

UNITED STATES DEPARTMENT OF COMMERCE
WEATHER BUREAU
WASHINGTON

August 8, 1958

IN REPLY, PLEASE ADDRESS
CHIEF, U. S. WEATHER BUREAU
WASHINGTON 25, D. C.
AND REFER TO
C-3.1

MEMORANDUM.

TO : Area and State Climatologists, Substation Inspectors, Field Aides,
WRPCs, River District Offices, and Area Engineers.
(With copies to cooperating Universities and State Agencies,
Regional Administrative Offices, and First Order Stations for
information)

FROM : Office of Climatology

SUBJECT: Climatological Services Memorandum No. 67

COOPERATIVE PROJECTS IN CLIMATOLOGY

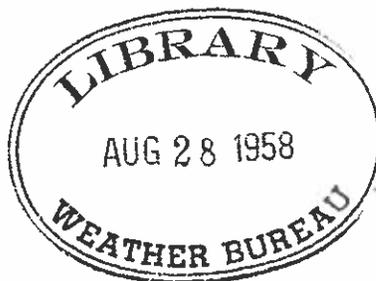
This issue of Climatological Services Memorandum outlines the progress of the cooperative projects (of which there are now 36) carried on by universities and state agencies in cooperation with the United States Weather Bureau.

This report for the period January 1 - December 12, 1957, supplements the Climatological Services Memorandum No. 59, dated April 26, 1957.

A sample copy of Memorandum of Understanding Type 2 will be found in the appendix of this report.

H. E. Landsberg

H. E. Landsberg
Director, Office of Climatology



108 843

FILE: 922

MEMO

(Climatological Services Memorandum No. 67)

WASHINGTON D. C.
8-8-58



APPENDIX

UNITED STATES DEPARTMENT OF COMMERCE
WEATHER BUREAU
Washington, D. C.

MEMORANDUM OF UNDERSTANDING TYPE 2

THIS MEMORANDUM OF UNDERSTANDING, entered into on _____,
between _____, hereinafter
called the Cooperator, and the UNITED STATES OF AMERICA, Department of
Commerce, Weather Bureau, hereinafter called the Government,

WITNESSETH:

1. PURPOSE. The purpose of this memorandum is to improve the use of
climatological data as applied to _____, all
of which shall be for the mutual benefit of the Cooperator and the
Government, and otherwise for the benefit of the people of the United States.

2. NAME OF PROJECT. The name of the project shall be the "United
States Weather Bureau and _____ Cooperative
Project in Climatology".

3. COOPERATING AGENCIES. The Cooperating agencies are (1) U. S.
Department of Commerce, Weather Bureau and (2) _____.

4. SUPERVISION. The work will be prosecuted by the Cooperator, under
the direction of _____ in cooperation
with the Chief of the United States Weather Bureau, acting for and in behalf
of the Government.

5. EFFECTIVE DATE AND DURATION OF PROJECT. This memorandum shall
become effective _____, and shall continue in effect in-
definitely until terminated by either party hereto upon thirty (30) days'
written notice to the other party; and may be supplemented upon further
agreement between the parties hereto.

6. RESPONSIBILITIES ASSUMED.

a. The Cooperator agrees -

(1) To defray the costs of placing the climatological data selected on punched cards by the National Weather Records Center, a unit of the U. S. Department of Commerce, Weather Bureau.

(2) To submit a check, made payable to the U. S. Department of Commerce, Weather Bureau, for the amount estimated by the National Weather Records Center as the cost of the card-punching. This check shall be submitted as soon as practicable following the effective date of this agreement, and before the Government begins the work, which check shall be deposited by the Weather Bureau in a trust fund established for the purpose of carrying out this agreement.

(3) In submitting this check, the Cooperator understands and agrees that, the Cooperator will pay any cost above the estimated amount, and the Government will return any unexpanded balance, upon submission to the Cooperator of a detailed cost-accounting when the card-punching is completed. This same procedure will be followed in the event that the Cooperator subsequently requests the Government to prepare tabulations or analyses of the punch-cards resulting from this agreement.

(4) To permit the Government to duplicate the punch-cards that shall be punched as a result of this agreement, and to allow the Government to make such use of this duplicate punch-card deck as it shall desire, without charge.

Note: When the Cooperator is a State or Local Government or its agent and payment would conflict with State law, a Purchase Order may be substituted in lieu of the check if the amount is \$500 or less as indicated in (2) and

(3) above. In this case the estimated cost will be the final billing.

b. The Government agrees, - upon compliance by the Cooperator with paragraphs 6.a(1), (2), and (3) above-

(1) To furnish the available climatological records necessary for punching the particular records desired, together with advice on the selection of these records.

(2) To place these records on punch cards, and process them for accuracy, in accordance with procedures for processing climatological data now in use by the Government.

(3) To provide all blank punch cards necessary for punching basic observational data and the duplicate deck to be furnished the Government in accordance with paragraph 6.a(4) above.

(4) To furnish the Cooperator, as they become available, a reproduced deck of current card records for the state in which the university is located in an amount equal to the amount of the backlog records punched at the Cooperator's expense.

7. EXPENDITURES UNDER THIS MEMORANDUM.

a. The expense to the Cooperator shall be limited to that necessary to comply with the provisions of paragraph 6.a. (1) and (3) above.

b. The expense to the Government shall be limited to that necessary to comply with the provisions of paragraph 6.b. (1), (3) and (4) above.

8. OWNERSHIP. Either party to this agreement shall be free to use any of the results obtained in the cooperation in official correspondence.

