

Report of the  
EASTERN SNOW CONFERENCE  
RESEARCH COMMITTEE

February 4, 1971

The major effort of the committee over the past year has been the preparation of the index to all the published Proceedings of the Eastern Snow Conference. A copy is attached to each of these reports and additional copies may be obtained from the committee members. Please see to it that any library with which you are associated has a copy. We would also welcome any comments or suggestions for improvement of future editions of the index. The results of our survey of snow and ice research being carried out by members of the Conference, and a selected bibliography of current books and articles on snow are also attached. Both the research summary and bibliography are divided into 8 sections as follows:

1. Properties of snow and ice
2. Precipitation and accumulation
3. Snowpack measurement
4. Snowmelt
5. Streamflow
6. Lake and river ice
7. Highways and buildings
8. Soil water and frost.

The student award for snow research has been approved in principle by the Executive Committee and an Information Brochure is being prepared. We will be asking the membership for help in seeing to it that this brochure gets wide and appropriate publicity.

R.B.B. Dickison  
C. A. Federer  
D. E. Nichols  
A. R. Eschner, Chairman

EASTERN SNOW CONFERENCE RESEARCH COMMITTEE

List of Studies in Progress

1. PROPERTIES OF SNOW AND ICE

- 71-1 SNOW, ICE AND CLIMATIC STUDIES OF THE COLD REGIONS OF THE EARTH. -- Michael A. Bilello, USA CRREL, Box 282, Hanover, New Hampshire.

Observations on the changes in physical characteristics of the seasonal snow cover and the formation, growth and decay of lake, river and sea ice in the Arctic and Subarctic continue. Climatic studies related to these surface conditions and the associated environment for specific locations and general zones in the cold regions continues.

See Bibliography.

- 71-2 DEFORMATION AND FAILURE OF ICE. -- L. W. Gold, Division of Building Research, National Research Council, Ottawa 7, Ontario, Canada.

To increase knowledge concerning the dependence of the deformation and failure of ice on stress, temperature and time.

Gold, L. W. "The Process of Failure in Ice" Canadian Geotechnical Journal (in press).

- 71-3 PHYSICAL PROPERTIES OF THE SNOW COVER AND CLIMATIC CONDITIONS AT LEBANON, N. H. AND VICINITY. -- Roy E. Bates, Snow and Ice Branch, U. S. Army CRREL, Box 282, Hanover, N. H.

The purpose of this investigation was to describe the snow-climate interactions in a typical temperate locale such as the upper Connecticut River Valley. Observations of a number of climatic parameters were made over a period of three years; these observations were then related to changes in the properties of the winter snow pack. In addition, a map of the mean snowfall in Vermont and New Hampshire was made. Project is completed.

USA CRREL TR 230, Physical Characteristics of the Snow Cover Fort Greely, Alaska, 1966-67 by M. A. Bilello, R. E. Bates and J. Riley. (Sept. 1970)

USA CRREL SR 43 Part IV, Ice thickness observations North American Arctic and Subarctic 1964-65 and 1965-66 by M. A. Bilello and R. E. Bates (Nov. 1969).

USA CRREL SR 125, Ice Thickness Observation Along the Coasts of Eastern Canada and Southern Greenland by M. A. Bilello, R. E. Bates and J. Riley (Oct. 1970).

- 71-4 RADIATION BALANCE OF A DECIDUOUS FOREST IN PENNSYLVANIA. -- Dr. David R. DeWalle, Institute for Research on Land & Water Resources, 105 Research Building A, University Park, Pennsylvania 16802.

The objective is to study the seasonal variations of the radiation balance components over a deciduous forest, including effects of snow cover. To date, ten 12-hour sampling periods have been completed to document effects of leaf fall, weather, and color change during fall, 1970. Measurements with snow cover present are anticipated for winter, 1971.

