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Hydrologic Data for Experimental Agricultural Watersheds in the United States 1967

Miscellaneous Publication No. 1262

Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE
In Cooperation With
State Agricultural Experiment Stations



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Hydrologic Data for Experimental Agricultural Watersheds in the United States 1967

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Miscellaneous Publication No. 1262

Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE
In Cooperation With
State Agricultural Experiment Stations

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PREFACE

This publication presents annual basic data on monthly precipitation and runoff; long-term monthly precipitation means for the locality; annual maximum discharges and volumes of runoff; daily air temperature, precipitation, and discharge (for some areas); and selected runoff events, with associated data on rainfall, land use, and antecedent conditions for agricultural watersheds where research was in progress during 1967. It is a continuation of processing and releasing hydrologic data of general interest collected cooperatively with other agencies.

Throughout the watershed studies the State agricultural experiment stations have collaborated in selecting, planning, and conducting these studies. In several studies, the U.S. Geological Survey and State and local agencies, such as State water boards and highway departments of local drainage and conservation districts, have assisted in the work. The classification and correlation of soils and evaluation of other watershed charac-

teristics in the descriptions have been based mostly on field surveys by the U.S. Soil Conservation Service.

These data were collected originally for specific research objectives, which are still in progress or have been attained. In addition, they can serve many other purposes. This publication provides information for other government agencies, university staff members, graduate students, private engineers, and others who need detailed, factual information concerning agricultural watersheds. High-quality hydrologic data such as these have historic value in addition to providing a basis for research and design and evaluation of projects and programs for conservation and development of the Nation's water resources.

Although the data on which this publication is based were collected in 1967, the findings are still valid and are used for further research on agricultural watersheds.

CONTENTS

	Page
Publications of earlier data.....	1
Form of data presentation.....	3
Continuing watersheds.....	3
New watersheds.....	4
Watershed descriptions.....	4
Standard symbols for tabular data.....	7
Revisions of previously published data.....	7
Personnel responsible for compilations.....	8
Additional publications by location.....	8
United States index map and related data.....	11
Location of experimental agricultural watersheds of the Agricultural Research Service (1967) by land resource regions and major land resource areas of the United States.....	12
Legend for land resource regions and major land resource areas (of the 48 conterminous States).....	13
Table 1.—Experimental agricultural watersheds, by States, localities, and locations, under study during 1967 and included in this publication.....	14
Table 2.—Watersheds, by States, where observations were discontinued during 1966.....	14
Table 3.—Additions or revisions, by States, regarding data published before 1967.....	15
Watershed data by location number and decimal paging [8.1-1 to 75.4-3, a total of 617 data sheets].....	17

The decimal system of paging is used to index the watershed data. Pages are numbered at the bottom according to location and watershed number, and the data for each watershed are given on one or more pages. For example, pages 8.2-2 is location 8 (Vero Beach, Fla.), watershed 2 (W-2 at Vero Beach), and page 2 of the data for that watershed.

For convenience in finding items in tables 2 and 3 in the "Contents" above, pages are also numbered consecutively at the top.

Table 1 is a list of continuing or new watersheds by State, locality, land resource area, assigned location number, watershed units, and number of selected runoff events reported for 1967 in this publication. Table 2 includes similar data on discontinued watersheds. Table 3 contains additions or revisions regarding watershed data.

Hydrologic Data for Experimental Agricultural Watersheds in the United States, 1967

This publication contains selected hydrologic data for 1967, including monthly precipitation and runoff summaries for 216 watersheds; annual maximum discharges and annual maximum volumes of runoff for 204 watersheds for intervals of 1, 2, 6, and 12 hours and 1, 2, and 8 days; daily precipitation and discharge or daily air temperature or both for 164 watersheds; and detailed information for one or more selected typical storm events for 174 watersheds. The decimal paging system used (see explanation on p. iv) is consistent with that at the bottom of pages in the nine previous publications (see next section), so that previously published records and general descriptions can be readily found and consulted.

Information on selected storm events includes (1) tabular data for the 30-day antecedent rainfall and runoff before the events; (2) data on rainfall intensities and runoff for the event and on accumulated depth of rainfall and runoff; (3) description of watershed conditions at the time of the selected events; (4) plottings of runoff hydrographs and rainfall histograms; (5) watershed maps; and (6) for some of the larger drainage areas, isohyetal maps of storm rainfall distribution.