By: _____
Title: _____

UNITED STATES OF AMERICA,
Department of Commerce, Weather Bureau
By: _____
Title: _____



ARIZONA, TUCSON - UNIVERSITY OF ARIZONARadiosonde Cards
Reproduced by the Weather Bureau

<u>STATION</u>	<u>Constant Pressure</u>	<u>Summary</u>
Ariz., Phoenix		1/46-12/56
Ark., Little Rock		1/46-12/56
Calif., Oakland	1/46-12/55	1/46-12/56
San Diego	1/46-12/55	1/46-6/56
Santa Maria	1/46-12/55	1/46-12/56
D. C., Washington		1/46-12/56
Colo., Denver	1-3/46; 10/48-12/55	
Grand Junction		1/46-12/56
Fla., Miami		1/46-12/56
Key West		5/54-12/56
Tampa		1/46-12/56
Idaho, Boise	1/46-12/55	1/46-12/56
Kans., Dodge City		1/46-12/56
La., Burrwood		1/46-12/56
Lake Charles		1/46-12/56
Maine, Caribou		1/46-12/56
Portland		1/46-12/56
Mass., Nantucket		4/46-12/56
Mexico, Merida	1/46-12/55	
Mazatlan	1/46-12/55	1/50-12/56
Tacubaya	1/46-12/55	
Vera Cruz	1/52-12/54	
Ciudad Victoria	1/46-1/52	
Mich., Sault Ste Marie		1/46-12/56
Minn., St. Cloud		1/46-12/56
International Falls		1/46-12/56
Mo., Columbia		1/46-12/56
Mont., Great Falls		1/46-12/56
Neb., North Platte	1/46-12/55	1/46-12/56
Omaha		1/46-12/56
Nev., Ely		1/46-12/56
Las Vegas		1/46-12/56
N. Mex., Albuquerque		1/46-12/56
New York, Albany		1/46-11/51; 10/55-12/56
Buffalo		1/46-12/56
N. Car., Greensboro		1/46-12/56
Hatteras		1/46-12/56
N. Dak., Bismarck	1/46-12/55	1/46-12/56

ARIZONA, University of (Cont.)Radiosonde Cards
Reproduced by the Weather Bureau

<u>STATION</u>	<u>Constant Pressure</u>	<u>Summary</u>
Ore., Medford	1/46-12/55	1/46-12/56
Okla., Okla. City	1/46-12/55	1/46-12/56
Pa., Pittsburgh		1/46-12/56
S. Car., Charleston		1/46-12/56
S. Dak., Rapid City	1/46-12/55	1/46-12/56
Tenn., Nashville		1/46-6/53; 1/54-12/56
Tex., Big Spring	1/46-11/53	
Brownsville	1/46-12/55	1/46-12/56
El Paso		1/46-12/56
Midland	11/53-12/55	1/46-12/56
San Antonio	1/46-12/55	1/46-12/56
Ft. Worth		1/46-12/56
Utah, Ogden	1/46-8/48; 7/52-12/55	
Va., Norfolk		12/49-12/56
Wash., Seattle		1/49-6/56
Spokane	1/46-12/55	1/46-12/56
Tatoosh Is.	1/46-12/55	1/46-12/56
Wis., Green Bay		3/53-12/56
Wyo., Lander	1/46-12/55	1/46-12/56

ARIZONA, University of (Cont.)Radiosonde Summary Cards

Alaska, Adak	9/50-12/56	Cuba, Havana	1/46-12/56
Anchorage	1/46-12/56	Guantanamo Bay	4/49-12/56
Annette Is.	1/47-12/56	T. H., Hilo	2/50-12/56
Barrow	1/46-12/56	Lihue	2/50-12/56
Bethel	1/47-12/56	Canton Is.	1/50-12/56
Fairbanks	2/47-12/56	Koror	7/51-12/56
Gambell	1/46-6/53	Ponape	7/51-12/56
Juneau	1/47-5/53	Truk	7/51-12/56
Kodiak	9/49-12/56	Wake Is	2/50-12/56
Kotzebue	1/46-12/56	Yap Is.	7/49-12/56
McGrath	1/47-12/56	Kwajalein Is.	9/50-12/56
Nome	1/47-12/56	Midway Is.	1/54-12/56
Northway	2/47-5/55	Morocco	6/49-12/56
St. Paul Is.	1/50-12/56	Nfld., Argentina	7/52-12/56
Yakutat	4/49-12/56	P. R., San Juan	1/46-12/55
B.W.I., Trinidad	6/52-12/56		

Radiosonde Constant Pressure Cards - Approx. 500,000 furnished the University by the Weather Bureau.

Radiosonde Summary Cards - Approx. 200,000 furnished the University by the Weather Bureau.

1009 Cards - Approx. 400,000 furnished the Weather Bureau by the University.

STUDIES

McDonald, James E., 1956: Variability of Precipitation in an Arid Region: A Survey of Characteristics for Arizona. Univ. of Arizona, Institute of Atmospheric Physics. 88pp.

McDonald, James E., 1957: A Critical Evaluation of Correlation Methods in Climatology and Hydrology. Univ. of Arizona, Institute of Atmospheric Physics. (Part of a study supported by the Alfred P. Sloan Foundation.)

ARKANSAS, FAYETTEVILLE - UNIVERSITY OF ARKANSAS

8,000 additional 1009 cards furnished the University by the Weather Bureau for 11 stations in Arkansas for 1956 and 1957.

STUDIES

Ford, Charles F., Daily Normal Temperatures and Precipitation for Fayetteville Experiment Station, Arkansas. University of Arkansas, Agricultural Experiment Station.

White, James H., 1956. Sprinkler Irrigation In Eastern Arkansas. University of Arkansas, Experiment Station. 16 pp.

COLORADO, FT. COLLINS - COLORADO STATE UNIVERSITY

The Colorado State University cooperative card punching program was started at Fort Collins the first part of April 1957.

A period of 30 years prior to 1948 is to be punched for the following Colorado Stations:

Akron
Arriba
Burlington
Cheyenne Wells
Eads
Haswell
Holly
Julesburg

Lamar
Limon
Rocky Ford
Rush
Springfield
Two Buttes
Wray

1009 Cards have been punched for Burlington, Lamar, Rocky Ford and Wray.

CONNECTICUT, STORRS - UNIVERSITY OF CONNECTICUT

(Memorandum of Understanding Type 2)

Tabulation to determine weekly rainfall probabilities, which is part of a University project on irrigation of crops in Connecticut.