- 71-5 ALBEDO OF SIMULATED SNOW SURFACES RELATED TO ROUGHNESS. -- R. B. B. Dickison, Faculty of Forestry, University of New Brunswick, Fredericton, New Brunswick.

A 12-foot square model forest was constructed of inverted conical paper cups and pipe cleaners inserted into styrofoam. Artificial snow was sprayed onto the model to simulate intercepted snow on a forest canopy. Reflected solar radiation measurements were taken over the model as "canopy density" was reduced in a random block pattern from 100% to 10%. Albedo was found to increase from less than 70% to more than 80% as the model canopy density was decreased.

- 71-6 ICE PRESSURES. -- R. Frederking, Division of Building Research, National Research Council, Ottawa 7, Ontario, Canada.

To establish the criteria required for the design of structures subject to forces due to ice.

- 71-7 CHANGE IN THE QUALITY AND QUANTITY OF RADIATION TRANSMITTED BY SNOW. -- Arthur R. Eschner, SUNY College of Forestry, Syracuse, New York 13210.

(1) Determination of the proportion of radiation incident upon the surface which is transmitted through snow of varying depths and stages of metamorphism. (2) Determination of the changes on the incident all wave spectrum in the transmission. New study being started winter 1970-71.

## 2. PRECIPITATION AND ACCUMULATION

- 71-8 SNOW STRATIGRAPHY AND DISTRIBUTION IN THE PETERBOROUGH, ONTARIO, AREA. -- W. P. Adams, Trent University, Peterborough, Ontario, Canada.

Study of the factors controlling snow distribution and of the nature of development of the snow profile during the winter.

- 71-9 PROBABILITIES OF EXTREME SNOWFALLS AND SNOW DEPTHS. -- Donald V. Dunlap, National Weather Service Office for State Climatology, Department of Meteorology, College of Agriculture and Environmental Science, Rutgers University, New Brunswick, New Jersey 08903

Maximum 24-hour snowfall for approximately 120 stations in the northeastern United States was determined by using the Lieblein method of extreme probability. Maximum depth of snow on the ground was also calculated, using the same technique. Maxima for return periods of 2, 10, 25, 50, and 100 years were calculated, based on records of fifteen seasons, and compared with the maximum values observed during the sampling period.

This study was published in May 1970.

"Probabilities of Extreme Snowfalls and Snow Depths", Northeast Regional Research Publication, Bulletin 821, New Jersey Agricultural Experiment Station, College of Agriculture and Environmental Science, Rutgers University - The State University of New Jersey, New Brunswick, New Jersey, 08903.

- 71-10 STUDY OF GREAT LAKES SNOWSTORMS. -- James E. Jiusto, State University of New York, 1400 Washington Avenue, Albany, New York 12203.

The objectives of this NOAA Sponsored study have been to examine the synoptic, mesoscale, and microphysical characteristics of snowbands occurring to the lee of Lakes Erie and Ontario. Via field programs and numerical modelling, efforts were made to better define the precipitation mechanisms, band structure, aerosol characteristics, and snowfall patterns associated with these storms.

Jiusto, James E., and Edmond W. Holroyd, 1970: Great Lakes Snowstorms, Part 1. Cloud Physics Aspects, NOAA Grant E 22-49-70 (G), ASRC SUNY, 142 p.

Jiusto, James E., Douglas A. Paine, and Michael L. Kaplan, 1970: Great Lakes Snowstorms, Part 2. Synoptic and Climatological Aspects. NOAA Grant E 22-13-69 (G), ASRC, SUNY, 58 p.

- 71-11 SNOWFALL, SNOWFALL FREQUENCIES, AND SNOW COVER DATA FOR STATIONS IN MAINE, MASS., NEW HAMPSHIRE AND VERMONT. -- Robert E. Lautzenheiser, National Weather Service/NOAA, 1000 Custom House, Boston, Mass. 02109.

To publish data for individual stations on average and extreme snowfall, averages and extremes of frequencies of snowfalls of various amounts, and snow cover.

