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Length of Snow Season Across a Portion of the Northern Blue Ridge Mountains in Virginia

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Introduction

Weather, in its most basic definition, is the atmospheric situation in which each of us exists at any given time. Over Virginia, weather patterns are complex, not only because of the longitudinal and the latitudinal variations across the state, but also because of altitude differences. The topography in the state varies from flat and near sea level for some distance inland from the Atlantic coast and shores of the Chesapeake Bay, to the rugged and comparatively high terrain of the Appalachian Mountains in the western section of the state.

In this paper, one particular component of weather for a specific region of Virginia is discussed, namely the length of period during the winter in which snow lies on the ground. The paper will document, for three sites in the region near and in the northern Blue Ridge Mountains, the variations of snow cover as a function of elevation for a number of years. It will be shown that in most winters a sufficient snow cover exists in the mountains to undertake winter sports activities.

Methods and Results

Snowfall and duration of snow on the ground for selected climatological sites are available from the publication *Climatological Data, Virginia* as prepared by the National Climatic Center in Asheville, North Carolina. These observations are supposed to be made at several locations at the site and are intended to represent the total snowfall and representative snow depth over the area. The effects of drifting, along with horizontal variations in melting, however, often make the interpretation of these measurements very difficult. In fact, it would be useful to have values of the standard deviation of the snow depth and snowfall, as well as their mean values.

Three sites were chosen for the study: Warrenton, east of the Blue Ridge at an altitude of 500 ft (164 m); Big Meadows, near the crest of the Blue Ridge at 3535 ft (1160 m); and Dale Enterprise, at 1400 ft (459 m) to the west in the Shenandoah Valley. The locations of these sites are indicated on Figure 1.

The data were evaluated for the winters of 1958–59 through 1974–75 and cataloged into days with measurable amounts, greater than 5 in. (12.7 cm), greater than 10 in. (25.4 cm), and greater than 15 in. (38.1 cm) of snow on the ground along with the maximum depth for that season, as shown in Table 1. The results are as one would expect, with the high elevation station of Big Meadows recording higher maximum amounts and longer durations of snow cover than the other stations. Dale Enterprise at a somewhat higher elevation than Warrenton and further inland, to the west of the Blue Ridge Mountains, is generally second in maximum amounts and duration. The averages and standard deviations for each category are also listed on the table.

For Warrenton and Dale Enterprise, the occurrence of snow depths greater than 15 in. (38.1 cm), or even 10 in. (25.4 cm), is a rare event. On the other