1009 Cards Punched

Cream Hill	1/26-12/55
Hartford	1/26-12/55
Nt. Carmel	2/36-12/55
Norwalk	1/26-11/54; 3/12-/55
Putnam	1/32-12/55
Storrs	1/26-12/55
Westbrook	2/40-12/55
Norfolk	9/42-4/43; 1/44-12/55
Waterbury	1/26-12/55

Publication

Friedman, D. G. and Janes, B. E., "Estimation of Rainfall Probabilities" - Storrs Agricultural Experiment Station Bulletin No. 332, Dec. 1957.

The Departments of Agronomy and Agricultural Economics of the University of Rhode Island have utilized the machine listing of the daily cards in connection with a joint Departmental study of the economics of irrigation in that State.

FLORIDA, GAINESVILLE - UNIVERSITY OF FLORIDA

Stations punched by the University

Bradenton
Homestead

No further exchange of cards.

ILLINOIS, URBANA - ILLINOIS STATE WATER SURVEY

1009 Cards

<u>STATION</u>	<u>Punched by State Water Survey</u>	<u>Furnished the State Water Survey by Weather Bureau</u>
Aledo	1/01-12/48	1/49-12/55
Anna		1-12/55
Aurora		1-12/55
Bloomington		1-12/55
Carbondale		1-12/55
Carlinville		1-12/55
Charleston	1/01-12/48	1/49-12/55
Danville		1-12/55
Decatur	1/01-12/48	1/49-12/55
Dixon	1/01-12/48	1/49-12/55
Du Quoin		1-12/55
Effingham	1/01-6/03; 6/11-12/48	
Fairfield	1/01-12/48	1/49-12/55
Flora	1/01-12/48	1/49-12/55
Freeport	1/09-12/48	1/49-12/55
Galva	1/01-12/48	1/49-12/55
Greenville		1-12/55
Griggsville		1-12/55
Havana		1-12/55
Harrisburg		1/54-12/55
Hillsboro	1/01-12/48	1/49-12/55
Hoopeston		1/49-12/55
Jacksonville	1/01-12/48	1/49-12/55
Joliet	1/01-12/48	1/49-12/55
Kankakee		1-12/55
La Harpe	1/01-12/48	1/49-12/55
Lincoln	2/06-12/48	1/49-12/55
Marengo	1/01-9/17; 6/18-12/48	1/49-12/55
Mascoutah	1/01-12/48	
McLeansboro		1-12/55
Minonk		1/54-12/55
Moline		1/54-12/55
Monmouth		1/54-12/55
Morrison	7.01-12/48	1/49-12/55
Morrisonville	1/01-12/48	1/49-12/55
Mt. Carmel		1/49-12/55
Mt. Carroll		1-12/55
Mt. Vernon		1/54-12/55
New Burnside		1-12/55
Olney		1-12/55

ILLINOIS STATE WATER SURVEY (Cont.)

<u>STATION</u>	<u>1009 Cards</u>	
	<u>Punched by State Water Survey</u>	<u>Furnished the State Water Survey by Weather Bureau</u>
Ottawa		1-12/55
Palestine		1-12/55
Pana	1/01-12/48	1/49-12/55
Paris		1-12/55
Peoria		1/54-12/55
Pontiac	1/03-12/48	1/49-12/55
Quincy	1/01-12/48	1/49-12/55
Roberts	1/12-12/48	1/49-12/55
Rockford		1/54-12/55
Rushville		1-12/55
Shawneetown		1/49-12/55
Sparta		1-12/55
Springfield		1/54-12/55
Sycamore	1/01-12/48	1/49-12/55
Urbana		1/54-12/55
Walnut		1-12/55
Waukegan	1/23-12/48	1/49-12/55
White Hall		1-12/55
Windsor		1-12/55
	<hr/>	<hr/>
	399,555	78,840
	 <u>WBAN #3 CARDS</u>	 <u>WBAN #3 CARDS</u>
Cairo		1/53-12/55
Chicago		1/54-12/55
Davenport	1/01-5/43	
Moline	6/43-12/48	
Peoria	1/05-12/48	
St. Louis		1/54-12/55
	<hr/>	<hr/>
	33,605	2,555
		<u>WBAN #1 CARDS</u>
Chicago		7-12/55
Rantoul		1/48-12/52
Springfield		7-12/55
		<hr/>
		52,560

ILLINOIS STATE WATER SURVEY (Cont.)

<u>Card Type</u>	<u>Punched by State Water Survey and Duplicates furnished the Weather Bureau</u>	<u>Reproduced by the Weather Bureau and furnished to State Water Survey</u>
1009	399,555	78,840
WBAN #3	33,605	2,555
WBAN #1		52,560

ILLINOIS STATE WATER SURVEY (Cont.)Studies - Utilizing IBM punched cardsThunderstorm Climatology of IllinoisCloud Census ProjectAtmospheric Moisture FlowWet-Dry Analysis ProgramHail Climatology of IllinoisPrecipitation Frequency StudiesMonthly Precipitation Summary Cards

These cards were punched to enable a preliminary study of techniques for drought analysis, based on statistical evaluation of monthly rainfall data.

Weekly Summary Cards. Duplicates machine produced for Project NC-26. From these cards average weekly precipitation, maximum temperature and minimum temperature were machine calculated for each week at 10 stations. These data have been used in identifying and analyzing a precipitation singularity in the week of April 5-11 at Urbana. These data will also be used in a climatological analysis of precipitation and temperatures in Illinois based on weekly periods.

Potential Water Resources of Southern Illinois - Urbana 1957 - Illinois State Water Survey. pp 79-85.

Reports

Changnon, S. A., "Thunderstorm Precipitation Relationships in Illinois", Report of Investigation 34, Illinois State Water Survey, 1957.

Changnon, S. A. and Huff, F. A., "Cloud Distribution and Correlation with Precipitation in Illinois", Report of Investigation 33, Illinois State Water Survey, 1957.

"Rainfall Intensity - Duration - Frequency Curves", Tech. Paper 25, U. S. Dept. of Commerce, Weather Bureau, Washington, D. C., 1955.

Neill, J. C., "Analysis of 1952 Radar and Raingage Data", Report of Investigation 21, Illinois State Water Survey, 1953.

