

SUMMARY REPORT OF THE
DEPARTMENT OF METEOROLOGY
1939-1940

April 21, 1940

S. B. Doten, Director
Agricultural Experiment Station
University of Nevada
Reno, Nevada

Dear Director Doten:

In response to your request for a brief summary of activities and plans of the Department of Meteorology, we submit the following:

Project 15 Adam's Fund 1932

"Timber and Snow Studies and Snow Surveying"

and

Project 44 Funnell Fund 1933-38

"Forecasting the Runoff of the Humboldt River, Nevada."

Leaders, J. E. Church
Carl Elges

Activities

The activities of the Department have been directed along four main lines, namely: Improvement of Equipment; Laying out Snow Courses; Forecasting Runoff- Determining Discordant Factors and Analysis of Flood Causes and Forecasting.

I. IMPROVEMENT OF EQUIPMENT

A spring balance has now been designed by Chatillon and Sons that is adjustable to zero and yet will weigh snow

cores in snow of 40 feet depth. This balance is approximately 99.98 percent accurate and therefore should serve well as a substitute for the bar balance in measuring evaporation pans.

No adhesion of snow to the snow sampler has been found the present season. This is due in part to the mildness of the temperature and partly to the thorough coating of shellac now insisted upon in connection with the sampler. It has been learned that an experiment was made at the suggestion of James C. Marr in Yellowstone National Park showing that the slots of the snow sampler caused no accretion of snow to the core. This was accomplished simply by covering the slots of one of the samplers with tape.

Following the advice of John T. Ryan, volunteer assistant to the Department, the Tucker Motor Sled has been improved so as to traverse snow with slight clogging of snow thrown back by the driving cylinder. The Forest Service has assisted in the trial of the sled in the Mount Rose area. The sled is planned as a run-about to carry snow surveyors and emergency equipment far into the mountains in order to make traveling for the surveyors easier and emergency relief possible. The present season one of the snow surveyors suffered severely from a dislocated arm but was forced to walk many miles to the auto.

In the eastern states a request has been made by the Army Board investigating flood conditions, for a snow cutter that can cut through rails of ice, three inches thick. It is now necessary to dig down and chisel the ice out of the way of the sampler. A spiral cutter is used in Maine which can probably be developed for this purpose.

II. LAYING OUT SNOW COURSES

The snow courses of the Humboldt Basin in which Project 44 is being conducted has been undergoing a thorough analysis to bring the percentages of the various courses into closer harmony with each other and the runoff from the watershed in which the courses are situated. A similar analysis is being made by Prof. H. P. Boardman who is Forecast Chairman of the Nevada Cooperative Snow Surveys and is working in close cooperation with the Station.

A request has been received from New Hampshire to advise regarding the location of snow courses at the mean snow level of the tributaries of the Merrimack River. Not only are these courses being expanded to other areas in the Merrimack Basin but snow courses are being laid out at various elevations in order to check more carefully the accuracy of the Mount Rose or percentage system as compared with the system of mean elevation, which is quantitative.

A long delayed project of analyzing the Yakima Basin for a snow survey system is now under way through cooperation with Prof. Boardman. A similar system has been urged for the lower areas of the tributaries of the Colorado in the state of Colorado.

III. FORECASTING RUNOFF

Activity in this project has been confined mainly to the Humboldt River for which a report is being made by Carl Elges. This stream is probably the most difficult in the western part of the United States because of its shallow snow, its fewness of precipitation stations, and large diversions high up on the tributaries.

IV. ANALYSIS OF FLOOD CAUSES IN FORECASTING

The project leader in Timber and Snow Studies was fortunate in being able to visit the northeastern states to study not only the causes of floods but progress in quantitative snow surveying and forecasting. The streams of that region are prone to flood under almost normal circumstances because of the shallowness of their soil and the tendency of the snow fields to melt in mid-winter. A study was made of the occurrence of frost in the soil and the possibility of its being eliminated by earth warmth before the period of spring floods should occur.

The present season has given a most satisfactory opportunity to study the effect of snow in augmenting floods. In the East the snow became deep because of continued cold through the winter. In the West the mild winter caused rain instead of snow to fall in the zones where early melting occurs. At the request of Colonel Elliott of the Army Engineers, Bonneville, Oregon, an extensive analysis of flood conditions in the West has been made.

