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UNITED STATES DEPARTMENT OF COMMERCE
U.S. WEATHER BUREAU
Washington, D.C.
August 15, 1955



MEMORANDUM

TO: Area and State Climatologists, Substation
Inspectors, Field Aides, WRPCs, River District Offices, and
Area Engineers. (With copies to Regional Offices for in-
formation.)

FROM: Climatological Services Division

SUBJECT: Climatological Service Memorandum No. 48.

GENERAL

1. REFINEMENT OF THE CLIMATOLOGICAL SUBSTATION NETWORK: The Weather Bureau's responsibility to establish and record the climate of the United States requires that adequate sampling be accomplished.

Actually this requires some interpretation because the word climate has many meanings. For example, many applications require detailed information concerning variations of a micro-nature and these frequently require special types of observation.

We adhere to the philosophy that it is the federal government's responsibility to provide a record of the general climate but not the very numerous special microclimatological applications with their respective special sampling requirements. The Weather Bureau can and must provide a satisfactory macroclimatological network; i.e., it must establish sufficient stations or substations to sample adequately the macroclimate so that it will be possible to superimpose a denser network of special microclimatological observing stations for which, after a short period of time, data can be so related to the macro-network so as to extend the special micro-type sampling in time.

Nearly all states have now completed their substation network maps. This represents, we hope, for many states, a satisfactory system for sampling the macroclimate of the State. However we must not lose sight of the fact that this network is based primarily upon an areal distribution of sampling points. For those states with pronounced topographic influences these maps are far from adequate if we are to obtain a true picture of the real macroclimate.

The first step to the solution of this problem insofar as temperature is concerned is:

- (1) To select and retain those substations which are representative of their geographical areas, and

- (2) Recommend additional substations which will be necessary to sample adequately some areas which are now inadequately covered. Only these stations should then be included in our basic long period macroclimatological network.

State Climatologists should take the initiative in this program. A good way to begin is:

- (1) To study the departures and differences on the arrays prepared by WRPC. This will in many instances show that observed values from some stations could have been deduced from nearby stations. After watching this for a period of time it will be possible to recommend that certain stations no longer need be included in the basic macro-network.
- (2) To make use of short periods of record from other locations within the area where you suspect that the present network is insufficient, in order to determine whether additional stations are needed. The same procedure utilized for arrays can be used manually.
- (3) In those areas where you suspect that additional stations might be needed and from which no records have ever been obtained, recommendations should be made to either establish a temporary cooperative substation or to establish a mobile station for a period of time.

The above should be considered only as a first step in this process and actual correlations making use of long periods of record must be the eventual deciding factor in making alterations to the "a" network.

For other parameters such as precipitation, evaporation etc., other techniques will be required. Suggestions for techniques to establish criteria for adequate precipitation networks will be appreciated.

2. CLIMATIC BENCH-MARK STATIONS: The primary purpose of establishing bench-mark stations is to gather records that will show whether there are climatic trends that can be identified.

A search of substation history forms and station records has revealed that there were few, if any, ideal stations for this purpose in our present climatological network. By "ideal" we mean stations of long-continued stability with excellent ground site exposures uninfluenced by environment or environmental changes; with little or no relocation of instruments and few, if any, changes of observers during their history; with past records of excellent quality, completeness and continuity, and with sound prospects for all of the above conditions to continue. Approximately 200 stations in our entire network of all types of stations were selected as most nearly qualifying as suitable for climatological bench-mark stations.

Further, a spot check of substation histories from three states showed that about half the stations undergo a change of site in four years. With these stations -

12.4%	were unchanged for less than 1 year
26.0%	" " " 1-2 years
19.9%	" " " 3-5 years
15.5%	" " " 6-10 years
7.5%	" " " 11-15 years
5.4%	" " " 16-20 years
6.9%	" " " 21-30 years
3.3%	" " " 31-40 years
2.2%	" " " 41-50 years
0.9%	" " " over 50 years

We all recognize that for climatological purposes continuity of records is essential, but the above history shows that we are far from this ideal state. Indications are, however, that this condition is improving and will continue to improve.

4. BOOKS FOR STATE CLIMATOLOGIST LIBRARIES: We have several books on climatology for issue to State Climatologist offices. Some of these have been distributed, and others will be soon, in the hope that they will be put to good use. We plan to furnish additional publications from time to time.

The following books have been (or will be) obtained: (We were not able to get all books for each office)

Flora, S. D., Tornadoes of the U. S. A.

U. S. Housing and Home Finance Agency, Application of climatic data to house design.

A.M.S. Meteorological Monograph, v. 2, no. 8, Recent studies in bioclimatology.

→ Conrad, V., Methods in climatology

→ Geiger, R., The Climate Near the Ground

Shapley, Harlow, ed., Climatic change.

Great Britain Meteorological Office, Handbook of Statistical Methods in Meteorology.

→ Brooks, C. E. P., Climate in everyday life.