INDIANA, LAFAYETTE - PURDUE UNIVERSITY1009 Cards

<u>STATION</u>	<u>Reproduced and furnished the University by the Weather Bureau</u>	<u>Punched and furnished the Weather Bureau by the University</u>
Albion	4/48-12/55	11/16-3/48
Berne	4/48-12/55	1/10-3/48
Bloomington	4/48-12/55	1/96-3/48
Markland Dam	5/48-12/55	1/93-3/48
Mount Vernon	4/48-12/55	1/93-3/48
Paoli	4/48-12/55	3/98-3/48
Rockville	4/48-12/55	1/93-3/48
Rushville	4/48-12/55	4/81-3/48
Valparaiso	4/48-12/55	1/01-4/06; 1/15-3/48
West Lafayette	4/48-12/55	1/93-3/48
Auburn		3/01-10/16
Bluffton		3/01-1/10
La Porte		5/06-12/14
	<hr/> 28,000	<hr/> 194,000

1009 Cards punched by the University

Angola	1/93-6/07;4/20-3/48
Auburn	7/96-12/16
Bloomington	1/96-3/48
Bluffton	1/01-12/09
Collegeville	1/08-3/48
Columbus	1/94-3/48
Kokomo	5/93-3/48
La Porte	1/06-12/15
Markland Dam 39	1/93-3/48
Mt. Vernon	1/93-3/48
Oolitic	1/93-5/07
Valparaiso	6/01-4/06;1/15-3/48
Washington	6/96-3/48
Winchester	1/93-3/48
	<hr/> 191,745

INDIANA, PURDUE UNIVERSITY (Cont.)

Further processing is planned for the purpose of producing weekly summary cards. It is anticipated that such summary cards for certain substations will be needed in a study on precipitation probabilities being conducted by the North Central States Agricultural Experiment Station.

Publications:

- Newman, J. E., Some Characteristics of Southern Indiana Climate,
Mimeograph AY-133, May, 1956.
- Schaal, L. A., Climatological Summary of Lafayette, Indiana, No. 20-12,
Climatology Series of United States, August, 1956.

A series of research studies are planned for the purpose of describing the Phyto-climate of Indiana.

- Number 1 - Indiana Growing Seasons
- Number 2 - Indiana Precipitation Patterns
- Number 3 - Temperature Changes and Persistence
- Number 4 - Light, Radiation and Environmental Energy Budget
- Number 5 - Phenology of Indiana Crops

KANSAS, MANHATTAN - KANSAS STATE COLLEGE

Plans are being made to utilize the punched cards in establishing patterns of factors that affect agriculture within the State. This will involve not only the classical climatological description of averages and normals, but also the delineation of risks by means of probabilities.

1009 Cards

<u>STATION</u>	<u>Punched by the College</u>	<u>Reproduced by the Weather Bureau</u>
Ashland	*1/1900-7/48	8/48-12/56 (1) 1900-1956 (2) 1907-1948
Colby	*1/1900-7/48	8/48-12/55 (1) 1900-1955
Columbus (3)	*1/1900-7/48	8/48-12/55 (1) 1900-1955
Emporia	1/1900-7/48	8/48-12/56 (2) 1900-1948
Elkhart-Richfield	*1/04-11/05; 8/11-7/48	8/48-12/56 (2)
Garden City	*1/1900-7/48	8/48-12/55 (1) 1900-1955
Hays (3)	*1/1900-7/48	8/48-12/55 (1) 1900-1955
Healy	4/01-7/48	8/48-12/56 (2) 1901-1948
Horton	*1/1900-7/48	8/48-12/55 (1) 1900-1955
Independence	1/1900-7/48	8/48-12/56 (2) 1900-1948
Iola		8/48-12/55
Larned	1/04-7/48	8/48-12/55 (2) 1904-1948
Manhattan (3)	*1/1900-7/48	8/48-12/55 (1) 1900-1955
McPherson	*1/1900-7/48	8/48-12/55 (1) 1900-1955
Medicine Lodge	*1/1900-7/48 (4 mos. missing)	8/48-12/55 (1) 1900-1955
Minneapolis	1/1900-7/48	8/48-12/56
Ottawa	*1/1900-7/48	8/48-12/55 (1) 1900-1955
Phillipsburg	1/1900-7/48	8/48-12/55 (2) 1900-1948
St. Francis	5/08-7/48	8/48-12/56 (2) 1908-1948
Tribune	*1/1900-10/01; 1/13-7/48	8/48-12/56 (2)
Winfield	*1/1900-7/48	8/48-12/55 (1) 1900-1955

302,565 1009 cards punched by the College.

1) 37,280 Weekly summary cards punched by College.

2) 4,600 Monthly summary cards punched by College.

3) 39,700 1009 cards punched by College in 1956.

* 222,800 1009 cards reproduced by the College and furnished the Weather Bureau.

62,780 1009 cards reproduced by the Weather Bureau and furnished the College.

Cards for 10 stations were used in the North Central Project No. 26 for precipitation probability study. Also some use was made of the cards in a watershed study for the Kansas Water Resources Board.

MAINE, ORONO - UNIVERSITY OF MAINE

(Type 2 Agreement)

1009 Cards

<u>STATION</u>	<u>Punched by the Weather Bureau for University</u>	<u>Duplicates furnished University by the Weather Bureau</u>
Caribou	1/32-2/42 4/44-5/48	6/48-12/55
Farmington	1/26-5/48	6/48-12/54
Fort Kent	1/45-5/48	6/48-4/49; 9/49-12/55
Houlton	1/36-5/48	6/48-12/55
Old Town	1/36-5/48	6/48-12/55
Portland	1/26-5/48	6/48-12/54
Presque Isle	1/26-5/48	6/48-12/54
	<hr/> 36,865	<hr/> 18,160