Personnel

The personnel of the Department consists of J. R. Church, Meteorologist on full time since 1939 and Carl Elges, Assistant Meteorologist and likewise Assistant Meteorologist of the Division of Irrigation, Soil Conservation Service, with allotment of time 6/7 and 1/7 between the two. However, this does not express fully the available personnel because of the eager cooperation given by others, usually without compensation.

Cooperative Work

This cooperation has been made possible and indeed inevitable by the organizations that have sprung from the pioneer work of the Station in snow. The following tribute belongs to the Station as well as to the Department:

"Tribute must be paid to all who have taken part in the Regional Meetings and Snow-Survey Conferences as listed above and for 1938. Especially may be mentioned Dr. J. E. Church, whose stimulating enthusiasm and indefatigable interest and efforts have done so much to promote the development of snow-surveys and their value in the science of hydrology not only nationally but internationally."

Preface
Part I
American Geophysical Union
Transactions of 1939

The editorship of the Transactions of the Western Interstate Snow Survey Conference has brought with it the planning of the meeting at Stanford in January and the coming meeting in June at Seattle. The chief feature of the Stanford meeting was a study of the Accuracy of Snow Survey Forecasts and Runoff in the basins of the Western states of Colorado, Utah, Nevada and California with its immediate suggestion of weak points in forecasting requiring further study. The program at Seattle will present the problem of forecasting floods and the improvement of snow survey systems in the Great Basin.

Apr. 1940	Seasonal Snow Survey and Forecast of Stream Flow	Humboldt Quadrangle (Mimeographed bulletins sent out by the Dept.)	pp. 1 to 10	C. Elges
July 1939	Improvements in the Method of Forecasting Streamflow	Transactions of the American Geophysical Union, Part 1 July 1939	Pp. 62-67	C. Elges
July 1939	Annual Report Committee on Snow	Transactions American Geophysical Union Part IV	pp. 489 506	J.E.C.
July 1939	List of Current Publications to Accompany Report of the Committee on Snow	Transactions American Geophysical Union, Part IV	pp. 617-631	C. Elges
July 1939	Applying the Chatillon Iso-Elastic Springs to the Mt. Rose spring balance	Transactions American Geophysical Union Part I	pp. 75-77	C. Elges
June 1939	News Letter, International Commission of Snow	Mimeographed (Plus 33 page postscript)	49 pages	J.E.C.
Nov. 1939	Flood Tendencies and their Causes in the Streams of Northeastern U. S.	(Typed Manuscript)	76 pages	J.E.C.
Apr. 1940	Causes of Maximum Floods in the Western States	(Typed Manuscript)	20 pages	J.E.C.
Sept. 4-17, 1939	Papers presented at the meeting of the International Commission of Snow, Washington, D.C. as follows: Present Development in Snow Surveying, Carl Elges Report of the President, International Commission of Snow, by J.E.C. Report of Formal Questions for 1936-1939 period, J.E.C.	(To be published by the International Assoc. of Scientific Hydrology)		
Jan. 12-13, 1940	Papers presented at meeting of Western Interstate Snow Survey Conference, Stanford: Accuracy of Streamflow forecasts, 1939, Humboldt Basin, Nev. by Carl Elges	(To be published in the 1940 Transactions, American Geophysical Union)		

The Chairmanship of the Research Committee on the Hydrology of Snow of the American Geophysical Union has advanced particularly the study of the physics of snow because of the rapidly increasing interest in transport and snow pleasures. The presidency of the International Commission of Snow has advanced internationally the three main projects of the improvement of snow survey systems, the nomenclature of snow and the development of snow cover maps.

Membership in the Research Advisory Committee of the Soil Conservation Service has aided in effecting the publication of data and results of runoff and in making these results available to all research workers whether federal or private.

All of these activities are along research lines and very little is routine.

Publicity

Publicity has been generously made possible by the cooperation of twenty two organizations that have purchased and distributed reprints of the Transactions of the Western Interstate Snow Survey Conference and the Report of the Committee on Snow of the American Geophysical Union. These have been edited by the Department. The following other publications have been issued by the Department: "Climatology and Evaporation in Alpine and Arctic Zones", now being published in the University of Michigan Studies; "Flood Tendencies and their Causes in the Streams of Northeastern United States" (typed); "Causes of Maximum Floods in the Western States" (typed); and "Seasonal Snow Survey and Forecast of Stream Flow in Humboldt Basin 1940"; "Improvements in the Methods of Forecasting Stream-Flow" by Carl Eges, Trans. 1939 A.G.U.

