27	10	2

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1940

Table 9

1941	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C	
Jan	84	60	37	15	3																	
Feb	75	51	28	8																		
Mar	113	82	51	22	5																	
Apr	161	131	101	71	42	20	6	1														
May	247	216	185	154	123	92	61	32	13	4	2	1										
Jun	453	423	393	363	333	303	273	243	213	183	153	123	94	70	49	35	24	15	7	1		
Jul	581	550	519	488	457	426	395	364	333	302	271	240	209	178	147	116	85	54	24	10	3	
Aug	498	467	436	405	374	343	312	281	250	219	188	157	126	95	64	33	12	5				
Sept	466	436	406	376	346	316	286	256	226	196	166	136	106	76	46	17	4					
Oct	384	353	322	291	260	229	198	167	136	106	78	55	35	19	8							
Nov	234	204	174	144	114	84	54	24	3													
Dec	219	188	157	126	95	64	34	10														
Total																						
for 1941	3515	3161	2809	2463	2152	1877	1619	1378	1174	1010	858	712	570	438	314	201	125	74	31	11	3	

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1941

Table 10

1942	Number of degree-days above :																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 °C
Jan	123	96	70	45	25	9	3											
Feb	43	23	7															
Mar	92	61	33	13	3	1												
Apr	186	156	126	96	66	38	17	8	2									
May	288	257	226	195	164	133	102	72	45	26	11	2						
Jun	418	388	358	328	298	268	238	208	178	148	118	89	60	37	21	10	3	
Jul	507	476	445	414	383	352	321	290	259	228	197	166	135	104	73	42	16	3
Aug	491	460	429	398	367	336	305	274	243	212	181	150	119	88	57	26	6	1
Sept	429	399	369	339	309	279	249	219	189	159	129	99	69	41	18	4		
Oct	355	324	293	262	231	200	169	138	107	76	46	22	6					
Nov	241	211	181	151	121	91	61	32	12	1								
Dec	225	194	163	132	101	70	39	15										
Total																		
for 1942	3398	3045	2700	2373	2068	1777	1501	1256	1035	850	682	528	389	270	169	82	25	4

20

1942

Table 11

1943	Number of degree-days above :																			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 °C
Jan	180	149	118	87	56	25	5													
Feb	163	135	107	79	51	23	2													
Mar	181	150	119	88	57	26	4													
Apr	227	197	167	137	107	77	47	22	6											
May	332	301	270	239	208	177	146	115	85	62	46	32	19	8	3					
Jun	446	416	386	356	326	296	266	236	206	176	146	116	86	56	27	8	2			
Jul	522	491	460	429	398	367	336	305	274	243	212	181	150	119	89	60	34	18	9	2
Aug	506	475	444	413	382	351	320	289	258	227	196	165	134	103	72	41	19	10	5	1
Sept	415	385	355	325	295	265	235	205	175	145	115	85	55	29	9					
Oct	350	319	288	257	226	195	164	133	102	71	40	13	2							
Nov	265	235	205	175	145	115	85	55	30	16	5									
Dec	208	177	146	115	84	53	23	5												
Total																				
for 1943	3795	3430	3065	2700	2335	1970	1633	1365	1136	940	760	592	446	315	200	109	55	28	14	3

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1943

**Table 12**

1944	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C	
Jan	188	157	126	95	64	34	8															
Feb	148	120	91	63	36	11	1															
Mar	144	113	83	53	28	8	1															
Apr	211	181	151	121	91	61	34	12														
May	312	281	250	219	188	157	126	95	64	39	23	14	9	5	3	1						
Jun	394	364	334	304	274	244	214	184	154	124	94	64	38	25	13	2						
Jul	507	476	445	414	383	352	321	290	259	228	197	166	135	104	73	42	14	1				
Aug	569	538	507	476	445	414	383	352	321	290	259	228	197	166	135	104	73	47	27	12	4	
Sept	412	382	352	322	292	262	232	202	172	142	112	82	53	27	8	2						
Oct	322	291	260	229	198	167	136	105	74	43	17	3										
Nov	230	200	170	140	110	80	50	21	5													
Dec	190	159	128	97	66	36	9															
<b>Total</b>																						
for 1944	3627	3262	2897	2533	2175	1826	1515	1261	1049	866	702	557	432	327	232	151	87	48	27	12	4	

22

1944

**Table 13**

1945	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	°C	
Jan	83	62	41	22	5	1																
Feb	115	87	60	33	13	3																
Mar	174	143	112	81	50	21	3															
Apr	246	216	186	156	126	96	66	38	21	8	2											
May	336	305	274	243	212	181	150	120	91	64	40	19	4									
Jun	424	394	364	334	304	274	244	214	184	154	124	94	64	36	22	11	2					
Jul	533	502	471	440	409	378	347	316	285	254	223	192	161	130	99	68	39	14	2			
Aug	551	520	489	458	427	396	365	334	303	272	241	210	179	148	117	86	55	25	7	1		
Sept	472	442	412	382	352	322	292	262	232	202	172	142	112	83	58	35	15	4	2	1		
Oct	389	358	327	296	265	234	203	172	141	110	79	48	21	3								
Nov	287	257	227	197	167	137	107	77	47	21	8	1										
Dec	224	193	162	131	100	69	37	10	1													
<b>Total</b>																						
for 1945	3834	3479	3125	2773	2430	2112	1814	1543	1305	1085	889	706	541	400	296	200	111	43	11	2		

23

1945

Table 14

1946	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 °C	
Jan	160	129	99	69	41	17	4														
Feb	141	113	85	59	34	12															
Mar	132	101	72	44	22	8	3														
Apr	220	190	160	130	100	70	40	18	3	1											
May	324	293	262	231	200	169	138	107	76	47	26	13	4								
Jun	402	372	342	312	282	252	222	192	162	132	102	72	42	22	9	2					
Jul	508	477	446	415	384	353	322	291	260	229	198	167	136	105	74	43	17	6	2	1	
Aug	476	445	414	383	352	321	290	259	228	197	166	135	104	73	42	11					
Sept	400	370	340	310	280	250	220	190	160	130	100	70	40	18	6						
Oct	342	311	280	249	218	187	156	125	94	63	37	16	6	1							
Nov	257	227	197	167	137	107	77	47	18	6	1										
Dec	199	168	137	106	75	44	16	3													
Total																					
for 1946	3561	3196	2834	2475	2125	1790	1488	1232	1001	805	630	473	332	219	131	56	17	6	2	1	