MARYLAND, BALTIMORE - UNIVERSITY OF MARYLAND, UNIVERSITY OF DELAWARE1009 Cards

<u>Maryland</u>	<u>Punched by the University</u>	<u>Reproduced by the Weather Bureau</u>
Baltimore	1/83-12/04; 1/48-12/57	5/48-12/55 (Hrly. precip.)
Charlotte Hall	7/38-7/48	
Cheltenham	7/36-7/48	8/48-12/55
Chestertown	1/93-7/48	
Chessville-Bridgeport	1/26-7/48	
Coleman	1/98-7/48	
College Park		*8/48-12/55
Cumberland	1/98-7/48	
Denton	12/98-7/48	
Easton	1/92-12/13; 1/16-12/29; 4/36-7/48	
Elkton	7/27-7/48	
Ft. George G. Meade	1/42-7/48	
Frostburg	1/26-7/48	
Glenn Dale Bell Station	1/21-7/48	
Hancock Fruit Laboratory	1/95-7/48	
La Plata	1/26-7/48	
Laurel	1/95-12/45	*8/48-12/55
Leonardtwn	4/39-7/48	
Millington	1/98-3/37	
Owings Ferry Landing	1/17-7/48	
Picardy	1/27-7/48	
Prince Frederick	7/36-7/48	
Rock Hall	1/98-12/47	
Salisbury		8/48-12/55
Snow Hill	12/31-7/48	(#1 cards)
Solomons	1/93-7/48	
Unionville	7/40-7/48	8/48-12/55
Westminster	1/95-7/48	8/48-12/55
Woodstock		8/48-12/55

MARYLAND, UNIVERSITY OF MARYLAND, UNIVERSITY OF DELAWARE (Cont.)1009 Cards

<u>Delaware</u>	<u>Punched by the University</u>	<u>Reproduced by the Weather Bureau</u>
Delaware City	12/21-7/48	
Dover	1/93-12/19	
Millsboro	1/02-7/48	
Odessa	5/37-12/42	
Wilmington Porter Reservoir	1/21-12/31	
Wyoming	1/99-4/00	

* Periods of data missing

Maryland, Keedysville 5/23-7/48

9,524 1009 cards reproduced by the University and furnished the Weather Bureau.

314,000 1009 cards punched by the University.

84,000 Total number of cards reproduced by the Weather Bureau and furnished the University.

The program now includes records from 31 stations in Maryland. One objective in 2 parts is the development of a means of drought forecasting in relation to supplemental irrigation. 1. To develop means of advising farmers of the probable frequencies of dry periods requiring supplemental irrigation. 2. To issue current short range advices and forecasts of when and how much irrigation is necessary.

MARYLAND, UNIVERSITY OF MARYLAND, UNIVERSITY OF DELAWARE (Cont.)

The first of these parts is being investigated in connection with climatological study, utilizing soil moisture storage and depletion data. Some progress has been made by setting up a machine tabulation program which will permit solution of the Penman and the Thornthwaite evapotranspiration computations on high speed electronic equipment. Preliminary trials using data applicable to the Tobacco Experimental Farm at Upper Marlboro are underway.

Card decks for the selected climatological stations in Maryland will be run to determine the number of times when irrigation would be needed on the basis of several levels of soil moisture storage.

Data pertinent to number 2 were collected during the 1957 season from the forage irrigation experiment at the Upper Marlboro Farm. These data will be used to check the applicability of the computed soil moisture consumptions to Maryland conditions.

Publications:

1. The effect of Climatic Variable on Evapotranspiration from Forage Crops - May 1957 - Milton L. Blanc.
2. Plant - Available Water in Soil, Deficit, and Precipitation Last Week - Weekly Weather and Crop Bulletin, June-Sept. 1957. Milton L. Blanc.
3. A Note on the 1957 Drought in Maryland - Aug. 1957. Howard H. Englebrecht.

MASSACHUSETTS, E. WAREHAM - UNIVERSITY OF MASSACHUSETTS

(Memorandum of Understanding Type 2)

Five widely scattered stations with long time records were chosen for punching to add to the three stations whose records are already punched. The five are - Amherst, beginning 1/26; East Wareham, beginning 2/26; Lawrence, beginning 1/26; Weston, beginning 1/29; and Worcester, beginning 1/26.

No card processing work has yet been done with Massachusetts data other than that done previously by R. S. Palmer in New Hampshire.

Work planned:

1. Completion of 8 station card punching and the beginning of analytical work with them.
2. Timing of fungicidal spray treatments to coincide with infection times determined by tagged spore infections.
3. Pinpointing of weather conditions necessary for overwintering of fruitworm cocoons.

MICHIGAN, EAST LANSING - MICHIGAN STATE COLLEGE

<u>Station</u>	<u>Punched by College and Duplicates furnished the Weather Bureau</u>	<u>Reproduced by Weather Bureau and furnished the College</u>
	<u>1009 Cards</u>	
South Haven		1/55-12/56
Chatham	1916-1925	1/55-12/56
Coldwater		1-12/56
Monroe		1-12/56
Saginaw	1898-1948	1/49-12/56
Traverse City		7/48-12/56
	<hr/> 25,185	<hr/> 8,395

Publications

"Is Michigan Getting Warmer?" Michigan Agricultural Experiment Station Quarterly Bulletin Vol. 39 No. 1 pp. 97-101. August, 1956.

"Corn Weather - Michigan and Iowa." Michigan Agricultural Experiment Station Quarterly Bulletin Vol 40 No. 2 pp. 344-351. November, 1957.

A Summary of Weather Data for Monroe, Michigan 1931-1956 has been accepted for publication as a booklet from the Agricultural Experiment Station at Michigan State University.

A Summary of Weather Data for Coldwater, Michigan is partially completed for statistical analysis.

MISSOURI, COLUMBIA - UNIVERSITY OF MISSOURI

<u>STATION</u>	<u>1009 Cards reproduced by the University and furnished the Weather Bureau</u>
Arcadia	1/18-12/48
Bolivar	1/18-12/48
Campbell	1/18-12/48
Elsberry	1/18-12/48
Fayette	1/27-12/48
Fulton	1/18-12/48
Greenville	1/22-12/48
Lamar	1/18-12/48
Moberly	1/36-12/48
Mount Vernon	1/38-12/48
St. Charles	1/18-12/48
Sedalia	4/37-12/48
Trenton	<u>1/18-12/48</u>

Total 121,280 Cards

Duplicate 1009 Cards punched by
the Weather Bureau and furnished
the University

1/53-12/55		
Bethany	Jefferson City	9/56-6/57
Clinton	Hannibal Waterworks	1/53-12/56
Columbia	Trenton	1/53-12/55
Farmington		
Hannibal		
Kansas City	<u>WBAN 3</u>	
Kirksville	Hannibal	1/49-12/52
Poplar Bluff		
Rolla		
St. Louis University		
St. Louis Airport		
Springfield		

Total 16,060 Cards

Studies:

1. Determination of Probability of Weekly Precipitation Amounts.
2. Determination of Dry Period Expectancies.
3. Special Weather Tabulations for use by Newspapers and Radio Stations.
4. Soil Temperatures in Missouri.
5. Solar Radiation Study for Columbia, Missouri.