Appreciation of the value of snow surveying is shown by the publication in the American Magazine of February 1940, of colored pictures portraying the process of snow surveying, and also the broadcast being planned by the University of Chicago-CBS educational broadcast "The Human Adventure", portraying the snow studies at the University of Nevada. To this should be added a report of "Science" March 29, 1940, entitled the New International Commission of Snow and Glaciers.

Plans

During the coming year attention will be given particularly to the study of the physics of the melting of snow, under the effect of rain and temperature. This project has been urged strongly by the Pennsylvania Water and Power Company because of the menace of floods.

An analysis of snow survey systems and courses is necessary to determine the cause of variation between forecasts and runoff. This project is particularly vital at this time of maximum use of water supplies.

Plans for snow survey systems in new regions such as the Eastern slope of the Cascades and the Western slope of the Rocky Mountains in Colorado have long been promised and have become urgent.

Monographs must also be prepared to make public the data already gathered by the Department on Snow Surveying. These data have been used much in the present study of floods and should be made accessible to all workers.

An engineer's handbook of a technical nature is underway and should be completed.

A chapter on the Hydrology of Snow and possibly Ice should be prepared for a volume on Hydrology being published by the American Geophysical Union in the Physics of the Earth Series. Such work as this lies at the very foundation of research.

Cooperation

Since the trip of 1935 to the watersheds of Western United States the Division of Irrigation and the Experiment Station have planned a cooperative effort to establish research centers in snow. However, additional funds have not been granted by Congress. The Division of Irrigation has now become a part of the Soil Conservation Service. The latter has begun research work in the Physics of Snow by establishing W. U. Garstka as research investigator in Cryology at the Michigan Agricultural Experiment Station at Lansing. E. F. Preece, Senior Engineer of the National Park Service also is turning his attention from Soil Physics to the Physics of Snow.

It is essential that research in snow be not confined to the East where the snow is shallower and water supplies less essential but should be applied also in the West where problems of great variety have sprung up in response to irrigation.

W. W. McLaughlin, Chief of the Division of Irrigation has heartily approved of a conference with Dr. Bennett, Chief of the Soil Conservation Service to determine whether the cooperative work so long planned can not be formally arranged. Correspondence awaits Station approval.

Training of Snow Surveyors

The increased interest in water is requiring an increase in snow surveyors and ability to interpret snow covering in terms of water supply.

In the winter of 1938-39 the Tahoe National Forest held a school in snow surveying and skiing for foresters at the Big Bend on the South Yuba under the instruction of Fred Paget, Director, California Cooperative Snow Surveys. The present winter 1939-40 a school was held by the Mono Forest at Galena Creek with Fred Paget and Carl Elges as teachers. Four days were spent at the camp.

At the University of Nevada Mr. Elges presented the snow survey problem for two periods total to the class in Agricultural Engineering. In the Department of Civil Engineering he gave instruction to the class in Hydrology for six periods with a Sunday field trip. Forecasts were made by members of the class based upon the snow surveys in the Tahoe Basin.

The writer gave also an evening's lecture on the History of Snow Surveying at the Forestry School at Galena.

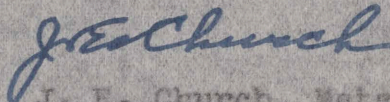
This instruction is slight in amount and can, if necessary, be transferred to the University instructors, but with loss in knowledge and experience. The cost was borne by the Nevada Cooperative Snow Surveys, for it will mean a reduction in costs for snow surveying as the Forest Service enters more fully into cooperative work. For the Station it means increase in research material.

Recommendation

It is recommended that the Memorandum regarding Research in the Department of Meteorology be accepted as the future plan of the Station and that the two projects, Adams Fund 15 and Purnell Fund 44 be united under the project title "Snow, Snow Surveying, and Forecasting of Runoff."

This broad title will make possible the large service that has now been developed by the Department in the natural evolution of its research.

Most sincerely,



J. E. Church, Meteorologist
Agricultural Experiment Station
University of Nevada