STUDIES OF OREGON'S CLIMATE FOR THE FOREST INDUSTRY

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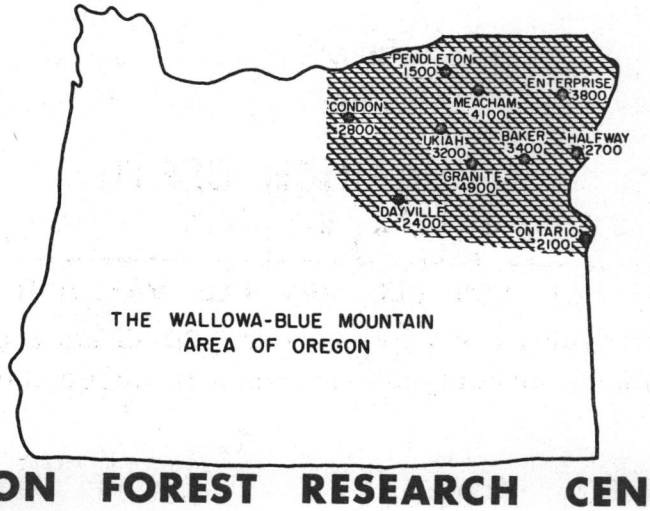
RELATIONSHIPS BETWEEN ELEVATION AND SELECTED SNOW DEPTHS IN THE WALLOWA-BLUE MOUNTAIN AREA (FROM CONDON TO ONTARIO)

Because snow is such an important environmental factor in the western United States, no series of climatological studies for Oregon would be complete without some consideration of it. Because of generally low temperatures at high elevations and wide range of terrain elevations in all parts of the region, there is usually a reliable connection between elevation and depth of the snow pack. This relationship changes, of course, from one year to another and from one period of the year to another. This Note examines the relationship and its variability, enabling the reader to estimate for a given date the lowest elevation at which a certain depth of snowpack will be found in the Wallowa-Blue Mountain area.

The map below shows the portion of Oregon for which information in this Note is considered applicable. Also on the map are located the official stations of the U. S. Weather Bureau which were the source of data on snow depth on which this Note is based. Beside each station name is given its elevation. With so few stations spread over such a large area, one clearly may draw only general conclusions about snow depth from data at hand. Nature of the area is such, however, that when allowance is made for obvious differences in accumulation of snow between, for instance, an open ridge top and a sheltered north-facing slope, the conclusions appear to be reliable. In interpreting the Figures in this Note, therefore, the reader must assume the information refers to a typical site in the area having average exposure, vegetative cover, and wind action. Allowance must be made for other factors acting beyond the "average" condition presented here.



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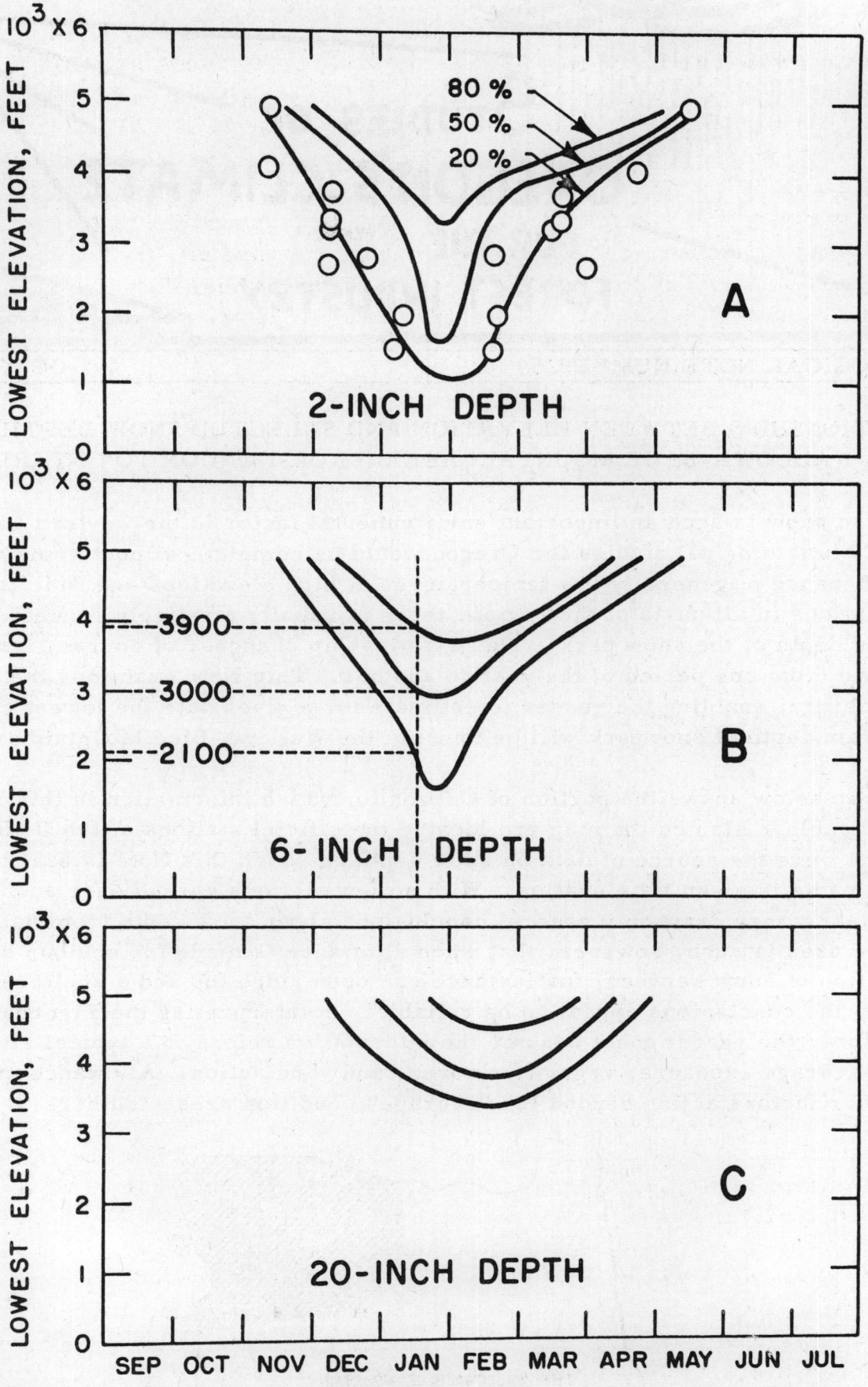