MONTANA, BOZEMAN - MONTANA STATE COLLEGE1009 Cards

<u>STATION</u>	<u>Punched by College</u>	<u>Duplicates furnished the Weather Bureau</u>
* Havre	1/23-12/48	
Hamilton		6/05-12/48
Savage		9/05-12/48
Bozeman		4/92-12/48
Bigfork		1/38-12/48
Lewistown		1/06-12/48
Stanford		4/27-12/48
Big Timber	4/94-12/48	
		80,085
* Billings Water Plant	4/94-12/48	* <u>174,835</u>
Browning	5/94-12/48	254,920
Choteau	1/93-12/48	
Conrad	3/11-12/48	
Crow Agency	4/98-12/48	
* Cut Bank AP	12/03-12/48	
Deer Lodge	1/93-12/48	
Dillon WMCE	1/95-12/48	
* Ekalaka	1/95-12/48	
* Fairview	11/32-12/48	
Flatwillow	6/13-12/48	
Forks	1/15-12/48	
Fortine	3/06-12/48	
Glasgow	7/93-12/48	

1009 Punched by College

Glendive	1/93-12/48
Great Falls	1/93-12/48
* Jordan	1/05-12/48
* Libby	6/95-12/48
* Livingston	9/95-12/48
Malta	5/05-12/40
Medicine Lake	1/11-12/48
Norris	1/07-12/48
Phillipsburg	9/03-12/48
Plevna	3/12-12/48
* Polson	7/06-12/48
Poplar	2/93-12/48
* Roundup	6/14-12/48
* White Sulphur Springs	<u>4/94-12/48</u>
	482,375

MONTANA, STATE COLLEGE OF (Cont.)

Punched cards for the Fort Assiniboine, Huntley and Moccasin experiment stations have been utilized by the Agricultural Research Service of the United States Department of Agriculture in a cooperative project with the Montana Agricultural Experiment Station. Correlations between crop yields, soil moisture and weather records were computed for spring wheat yields on both fallowed and continuous cropped plots. Analyses were also made of soil moisture as it relates to various weather factors during the growing season.

Climatological analysis of the punched weather data is expected to begin shortly and the information will also be applied in studies relating weather to agricultural production.

NEBRASKA, LINCOLN - UNIVERSITY OF NEBRASKA

<u>STATION</u>	<u>1009 Cards</u>	
	<u>Punched by University and Duplicates furnished the Weather Bureau</u>	<u>Reproduced by Weather Bureau and furnished the University</u>
Albion	1/93-6/48	7/48-12/56
Alliance	1/95-6/48	
Atkinson	6/06-6/48	
Bridgeport	6/97-6/48	
Broken Bow	11/94-6/48	
Culbertson	6/89-6/48	
David City	1/89-6/48	
Fairbury	1/93-6/48	
Franklin	1/88-6/48	
Gordon	1/98-6/48	
Gothenburg	9/94-6/48	
Grand Island	1/95-6/48	
Halsey	2/03-6/48	
Harrison	5/14-6/48	
Hartington	1/93-6/48	
Kimball	1/93-6/48	
Lincoln Agronomy Farm	4/21-6/48	
Madrid	1/93-6/48	
Mitchell	6/09-6/48	
North Platte		
Oshkosh	6/13-6/48	7/48-12/56
Pawnee City	9/02-6/48	7/48-12/56
West Point	1/87-6/48	7/48-12/56
	<hr/>	<hr/>
Total cards	390,510	71,346

One paper has been presented for publication by Dr. Andrews, "Large sample variance of an estimator for values of the probability distribution of precipitation."

Regional reports on rainfall probability and on the requirements for an ideal weather station are forthcoming.

Further work on temperature summaries is being planned.

NEW HAMPSHIRE, DURHAM - UNIVERSITY OF NEW HAMPSHIRE

Approximately 90,300 1009 cards have been reproduced by the University and furnished the Weather Bureau.

A program is now being prepared for processing the precipitation and temperature data on the IBM 704 Electronic Data Processing Machine.

Work planned:

1. Complete punched card analyses for precipitation and temperature data.
2. Development of instrumentation on solar radiation for New Hampshire studies.
3. Investigation of a controlled environment applicable to high value cash crops

NEW JERSEY, NEW BRUNSWICK - RUTGERS UNIVERSITY

(Memorandum of Understanding Type 2)

<u>STATION</u>	<u>Punched for</u> <u>University</u>	<u>1009 Cards</u>	<u>Reproduced by</u> <u>Weather Bureau</u>
Belleplain	1/26-12/47		1/48-12/56
Belvidere	1/26-12/47		
Boonton	1/26-12/47		
Charlottesville	1/26-12/47		
Flemington	1/26-12/47		
Indian Mills	1/26-12/47		
Layton	1/26-12/47		
Long Branch	1/28-12/47		
Moorestown	1/26-12/47		
New Brunswick	1/12-12/47		
Pleasantville	1/26-12/47		1/48-12/56

The first use of the punched cards will be those temperature and precipitation studies called for by the NE-35 project in Agricultural Climatology. In addition, application of punched-card summaries and analyses to various phases of the research program of the University is planned.

NEW MEXICO, LAS CRUCES
NEW MEXICO COLLEGE OF AGRICULTURE AND MECHANIC ARTS

Started 10-1-57

1009 Cards Punched by University

Clayton	1896-1947
Clovis	1910-1947
Tucumcari	1904-1910

Approximately 35,000 cards have been punched by the University.