Aronin, J. E., Climate and architecture.

Tannehill, I. E., Drought.

Tannehill, I. R., Hurricanes.

Japan's Natural-Vegetation and Agro-Climatic Analogues in North America

5. COMPUTATION OF HEATING DEGREE DAYS FOR CLIMATOLOGICAL SUBSTATION SUMMARIES: As a result of several inquiries about a shorter method of deriving average heating degree days for climatological substation summaries, we have decided to adopt the computational method described by H. C. S. Thom, "The Rational Relationship between Heating Degree Days and Temperature" (Monthly Weather Review, Vol. 82, No. 1, pp 1-6).

Maps of the United States depicting the standard deviation of average temperature are being prepared for each month of the year. These maps, along with adequate instructions, will be distributed to all State Climatologists and should be available with the next few weeks.

6. CLIMATOLOGICAL SUMMARIES FOR SUBSTATIONS: From time to time individual summaries have been published for a number of substations. Some were prepared by the former Section Centers or the present State Climatologists' Offices, others with the cooperation of outside agencies - federal, state, private, and semi-private. Some were printed and others mimeographed. Some were quite elaborate, containing summary tables of numerous meteorological elements, while others were simple, single-sheet summaries.

These summaries were not generally distributed to field stations other than those within the state in which the substation was located. We believe, however, that all State Climatologists' Offices should be apprised of their availability. Following is the list:

ALABAMA

Auburn
Talledega
Troy
(Dothan, soon to be available)

ALASKA

Ft. Yukon
Gulkana
Homer
Matanuska Agric.
Exp. Station
Middleton Island
McKinley Park
Petersburg
Talkeetna
Whittier

FLORIDA

Belle Glade
Bradenton
Cross City
Everglades

FLORIDA (Cont'd.)

Eustis 2S
Gainesville
Lake City
Moore Haven
Ocala
Palatka
St. Augustine
St. Leo
Titusville
Vero Beach

ILLINOIS

Mt. Vernon
Urbana

INDIANA

Berne
Ogden Dunes

ICWA

Cedar Rapids
Osage
Waterloo

MICHIGAN

South Haven

MINNESOTA

Wadena

NEW MEXICO

Artesia
Carlsbad
Clayton
Hobbs
Las Vegas
Portales
Silver City

OREGON

Bend
Forest Grove

TENNESSEE

Gatlinburg

Twelve of these are the type of substation summaries recently proposed to State Climatologists as a cooperative project. Requests for any of the above summaries should be made to the NWRC, or to the appropriate State Climatologist's Office. There may also be others, not included in this list. If so, please furnish 6 copies to the Central Office, and 10 or 12 to the NWRC, if available.

7. MAP STANDARDIZATION FOR A LOOSE-LEAF NATIONAL ATLAS: The Committee on a National Atlas of the United States, established by the Division of Earth Sciences of the National Academy of Sciences - National Research Council has recommended that Federal agencies preparing and issuing maps showing resources, facilities, or other physical or cultural information, standardize the size of sheet and related map features so as to build up a Loose-Leaf National Atlas of the United States.

The Weather Bureau will conform to the committee recommendations as to projection, scale, size of sheet, standard lettering, format and Library of Congress catalogue number. Anyone preparing climatological maps of the United States which would have potential value as part of the National Atlas should write the Climatological Services Division for information on specifications. A copy of the recommendations of the committee will be sent to each State and Area Climatologist's office.

8. PARTICIPATION IN AGRICULTURAL PROGRAMS: In the present pattern of things it would seem quite natural if a considerable amount of effort on the part of most of our State Climatologists were expended for the benefit of agriculture. From the number of calls for help we have had from various agricultural activities, it seems obvious that there are many unexploited opportunities for making climatology useful in agriculture. Hence, we should like to encourage State Climatologists to make or continue suitable contacts in this direction.

Although we believe that agriculture will be one of the main beneficiaries of a vigorous program of applied climatology, it is not our intention to neglect other opportunities to serve the public. State Climatologists should try to exploit these opportunities to make our vast storehouse of climatological data useful to public interests, (Water Boards, Highway Departments, etc.) and larger groups of industry (such as transportation, building construction, air conditioning, insurance etc.).

9. REQUESTS FOR ORIGINAL SUBSTATION FORMS DURING 1954: The report of WRPC's concerning the number of Section Center (or State Climatologist) requests for original substation forms during the year 1954 shows that a total of only twelve (12) requests were received by the 3 WRPCs. This is an indication that, in general, published data in conjunction with carbon copies of the observer's records are satisfactory for local and/or State requirements. For this reason the original substation records retained at the WRPCs will be forwarded to the NWRC annually after preparation of the Climatological Data - Annual. They will not be micro-filmed in segments of less than 10 years unless requested for some specific purpose.

10. SELECTION OF NORTHEASTERN AREA CLIMATOLOGIST: Mr. James K. McGuire has been designated Northeastern Area Climatologist to serve Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, New Jersey, Delaware, Maryland and West Virginia.