For newly established watersheds, descriptions of watershed physical characteristics, instrumentation, graphs, maps, land management, and recommended area of application of the results are also given. Original descriptions of characteristics have been revised or updated for several watersheds and additions are listed in table 3, with details given on the respective data sheets for each watershed.

PUBLICATIONS OF EARLIER DATA

Hydrologic data for past years on many of the currently operating experimental agricultural watersheds have been previously summarized in three looseleaf publications (reprints in bound volumes) by the Agricultural Research Service of the U.S. Department of Agriculture, Beltsville,

Md. 20705. These reports, listed as references 1, 2, and 3, are described in the following summary. Beginning with the hydrologic data for 1956 through 1966, the types of data previously published separately in these three references were combined in U.S. Department of Agriculture Miscellaneous Publications 945, 994, 1070, 1164, 1194, 1216, and 1226. These are listed below as references 4, 5, 6, 7, 8, 9, and 10. All 10 publications have been assigned these reference numbers to simplify citations to them in this and future publications.

Reference 1.—MONTHLY PRECIPITATION AND RUNOFF FOR SMALL AGRICULTURAL WATERSHEDS IN THE UNITED STATES. Soil and Water Conservation Research Branch, 691 pages, 1957. (Includes physical descriptions and land use of 334 experimental agricultural watersheds at 60 locations in 27 States from 1923 through 1957. Many of these watersheds were discontinued before 1955.)

Reference 2.—ANNUAL MAXIMUM FLOWS FROM SMALL AGRICULTURAL WATERSHEDS IN THE UNITED STATES. Soil and Water Conservation Research Division, 330 pages, 1958. (Includes records from 322 watersheds at 59 locations in 27 States from 1923 through 1957. Many of these watersheds were discontinued before 1957.)

Reference 3.—SELECTED RUNOFF EVENTS FOR SMALL AGRICULTURAL WATERSHEDS IN THE UNITED STATES. Soil and Water Conservation Research Division, 374 pages, 1960. (Includes a sampling of one to six typical runoff events from 68 watersheds at 40 locations in 25 States from 1933 through 1959. The publication has maps of each watershed, watershed conditions for each event—including the 30-day antecedent rainfall and runoff—and tabular as well as graphic data on each storm.)

Reference 4.—HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1956-59. Harold W. Hobbs, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture Miscellaneous Publication 945, 672 pages, 1963. (Contains monthly precipitation and runoff from

157 watersheds, including 45 newly established watersheds for which data had not been previously published; annual maximum discharges and annual maximum volumes for 1 hour to 8 days for 142 watersheds; and one or more typical selected runoff events for 134 watersheds. The publication has watershed maps, when new or revised, and graphs of each selected event, together with tabular data. Locations of experimental studies are shown on a U.S. fold-in map of land resource areas in 48 States.)

Reference 5.—HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1960–61. Harold W. Hobbs and Florence B. Crammatte, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture Miscellaneous Publication 994, 496 pages, 1965. (Contains monthly precipitation and runoff from 160 watersheds, including 24 newly established watersheds for which data had not been previously published; annual maximum discharges and annual maximum volumes for 1 hour to 8 days for 145 watersheds; and one or more typical selected runoff events for 133 watersheds. The publication has watershed maps, either new or revised, and graphs of each selected event, together with corresponding tabular data. Selected runoff events published through 1961 for each watershed are listed in table 4.)

Reference 6.—HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1962. Harold W. Hobbs, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture Miscellaneous Publication 1070, 447 pages, 1968. (Contains monthly precipitation and runoff from 164 watersheds, including 13 watersheds for which data had not been previously published; annual maximum discharges and annual maximum volumes for 1 hour to 8 days for 155 watersheds; and one or more typical selected runoff events presented in both tabular and graphic form for 136 watersheds. Selected runoff events published through 1962 for each watershed are listed in table 4. Several watershed maps, either new or revised, are included.)