No exchange of cards as yet.

NORTH DAKOTA, FARGO - NORTH DAKOTA AGRICULTURAL COLLEGE1009 CardsReproduced by Weather
Bureau and furnished
College

<u>STATION</u>	<u>Punched by College</u>	
Bowman	1/15-8/26 *	
	1/28-6/48	
Fargo	1/38-6/48	7/48-12/55
Fessenden	1/12-6/48	
Hettinger	1/16-6/48 *	
Minot Airport	6/05-6/48 *	
Minot Experiment Station	4/46-6/48	
Park River	1/27-6/48	
Washburn	1/31-6/48	
Williston	1/94-6/48 *	
	<hr/>	
	91,250	
Bottineau		7/48-12/55
Jamestown		7/48-12/55
Napoleon		7/48-12/55
Wahpeton		7/48-12/55
	<hr/>	<hr/>
	91,250	13,870

* 59,130 Cards reproduced by the College and furnished the Weather Bureau.

Preliminary precipitation summaries for ten North Dakota Stations have been completed. A more complete summary will be issued at a later date.

OHIO, WOOSTER - OHIO AGRICULTURAL EXPERIMENT STATION

<u>STATION</u>	<u>1009 Cards</u> Punched by <u>University</u>	Reproduced by Weather Bureau and furnished the University
*Wooster	1/1894-6/1948	
Columbus Ohio State University	1/94-6/48	7/48-12/55
Napoleon	1/94-6/48	
Hillsboro	1/94-6/48	
Hiram	1/94-6/48	7/48-12/56
McConnelsville		5/48-12/56
Norwalk		5/48-12/56
	<hr/>	<hr/>
	79,935	12,045

*19,710 1009 cards for Wooster for the period 1/1894-6/1948 reproduced by the University and furnished to the Weather Bureau.

OKLAHOMA, STILLWATER - OKLAHOMA A & M COLLEGE

<u>STATION</u>	<u>Punched by the College</u>	<u>Reproduced by Weather Bureau and furnished the College</u>
Ada		2/48-12/55
Ardmore		1955
Bristow		8/47-12/55
Chandler		2/48-12/55
Chickasha	1/01-12/09	8/47-12/55
Durant		8/47-12/55
El Reno	1/93-7/47	2/48-12/55
Enid		8/47-12/55
Frederick	1/05-12/46	1/48-12/55
Holdenville		8/47-12/55
Hollis	1/23-12/46	1/48-12/55
Jefferson		1955
Kingfisher	4/94-3/97	1955
Lookeba	1/41-12/46	1/48-12/55
Marlow	10/00-12/06	2/48-12/55
Newkirk	1/98-12/46	1/48-12/55
Okemah		8/47-12/55
Pawhuska	1/98-12/46	1/48-12/55
Pauls Valley	3/00-6/46	1/48-12/55
Shawnee	8/01-12/46	1/48-12/55
Stillwater		1955
Tipton	1/39-12/46	1/48-12/55
Tishomingo	12/02-6/25	8/47-12/55
Waurika		8/47-12/55
	<hr/>	<hr/>
Total Cards	133,525	57,670

PENNSYLVANIA, UNIVERSITY PARK - PENNSYLVANIA STATE UNIVERSITY1009 Cards Punched by University - 1/31/26-4/48

Altoona	Gettysburg	Ridgway
Bethlehem	Greenville	Selinsgrove
Butler	Huntingdon	Somerset
Brookville	Johnstown	State College
Carlisle	Lancaster	Stroudsburg
Claysville	Lawrenceville	Towanda
Corry	Lock Haven	Uniontown
Donora	Montrose	Warren
Ebensburg	Mt. Pocono	Wellsboro
Emporium	New Castle	York
Franklin	Newell	Clearfield 1/26-3/43
Freeland	Palmerton	Williamsport 1/26-10/3/45
Georgeschool	Philadelphia	

No exchange of cards as yet.

The punched cards are now ready for the completion of frequency tabulations and distributions of specific parameters.

Contemplated Studies:

1. Temperature Tabulations.
2. Precipitation Tabulations.
3. Climatic Risks for Freezes, Hail, Lack of Precipitation, Excess of Precipitation, Lightning, Tornadoes and Windstorms.

SOUTH DAKOTA, BROOKINGS - SOUTH DAKOTA STATE COLLEGE1009 Cards Reproduced by the Weather Bureau and Furnished the College
1-12/1956

Academy	Hilland	Pine Ridge
Angostura Dam	Hopewell	Pollock
Armour	Howard	Redfield
Bison	Hot Springs	Redfield 6 E
Britton	Kennebec	Redig
Brookings	Lead	Roscoe
Camp Crook	Lemmon	Shadehill Dam
Centerville	Longvalley	Sisseton
Clark	Marion	Spearfish
Cottonwood	Martin	Timber Lake
Custer	Mc Intosh	Tyndall
Deerfield Dam	Mellette	Vale
Dupree	Menno	Vermillion
Eureka	Milbank	Vivian
Faith	Miller	Wasta
Faulkton	Mitchell	Webster
Forestburg	Mobridge	Wentworth
Gannvalley	Murdo	White Lake
Gettysburg	Newell	Winner
Gregory	Oelrich	Wood
Highmore	Pickstown	Bonesteel 5-12/56
		Fairfax 1-4/56

Reproduced by the Weather Bureau and Furnished the CollegeWBAN 3 1-12/56

Aberdeen
Huron
Sioux Falls
Rapid City
Watertown
Yankton

WBAN 1 1-12/56

Huron
Pierre
Rapid City

23,360 #3 cards for 4 South Dakota stations (1932-1947) reproduced by the College and furnished to the Weather Bureau.

51,465 Total cards reproduced by the Weather Bureau and furnished the College.

