

1981
EASTERN SNOW CONFERENCE

RESULTS OF SNOW SURVEY SCHEDULE COMMITTEE
QUESTIONNAIRE

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INTRODUCTION:

In order to evaluate the value and the needs for snow data as well as the status of snow survey networks, a questionnaire was prepared and mailed to all agencies associated with snow measurements (nearly 100 agencies). A form of the questionnaire is presented in Appendix I. Despite the fact that the response rate to the questionnaire was approximately 20 percent, the results are presented in this paper. The results of this questionnaire are also compared with a similar one which was done nearly two years ago. It is hoped that this paper will present some indication on the status of the operating snow survey networks and the changes in technology or instrumentation which have taken place in the past two years.

QUESTIONNAIRE RESULTS, 1981

NETWORKS

1. Q. How many snow survey stations does your agency operate?
 - A. The total number of operating stations reported is 712. This total number of stations is operating in 18 networks out of 19 respondents. The size of networks range from 1 to 140 stations.
2. Q. Has the number of stations changed recently?
 - A. Recent changes have been reported in two (2) networks only. The change was reported as an increase of one station in one network and a decrease of five stations in the other network.
3. Q. Have you recently done a snow network calculation? If so, what methods were used? (Please describe).
 - A. Seven (7) networks have been evaluated. The methods used in the evaluation include: Optimal Interpolation (Gandin), Basin Characteristics, Detailed Areal Survey, and Statistical Averages.
4. Q. What standard of station operation do you follow?
 - A. The number of networks operated under various standards are listed below:

AES = 7, NWS = 1, USGS = 3, SCS = 1, ESC = 5, Unspecified = 3.

DATA AND ANALYSES

5. Q. Indicate parameters observed: snow depth, water equivalent. In what ratio do you observe these parameters? What is your frequency of observation?

A. All respondents measure snow depth and water equivalent. Sixteen agencies measure these parameters at a ratio of 1:1; one agency uses a ratio of 3:1; and one agency uses a ratio of 10:1. The frequency of observation is listed below in a descending order:

Observation Frequency	No. of Agencies
ESC schedule (see Appendix I)	8
Weekly	3
Monthly	3
Daily	1
Every three weeks	1
Three times per year	1
Annually	1

6. Q. What accuracy is required for a single station observation?

A. Accuracy standards varied significantly between respondents. Eight agencies reported no accuracy standards; two agencies reported an accuracy standard of 15 to 20 percent of the mean; two other agencies consider the nearest centimeter as the accuracy standards; while five agencies take 0.1 inch as the standard.

7. Q. What are the data used for?

A. The various types of uses for snow data are listed below with the corresponding number of agencies using the data for such purposes.

Flood Forecasting	17	Water Balance	7
Reservoir Storage	11	Recreation	5
Research	11	Water Supply	5
Publication	9	Wildlife	4
Climatology	9	Agriculture	3
Hydropower	7		

8. Q. Are the data used operationally? Are snow data essential?

A. Operational Use: Yes = 17; No = 2
Essentialness: Yes = 17; No = 2

9. Q. Do you cooperate with others to exchange snow data? If so, in real-time or historic?

A. Data Exchange: Yes = 17; No = 2
Real-Time = 13
Historic = 8

10. Q. Do you use a standard data format in exchange or in archiving?

A. Exchange: Yes = 12; No = 4; Unspecified = 3
Archiving: Yes = 12; No = 4; Unspecified = 3

11. Q. What means of data exchange do you use?

A. Means of data exchange are listed below in descending order:

Mail	16
Telephone	15
Reports	4
Telex	1
Telecopy	1

12. Q. Are your data quality controlled?

A. Yes = 12; No = 7

Methods used for quality control vary from standard screening and inspection of data through field and office procedures to the selection of acceptable methods for snow survey as well as regular site inspection and calibration of instruments.

13. Q. What types of analysis do you perform?

A. Mapping	12
Areal Averaging	10
Hydrologic Studies	8
Water Balance	5
Indexing	5
Terrain Correlation	5
No Analysis	3

INSTRUMENTS

14. Q. What types of instruments do you use? (Please identify the main stay).

A. Federal (Mount Rose) snow sampler is the most widely used instrument between the respondents (total number of 13 users). Other instruments are also in use; such as Adirondack snow sampler (2), Sacramento snow gauge (1), Environment Quebec Instrument (1), and Carpenter snow sampler (1).

15. Q. Has your instrumentation changed recently? If so, why? (Describe the change).

A. There has been, generally, no changes in snow instrumentation among the respondents. The only change that was reported resulted from a regional standardization.

16. Q. Do you have any new technology snow instrumentation in operation? If yes, please indicate.

A. Yes = 3; No = 16.

New technologies which were reported include: the use of gamma measuring gauges; a comparison study between Nipher and Tretyakov snow gauges; the use of rain gauges as snow samplers; and metric snow samplers.

CONCLUSIONS

The following conclusions are based on the responses received for the 1981 questionnaire (a total of 19 respondents) and must be interpreted as such.