Results are published in Substation Climatological Data, a single sheet bulletin containing much climatic information.

Stations available since last reporting: Reading, Mass.; Springfield, Mass.; Bangor, Maine; Machias, Maine; Rockland, Maine; and Windham, N. H.

- 71-12 AVALANCHE DEFENSE. -- P. A. Schaerer, Division of Building Research, National Research Council, Ottawa 7, Ontario, Canada.

To obtain the information required for making decisions concerning avalanche control projects and for the design of defense structures.

### 3. SNOWPACK MEASUREMENT

- 71-13 STUDY TO DEVELOP IMPROVED TECHNIQUES FOR MAPPING MOUNTAIN SNOW EXTENT FROM SATELLITE DATA. -- James C. Barnes, Allied Research Associates, Inc., Virginia Road, Concord, Massachusetts 01742.

Techniques to map areal snow extent from environmental satellite photography are tested in three regions of the western United States during the 1967 and 1969 snowmelt seasons. The three regions, each with characteristically different terrain, forest cover, and snowfall climatologies, are: (1) the Southern Sierra Nevada in California, (2) The Upper Columbia Basin in Idaho and Montana, and (3) the Salt River Project Area in Arizona. Snow extent measurements from aerial surveys are used as ground-truth data. Study completed.

Barnes, J. C. and C. J. Bowley, 1970: The Use of Environmental Satellite Data for Mapping Annual Snow-Extent Decrease in the Western United States, Final Report, Contract E-252-69(N), Allied Research Associates, Inc.

- 71-14 CONTINUING PROGRAM OF SNOW-COVER INVESTIGATIONS. -- River Basin Research Branch, Ontario Water Resources Commission, Division of Water Resources, 135 St. Clair Ave. W., Toronto 195, Ontario, Canada.

To determine reliable estimates of basin-wide snowpack conditions (measured indices - snow depth, water equivalent, core length and temperature) for use in evaluating the snowpack liquid storage potentials, time delays to runoff and discharge hydrographs.

A statistical evaluation of data from part of the sampling network has been completed.

In press: L. A. Logan, Snow Survey Report, East and Middle Oakville Creeks Basin, 1968-1969, Water Resources Bulletin 4-1.

### 4. SNOWMELT

- 71-15 SNOW ACCUMULATION AND MELT IN A HARDWOOD FOREST STRIP-CUTTING. -- C. A. Federer, J. W. Hornbeck, U. S. Forest Service, P. O. Box 640, Durham, New Hampshire 03824.

Objectives: Ascertain the effect of two widths of east-west strip cuts on snow accumulation and melt, and on spring streamflow.

Progress: New study being initiated in winter 1970-71.

- 71-16 THE ENERGY BALANCE OF SNOWMELT IN NORTHERN HARDWOODS. -- C. A. Federer  
U. S. D. A. - Forest Service, Northeastern Forest Exp. Station, Box  
640, Durham, New Hampshire 03824.

Study of the influence of the winter hardwood forest canopy on the heat sources required for snowmelt. Current knowledge is summarized in a paper for the 1971 ESC. A paper on canopy absorption of solar radiation has been submitted to Agricultural Meteorology. Work on the energy budget in strips and other openings has just begun.

- 71-17 DEVELOPMENT OF WATER-INPUT-ENVIRONMENT RELATIONSHIPS IN THE SLEEPERS RIVER WATERSHED. -- Robert L. Hendrick, USDA-ARS-SWCRD, New England Watersheds Research Center, Agricultural Engineering Building, University of Vermont, Burlington, Vermont 05401.

Objectives are: (1) To determine the annual water-input climatology, (the annual rainfall plus snowmelt curves) for specified forest and topographic environments in the watershed; (2) to construct a general water-input-environment model and calculate the integrated water-input over the entire watershed, and (3) compare calculated with measured water inputs, and compare both with watershed runoff.