24

1946

Table 15

1947	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 21 °C	
Jan	140	111	82	54	28	10	1															
Feb	42	20	4																			
Mar	47	27	11	1																		
Apr	140	110	80	52	29	9	1															
May	308	277	246	215	184	153	122	97	74	56	41	30	21	13	8	5	3	1				
Jun	474	444	414	384	354	324	294	264	234	204	174	144	114	84	55	35	23	14	8	4	2	
Jul	521	490	459	428	397	366	335	304	273	242	211	180	149	118	87	56	31	10	2			
Aug	622	591	560	529	498	467	436	405	374	343	312	281	250	219	188	157	126	95	64	35	14	4
Sept	507	477	447	417	387	357	327	297	267	237	207	177	147	117	88	61	40	23	13	5	1	
Oct	392	361	330	299	268	237	206	175	144	113	82	52	27	8								
Nov	271	241	211	181	151	121	91	62	38	19	6											
Dec	200	169	138	107	76	45	16															
Total																						
for 1947	3664	3318	2982	2667	2372	2089	1828	1604	1404	1214	1033	864	708	559	426	314	223	143	87	44	17	4

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1947



Table 16

1948	Number of degree-days above :																						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21 °C	
Jan	178	147	116	85	54	23	4																
Feb	148	119	90	61	33	13																	
Mar	179	148	117	86	55	25	4																
Apr	229	199	169	139	109	79	49	26	12	2													
May	374	343	312	281	250	219	188	157	126	96	73	50	29	12	4	1							
Jun	432	402	372	342	312	282	252	222	192	162	132	102	72	46	27	11	2						
Jul	480	449	418	387	356	325	294	263	232	201	170	139	108	77	48	31	20	14	10	6	3	1	
Aug	506	475	444	413	382	351	320	289	258	227	196	165	134	103	72	42	25	14	7	3	1		
Sept	414	384	354	324	294	264	234	204	174	144	114	84	54	26	8								
Oct	370	339	308	277	246	215	184	153	122	91	60	33	11	1									
Nov	276	246	216	186	156	126	96	66	37	15	2												
Dec	233	202	171	140	109	78	48	23	5	1													
Total																							
for 1948	3819	3453	3087	2721	2356	2000	1673	1403	1158	939	747	573	408	265	159	85	47	28	17	9	4	1	

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1948

Table 17

1949	Number of degree-days above :																						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21 °C	
Jan	189	158	127	96	64	34	4																
Feb	155	127	99	71	44	18	2																
Mar	172	141	110	79	48	19	3																
Apr	233	203	173	143	113	83	53	26	7	1													
May	364	333	302	271	240	209	178	147	116	85	57	35	16	3									
Jun	486	456	426	396	366	336	306	276	246	216	186	156	126	96	74	56	43	32	22	13	5		
Jul	576	545	514	483	452	421	390	359	328	297	266	235	204	173	142	111	80	51	28	13	5	1	
Aug	539	508	477	446	415	384	353	322	291	260	229	198	167	136	105	74	44	23	13	4			
Sept	510	480	450	420	390	360	330	300	270	240	210	180	150	120	90	60	31	15	4				
Oct	430	399	368	337	306	275	244	213	182	151	120	93	67	44	24	7							
Nov	270	240	210	180	150	120	90	60	30	10	1												
Dec	214	183	152	121	90	59	28	5															
Total																							
for 1949	4138	3773	3408	3043	2678	2318	1981	1708	1470	1260	1069	897	730	572	435	308	198	121	67	30	10	1	

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1949

Table 18

1950	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 °C	
Jan	185	154	123	92	61	33	12														
Feb	139	111	83	55	27	4															
Mar	181	150	119	88	57	27	7														
Apr	203	173	143	113	83	53	23	2													
May	321	290	259	228	197	166	135	104	74	52	32	13	1								
Jun	503	473	443	413	383	353	323	293	263	233	203	173	143	113	84	56	29	13	5	2	
Jul	521	490	459	428	397	366	335	304	273	242	211	180	149	118	87	56	25	3			
Aug	513	482	451	420	389	358	327	296	265	234	203	172	141	110	79	49	25	10			
Sept	399	369	339	309	279	249	219	189	159	129	99	69	39	21	6						
Oct	333	302	271	240	209	178	147	116	85	55	27	5									
Nov	225	195	165	135	105	75	47	22	5												
Dec	111	82	55	31	16	5	1														
Total																					
for 1950	3634	3271	2910	2552	2203	1867	1576	1326	1124	945	775	612	473	362	256	161	79	26	5	2	

28

1950

Table 19

1951	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 °C	
Jan	91	63	38	18	3																
Feb	75	49	26	8																	
Mar	106	78	50	25	5	1															
Apr	184	154	124	94	64	34	12	4	1												
May	306	275	244	213	182	151	120	91	68	47	27	9	2								
Jun	441	411	381	351	321	291	261	231	201	171	141	111	81	51	23	8	1				
Jul	567	536	505	474	443	412	381	350	319	288	257	226	195	164	133	102	71	41	15	3	
Aug	533	502	471	440	409	378	347	316	285	254	223	192	161	130	99	68	39	19	8	1	
Sept	442	412	382	352	322	292	262	232	202	172	142	112	82	52	24	7					
Oct	375	344	313	282	251	220	189	158	127	96	66	39	20	5							
Nov	267	237	207	177	147	117	87	57	28	8	1										
Dec	208	177	146	115	84	53	24	8													
Total																					
for 1951	3595	3238	2887	2549	2231	1949	1683	1447	1231	1036	857	689	541	402	279	185	111	60	23	4	