Figure 1. Probabilities of several depths of snow in Wallowa-Blue Mountain area at various elevations (in thousands of feet).

Question: "At a given time in the winter, what is the lowest elevation in the Wallowa-Blue Mountain area at which the general snow pack reaches a certain depth?"

Figure 1: As an example of how to read this Figure, assume the question above is asked by an operator whose equipment may not be used if the snow depth is six inches or greater, and who is interested in the period around the middle of January. To obtain the answer to his question, look at Figure 1B, the middle portion of Figure 1, in which the critical snow depth is 6 inches. Looking at the vertical line representing January 15, he sees this line intersects the three curved lines at elevations of 3900, 3000, and 2100 feet. This means that in 8 years out of ten (the upper line marked "80%") the snow pack will exceed 6 inches in depth above 3900 feet; in 5 years out of 10 the critical elevation will be as low as 3000 feet, and 2 years out of 10 (lower line marked "20%") the equipment will be inoperable below 2100 feet. There is, then, no single answer to the question, and one must take into account the probabilities involved when making an operational decision. That is, the operator in this example sees that only rarely would he be able to operate above 3900 feet in mid-January and only rarely would he NOT be able to operate up to 2100 feet. If this information is not sufficient for his planning purposes, of course, he must wait until the actual time of concern arrives and obtain information on the situation existing at the time. The information in Figure 1, then, is for general planning only and cannot serve safely as a forecasting tool for any particular year.

The data: The Figures in this Note are based on observations of snow depth made at stations indicated on the map during the years 1949-59. Rather than readings of snow depth for each day of the winter, readings from the tenth, twentieth, and last days of each month were selected in constructing the Figures. Circles plotted in Figure 1A for the 2-inch snow depth were the points plotted in drawing the curve to show 20 per cent probability in that Figure. They were included to give the reader some idea of the ability of the Figure to portray average conditions over the entire area in question.

The points from which curves in the Figures were plotted were located by noting the earliest and latest dates of the three selected for each month, on which the station had observed the critical snow depth the required percentage of the years examined. In instances of shorter record than the full ten winters, dates were estimated as well as possible. Most of the points, however, are based on the full ten winters of record.

The three snow depths chosen--two, six, and twenty inches--were selected as representing critical depths for most operations likely to be conducted in the area during the winter. The reader wishing information on greater depths should consult the monthly publication "Climatological Data for Oregon" of the U. S. Weather Bureau, or write to the Oregon Forest Research Center, Corvallis.