Reference 7.—HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1963. Harold W. Hobbs and J. B. Burford, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture Miscellaneous Publication 1164,

465 pages, 1970. (Contains monthly precipitation and runoff from 168 watersheds, including nine, watersheds for which data had not been previously published; annual maximum discharges and annual maximum volumes for 1 hour to 8 days for 156 watersheds; and one or more typical selected runoff events presented in both tabular and graphic form for 142 watersheds. Selected runoff events published through 1963 for each watershed are summarized in table 4. Several watershed maps, either new or revised, are included.)

Reference 8.—HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1964. J. B. Burford, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture Miscellaneous Publication 1194, 460 pages, 1971. (Contains monthly precipitation and runoff from 163 watersheds, including eight watersheds for which data had not been previously published; annual maximum discharges and annual maximum volumes for 1 hour to 8 days for 163 watersheds; and one or more typical selected runoff events presented in both tabular and graphic form for 143 watersheds. Several watershed maps, either new or revised, are included.)

Reference 9.—HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1965. J. B. Burford, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture Miscellaneous Publication 1216, 568 pages, 1972. (Contains monthly precipitation and runoff from 189 watersheds, including 22 watersheds for which data had not been previously published; annual maximum discharges and annual maximum volumes for 1 hour to 8 days for 178 watersheds; and one or more typical selected runoff events presented in both tabular and graphic form for 122 watersheds. Several watershed maps, either new or revised, are included.)

Reference 10.—HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1966. J. B. Burford, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture Miscellaneous Publication 1226, 399 pages, 1972. (Contains monthly precipitation and runoff from 198 watersheds, including 11 watersheds for which data had not been previously published; annual maximum discharges and annual maximum volumes for 1 hour to 8 days for 185 watersheds; and

one or more typical selected runoff events presented in both tabular and graphic form for 106 watersheds. Several watershed maps, either new or revised, are included.)

Copies of these 10 publications have been furnished to the Soil Conservation Service and to other government agencies—Federal, State, and local. They have also been distributed to State agricultural experiment stations, university libraries and engineering departments, and, when requested, to private engineers and individuals. Distribution has also been made to similar foreign institutions and individuals.

FORM OF DATA PRESENTATION

The data in this publication are presented for each watershed in the following order: (1) Watershed description, if not previously published; (2) monthly precipitation and runoff; (3) average monthly precipitation and runoff for period of record; (4) local mean monthly precipitation (previously called normal P in publications through 1961 (ref. 5)); (5) annual maximum flows; (6) daily temperature extremes, daily precipitation, and discharge for some watersheds; (7) tabulations of data for selected runoff events; (8) graphs of selected runoff events; (9) watershed maps, if not previously published or if revised; and (10) isohyetal maps (if included) of storm rainfall distribution for selected runoff events.

Continuing Watersheds

For current watersheds, for which the descriptive information has been published in references 1, 4, 5, 6, 7, 8, 9, or 10, the tabular data begin at the top of the first page. Above the border at the center the page is numbered, and the decimal paging system is shown at the bottom.

In the space to the right of the first table title, **MONTHLY PRECIPITATION AND RUNOFF (inches)**, the location *name*, watershed *number* (or designation), and watershed *size* are given. In the table for the current *calendar year*, the *precipitation* (P) in inches is listed in the monthly columns, with the yearly total given in the last column, headed *annual*. In the line below, the corresponding *runoff* (Q) in inches is similarly listed for each month and the total for the year. Underneath, in two lines, are given the (P) and (Q) station average amounts (STA AVG) by months, with aver-

age annual total for the period of record. On the bottom line of the table are given the long-term monthly and annual precipitation means (averages) for the nearest U.S. Weather Bureau Station.

In the second table, entitled **ANNUAL MAXIMUM DISCHARGES (inches per hour) AND ANNUAL MAXIMUM VOLUMES OF RUNOFF (inches) FOR SELECTED TIME INTERVALS**, data are also given for the *calendar year* listed in the first column. Under the *maximum discharge* heading, the date column shows the day and month that the instantaneous peak in inches per hour occurred. In computing this rate, corrections were made, where needed, for any significant pondage above the runoff-measuring device. Under the *maximum volume* heading, the date refers to the day and month on which the interval began; for example, if the interval began August 30 at 2359, the entry in the date column will be 8-30. The depths for *1 hour to 8 days* are the annual maximum values recorded, without regard to entire clock hours or days; thus, if the 6-hour interval began at 1332, the interval would end exactly 6 hours later at 1932. The volume given is in inches of average depth over the watershed for each of the seven selected time intervals (1, 2, 6, and 12 hours, and 1, 2, and 8 days). In the last section of the table, the maximum discharges and depths for the various periods are given under **MAXIMUMS FOR PERIOD OF RECORD**.