29

1951

Table 20

1952	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	°C
Jan	109	84	60	38	19	6															
Feb	74	51	29	11	3																
Mar	161	130	99	68	37	10	1														
Apr	235	205	175	144	114	86	59	38	21	8	2	1									
May	397	366	335	304	273	242	211	180	149	118	89	68	52	36	22	9	2				
Jun	468	438	408	378	348	318	288	258	228	198	168	138	108	78	48	21	7	1			
Jul	548	517	486	455	424	393	362	331	300	269	238	207	176	145	114	83	52	25	9	2	
Aug	520	489	458	427	396	365	334	303	272	241	210	179	148	117	86	55	27	7			
Sept	408	378	348	318	288	258	228	198	168	138	108	78	49	27	15	6	1				
Oct	300	269	238	207	176	145	114	83	52	22	7										
Nov	188	159	131	103	76	53	32	14	5												
Dec	86	57	30	10	3																
Total																					
for 1952	3494	3143	2797	2463	2157	1876	1629	1405	1195	994	822	671	533	403	285	174	89	33	9	2	

30

1952

Table 21

1953	Number of degree-days above :																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	°C
Jan	96	69	42	19	3																			
Feb	89	63	38	19	7	1																		
Mar	161	130	100	70	42	19	4																	
Apr	228	198	168	138	108	78	49	26	11	4	1													
May	414	383	352	321	290	259	228	197	166	135	104	74	48	28	15	7	2							
Jun	483	453	423	393	363	333	303	273	243	213	183	154	128	102	77	53	33	21	13	7	2			
Jul	550	519	488	457	426	395	364	333	302	271	240	209	178	147	116	85	56	37	25	17	10	5	2	
Aug	551	520	489	458	427	396	365	334	303	272	241	210	179	148	117	86	55	27	11	2				
Sept	448	418	388	358	328	298	268	238	208	178	148	118	88	58	31	10	1							
Oct	393	362	331	300	269	238	207	176	145	114	83	52	26	7	1									
Nov	284	254	224	194	164	134	104	74	44	15	1													
Dec	244	213	182	151	120	89	58	28	6															
Total																								
for 1953	3941	3582	3225	2878	2547	2240	1950	1679	1428	1202	1001	817	647	490	357	241	147	85	49	26	12	5	2	

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1953

Table 22

1954	Number of degree-days above :																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 °C
Jan	157	126	95	66	39	14	1											
Feb	63	46	30	16	5													
Mar	141	114	87	61	38	19	5											
Apr	254	224	194	164	134	104	74	45	26	11	3							
May	357	326	295	264	233	202	171	140	109	79	55	35	21	8	2			
Jun	449	419	389	359	329	299	269	239	209	179	149	119	89	59	29	7	2	
Jul	494	463	432	401	370	339	308	277	246	215	184	153	122	91	61	33	14	1
Aug	487	456	425	394	363	332	301	270	239	208	177	146	115	84	53	26	7	
Sept	413	383	353	323	293	263	233	203	173	143	113	83	53	27	11	2		
Oct	371	340	309	278	247	216	185	154	123	92	61	32	7					
Nov	280	250	220	190	160	130	100	70	40	19	9	2						
Dec	224	193	162	131	100	69	38	11	1									
Total for 1954	3690	3340	2991	2647	2311	1987	1685	1409	1166	946	751	570	407	269	156	68	23	1

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1954

Table 23

1955	Number of degree-days above :																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23 °C
Jan	116	92	68	45	25	10	1																	
Feb	81	58	39	24	12	4																		
Mar	81	58	37	18	6	1																		
Apr	258	228	198	168	138	108	81	55	35	18	4													
May	311	280	249	218	187	156	124	93	63	35	23	16	10	4	1									
Jun	443	413	383	353	323	293	263	233	203	173	143	113	84	56	29	10	1							
Jul	636	605	574	543	512	481	450	419	388	357	326	295	264	233	202	171	143	117	92	68	46	26	9	1
Aug	631	600	569	538	507	476	445	414	383	352	321	290	259	228	197	166	135	104	73	42	18	8	2	
Sept	501	471	441	411	381	351	321	291	261	231	201	171	141	111	81	52	31	17	6	1				
Oct	369	338	307	276	245	214	183	152	121	91	65	44	27	11	2									
Nov	260	230	200	170	140	110	80	50	22	5														
Dec	199	168	137	106	75	45	20	6																
Total for 1955	3886	3541	3202	2870	2551	2249	1968	1713	1476	1262	1083	929	785	643	512	399	310	238	171	111	64	34	11	1

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1955

Table 24

1956	Number of degree-days above :																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 °C
Jan	143	114	85	56	27	7													
Feb	54	33	14	3	1														
Mar	140	110	80	52	29	12	3												
Apr	240	210	180	150	120	90	60	33	16	6									
May	357	326	295	264	233	202	171	140	109	78	48	29	17	7	1				
Jun	441	411	381	351	321	291	261	231	201	171	141	111	81	52	29	15	4		
Jul	528	497	466	435	404	373	342	311	280	249	218	187	156	125	94	63	32	9	2
Aug	480	449	418	387	356	325	294	263	232	201	170	139	108	77	46	20	5		
Sept	441	411	381	351	321	291	261	231	201	171	141	111	81	51	22	4			
Oct	367	336	305	274	243	212	181	150	119	88	59	33	9	2					
Nov	252	222	192	162	132	102	72	44	20	3									
Dec	220	189	158	127	96	65	38	15	3										
Total																			
for 1956	3663	3308	2955	2612	2283	1970	1683	1418	1181	967	777	610	452	314	192	102	41	9	2

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1956

Table 25

1957	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C
Jan	185	154	123	92	61	31	9														
Feb	151	124	97	70	43	21	6														
Mar	225	194	163	132	101	71	43	18	2												
Apr	271	241	211	181	151	121	91	61	32	12	3										
May	371	340	309	278	247	216	185	154	123	92	61	34	18	7	1						
Jun	524	494	464	434	404	374	344	314	284	254	224	194	164	134	104	74	47	27	11	2	
Jul	591	560	529	498	467	436	405	374	343	312	281	250	219	188	157	126	95	64	34	12	2
Aug	545	514	483	452	421	390	359	328	297	266	235	204	173	142	111	81	55	33	18	7	
Sept	415	385	355	325	295	265	235	205	175	145	115	85	55	29	12	3					
Oct	365	334	303	272	241	210	179	148	117	86	55	27	10								
Nov	261	231	201	171	141	111	81	51	21	5											
Dec	207	176	146	115	84	52	24	5													
Total																					
for 1957	4111	3747	3384	3020	2656	2298	1961	1658	1394	1172	974	794	639	500	385	284	197	124	63	21	2