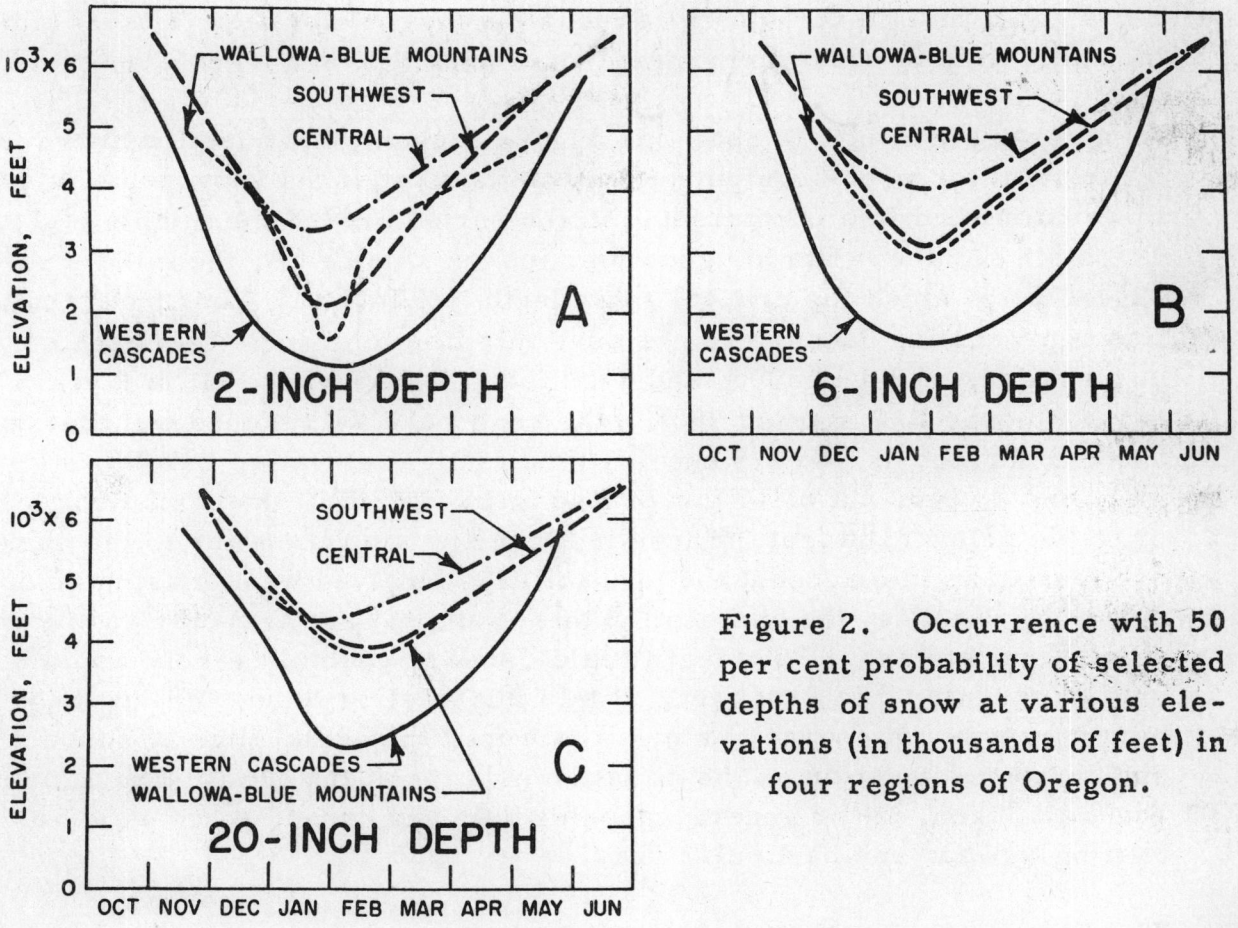

Figure 2. Occurrence with 50 per cent probability of selected depths of snow at various elevations (in thousands of feet) in four regions of Oregon.

The reader will gain an idea from Figure 2 of the relationships between elevation and snow depth for various areas of the state of Oregon. The three parts of the Figure represent information on the three snow depths considered, and in each appear curves representing four sections of Oregon. The curves denote 50 per cent probability from each of the elevation-snow depth Figures in this series of Climatological Notes.

In examining Figure 2, one sees deep snows arrive earliest, reach lowest elevations, and are gone soonest in the spring in the western Cascades. The end of January is generally the height of winter, and at this time conditions are similar in Southwest Oregon and in the Wallowa-Blue Mountain area. The sharp dip in the 2-inch snow line (Figure 2C) at mid-winter in the Wallowas and Blue Mountains indicates the low elevations receive shallow snows at this time that last for only a few weeks, then disappear.

Curves for Southwest and Central Oregon come together for high elevations in each instance because data from Crater Lake National Park Headquarters were followed in constructing both curves. The Headquarters lies on the dividing line between the two regions.

William P. Lowry,
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