Notes and footnotes in explanation of the data, given below the first two tables, include (1) a general statement as to watershed conditions and other physical changes for the period covered; (2) corrections or revisions for previously reported data; (3) source of long-term precipitation means or averages and years covered; and (4) other pertinent material or explanations of the hydrologic data in the two tables.

Before the 1963 volume, statements of the estimated quality of P and Q records were given in these notes. Beginning with the 1963 volume through this volume, with a few exceptions, no attempt has been made to evaluate the records; therefore, the statements under "Continuing Watersheds," on page 3 of the 1963 through 1966 volumes that indicate that quality statements are given only when records are considered to be less than excellent (less than 95 percent accurate) are in error and should be deleted. Reevaluations of previously published records are also included in these footnotes.

For some watersheds, tables of DAILY AIR TEMPERATURE (maximum and minimum in degrees Fahrenheit), DAILY PRECIPITATION (inches), and MEAN DAILY DISCHARGE (c.f.s) are next, with appropriate footnotes in explanation of the data at the end of each table. The multiplier to convert mean daily discharge in cubic feet per second to inches per day is given as the first note to the mean daily discharge table. The conversion factor for daily inches to acre-feet is sometimes included.

If no daily tables are given, the tabular data for SELECTED RUNOFF EVENTS begin in the remaining space on the first page and are carried forward on continuation sheets (or pages) until completed. In general, the SELECTED RUNOFF EVENTS were those in which runoff was produced by a relatively uniform rainfall excess of short duration. The information for each event includes tabulation of (1) antecedent daily rainfall and runoff for 30 days before the event, or reference made to daily tables if included; (2) rainfall intensities and accumulated amounts for the event; (3) runoff rates and accumulated amounts for the event; and (4) specific watershed conditions at the time of the event. Simple graphs of rainfall and runoff rates are shown for all events on pages following the tabular data.¹ Maps follow the graphs unless previously published in references 3 through 10 or unless shown herein on the map of another watershed. Isohyetal maps, if any, generally follow the regular maps.

In the "Notes" at the bottom of the first page for runoff events, the multiplier to convert runoff rates in inches per hour to cubic feet per second, or vice versa, is given, followed by references to maps, if required, and explanatory notes or footnotes relating to the tabular data. Below the bottom border and above the first index page number, the cooperating agencies are listed. The notes on continuation pages contain the statement on the multiplier and similar explanations of the data on each page.

New Watersheds

For the 26 watersheds installed in recent years and not reported previously, the presentation begins with the watershed description in the upper

part of the first page. The explanations and definitions on which the description is based are given in the next section.

The first line, centered at the top of the sheet, indicates the *project location*, which is the nearest city or town, and the number or name of the watershed used locally. The descriptive material is then given under the 12 major topics listed generally down the left side of the sheet: *Location, Area, Slopes, Soils, Erosion, Land Capability, Geology, Surface Drainage, Character of Flow, Instrumentation, Watershed Conditions, and Generally Represents*.

After this description, the tabular data are summarized in the first two tables and notes are included as previously described for "Continuing Watersheds." The tabular data for daily air temperatures, precipitation, and discharge, if presented, precede the tabular data for SELECTED RUNOFF EVENTS. The rest of the material of the series for the particular watershed follows in the same order as previously indicated.

WATERSHED DESCRIPTIONS

The following definitions and explanations were used in describing watershed location, watershed characteristics, instrumentation, land management, and recommended area of application of the hydrologic data.

LOCATION gives county and State, distance and direction of the runoff gaging station from the nearest city or town, and the major river basin in which it lies. When two or more basins are involved, the tributary or subbasin is mentioned first, followed by the major basin.

AREA of watershed is given in acres if less than 640 acres, and in both acres and square miles (in parentheses) if more than 1 square mile. If areas are revised, additional values are included with notes on date of change.