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1957

Table 26

1958	Number of degree-days above :																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 °C
Jan	138	110	82	55	29	6													
Feb	108	81	54	30	12	1													
Mar	96	71	46	23	8														
Apr	196	166	136	106	76	46	27	10	2	1									
May	317	286	255	224	193	162	131	100	69	38	14	3							
Jun	450	420	390	360	330	300	270	240	210	180	150	120	90	60	33	12	4	1	
Jul	540	509	478	447	416	385	354	323	292	261	230	199	168	137	106	75	44	18	
Aug	534	503	472	441	410	379	348	317	286	255	224	193	162	131	100	69	38	11	
Sept	507	477	447	417	387	357	327	297	267	237	207	177	147	117	87	59	36	16	2
Oct	382	351	320	289	258	227	196	165	134	103	72	41	14	4	1				
Nov	282	252	222	192	162	132	102	72	42	19	6								
Dec	191	160	129	98	67	36	11	2											
Total for 1958	3741	3386	3031	2682	2348	2031	1766	1526	1302	1094	903	733	581	449	327	215	122	46	2

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1958

Table 27

1959	Number of degree-days above :																			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 °C
Jan	76	58	40	24	12	5	1													
Feb	56	45	33	21	8															
Mar	192	161	130	99	68	37	11													
Apr	244	214	184	154	124	94	64	34	15	5	1									
May	429	398	367	336	305	274	243	212	181	150	119	92	67	47	30	16	5			
Jun	508	478	448	418	388	358	328	298	268	238	208	178	148	118	88	60	36	18	6	
Jul	576	545	514	483	452	421	390	359	328	297	266	235	204	173	142	111	80	49	21	5
Aug	579	548	517	486	455	424	393	362	331	300	269	238	207	176	145	114	83	52	23	5
Sept	513	483	453	423	393	363	333	303	273	243	213	183	153	123	93	63	36	18	4	
Oct	439	408	377	346	315	284	253	222	191	160	129	99	72	45	23	6				
Nov	271	241	211	181	151	121	91	61	32	15	6									
Dec	212	181	150	119	88	57	27	5												
Total for 1959	4095	3760	2424	3090	2759	2438	2134	1856	1619	1408	1211	1025	851	682	521	370	240	137	54	10

37

1959

Table 28

1960	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20°C	
Jan	162	131	100	70	41	16	4															
Feb	99	76	54	35	18	4																
Mar	163	132	101	70	40	15	1															
Apr	242	212	182	152	122	92	62	38	24	12	5											
May	401	370	339	308	277	246	215	184	153	122	91	61	37	19	7	3	1					
Jun	535	505	475	445	415	385	355	325	295	265	235	205	175	145	115	85	57	34	19	8	1	
Jul	535	504	473	442	411	380	349	318	287	256	225	194	163	132	101	70	39	10				
Aug	542	511	480	449	418	387	356	325	294	263	232	201	170	139	108	77	46	15				
Sept	475	445	415	385	355	325	295	265	235	205	175	145	115	85	56	28	10					
Oct	367	336	305	274	243	212	181	151	120	89	58	29	17	7								
Nov	244	214	184	154	124	94	64	34	10	4	1											
Dec	183	152	121	90	59	29	10	2														
Total																						
for 1960	3948	3588	3229	2874	2523	2185	1892	1642	1418	1216	1022	835	677	527	387	263	153	59	19	8	1	

38

1960

Table 29

1961	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	°C		
Jan	129	99	69	39	15	3	1															
Feb	139	111	83	55	27	6																
Mar	198	167	136	105	74	43	15	2	1													
Apr	266	236	206	176	146	116	86	57	34	17	3											
May	386	355	324	293	262	231	200	169	138	107	76	47	25	7								
Jun	445	415	385	355	325	295	265	235	205	175	145	115	85	55	27	9	3	1				
Jul	517	486	455	424	393	362	331	300	269	238	207	176	144	114	82	51	23	5	1			
Aug	494	463	432	401	370	339	308	277	246	215	184	153	122	91	60	29	5					
Sept	470	440	410	380	350	320	290	260	230	200	170	140	110	80	50	23	8	3				
Oct	372	341	310	279	248	217	186	155	124	93	63	42	25	9								
Nov	249	219	189	159	129	99	69	39	16	3												
Dec	144	118	93	69	45	27	11	1														
Total																						
for 1961	3809	3450	3092	2735	2384	2058	1762	1495	1263	1048	848	673	511	356	219	112	39	9	1			

39

1961

Table 30

1962

Number of degree-days above :

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	°C
Jan	116	90	64	38	13													
Feb	125	97	69	41	16	2												
Mar	86	62	39	18	6	1												
Apr	200	170	140	110	80	51	31	20	10	3								
May	340	309	278	247	216	185	154	123	92	61	30	7	1					
Jun	438	408	378	348	318	288	258	228	198	168	138	108	78	50	25	10	2	
Jul	498	467	436	405	374	343	312	281	250	219	188	157	126	95	64	35	11	
Aug	473	442	411	380	349	318	287	256	225	194	163	132	101	70	39	14	2	
Sept	423	393	363	333	303	273	243	213	183	153	123	93	63	33	13	5		
Oct	376	345	314	283	252	221	190	159	128	97	66	38	13					
Nov	239	209	179	149	119	89	61	38	23	9								
Dec	130	103	77	54	33	14	2											
Total																		
for 1962	3444	3095	2748	2406	2078	1785	1538	1318	1109	904	708	535	382	248	141	64	15	

40

1962

Table 31

1963

Number of degree-days above :

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	°C
Jan	17	9	3																			
Feb	0																					
Mar	99	74	50	26	8																	
Apr	196	166	136	106	76	47	24	11	5													
May	305	274	243	212	181	150	119	88	57	32	18	11	7	3	1							
Jun	480	450	420	390	360	330	300	270	240	210	180	150	120	90	60	35	20	10	3			
Jul	518	487	456	425	394	363	332	301	270	239	208	177	146	115	84	54	26	12	4	1		
Aug	526	495	464	433	402	371	340	309	278	247	216	185	154	123	92	62	39	22	11	6	1	
Sept	430	400	370	340	310	280	250	220	190	160	130	100	70	40	11							
Oct	367	336	305	274	243	212	181	150	119	88	57	27	8	1								
Nov	278	248	218	188	158	128	98	68	40	20	7											
Dec	134	109	85	62	41	20	7	1														
Total																						
for 1963	3350	3048	2750	2456	2173	1901	1651	1418	1199	996	816	650	505	372	248	151	85	44	18	7	1	