#### 5. STREAMFLOW

- 71-18 PREDICTING SNOWMELT STREAMFLOW FROM AN ADIRONDACK WATERSHED. -- James R. Colquhoun, SUNY College of Forestry, Syracuse, New York 13210.

To develop a prediction equation for streamflow (mean daily c.f.s.) from 1 March until snow disappears. Independence River, N. Y. Expected completion: March 1970.

- 71-19 CRITICAL METEOROLOGICAL CONDITIONS AND MAXIMUM FLOWS OF CHAUDIERE AND ST. FRANCOIS RIVERS, QUEBEC, CANADA. -- Gagnon, R.-M., Meteorological Service of Quebec, 1640 Boul. de l'Entente, Quebec 6, P.Q., Canada

A study of the meteorological conditions responsible for maximum flows of the Chaudiere and Saint-Francois Rivers, Quebec. Rainstorms and snowmelt are analyzed in view to determine upper limits of flows. A final report has been published in French and English versions.

Gagnon, R. M., D. M. Pollock et D. M. Sparrow. Conditions meteorologiques critiques et crues exceptionnelles des rivieres Chaudiere et Saint-Francois. MP-29. Service de Meteorologie. Ministere des Richesses naturelles du Quebec. 1970.

Gagnon, R. M., D. M. Pollock and D. M. Sparrow. Critical Meteorological Conditions for Maximum Flows, The Saint-Francois and Chaudiere River Basins, Quebec. Climatological Studies No. 16. Meteorological Branch, Department of Transport, Toronto, Ontario.

- 71-20 RUNOFF QUALITY IN A SUBURBAN STREAM\*. -- Richard H. Hawkins, SUNY Water Resources Center, College of Forestry at Syracuse University, Syracuse, New York 13210.

This is an investigation on the quality of water in an urban stream, with special attention to the relationship between inter street salting and stream chlorides. By its nature, the study is also concerned with urban hydrology, sewage and drainage arrangements, and the biological quality of the stream.

The area is in the final stages of instrumentation. A stream gage has been installed and recording conductivity equipment is expected to be operational shortly. Over 350 samples have been taken over the past year at four different locations along the stream.

Two progress reports have been submitted to the principle sponsor (NEWPCC), and a technical conference paper has been presented (not yet available).

\*Funded by SUNY, New England Interstate Water Pollution Control Commission, and New York Dept. of Environmental Conservation.

- 71-21 THE EFFECT OF FOREST CLEARING ON SNOWMELT RUNOFF IN NEW ENGLAND. -- Robert S. Pierce, USDA Forest Service, Northeastern Forest Exp. Sta., Box 640, Durham, New Hampshire 03824.

Small, gaged watersheds are being used to study the effects of forest practices on snowmelt runoff. A 40 acre watershed has been devegetated for five years (see publications). A study of snow accumulation and melt in a new hardwood forest strip-cutting has just begun.

Hornbeck, J. W. and R. S. Pierce. 1969. Changes in snowmelt runoff after forest clearing on a New England watershed. Proc. 1969 Eastern Snow Conference, pp. 104-112.

Hornbeck, J. W., R. S. Pierce and C. A. Federer. 1970. Stream-flow changes after forest clearing in New England. Water Resources Res. 6:1124-1132.

- 71-22 CONTINUING STUDY OF WINTER STREAMFLOW MEASUREMENT CONDITIONS, PROBLEMS AND TECHNIQUES AT GAUGING STATIONS ON SMALL STREAMS. -- River Basin Research Branch, Ontario Water Resources Commission, Division of Water Resources, 135 St. Clair Ave. W., Toronto 195, Ontario, Canada.

A review is continuing of winter conditions and the problems associated with them for the obtaining of accurate stage-discharge relationships at gauging stations on small streams. From this review, it is anticipated that techniques can be developed and improved to aid in winter streamflow data collection. Initial results have led to experimentation on the use of heating cables, observers, etc.