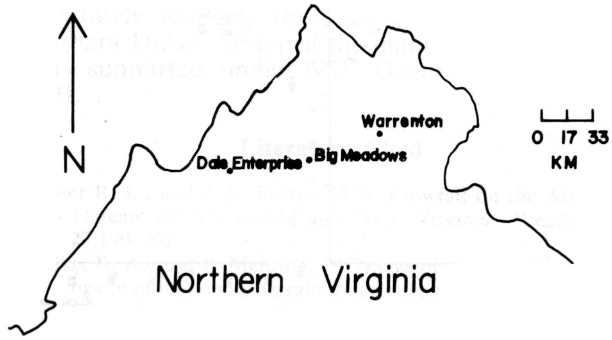

FIG. 1—Locations of Warrenton, Big Meadows and Dale Enterprise in Virginia

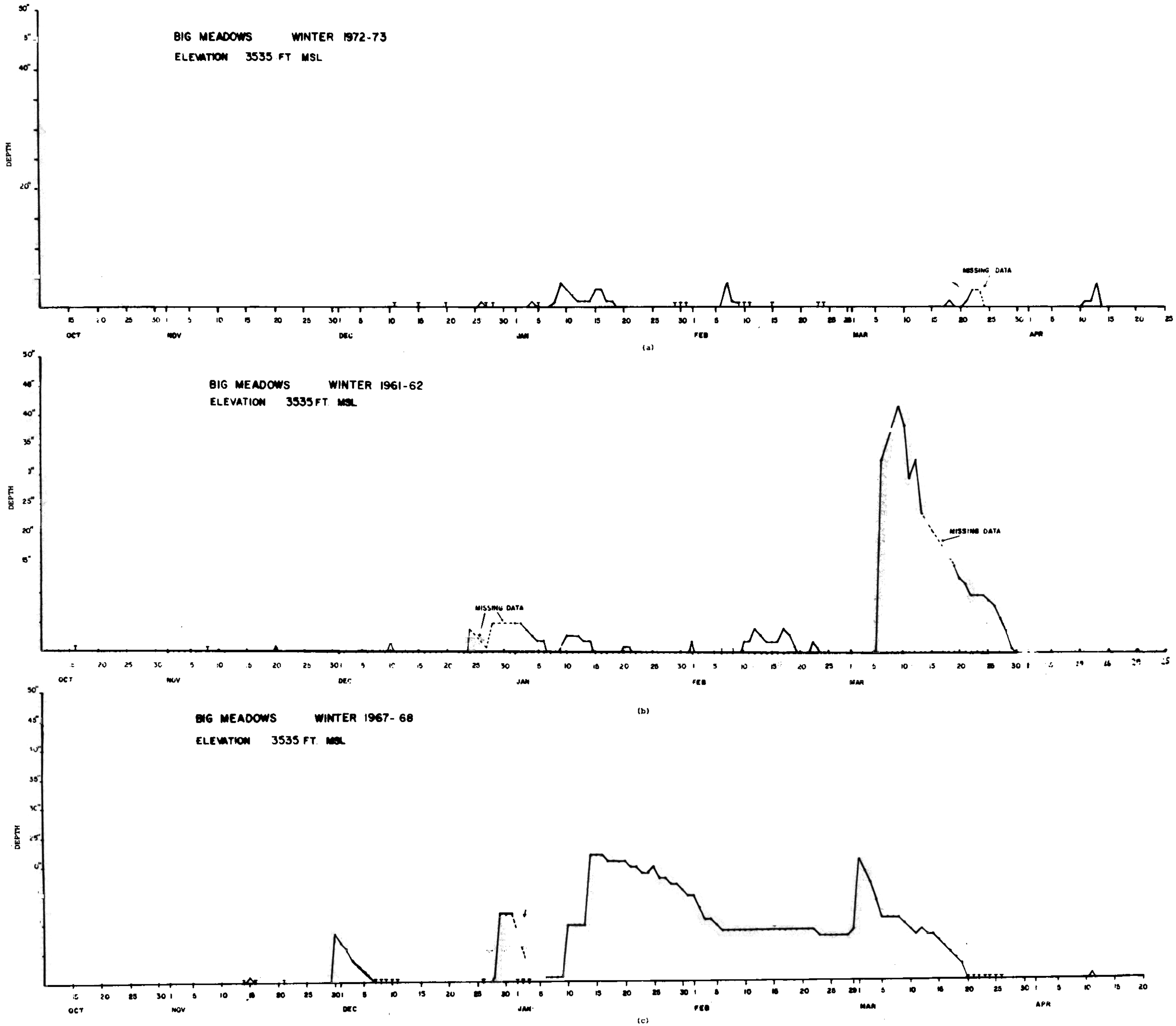

FIG. 2—Plots of snow depth against time at Big Meadows, Virginia, for several winter seasons (a) 1972-73, (b) 1961-62, and (c) 1967-68

TABLE I

Number of days with a) measurable; b) greater than 5 inches (12.7 cm); c) greater than 10 inches (25.4 cm); d) greater than 15 inches (38.1 cm) of snow on the ground along with e) maximum depth of snow on the ground in inches (cm).