41

1963



Table 32

1964	Number of degree-days above :																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 °C
Jan	121	94	67	44	23	4													
Feb	126	99	72	45	21	3													
Mar	143	112	81	50	21	1													
Apr	199	169	139	109	79	52	29	14	4										
May	335	304	273	242	211	180	149	118	88	65	48	33	21	9	4	1			
Jun	442	412	382	352	322	292	262	232	202	172	142	112	83	55	31	17	8	2	1
Jul	535	504	473	442	411	380	349	318	287	256	225	194	163	132	101	70	43	18	4
Aug	548	517	486	455	424	393	362	331	300	269	238	207	176	145	114	83	52	25	8
Sept	463	433	403	373	343	313	283	253	223	193	163	133	103	73	43	22	7		
Oct	368	337	306	275	244	213	182	151	120	89	58	29	15	6					
Nov	263	233	203	173	143	113	83	53	26	5									
Dec	168	141	114	87	60	35	15	3											
Total for 1964	3711	3355	2999	2647	2302	1979	1714	1473	1250	1049	874	708	561	420	293	193	110	45	13

42

1964

Table 33

1965	Number of degree-days above :																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 °C	
Jan	117	87	59	38	18	3													
Feb	101	76	52	28	8	1													
Mar	99	76	53	31	13	2													
Apr	213	183	153	123	93	63	34	9											
May	349	318	287	256	225	194	163	132	101	71	48	28	11	3	1				
Jun	454	424	394	364	334	304	274	244	214	184	154	124	95	67	41	19	6		
Jul	511	480	449	418	387	356	325	294	263	232	201	170	139	108	77	46	17	3	
Aug	506	475	444	413	382	351	320	289	258	227	196	165	134	103	72	41	17	4	
Sept	421	391	361	331	301	271	241	211	181	151	121	91	61	31	6				
Oct	381	350	319	288	257	226	195	164	133	102	71	41	16	4					
Nov	221	191	161	132	103	77	51	30	17	5	1								
Dec	142	113	84	55	27	7	1												
Total for 1965	3515	3164	2816	2477	2148	1855	1604	1373	1167	972	792	619	456	316	197	106	40	7	

43

1965

Table 34

1966	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19°C	
Jan	102	74	48	26	9	3															
Feb	114	89	65	42	22	5															
Mar	179	148	117	86	55	24	4														
Apr	207	177	147	117	87	57	28	11	5	1											
May	347	316	285	254	223	192	161	130	99	68	38	17	8	5	3	1					
Jun	504	474	444	414	384	354	324	294	264	234	204	174	144	114	84	55	29	9	1		
Jul	559	528	497	466	435	404	373	342	311	280	249	218	187	156	125	94	63	33	11	1	
Aug	511	480	449	418	387	356	325	294	263	232	201	170	139	108	77	46	17	2			
Sept	457	427	397	367	337	307	277	247	217	187	157	127	97	67	37	10	1				
Oct	395	364	333	302	271	240	209	178	147	116	86	57	31	11							
Nov	246	216	186	156	126	96	65	37	19	5	2	1									
Dec	182	151	120	89	58	28	3														
Total																					
for 1966	3803	3444	3088	2737	2394	2066	1769	1533	1325	1123	937	764	606	461	326	206	110	44	12	1	

44

1966

Table 35

1967	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19°C	
Jan	131	102	75	49	24	7	2	1													
Feb	154	126	98	70	42	15	1														
Mar	180	149	118	87	56	25	3														
Apr	213	183	153	123	93	63	34	15	3												
May	306	275	244	213	182	151	120	89	58	28	10	3	1								
Jun	501	471	441	411	381	351	321	291	261	231	201	171	141	111	82	58	38	21	11	3	
Jul	552	521	490	459	428	397	366	335	304	273	242	211	180	149	118	87	56	26	9	1	
Aug	537	506	475	444	413	382	351	320	289	258	227	196	165	134	103	72	41	16	4		
Sept	453	423	393	363	333	303	273	243	213	183	153	123	93	63	33	12	2				
Oct	356	325	294	263	232	201	170	139	108	77	48	27	11	2							
Nov	231	201	171	141	111	81	51	26	10												
Dec	167	137	107	77	47	22	8	1													
Total																					
for 1967	3781	3419	3059	2700	2342	1998	1700	1460	1246	1050	881	731	591	459	336	229	137	63	24	4	

45

1967

Table 36

1968	Number of degree-days above :																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 °C	
Jan	115	88	61	38	19	4															
Feb	81	58	35	16	4	1															
Mar	136	106	78	51	26	6															
Apr	222	192	162	132	102	72	47	29	16	8	3										
May	342	311	280	249	218	187	156	125	94	63	36	20	11	6	3	1					
Jun	527	497	467	437	407	377	347	317	287	257	227	197	167	137	107	77	48	26	14	4	
Jul	531	500	469	438	407	376	345	314	283	252	221	190	159	128	97	66	36	13	1		
Aug	547	516	485	454	423	392	361	330	299	268	237	206	175	144	113	82	51	21	3		
Sept	468	438	408	378	348	318	288	258	228	198	168	138	108	78	50	26	12	1			
Oct	394	363	332	301	270	239	208	177	146	115	84	53	22	3							
Nov	249	219	189	159	129	99	69	39	14	3	1										
Dec	184	153	122	91	65	41	22	10	2												
Total																					
for 1968	3796	3441	3088	2744	2418	2112	1843	1599	1369	1164	977	804	642	496	370	252	147	61	18	4	