## 6. LAKE AND RIVER ICE

- 71-23 STUDY OF RIVER AND LAKE ICE. -- Mr. J. B. Bryce, Ontario Hydro, 620 University Avenue, Toronto, Ontario, Canada.

A ten-year program to study the formation, movement, and dissipation of ice in the Niagara River between Fort Erie and Grass Island Pool. (Grass Island Pool is formed by the Niagara River Control Structure, which is located immediately above the Canadian Falls.)

During the 1969-70 season, investigations included the determination of methods to assess the concentration of frazil and anchor ice to correlate with meteorological conditions, and to examine further ice crystal structures. Water temperature surveys at cross-sections and along certain reaches of river, and experiments involving icing of underwater objects particularly thermometer sensors were carried out. Measurements of ice volume passing the Grass Island Control Dam were determined on a continuous basis.

The project continues with the emphasis on mathematical and correlation studies for 1970-71.

Wigle, T. E. Investigations Into Frazil, Bottom Ice, and Surface Ice Formation In the Niagara River.

Arden, R. S. Instrumentation For Ice Investigations in the Niagara River.

Int. Assoc. for Hydraulic Research, Committee on Ice Problems Ice Symposium, Reykjavik, Iceland. September 1970.

- 71-24 STUDY TO DEVELOP IMPROVED TECHNIQUES FOR MAPPING SEA ICE FROM SATELLITE INFRARED DATA. -- James C. Barnes, Allied Research Associates, Inc. Virginia Road, Concord, Massachusetts 01742.

High Resolution Infrared Radiometer (HRIR) data from the Nimbus II and III satellites are used to develop improved techniques for ice mapping. Sea-ice distributions in the autumn of 1969 mapped from Nimbus III HRIR film strips are compared with distributions previously mapped from Nimbus II for the similar period of 1966. Ice is also mapped for two winter months, a season for which data had not previously been available. Densitometric measurements are also carried out, and experiments are performed to enhance the gray-scale contrast within the temperature range of interest. Study completed.

Barnes, J. C., D. T. Change, and J. H. Willand, 1970: Improved Techniques for Mapping Sea Ice from Satellite Infrared Data, Final Report, Contract E-67-70(N), Allied Research Associates, Inc. (to be published).



- 71-25 ICE FORCES ON BRIDGE PIERS. -- C. R. Neill, Research Council of Alberta, 303 Civil Electrical Building, U. of Alberta, Edmonton,

To measure and analyze ice forces on piers in spring break-up conditions in rivers. Force-measuring devices are installed on two piers where observations are made each spring.

C. R. Neill "Ice pressure on bridge piers in Alberta, Canada" Paper to IAHR Ice Symposium, Reykjavik, Sept. 1970.

- 71-26 ICE FORMATION AND BREAK-UP. -- G. P. Williams, Division of Building Research, National Research Council, Ottawa 7, Ontario, Canada.

To develop an improved method for predicting the date of break-up of lakes for purposes of transportation and construction and methods of predicting the formation of frazil ice, using weather and water temperature records.

Williams, G. P. 1969. Water Temperature During the Melting of Lake Ice, Water Resources Research, Vol. 5, No. 5, p. 1134-1138.

#### 7. HIGHWAYS AND BUILDINGS

- 71-27 NATIONAL SURVEY OF ICING LOADS ON STRUCTURES. -- D. W. Boyd, Division of Building Research, National Research Council, Ottawa 7, Ontario, Canada

To obtain through reports of icing occurrences and structural failures, information required for establishing design icing loads on a regional basis for electrical and communication lines, and for towers and similar structures.

Boyd, D. W. Icing of Wires in Canada, NRC Report 11448, June 1970.

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1. Properties of snow and ice
2. Precipitation and accumulation
3. Snowpack measurement
4. Snowmelt
5. Streamflow
6. Lake and river ice
7. Highways and buildings
8. Soil water and frost

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