SLOPES are given in terms of the ranges commonly used in survey work in the locality. The percentages of the watershed lying in each slope class are listed. As an example, "8% is in 0-2% class" means that 8 percent of the watershed area has slopes ranging from 0 to 2 percent.

SOILS are described briefly, according to definitions from the U.S. Department of Agriculture SOIL SURVEY MANUAL, Agriculture Handbook 18, published in 1951. Soil descriptions are given for the 26 new watersheds.

¹ In some included events, noncritical points were eliminated from original tabulations to reduce the number of lines required in the tables for time, rates, and accumulations.

Soil texture refers to the relative proportions of the various size groups (or separates) of individual soil grains in a mass of soil. Specifically it refers to the proportions of clay, silt, and sand less than 2 mm. in diameter. The various classes of texture in order of increasing percentages of the smaller size groups are (1) sands, (2) loamy sands, (3) sandy loams, (4) loam, (5) silt loam, (6) silt, (7) sandy clay loam, (8) clay loam, (9) silty clay loam, (10) sandy clay, (11) silty clay, and (12) clay. In some of the descriptions the broader classification of coarse, moderately coarse, medium, moderately fine, and fine has been used—the coarse soils are the sands and the fine soils the clays.

Soil structure refers to the aggregation of primary soil particles into compound particles, or clusters of primary particles, that are separated from adjoining aggregates by surfaces of weakness. Structure grade, or the durability of the aggregates when subjected to disturbance, is described as *structureless, weak, moderate, or strong*. For some soils the structureless grade is described as *massive*, if coherent, or *single grain*, if non-coherent. The size of the aggregates is reported as *very fine, fine, medium, coarse, or very coarse*. Structure shape is given as being *platy, prismatic, columnar, angular blocky, subangular blocky, granular, or crumb*.

Permeability is the quality of a soil that enables it to transmit water or air. This quality is indicated by the terms *very slow, slow, moderately slow, moderate, moderately rapid, rapid, or very rapid*.

Internal soil drainage is the quality of a soil that permits the downward flow of excess water through it. Internal drainage is reflected in the frequency and duration of periods of saturation with water. It is determined by the texture, structure, and other characteristics of the soil profile and of underlying layers and by the height of the water table, either permanent or perched, in relation to the water added to the soil. *Internal drainage* is described as *none, very slow, slow, medium, rapid, or very rapid*.

EROSION conditions on the watershed are described in accordance with the following classification for water and wind erosion, also briefed from Agriculture Handbook 18. The percentages of the watershed in the following erosion classes are given.

Class 1.—The soil has a few rills or places with thin A horizons that give evidence of accelerated erosion, but not to an extent to alter greatly the thickness and character of the A horizon. Except for soils having very thin A horizons (less than 8 inches), the surface soil consists entirely of A horizon throughout nearly all the delineated areas. Up to about 25 percent of the original A horizon, or original plowed layer in soils with thin A horizons, has been removed from most of the area. This class also includes the areas with no erosion.

Class 2.—The soil has been eroded to the extent that ordinary tillage implements reach through the remaining A horizon or well below the depth of the original plowed layer in soils with thin A horizons. Generally the plowed layer consists of a mixture of the original A horizon and the underlying horizons. Mapped areas of eroded soil usually have patches in which the plowed layer consists entirely of the original A horizon, and others in which it consists entirely of underlying horizons. Shallow gullies may be present. Approximately 25 to 75 percent of the original A horizon or surface soil may have been lost from most of the area.

Class 3.—The soil has been eroded to the extent that all or practically all the original surface soil, or A horizon, has been removed. The plowed layer consists essentially of materials from the B or other underlying horizons. Patches in which the plowed layer is a mixture of the original A horizon and the B horizon, or other underlying horizons, may be included within mapped areas. Shallow gullies, or a few deep ones, are common in some soil types. More than about 75 percent of the original surface soil, or A horizon, and commonly part or all the B horizon, or other underlying horizons, have been lost from most of the area.

Class 4.—The land has been eroded until it has an intricate pattern of moderately deep or deep gullies. Soil profiles have been destroyed except in small areas between the gullies. Such land is not useful for crops in its present condition. Reclamation for crop production or for improved pasture is difficult, but may be practicable if other characteristics of the soil are favorable and erosion can be controlled.