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1968

Table 37

1969	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C	
Jan	147	117	87	57	29	6																
Feb	53	34	18	7	2																	
Mar	78	53	29	9	2																	
Apr	194	165	136	107	78	51	24	5														
May	329	298	267	236	205	174	143	112	81	52	34	21	11	4	1							
Jun	503	473	443	413	383	353	323	293	263	233	203	173	143	113	85	60	37	17	8	3		
Jul	551	520	489	458	427	396	365	334	303	272	241	210	179	148	117	86	55	30	11	4	1	
Aug	584	553	522	491	460	429	398	367	336	305	274	243	212	181	150	119	88	59	33	13	2	
Sept	484	454	424	394	364	334	304	274	244	214	184	154	124	94	65	39	20	8	1			
Oct	406	375	344	313	282	251	220	189	158	127	96	65	35	9								
Nov	242	212	182	152	122	93	68	46	30	18	8	3	1									
Dec	141	110	80	49	19	2	1															
Total																						
for 1969	3712	3364	3021	2686	2373	2089	1846	1620	1415	1221	1040	869	705	549	418	304	200	114	53	20	3	

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1969

Table 38

1970	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C	
Jan	74	55	36	17	3																	
Feb	58	39	22	7																		
Mar	97	70	44	23	8																	
Apr	163	133	103	73	43	18	4	1														
May	383	352	321	290	259	228	197	166	136	109	83	59	38	20	4							
Jun	545	515	485	455	425	395	365	335	305	275	245	215	185	155	125	96	68	40	21	8	1	
Jul	513	482	451	420	389	358	327	296	265	234	203	172	141	110	79	48	19	6	1			
Aug	546	515	484	453	422	391	360	329	298	267	236	205	174	143	112	81	52	27	10	2		
Sept	438	408	378	348	318	288	258	228	198	168	138	108	78	48	24	9	2					
Oct	363	332	301	270	239	208	177	146	115	84	55	31	13	2								
Nov	245	215	185	155	125	95	65	36	17	6	1											
Dec	189	158	127	96	65	38	16	3														
Total																						
for 1970	3614	3274	2937	2607	2296	2019	1769	1540	1333	1143	961	790	629	478	344	234	141	73	32	10	1	

48

1970

Table 39

1971	Number of degree-days above :																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C	
Jan	128	103	78	53	29	6																
Feb	124	97	70	43	18	2																
Mar	153	123	93	63	33	9	1															
Apr	248	218	188	158	128	98	68	42	21	4												
May	396	365	334	303	272	241	210	179	148	117	86	58	32	11	1							
Jun	438	408	378	348	318	288	258	228	198	168	138	108	78	48	20	5	2					
Jul	587	556	525	494	463	432	401	370	339	308	277	246	215	184	153	122	91	62	33	14	3	
Aug	547	516	485	454	423	392	361	330	299	268	237	206	175	144	113	82	51	23	6	1		
Sept	488	458	428	398	368	338	308	278	248	218	188	158	128	98	68	38	12					
Oct	394	363	332	301	270	239	208	177	146	115	84	57	35	21	9							
Nov	241	211	181	151	121	91	62	40	23	11	5											
Dec	208	177	146	115	84	53	24	3														
Total																						
for 1971	3952	3595	3238	2881	2527	2189	1901	1647	1422	1209	1015	833	663	506	364	247	156	85	39	15	3	

49

1971

Table 40

1972	Number of degree-days above :																						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21 °C	
Jan	155	125	95	66	37	9																	
Feb	118	91	64	37	12	1																	
Mar	172	141	110	80	49	24	8	1															
Apr	232	202	172	142	112	82	52	30	13	1													
May	325	294	263	232	201	170	139	108	77	47	25	11	3										
Jun	381	351	321	291	261	231	201	171	141	111	81	51	24	7	1								
Jul	542	511	480	449	418	387	356	325	294	263	232	201	170	139	108	83	65	48	32	17	4	1	
Aug	548	517	486	455	424	393	362	331	300	269	238	207	176	145	114	83	52	23	4	1			
Sept	457	427	397	367	337	307	277	247	217	187	157	127	97	67	39	18	10	4	1				
Oct	379	348	317	286	255	224	193	162	131	100	69	40	19	4									
Nov	261	231	201	171	141	111	81	53	35	21	10	1											
Dec	196	165	134	103	72	41	14	1															
Total																							
for 1972	3766	3403	3040	2679	2319	1980	1683	1429	1208	999	812	638	489	362	262	184	127	75	37	18	4	1	

50

1972

Table 41

1973	Number of degree-days above :																						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 °C		
Jan	155	125	95	65	36	13																	
Feb	130	103	80	56	33	11																	
Mar	192	161	130	99	68	37	12	1															
Apr	226	196	166	136	106	76	48	27	12	3													
May	350	319	288	257	226	195	164	133	102	71	46	29	17	9	3								
Jun	504	474	444	414	384	354	324	294	264	234	204	174	144	114	85	59	36	17	5	1			
Jul	566	535	504	473	442	411	380	349	318	287	256	225	194	163	132	101	70	42	18	5			
Aug	564	533	502	471	440	409	378	347	316	285	254	223	192	161	130	99	68	40	19	8	1		
Sept	480	450	420	390	360	330	300	270	240	210	180	150	120	90	61	35	15	3	1				
Oct	359	328	297	266	235	204	173	142	111	80	49	27	16	7	1								
Nov	241	212	183	154	125	96	69	43	22	9	2												
Dec	169	139	109	79	49	22	5	1															
Total																							
for 1973	3936	3575	3218	2860	2504	2158	1853	1607	1385	1179	991	828	683	544	412	294	189	102	43	14	1		

51

1973

Table 42

1974	Number of degree-days above :																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 °C
Jan	176	145	114	83	52	21	2												
Feb	164	136	108	80	52	26	6	2											
Mar	181	150	119	88	57	29	9	1											
Apr	276	246	216	186	156	126	96	66	37	13	4								
May	380	349	318	287	256	225	194	163	132	101	71	47	29	12	3				
Jun	486	456	426	396	366	336	306	276	246	216	186	156	126	96	67	44	26	11	2
Jul	530	499	468	437	406	375	344	313	282	251	220	189	158	127	96	65	34	7	
Aug	527	496	465	434	403	372	341	310	279	248	217	186	155	124	93	62	31	8	1
Sept	425	395	365	335	305	275	245	215	185	155	125	95	65	40	18	4			
Oct	305	274	243	212	181	150	119	89	60	34	14	3							
Nov	220	190	160	130	100	70	40	15	2										
Dec	209	178	147	116	85	54	25	6											
Total																			
for 1974	3879	3514	3149	2784	2419	2059	1727	1456	1223	1018	837	676	533	399	277	175	91	26	3