	Warrenton					Big Meadows					Dale Enterprise				
Season	a	b		d			b		d	e		b		d	
1974–1975	9	0	0	0	4 (10.2)	57	8	3	0	12 (30.5)	17	0	0	0	5 (26.2)
1973–1974	21	2	0	0	9 (22.9)	35	7	4	0	14 (35.6)	18	6	0	0	8 (20.3)
1972–1973	5	0	0	0	1 (2.54)	29	0	0	0	4 (10.2)	4	0	0	0	2 (5.1)
1971–1972	18	0	0	0	4 (10.2)	46	17	11	7	20 (50.8)	19	5	0	0	8 (20.3)
1970–1971	37	6	0	0	10 (25.4)	63	9	6	4	18 (45.7)	38	4	2	0	12 (30.5)
1969–1970	45	14	4	0	12 (30.5)	76	12	4	0	12 (30.5)	38	5	0	0	8 (20.3)
1968–1969	22	2	0	0	7 (17.8)	55	24	6	3	25 (63.5)	21	2	0	0	7 (17.8)
1967–1968	39	3	0	0	8 (20.3)	92	72	32	22	22 (55.9)	47	17	0	0	10 (25.4)
1966–1967	44	12	0	0	9 (22.9)	72	35	6	0	13 (33.0)	37	8	0	0	7 (17.8)
1965–1966	28	18	12	10	22 (55.9)	48	26	20	15	35 (88.9)	27	21	14	9	22 (55.9)
1964–1965	35	1	0	0	6 (15.2)	48	10	4	0	12 (30.5)	29	3	0	0	7 (17.8)
1963–1964	45	8	0	0	9 (22.9)	104	54	35	13	18 (45.7)	48	21	0	0	10 (25.4)
1962–1963	35	15	0	0	9 (22.9)	80	32	0	0	9 (22.9)	54	17	0	0	9 (22.9)
1961–1962	16	0	0	0	4 (10.2)	70	23	17	14	42 (106.7)	39	8	7	6	24 (61.0)
1960–1961	53	31	5	0	15 (38.1)	91	46	32	22	42 (106.7)	50	22	3	0	15 (38.1)
1959–1960	37	15	4	0	12 (30.5)	58	47	41	40	38 (96.5)	47	15	2	0	13 (33.0)
1958–1959	12	0	0	0	4 (10.2)	42	4	0	0	10 (25.4)	12	0	0	0	4 (10.2)
Mean	29.5	7.5	1.5	0.6	8.5 (21.6)	62.7	25.1	13.0	8.2	20.4 (51.8)	32.1	9.1	1.6	.88	10.1 (25.7)
Standard Deviation	14.3	8.8	3.2	2.43	5.0 (12.7)	21.1	20.2	13.8	11.4	12.0 (30.5)	15.0	8.0	3.7	2:55	5.8 (14.7)

hand, depths greater than 15 in. (38.1 cm) at Big Meadows occur almost every winter, although none have occurred in the last three years.

To illustrate the variations of snow depth for three characteristic winters at Big Meadows, the snow depth versus time is plotted in Figures 2a to 2c. The slope of the line is positive during snowfall events and negative during melt and ablation episodes. Figure 2a is an example of an extreme minimum of snow activity with minor snow events widely dispersed during the season, while Figure 2b, in contrast, is an example of a winter with minimal snow activity until a major event in March. The last figure is representative of a winter with a long period of continuous and comparatively deep snows. The notation of missing data on the figures indicates observations were not taken on these dates, while the label "questionable data" for several days for the 1967-68 winter was given because the observation of a rapid removal of the snow cover was not consistent with the recorded maximum temperatures which remained below freezing during that period.

Conclusions

Several conclusions concerning the snow climatology of the northern Blue Ridge are possible from this data:

1. The duration of snow cover and maximum depth have decreased in recent years at all elevations. Because of the nature of climatic fluctuations, no indication of future snow conditions in the region should be interpreted from this data.
2. Maximum snow depth and duration at the lower elevations occur frequently enough to promise winter conditions each year, but the lack of significant periods of deep snow generally precludes the use of the snow for recreational activities such as snowshoeing, cross-country skiing or snowmobiling.
3. At the higher elevations, on the other hand, snow depths and durations are often sufficient for winter recreation activities. Although it is well known (see Leffler and Foster 1974) the Allegheny Plateau in West Virginia is superior in the amounts of snow, the Blue Ridge Mountains can also play an important role in winter sports, and facilities should be encouraged at higher elevations to take advantage of this resource. As shown by Pielke and Mehring (1977), the mean monthly temperatures at the same elevation in the Allegheny Plateau and the Blue Ridge are nearly the same; thus when snow falls it is as likely to remain there as in the Plateau region to the west.

Acknowledgements

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