TEXAS, AUSTIN - TEXAS BOARD OF WATER ENGINEERS1009 Cards Punched by the Board

Alpine	1900;1911-1917;1929-1946
Kerrville	1895-1947
New Braunfels	1888-1947
Plainview *	1908-1947
Seminole *	1922-1947
Spearman *	1923-1947
Vega *	1923-1947
Clarendon *	
Albany *	
Claude *	

91,023	1009 Cards punched by the Water Engineers
*94,612	1009 Cards reproduced by the Water Engineers and furnished to the Weather Bureau.
164,000	Hourly precipitation cards for 247 stations (1/40-12/46) punched by the Water Engineers.
120,000	1009 Cards reproduced by the Weather Bureau and furnished to the Water Engineers (all Texas stations 1-6/1957).
20,000	Hourly precipitation cards reproduced by the Weather Bureau and furnished to the Water Engineers.

Floods of April, May and June 1957 were reported in a special publication by the Board of Water Engineers. By use of the punched cards they were able to produce maps and tabulations for the report which would have been impossible by hand labor.

They now have an expanded program which is to include some planning on watersheds. This work will include rainfall-runoff correlations that can best be made by machine operations.

WASHINGTON, PULLMAN - WASHINGTON STATE COLLEGE

May - 1957

1009 Cards

<u>STATION</u>	<u>Punched by College</u>	<u>Reproduced by the Weather Bureau and furnished the College</u>
Prosser	1/31-5/48	6/48-12/56
	6355 cards	3120 cards

They are interested in the analysis of evaporation data. One of the questions they have is what the greatest evaporation is in one, two, three and up to 30 days and the frequency these evaporation amounts can be expected. By using this information, along with data on water use amounts by various plants, they hope to arrive at a design for more efficient irrigation systems where they can be reasonably certain that a particular system will be adequate for a certain percent of the growing season.

WASHINGTON, SEATTLE - UNIVERSITY OF WASHINGTON1009 Cards Punched by University

Ellensburg	1/01-12/47
Olga	7/91-5/48
	<hr/>
	38,700

WEST VIRGINIA, MORGANTOWN - WEST VIRGINIA UNIVERISTY

(Memorandum of Understanding Type 2)

They are planning to make a detailed study of drought and rainfall deficient periods.

1009 Cards Punched

<u>STATION</u>	<u>PERIOD OF RECORD</u>
Bayard	1/26-7/44; 10/44-12/55
Charleston 1	1/26-12/55
Clarksburg	1/26-12/55
Elkins	1/26-12/55
Fairmont	1/26-12/55
Flat Top	1/31-12/55
Gary	1/26-12/55
Glenville	1/26-1/46; 6/46-12/55
Huntington	1/26-12/55
Kearneysville	5/30-12/55
London Lock	8/36-12/55
Mannington	1/26-12/55
Marlinton	1/26-4/35; 1/37-11/42; 12/43-12/55
Martinsburg	1/26-12/55
Parkersburg	1/26-12/55
Petersburg	2/26-12/47; 8/48-12/55
Piedmont	1/26-11/49; 7/50-12/55
Point Pleasant	1/26-3/54
Point Pleasant	6/51-12/55
Rainelle	9/30-7/55-9/55-12/55 (McRoss)
Spencer	1/26-12/55
Wardensville	1/26-12/55
Wheeling	1/26-12/55
White Sulphur Springs	1/26-12/55
Williamson	2/26-12/55

Approximately 248,000 cards punched

WISCONSIN, MADISON - UNIVERSITY OF WISCONSIN1009 cards reproduced by the Weather Bureau and furnished the UniversitySTATION

Burnett	1/49-11/51;12/52-12/56
Darlington	1/52-12/56
Hancock	1/49-12/56
Marshfield	1/48-12/56
Plymouth	1/50-5/54;9/54-12/56
Spooner	1/49-12/56
Watertown	1/49-12/56
West Bend	1/50-12/56
Madison	1/51-12/56

23,600

WYOMING, LARAMIE - UNIVERSITY OF WYOMING

<u>STATION</u>	<u>Punched by University</u>	<u>Reproduced by the Weather Bureau and furnished the University</u>
Cheyenne	1915-7/48	
Chugwater	1915-7/48	
Cody	1926-7/48	
Evanston	1915-7/48	
Farson	1915-7/48	
Laramie		1956
Newcastle	1918-7/48	
Powell	1915-7/48	
Sheridan		1956
Torrington		1956
Worland	1915-7/48	
	<hr/>	<hr/>
	92,950	1,095

A part of the Wyoming Experiment Station contributing project to Western Regional Project W-36, "Efficiency in the Harvesting and Use of Seeded Forage Crops", was concerned with the evaluation of different hay-harvesting methods from the standpoint of the probability of damage to the hay due to rain.

Work contemplated for the future includes the determination of the relationship between the seasonal distribution of rainfall and the yield of selected crops and to produce and describe climatological statistics which are usable for, and important to, crop production.

COOPERATIVE AGREEMENTS EFFECTED IN 1957.

<u>UNIVERSITY</u>	<u>DATE STARTED</u>
Idaho, Moscow University of Idaho	2-1-57
Maine, Orono University of Maine (Type 2 Agreement)	4-12-57
New Mexico, Las Cruces New Mexico College of Agriculture & Mechanic Arts	10-1-57
Washington, Pullman State College of Washington	5-29-57
Colorado, Fort Collins Colorado State University	4-1-57

REFERENCES

- Changnon, Stanley A., Jr., Third Progress Report. Illinois State Water Survey. August 1957
- Newman, James E. & Schaal, Lawrence A., First Annual Progress Report, Purdue University. April 1957.
- Bark, L. Dean, First Progress Report, Kansas Agricultural Experiment Station. August 1957.
- Decker, Wayne L & McQuigg, James D., Ninth Annual Progress Report, University of Missouri. July 1957.
- Dightman, R. A. & Caprio, J.M., Second Interim Progress Report, Montana Agricultural Experiment Station. June 1957.
- Gosslee, David G., Third Annual Progress Report, North Dakota Agricultural Experiment Station. March 1958.
- Hosler, C. L. & Welser, Edward V. Jr., First Progress Report, Pennsylvania State University. December 1957.
- Dickerson, W. H., West Virginia University Agricultural Experiment Station. 1957 Progress Report for NE-35.
- Becker, Clarence F.; Long, Joseph; & Hosick, A. H., Wyoming Climatology Progress Report. January 1958.