52

1974

Table 43

1975	Number of degree-days above :																						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 °C
Jan	204	173	142	111	80	49	20	2															
Feb	151	123	95	67	39	14	2																
Mar	165	134	103	72	41	15	3																
Apr	228	198	168	138	108	80	56	36	21	12	6	2											
May	360	329	298	267	236	205	174	143	112	81	53	31	17	8	3	1							
Jun	507	477	447	417	387	357	327	297	267	237	207	177	147	118	92	67	44	24	9	1			
Jul	587	556	525	494	463	432	401	370	339	308	277	246	215	184	153	122	91	60	32	9			
Aug	643	612	581	550	519	488	457	426	395	364	333	302	271	240	209	178	147	116	85	55	33	17	5
Sept	469	439	409	379	349	319	289	259	229	199	169	139	109	79	54	33	20	9	1				
Oct	348	317	286	255	224	193	162	131	100	69	38	13	3										
Nov	252	222	192	162	132	102	72	44	21	8	3												
Dec	182	151	120	89	58	29	9	1															
Total																							
for 1975	4096	3731	3366	3001	2636	2283	1972	1709	1484	1278	1086	910	762	629	511	401	302	209	127	65	33	17	5

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1975

Table 44 Summary of degree-days by season 1933-1975.

(a) Degree-days over 0° C (derived from Tables 1 - 43) are shown for each season of the year. Winter has been taken as December - January - February and is listed under the January date, spring March - April - May, summer June - July - August and autumn September - October - November. The lowest and highest values in each season are shown underlined in the table.

(b) The degree-days over 0° C in Table 44 (a) were ranked in order of magnitude in each season and arbitrarily divided into three categories. In each season the eleven years with the highest ranks have been designated warm, the eleven lowest ranks designated cool and the remainder medium. The results have been tabulated as w (warm), m (medium) and c (cool).

Table 44

	(a)				(b)			
	Win.	Spr.	Sum.	Aut.	Win.	Spr.	Sum.	Aut.
	Degree-days above 0° C							
1933	-	705	1659	1125	-	m	w	w
34	480	602	1560	1030	m	c	m	c
35	<u>611</u>	735	1568	1007	w	m	m	c
36	416	661	1487	1061	m	m	m	m
37	549	684	1557	1082	w	m	m	m
38	481	764	1435	1084	m	m	c	m
39	558	733	1550	1094	w	m	m	m
40	360	719	1588	989	c	m	m	c
41	356	521	1532	1084	c	c	m	m
42	385	566	1416	1025	m	c	c	c
43	568	740	1474	1030	w	m	m	c
44	544	<u>667</u>	1470	964	w	m	c	c
45	388	756	1508	1148	m	m	m	w
46	525	676	<u>1386</u>	999	w	m	c	c
47	381	<u>495</u>	1617	1170	c	c	w	w
48	526	782	1418	1060	w	w	c	m
49	577	769	1601	1210	w	w	m	w
50	538	705	1537	957	w	m	m	c
51	277	596	1541	1084	c	c	m	m
52	391	793	1536	<u>896</u>	m	w	m	c
53	271	803	1584	1125	c	w	m	w
54	464	752	1430	1064	m	m	c	m
55	421	650	1710	1130	m	c	w	w
56	396	737	1449	1060	m	m	c	m
57	556	<u>867</u>	1660	1041	w	w	w	m
58	453	609	1524	1171	m	c	m	w
59	323	865	1663	<u>1223</u>	c	w	w	w
60	473	806	1612	1086	m	w	w	m
61	451	850	1456	1091	m	w	c	m
62	385	626	1409	1038	m	c	c	m
63	<u>147</u>	600	1524	1075	c	c	m	m
64	381	677	1525	1094	c	m	m	m
65	386	661	1471	1023	m	m	c	c
66	358	733	1574	1098	c	m	m	m
67	467	699	1590	1040	m	m	m	m
68	363	700	1605	1111	c	m	w	w
69	384	601	1638	1132	m	c	w	w
70	273	643	1604	1046	c	c	w	m
71	441	797	1572	1123	m	w	m	w
72	481	729	1471	1097	m	m	c	m
73	481	768	1634	1080	m	w	w	m
74	509	837	1543	950	m	w	m	c
75	564	753	<u>1737</u>	1069	w	m	w	m

w = warm,  
m = medium,  
c = cool.

Table 45

Degree-days 1933-1975 (derived from Tables 1 - 43).

(a) January to March over 5° C

(b) June to September over 15° C

(c) June to September over 20° C

Table 45

	(a) January to March Degree-days over 5° C	(b) June to September Degree-days over 15° C	(c) June to September Degree-days over 20° C
1933	43	323	7
34	33	198	15
35	104	220	1
36	21	170	0
37	53	207	1
38	71	102	2
39	72	217	0
40	8	217	10
41	0	201	3
42	10	82	0
43	74	109	0
44	53	150	4
45	25	200	0
46	37	56	0
47	10	309	17
48	61	84	4
49	71	301	10
50	64	161	0
51	1	185	0
52	16	165	0
53	20	234	12
54	33	68	0
55	15	399	64
56	19	102	0
57	123	284	2
58	7	203	0
59	42	348	0
60	35	260	1
61	52	112	0
62	3	64	0
63	0	151	1
64	8	192	0
65	6	106	0
66	32	205	0
67	47	229	0
68	11	251	0
69	6	304	3
70	0	234	1
71	17	247	3
72	34	184	4
73	61	294	1
74	76	175	0
75	78	400	33