Class +.—Recent alluvial and colluvial deposition.

LAND CAPABILITY is given as classified by Klingebiel and Montgomery in U.S. Department of Agriculture LAND-CAPABILITY CLASSIFICATION,

Agriculture Handbook 210, published in 1961. The classification expresses the suitability of land for use without deterioration. The eight land-capability classes are distinguished according to the risk of land damage or difficulty of land use. The following classes I through IV are suitable for cultivation and other uses, whereas classes V through VIII are not suitable for cultivation.

Class I.—Very good land for cultivation; nearly level and productive; not subject to erosion; needs only ordinary good farming methods.

Class II.—Good land for cultivation; mostly gently sloping; not more than moderately subject to erosion; some land may be rather wet; can be farmed safely with easily applied practices.

Class III.—Moderately good land for cultivation; mostly moderately sloping; some areas too wet or too dry; can be farmed safely with practical conservation measures, carefully applied; usually a combination of two or more measures is needed.

Class IV.—Fairly good land, suitable for occasional cultivation; generally strongly sloping; often shallow or very sandy; often found in dry climate.

Class V.—Land very well suited for grazing or forestry; requires good range or woodland management.

Class VI.—Land well suited for grazing or forestry; steeply sloping land, or stony or shallow soil; eroded, droughty, or wet land; requires careful management.

Class VII.—Land fairly well suited for grazing or forestry; severely limited in use by such factors as very steep slope, shallow or droughty soil, wetness, severe erosion, or excessive salinity; requires very careful management.

Class VIII.—Land not suitable for cultivation, grazing, or forestry; may be useful for wildlife, recreation, or protection of water supplies.

GEOLOGY of the 26 new watersheds is reported herein. The parts of the watershed occupied by various geological formations or series are briefly described, together with strike and dip of the strata, thickness, and relative position, when known. Faults, perched water tables, outcrops, if present, and other details relating to the movement of water within the drainage area or affecting the hydrology of the watershed are described.

SURFACE DRAINAGE refers to the ease with which excess water flows from the watershed area. The length of principal waterway is the distance from the gaging station to the most remote point on

the watershed boundary, measured along the flood plain of the watercourse.

CHARACTER OF FLOW describes the flow of the principal watercourse with respect to permanence and space. The following definitions are from Meinzer's OUTLINE OF GROUND-WATER HYDROLOGY U.S. Geological Survey Water-Supply Paper 494 published in 1923.

As to permanence, streams may be divided into perennial, intermittent, and ephemeral streams.

A *perennial stream*, or stretch of a stream, flows continuously. Perennial streams are generally fed in part by springs, and their upper surfaces usually stand lower than the water table in the localities through which they flow.

Intermittent streams may be divided, with respect to their water source, into spring-fed intermittent streams and surface-fed intermittent streams. They also flow in direct response to precipitation.

A *spring-fed intermittent stream*, or stretch of a stream, flows only at certain times when it receives water from springs. The intermittent character of streams of this type is generally caused by fluctuations of the water table whereby the stream channels stand part of the time below and part of the time above the water table. This is the ordinary type of intermittent stream.

A *surface-fed intermittent stream*, or stretch of a stream, flows during protracted periods when it receives water from some surface source, generally the gradual and long-continued melting of snow in a mountainous or other cold tributary area. The term may be arbitrarily restricted to streams or stretches of streams that flow continuously during at least 1 month.

An *ephemeral stream*, or stretch of a stream, flows only in direct response to precipitation. It receives no water from springs and no long-continued supply from melting snow or other surface source. Its stream channel is at all times above the water table. The term may be arbitrarily restricted to streams or stretches of streams that do not flow continuously for as long as 1 month.

With respect to continuity in space, streams may be divided into interrupted and continuous streams. An *interrupted stream* contains (1) perennial stretches with intervening, intermittent, or ephemeral stretches or (2) intermittent stretches with intervening ephemeral stretches. These two classes of interrupted streams are designated, respectively, *perennial interrupted*

streams and intermittent interrupted streams. A continuous stream does not have interruptions in space. It may be perennial, intermittent, or ephemeral, but it does not habitually have wet and dry stretches.

