

RESULTS OF THE SNOW SURVEY SCHEDULE COMMITTEE QUESTIONNAIRE 1988

INTRODUCTION

The members of the Snow Schedule Survey Committee of the Eastern Snow Conference(ESC) in 1979 and 1981 have proceeded to evaluate the status of the snow survey networks in the eastern part of the continent and the results have been reported to the Executive Committee of the Conference.

Since that time, a certain number of agencies that are responsible for the operation of these networks, have been under pressure to cut into the expenses of these operations and in some cases stations have had to be closed.

The members of the Snow Survey Schedule Committee for 1987-1988 thought it might be appropriate at this time to proceed to a similar investigation and have come up with a questionnaire that was sent to all members of the ESC and agencies that either operate or use snow survey data. The questionnaire was sent at the end of January 1988.

Thirty-one returns of the questionnaire have been received and of these twenty-seven were from agencies that operate networks of magnitude ranging from 1 to 213.

The airborne gamma ray surveys of the NWS which represented 1250 flight lines in 1986 were not considered in analysing the questionnaires since our purpose was to evaluate the standard networks. The members of the Snow Survey Committee want to stress that their decision has nothing to do with the validity of the NWS program.

The total number of stations reported here is 1221. As a matter of comparison the totals for 1979 and 1981 were 1164 and 712 respectively.

QUESTIONNAIRE RESULTS, 1988

NETWORKS

1. NUMBER OF SNOW SURVEY STATIONS IN 1986, 1987, 1988.

	1988		1987		1986	
	CAN	US	CAN	US	CAN	US
Snow depth	771	283	767	253	740	253
Water equiv.	773	448	769	418	742	418

NUMBER OF POINTS PER STATION. Percentage of stations with given number of points.

	CAN	US
Single point	2.6%	27.9%
Five-point	14.7%	47.8%
Ten-point	79.0%	24.3%
Other	<u>3.7%</u>	<u>0.0</u>
	100.0%	100.0%

2. FREQUENCY OF OBSERVATION. Number of observations per month.

	CAN	US
during the accumulation period	1.7	1.6
during the ablation period	2.0	2.4

The answers to the second part of question 2 referring to the number of stations sampled at regular intervals or on an event basis were impossible to breakdown into accumulation and ablation periods and have therefore been analysed together.

PERCENTAGE OF STATIONS SAMPLED.

	CAN	US
At regular intervals	98.2%	100.0%
On an event basis	10.5%	2.9%
On Landsat coincident dates	23.9%	13.2%

3. TYPE OF SNOW SAMPLER. Percentage of stations with a given sampler.

	CAN	US
Mont Rose	72.4%	9.4%
AES	15.9%	0
Utah	0.8%	0
Carpenter	8.2%	0
WSC	2.6%	0
Adirondak	0.1%	57.6%
Modified federal	0	3.1%
Other	<u>0</u>	<u>29.9%</u>
	100.0%	100.0%

4. QUALITY CONTROL OF THE DATA. Percentage of stations.

It was evident in a certain number of answers that different persons have different ideas on what constitutes a sufficient quality control on snow survey data. The responses have nevertheless been compiled although their meaning should be viewed with caution.

	CAN	US
YES	92.5%	38.2%
NO	<u>7.5%</u>	<u>61.8%</u>
	100.0%	100.0%

5. THE STANDARDS THAT ARE USED. Percentage of stations.

	CAN	US
ESC	6.1%	54.5%
AES	61.1%	0
WSC	1.1%	0
USGS	0	15.4%
SCS	0	3.6%
Others	<u>31.7%</u>	<u>26.5%</u>
	100.0%	100.0%

USE AND EXCHANGE OF DATA

6. THE USE OF THE DATA.

The twelve different uses that were presented were indeed quite vast and some of them had common domain. The answers were grouped in seven categories and are presented below. The figures represent the number of responses indicating a particular use with respect to the total number of uses mentioned.

	CAN	US
Flood forecasting		
Reservoir Storage		
Hydro-Power	58.2%	75.6%
Water Balance		
Water Supply		
Research	3.8%	7.3%
Climatology	10.1%	4.9%
Publication	11.4%	2.4%
Agriculture	7.6%	0
Wildlife	6.3%	2.4%
Recreation	<u>2.5%</u>	<u>7.3%</u>
	100.0%	100.0%

7. IS THE DATA USED OPERATIONALLY? Percentage of stations.

	CAN	US
YES	99.5%	99.1%
NO	<u>0.5%</u>	<u>0.9%</u>
	100.0%	100.0%

DATA STORAGE. Percentage of stations with data on a particular support.

