

COLLECTION AND PUBLICATION OF SNOW COVER DATA BY
THE METEOROLOGICAL SERVICE OF CANADA

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ABSTRACT

This paper describes the snow survey program presently being undertaken by the Meteorological Service of Canada and some of the changes being made in the publication of snow cover data.

During the past two years decisions have been made whereby the Meteorological Service of Canada will become much more active in the field of snow survey and publication of snow survey data. Before describing this new policy, I would like to take a few minutes to explain the reason for the seemingly belated action, and in so doing put on record what the Meteorological Service of Canada has accomplished in these fields in the past.

In a country where the meteorological and hydrological services are in different departments of government, there may be some problems in assigning the responsibility for snow cover. If we define meteorology as the study dealing with the phenomena of the atmosphere, and hydrology as the scientific study of the waters of the earth, especially with relation to the effects of precipitation and evaporation upon the occurrence and character of water in streams, lakes, and on or below the land surface, then snow cover, which is no longer part of the atmosphere, and which has not changed its state to the natural form of water, may be considered to lie outside the primary field of interest of both these disciplines. In a large country with a small population scattered throughout a large area, the cost of providing basic meteorological service has also imposed restrictions on the activities of the Meteorological Service and considerable pressure has been necessary before any responsibilities which appeared to be outside the normal sphere of interest have been assumed.

When the Meteorological Service was first organized 90 years ago, we can find little evidence of interest in snow cover. By 1881 the observers were first supplied with a form which contained a space for providing some information on snow cover. Most observers simply described conditions for sleighing as good, fair, or no sleighing.

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The first systematic approach to collecting information on snow cover at all principal stations was taken in 1916 when observers were supplied with new forms with a space for a daily description of sleighing, and elsewhere on the form provision was made to record the depth of snow in inches each Monday morning and on the last day of the month. This snow depth on the last day of each month was not recorded regularly by all stations, but when data were available they were published from 1916 onward in the Monthly Record of Meteorological Observations in Canada ⁽¹⁾. This series of data continues to be published in the same form. Data from this source made it possible to draw the Canadian section of the maps of Depth of Snow Cover in the Northern Hemisphere ⁽²⁾ issued by the Corp of Engineers of the United States Army.

The only other action of interest taken prior to the ending of World War II was the adoption of the use of a new international synoptic code in January 1941 which made it mandatory for all principal stations to take a daily observation of snow cover depth for dissemination by teletype. While we have records of these observations, none of this extra data was published.

In looking back over the years prior to the end of World War II, it appears that any activity in the field of snow cover by the Meteorological Service of Canada likely arose from the requirements of the transportation industry and others interested only in snow depth, and there was little pressure to observe the water content.

Increased operations in the north during World War II, especially those involving ski-equipped aircraft, raised questions concerning the physical characteristics of snow cover. The Meteorological Branch cooperated with our National Research Council at the end of the war in taking specialized observations of this nature at selected stations in the different climatic regions of Canada. Some observations were also taken along these lines for the use of SIPRE.

The foregoing isolated instances of interest in snow cover do not appear to have arisen out of any pressure from hydrologic interests. However, the accumulation of such data over a long period of time created an awareness within the Meteorological Service that we should be more active in this field. When the proposal was made some nine years ago by the Eastern Snow Conference that the snow survey data from eastern Canada by various private companies and other governmental agencies for each winter should be collected centrally and published, the Meteorological Service of Canada accepted this responsibility. This publication ⁽³⁾ has been issued annually beginning with the winter of 1954-55.

The next step forward occurred shortly after this in 1958 when a decision was made to establish a Hydrometeorology Section within the Meteorological Service. Since this section is responsible for that part of meteorology of direct concern to the hydrologic problems, particularly to flood control, it also resulted in a more direct interest in snow cover - particularly the water content.

Shortly after this, the Meteorological Branch was requested formally by the Sub-committee of Hydrology and the Associate Committee of Soil and Snow Mechanics of the National Research Council to conduct regular snow surveys at weather stations. The first of these was, of course, interested in gathering data for hydrologic purposes in areas of Canada where private industry or other organizations do not carry out snow surveys. This includes all that region north of approximately 50° N in eastern Canada and north of 55° N in western Canada. The Associate Committee of Soil and Snow Mechanics wanted information over the same area of snow cover depth and density. They particularly felt that there was a requirement for more information on density as from this a forecast of the bearing strength of the snow could be produced.