1. The total number of stations with the 18 networks were reported to be 712. A minimal change has been observed within these networks which resulted in the deletion of four stations. Recently about 40 percent of these networks have been evaluated.

2. Various standards of network operation are exercised; the AES and ESC standards are the most commonly used among agencies.
3. Generally, snow depth and water equivalent are measured at a ratio of 1:1 in most of the networks, as was observed in 1979. The snow survey schedule is the most favourable observation routine between all agencies.
4. As was observed in the 1979 questionnaire, Flood Forecasting, Reservoir Storage and Research still hold the top of the list of uses for snow data.
5. The importance of snow data for operational uses appear to be very popular within all agencies. Also, a wide exchange of data is evident within the entire region. Exchange of data on a real-time basis makes up 60 percent of the data exchanged; about a 10 percent increase above that observed in 1979. Yet, only 63 percent of the snow data are quality controlled which may have a significant effect on all data users within the area.
6. Federal (Mount Rose) snow sampler is the most commonly used snow instrument in the area. The questionnaire revealed that there was no significant change in instrumentation; only a few cases are under study at the time.

ABBREVIATIONS

AES: Atmospheric Environment Service, Canada
ESC: Eastern Snow Conference
NWS: National Weather Service, United States
SCS: Soil Conservation Service, United States
USGS: United States Geological Survey

APPENDIX 1

1981

EASTERN SNOW CONFERENCE

SNOW SURVEY SCHEDULE COMMITTEE QUESTIONNAIRE

NAME: _____
AGENCY: _____
ADDRESS: _____

NETWORKS

1. How many snow survey stations does your Agency operate? _____

2. Has the number of stations changed recently? [] YES [] NO

If so, by how much? _____

3. Have you recently done a snow network evaluation? [] YES [] NO

If so, what methods were used? (Please describe) _____

List available reference(s): _____

4. What standard of station operation do you follow?

[] AES [] NWS [] USGS

[] SCS [] ESC [] OTHER (Specify)

DATA AND ANALYSES

5. Indicate parameters observed:

[] Snow depth [] Water equivalent

In what ratio do you observe these parameters? _____

What is your frequency of observation? _____

6. What accuracy is required for a single station observation? _____

7. What are the data used for? (In order of importance)

[] Flood Forecasting [] Agriculture [] Publication

[] Reservoir Storage [] Wildlife [] Water Supply

[] Hydropower [] Research [] Climatology

[] Water Balance [] Recreation [] Other (Specify)

8. Are the data used operationally? [] YES [] NO

Are snow data essential? [] YES [] NO

9. Do you cooperate with others to exchange snow data? YES NO
 If so, in real-time or historic? _____
10. Do you use a standard data format; in exchanging? YES NO
 in archiving? YES NO
11. What means of data exchange do you use?
 Mail Telex Reports
 Telephone Telecopy Other (Specify)
12. Are your data quality controlled? YES NO If so, how?

13. What type(s) of analysis do you perform?
 Mapping Hydrology studies Indexing No Analysis
 Areal Averaging Water Balancing Terrain Correlation

INSTRUMENTS

14. What type(s) of instruments do you use? (Please identify the main stay)

15. Has your instrumentation changed recently? YES No If so, why?

 Describe the change: (metric, technology, etc.) _____

16. Do you have any new technology snow instrumentation in operation?
 YES NO if yes, please describe _____

Please return to: Dr. Nabil D. Elhadi, P. Eng.
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 N.B. Department of Environment
 P.O. Box 6000
 Fredericton, New Brunswick E3B 5H1

EASTERN SNOW CONFERENCE

PROPOSED SNOW SCHEDULING FOR 1981

Survey Number	Dates 1981	Report Data to Regional Office by:
1	Jan. 26 - Jan. 28	Jan. 29
2	Feb. 23 - Feb. 25	Feb. 26
3	Mar. 16 - Mar. 18	Mar. 29
4	Mar. 30 - Apr. 01	Apr. 02
5	Apr. 13 - Apr. 15	Apr. 16
6	Apr. 27 - Apr. 29	Apr. 30
7	May 11 - May 13	May 14

Regional Reporting Centres:

ATLANTIC PROVINCES: Mr. J.E. Peters, Water Survey of Canada, DOE, P.O. Box 365, Halifax, Nova Scotia, Canada.

MAINE: Mr. Jeffery Armbruster, U.S. Geological Survey, State House Annex, Augusta, ME 04330.

NEW BRUNSWICK: Mr. J.G. Lockhart, N.B. Dept. of the Environment, P.O. Box 6000, Fredericton, N.B. E3B 5H1, Canada.

NEW ENGLAND STATES: Mr. Ivan C. James II, U.S. Geological Survey, WRD, 150 Causeway St., Boston, Mass 02114

QUEBEC: Mr. André Fréchette, Quebec Meteorological Service, Dept. of Environment, 194 St. Sacrement, Quebec G1N 4J5, Canada

This schedule has been compiled in accordance with the Eastern Snow Conference Snow Survey Schedule Committee's Operating Rules by Dr. Nabil Elhadi, Mr. André Fréchette, and Mr. Hugh Greenan.