Table 46

## Monthly mean surface temperatures, Windermere 1933 to 1975, in degrees centigrade

Year	1933	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Jan	5.3	5.3	6.5	5.0	6.1	5.4	5.8	2.1	2.7	4.0	5.8	6.1	2.7	5.2	4.5
Feb	5.0	5.2	5.9	2.6	5.5	5.0	5.3	2.6	2.7	1.5	5.8	5.1	4.1	5.0	1.5
Mar	5.4	5.0	6.0	4.4	4.4	6.4	5.9	4.2	3.7	3.0	5.8	4.7	5.6	4.3	1.5
Apr	6.8	5.8	6.9	6.0	6.5	7.9	7.1	6.6	5.4	6.2	7.6	7.0	8.2	7.3	4.7
May	10.8	8.8	11.0	11.2	11.4	10.6	10.8	12.6	8.0	9.3	10.7	10.1	10.8	10.5	9.9
Jun	16.7	15.3	14.9	14.8	15.1	13.7	16.4	18.9	15.1	13.9	14.9	13.1	14.1	13.4	15.8
Jul	19.1	19.2	18.3	17.3	16.8	15.6	16.2	16.5	18.7	16.4	16.8	16.4	17.2	16.4	16.8
Aug	16.2	16.3	17.9	16.4	18.7	17.5	17.9	16.4	16.1	15.8	16.3	18.4	17.8	15.4	20.1
Sep	16.4	14.7	14.3	15.5	15.0	14.7	16.3	13.8	15.5	14.3	13.8	13.7	15.7	13.3	16.9
Oct	12.7	11.2	10.5	11.3	12.3	11.3	11.0	10.6	12.4	11.5	11.3	10.4	12.6	11.0	12.7
Nov	8.0	8.0	8.4	8.3	8.4	9.8	8.8	8.2	7.8	8.0	8.8	7.7	9.6	8.6	9.0
Dec	5.5	7.8	6.0	6.6	5.6	7.5	7.1	6.4	7.1	7.3	6.7	6.1	7.2	6.4	6.5
Year	1948	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Jan	5.7	6.1	6.0	2.9	3.5	3.1	5.1	3.7	4.6	6.0	4.5	2.5	5.2	4.2	3.7
Feb	5.1	5.5	5.0	2.7	2.6	3.2	2.3	2.9	1.9	5.4	3.9	2.0	3.4	5.0	4.5
Mar	5.8	5.6	5.8	3.4	5.2	5.2	4.6	2.6	4.5	7.3	3.1	6.2	5.3	6.4	2.8
Apr	7.6	7.8	6.8	6.1	7.8	7.6	8.5	8.6	8.0	9.0	6.5	8.1	8.1	8.9	6.7
May	12.1	11.7	10.4	9.9	12.8	13.4	11.5	10.0	11.5	12.0	10.2	13.8	12.9	11.9	11.0
Jun	14.4	16.2	16.8	14.7	15.6	16.1	15.0	14.4	14.7	17.5	15.0	16.9	17.8	14.8	14.6
Jul	15.5	18.6	16.8	18.3	17.7	17.7	15.9	20.5	17.0	19.1	17.4	18.6	17.3	16.7	16.1
Aug	16.3	17.4	16.6	17.2	16.8	17.8	15.7	20.4	15.5	17.6	17.2	18.7	17.5	15.9	15.3
Sep	13.8	17.0	13.3	14.7	13.6	14.9	13.8	16.7	14.7	13.8	16.9	17.1	15.8	15.7	14.1
Oct	11.9	13.9	10.7	12.1	9.7	12.7	12.0	11.9	11.8	11.8	12.3	14.2	11.8	12.0	12.1
Nov	9.2	9.0	7.5	8.9	6.3	9.4	9.3	8.7	8.1	8.7	9.4	9.0	8.1	8.3	8.0
Dec	7.5	6.9	3.6	6.7	2.8	7.9	7.2	6.4	8.4	6.7	6.2	6.8	5.9	4.7	4.2

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Table 46 cont'd

## Monthly mean surface temperatures, Windermere 1933 to 1975, in degrees centigrade

Year	1963	64	65	66	67	68	69	70	71	72	73	74	75
Jan	0.6	3.9	3.8	3.3	4.2	3.7	4.7	2.4	4.1	5.0	5.0	5.7	6.6
Feb	0.0	4.3	3.6	4.1	5.5	2.8	1.9	2.1	4.4	4.1	4.6	5.9	5.4
Mar	3.2	4.6	3.2	5.8	5.8	4.4	2.5	3.1	4.9	5.6	6.2	5.8	5.3
Apr	6.5	6.6	7.1	6.9	7.1	7.4	6.5	5.4	8.3	7.7	7.5	9.2	7.6
May	9.8	10.8	11.3	11.2	9.9	11.0	10.6	12.4	12.8	10.5	11.3	12.3	11.6
Jun	16.0	14.7	15.1	16.8	16.7	17.6	16.8	18.2	14.6	12.7	16.8	16.2	16.9
Jul	16.7	17.3	16.5	18.0	17.8	17.1	17.8	16.6	18.9	17.5	18.3	17.1	18.9
Aug	17.0	17.7	16.3	16.5	17.3	17.7	18.8	17.6	17.7	17.7	18.2	17.0	20.7
Sep	14.3	15.4	14.0	15.2	15.1	15.6	16.1	14.6	16.3	15.2	16.0	14.2	15.6
Oct	11.8	11.9	12.3	12.7	11.5	12.7	13.1	11.7	12.7	12.2	11.6	9.8	11.2
Nov	9.3	8.8	7.4	8.2	7.7	8.3	8.1	8.2	8.0	8.7	8.0	7.3	8.4
Dec	4.3	5.4	4.6	5.9	5.4	5.9	4.6	6.1	6.7	6.3	5.5	6.7	5.9

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Table 47

Frequency distributions of monthly mean surface water temperatures  
Windermere 1933 to 1975

Degrees centigrade	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
20.0-20.9							1	3				
19.0							3	0				
18.0						2	9	6				
17.0						3	13	18	2			
16.0						13	14	10	8			
15.0						8	3	6	12			
14.0						12			12	1		
13.0					2	4			9	2		
12.0					8	1				16		
11.0					13					18		
10.0					13					4		
9.0				2	5					2	10	
8.0				8	2						26	1
7.0			1	15							6	9
6.0	7		5	14							1	17
5.0	13	17	16	3								9
4.0	8	7	10	1								5
3.0	8	4	7									1
2.0	6	10	3									1
1.0	0	4	1									
0.0-0.9	1	1										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec

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AMBLESIDE, 1977.

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