As a result of these requests the Meteorological Branch decided to initiate a formal snow survey observational program at all its principal stations staffed by full-time employees of the Meteorological Branch or Department of National Defense personnel. This includes approximately 100 stations and includes most of our stations in the less densely populated areas of Canada.

At approximately 30 of these stations the snow course will be a 10-point course and observations will be taken twice monthly. At the remainder where the observers cannot be away from their duties for any extended period, samples will be taken at only 5 points, but 4 observations will be made each month.

A pilot project was begun in the winter of 1961-62 at twelve of these stations for testing equipment and procedures. The stations where the snowfall was greater than 60 inches per annum were supplied with a snow sampler of the Mount Rose type. In prairie and arctic areas where the snowfall is less than 60 inches the equipment supplied was a sampling tube of larger diameter, (approx. 3 in.) designed by MacKay and called the "Prairie Sampler". When the pilot program was begun last winter it was thought that the program could get underway at all stations for the current winter of 1962-63. However, serious problems with the equipment came to light. A full-scale implementation of this program will not occur until the winter of 1963-64 at the earliest. We are presently surveying existing equipment in an attempt to design equipment that will overcome the difficulties encountered during the pilot project. We have also found that lack of snow surveying experience among most staff members of the Meteorological Service is a great handicap in attempting to start a program of this size.

Since our publication of snow cover data up until last winter covered only the 6 eastern provinces of Canada, it was necessary, once we began a country-wide program of snow surveys, to consider changing this publication. At present we are planning to include in this publication only regular snow survey data, and eliminate all the point measurements of snow depth which were included formerly. Data from all parts of Canada will be included.

Before the publication appears in its final form in two or three years time the issues for the intervening years will compromise between the two forms. For example, the coverage in the issue for 1961-62 has been extended to include all the snow survey data presently being collected in the three Prairie Provinces as well as eastern Canada. This is only possible through the cooperation of the numerous agencies carrying out snow surveys in that region. We did not, for this year, include the regular snow surveys in the Columbia and Fraser Valleys carried on by the Water Rights Branch of the government of British Columbia as they regularly publish their data in bulletin form. We have had preliminary discussions with them and ultimately their data will likely be included in our publication.

Since snow cover data were available from only a few of our principal stations this year, we thought that initially we would continue to include a section in the publication that would give the regular observations of snow depth only on the 15th and 31st of the month at our principal stations and the stations of the Canada Department of Agriculture which regularly carry on this observation. When our full snow survey program is under way, these data will not likely be included.

It will be seen that the Meteorological Branch has moved more rapidly during the past few years in assuming additional responsibilities both in taking observations and in the publication of data, and there is every indication that this trend will continue. In our publication of data from other agencies we are particularly grateful to the excellent cooperation of the members of the Eastern Snow Conference who have made the results of their annual snow survey available to us for the past eight winters. Much of the data reach us each winter without being requested and are assembled in a form which makes it possible to type directly from the listing to the manuscript. During last winter in the first collection of data from agencies in the Prairie Provinces we had the same excellent cooperation. Without this spirit of cooperation it would have been impossible for us to carry on this publication, and I wish to personally thank each one of you who have assisted us in this matter.

REFERENCES:

- (1) Monthly Record of Meteorological Observations in Canada - This publication has been issued monthly at Toronto since January 1916, but is at present about 1 year in arrears. The Monthly Record is the most complete monthly summary of temperature, precipitation, wind, sunshine and general weather available for all Canadian stations. Daily listings of temperature, precipitation, sunshine and radiation are given.
- (2) U.S. Army - Depth of snow cover in the Northern Hemisphere. Corps of Engineers, Arctic Construction and Frost Effects Laboratory, Boston, 1954. 4p., 18 tables, 38 plates.

REFERENCES CONTINUED:

- (3) Snow Cover Data, Eastern Canada - This periodical was begun for the winter of 1954-55, and is issued annually from Toronto about six months after the end of the snow cover season in southeastern Canada. The periodical contains a listing of all available data on the depth of snow on the ground twice a month from climatological stations and monthly data on snow depth and water equivalents from snow course surveys. Much of the data in this periodical is supplied from snow courses operated by other organizations.