	CAN	US
Documents only	27.7%	38.8%
Mag. tapes	<u>72.3%</u>	<u>61.2%</u>
	100.0%	100.0%

NUMBER OF YEARS OF DATA IN ARCHIVE.

	CAN	US
On documents only	27.6 years	44.6 years
On mag. tapes	21.2 "	27.3 "

8. EXCHANGE OF DATA. Percentage of stations exchanging data with other agencies.

	CAN	US
YES	99.6%	100.0%
In Real Time	94.4%	94.8%
By Mail	90.6%	95.8%
By Telex	21.5%	0
By Telephone	96.9%	37.1%
By Computer	27.6%	53.6%

9. TYPE OF ANALYSIS PERFORMED. Percentage of stations on which a particular analysis is performed.

	CAN	US
Mapping	75.3%	87.9%
Areal Averaging	76.7%	93.3%
Probability analysis	0.1%	0
Chemical analysis	0.1%	0
Hydrological studies	60.4%	20.5%
Water Balancing	51.4%	13.2%
Indexing	14.8%	10.0
Terrain correlation	14.8%	0

10. NEW TECHNOLOGY.

AES is preparing a prototype acoustic snow depth sensor.

AES uses airborne gamma ray surveys and satellite microwave to measure snow water equivalent in research studies.

NWS operates the airborne gamma ray survey program in the US. A total of 1250 flight lines were surveyed in 1986.



## CONCLUSION

### NETWORKS

Since not the same agencies returned a questionnaire in the three years that an evaluation of the networks was performed (i.e. 1979, 1981 and 1988) no conclusion can be drawn in terms of the evolution of the number of stations from 1979 to 1988. The answers to question 1 of the 1988 questionnaire indicate however that the number of stations has increased by 7.2% in the US and 4.2% in CANADA from 1986 to 1988.

The stations are essentially all surveyed at regular intervals with less than 10% also surveyed on an event basis. In view of the relatively small percentage of measurements being done on Landsat coincident dates, an effort is probably necessary to inform the agencies on the benefits of using the ESC snow survey schedule which is prepared in accordance with Landsat passes.

### USE AND EXCHANGE OF DATA

The data is essentially all used operationally in real time and in greater part for flood forecasting, reservoir storage and hydro-power. The majority of analysis performed are mapping, areal averaging, hydrological studies and water balancing.

A surprisingly long period of record is available in the different agencies either on magnetic tapes, diskettes or documents.

### NEW TECHNOLOGIES

The only agencies using new technologies are AES and NWS which are involved in remote sensing.

## 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  
WSC: Water Survey of Canada

**PROPOSED SNOW SURVEY SCHEDULE FOR 1988**

<b>Survey Number</b>	<b>Dates 1988</b>	<b>Report Data to Regional Reporting Office by:</b>
1	Jan 25 - Jan 27	Jan 28
2	Feb 29 - Mar 02	Mar 03
3	Mar 14 - Mar 16	Mar 17
4	Mar 28 - Mar 30	Mar 31
5	Apr 11 - Apr 13	Apr 14
6	Apr 25 - Apr 27	Apr 28
7	May 16 - May 18	May 19

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**Regional Reporting Centers:**

**ATLANTIC PROVINCES:** Mr. D. McBride, Water Survey of Canada, DOE  
5<sup>th</sup> Floor, Queen Square 45 Alderney Drive  
Darmouth, Nova Scotia, B2Y 2N6, Canada

**MAINE:** Mr. Derril Cowing, U.S. Geological Survey  
26 Ganneston Drive, Augusta, Maine, 04330, U.S.A.

**NEW BRUNSWICK:** Mr. J.G. Lockhart, N.B. Department 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, U.S.A.

**QUEBEC:** Mr. Paul Lamb, Quebec Meteorological Directorate  
Dept. of the Environment, 2360, Chemin Sainte-Foy  
Sainte-Foy, Québec, G1V 4H2, Canada

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**Landsat 5 Coincident Pass Dates**

Path 10 East  
Jan 24  
Feb 09  
Feb 25  
Mar 12  
Mar 28  
Apr 13  
Apr 29  
May 15

Path 18 - West  
Feb 01  
Feb 17  
Mar 04  
Mar 20  
Apr 05  
Apr 21  
May 07  
May 23

**Note: Landsat 4 is "Out",  
not collecting data.**

Consult a Landsat Index Map for Intermediate dates and passes.