Mr. McGuire's prime objective will be to stimulate the Bureau's climatological program by assisting the state climatologists in the development and strengthening of climatological programs within these states.

Mr. McGuire will be stationed at the Weather Bureau City Office, New York, N.Y.

11. CLIMATOGRAPHY OF THE UNITED STATES: A new publication series "Climatology of the United States" has been established. This series is to include all publications of summarized data covering periods exceeding one year. Since the purpose of the series is to reflect climatographic conditions and trends (as distinguished from the presentation of more or less current data) it will not include such publications as Climatological Data and Local Climatological Data and Supplements. It will include, among other things, Bulletin W and Supplements, substation Climatological Summaries, five-year summarizations of data contained in Local Climatological Data-Supplements and similar long-period publications.
12. HAND TABULATION OF RUNS OF DRY AND WET SPELLS: Mr. L. A. Joos' article in the Weekly Weather and Crop Bulletin for June 20, 1955, "Hay-Drying Weather at Madison, Wisconsin", has resulted in a considerable favorable response.

Mr. Paul C. Kangieser, State Climatologist for Massachusetts, has outlined a procedure for hand tabulation for those not quite so fortunate as to have punched cards available.

We quote from Mr. Kangieser's Memorandum:

"A recent article by L. A. Joos, "Hay-Drying Weather at Madison, Wisconsin" in the June 20th Weekly Weather and Crop Bulletin, presents data that should have wide application in the United States. Mr. Joos utilized an IBM file of daily weather records for Madison and analyzed the deck for dry spells by machine methods. The need for a similar summarization for Boston developed recently and to fill it quickly it was necessary to do the job "by hand". The method used may be of value to others with similar needs and requires only that one count the number of runs of various length in the series. The method is described and illustrated below for runs of "dry" days, where a "dry" day is defined as a day on which the 24-hour accumulation of precipitation is less than .10 inch.

- "Step 1. Go through the daily records and make a frequency tabulation of the number of runs of various lengths for dry days.
- Step 2. Make a cumulative table of the frequency of these periods from the longest to the shortest. This gives the number of days which were dry and were followed by (N-1) more dry days.
- Step 3. Cumulate the values obtained in Step 2, above, again from the longest to the shortest periods. This gives the number of days which were dry and were followed by at least (N-1) more dry days.

"If one were to begin counting runs on the 1st of each month and end with the last day, a bias would be introduced toward runs of shorter length by splitting up all runs spanning the month boundaries. It is advisable, therefore, to adopt a convention like the following for counting runs: Assign a run to the month in which the majority of the days occurred; in the case of a tie, assign it to the later month. Thus the method will not yield the same numerical result as the machine method used by Mr. Joos, but if the data are stratified by months (instead of weeks) and a long period of record is used the approximation is a very good one."

13. WEATHER STORIES IN CLIMATOLOGICAL DATA: Because we did not believe that Climatological Data weather stories should be written at busy Weather Bureau Offices concerned with many other matters, some of higher priority, this task was last summer assigned to the WRPCs.

The question has arisen again, however, about whether or not these stories should be written by full-time State Climatologists, when established, or by the WRPC. To help decide it we should like to have an expression of opinion from all full-time climatologists, from the WRPCs, and from any other interested offices. Some points to be considered are (a) the quality of the present stories, (b) adequacy of severe storm and flood reports, (c) whether WRPC deadlines could be readily met if stories were written in the states, (d) what provision should be made in case of absence of the State Climatologist, if stories were written locally, and (e) which offices are best able to prepare the stories by reason of information available to them.

14. DISCONTINUANCE OF THE TERM "KILLING FROST" OR "FREEZE": Reference: Item 5, CSM No. 47 dated May 18, 1955.

Reference above pertains to use of the term "Killing Frost" as a climatological parameter as it has been generally used in the past. It does not in any way alter instructions to report Freeze (Circular N, paragraph 3934.62) as a phenonema where it applies to specific types of vegetation.

FOR WRPC'S

15. INDICATING SURFACE COVER AND SOIL TYPE FOR STATIONS WHERE SOIL TEMPERATURES ARE PUBLISHED: Since surface cover and soil type influence soil temperature, a note should be carried immediately following the soil temperature table indicating soil type and cover for each station. An example is "Grundy silt loam - under blue grass sod".

State Climatologists for states concerned should furnish the above information to WRPCs.

16. PUBLICATION OF LOCAL CLIMATOLOGICAL DATA SUPPLEMENT FOR STATIONS WHERE HOURS OF OPERATION HAVE BEEN REDUCED: Reference: CSM No. 36, Item 9 and CSM No. 45, Item 9. Change the last sentence to: "The Superintendent of Documents should be advised of the discontinuance of the Supplement, but it will not be necessary to furnish his office with a list of subscribers if the monthly Local Climatological Data for the station is to continue".

See memo with attached