INSTRUMENTATION describes type of runoff control or measuring device, number and type of precipitation gages, type of charts used, and snow courses, if employed.

WATERSHED CONDITIONS describes the general use and farm, forest, or range practices before the period of record and the conservation measures, crops, yields, and general cultural operations and practices during the period of record. Rotation crops are listed in the order grown. Operations are described with commonly used agricultural terms, and only those that appear to have a significant relationship to the hydrology of the watershed are mentioned.

GENERALLY REPRESENTS gives the broad area of application for which the data of the specific watershed are recommended. The land resource areas named are those delineated on the map titled "Location of Experimental Agricultural Watersheds of the Agricultural Research Service," on pages 12 and 13. Solid circles show the approximate locations of the "continuing" or "new" watersheds; open circles show approximate locations of the discontinued studies. For a few studies the circles indicate the locations of the project headquarters instead of the watershed locations. A larger index map with more detail is included in reference 4.

For some studies, there is an apparent contradiction between the watershed location on the maps and the descriptive information under "Generally Represents." This is caused by the small scale of the maps; it is difficult to show many small local variations in boundaries of the land resource areas. The descriptive statements, instead of the map location, should be the guide to the application of the data.

STANDARD SYMBOLS FOR TABULAR DATA

The following capital letters have been used as standard symbols throughout this volume to designate specific items or meanings:

Symbol	Meaning
A—	precipitation of unknown time of occurrence, amount generally carried forward.

Symbol	Meaning
E—	value is estimated or partially estimated.
H—	precipitation in form of hail.
L—	precipitation in form of sleet or freezing rain.
M—	mixed precipitation in form of rain, snow, and sleet.
N—	precipitation in form of rain and snow.
NR—	when used in place of value, "no record."
P—	monthly or annual precipitation in inches.
Q—	monthly or annual runoff in inches.
R—	followed by hyphen and number, recording rain gage.
RG—	rain gage, generally followed by gage number.
S—	followed by hyphen and number, standard rain gage.
S—	precipitation in form of snow.
STA AV (or AVG)—	station average for period of record.
T—	trace, generally less than 0.005 inch of precipitation and 0.01 inch of runoff (or 0.0001 inch of runoff, if four decimal places are used).

Time-of-day symbols or designations *a*, *p*, *m*, and *n* used in previous publications through 1961 have been discontinued and military time (0001 to 2400) has been substituted in publications since then. Unless stated otherwise, time used in tables is eastern, central, mountain, or Pacific standard, whichever applies to the given location.

REVISIONS OF PREVIOUSLY PUBLISHED DATA

In some instances it has been necessary to revise previously published data on specific watersheds. If the corrections involve changed values of monthly precipitation, runoff, annual maximum discharges, or maximum volumes for various durations, entire lines for the year are republished with the changed items *underlined*. These revisions are explained in footnotes following the tables in which they appear.

If additions or revisions are made in watershed descriptions, they are placed after the above-mentioned tables. In some cases a statement on geology has been added to the original descriptions. The geology for the 26 new watersheds is also described. The foregoing changes are listed by States in table 3, page 15.

PERSONNEL RESPONSIBLE FOR COMPILATIONS

At each research location, many individuals have contributed to the planning and establishment of the watersheds and the collection, compilation, and analysis of the data. Some of those who made substantial contributions to the success of the research work behind this report are—

<i>Location</i>	<i>Name or names</i>
8.....	William H. Speir, John C. Stephens.
13, 66.....	James B. Burford, Jan C. Carr, Vernon O. Shanholtz.
21, 25, 61, 71..	Larry A. Kramer, Keith E. Saxton.
26.....	Lloyd L. Harrold.
29, 31, 32.....	Gordon Waddell.
34, 37.....	Wendell R. Gwinn, William O. Ree, Francis L. Wimberly.
42.....	Walter G. Knisel, Jimmy R. Williams.
44.....	Clayton Hanson, David A. Woolhiser.
45, 47, 63, 64, 73.	Orfelia Garcia, Leonard J. Lane.
62.....	William A. Champion, Farris E. Dendy, Mary A. Marshall, Robert B. Wilson.
65.....	Clayton Hanson, Armine R. Kuhlman.
67.....	Rodger DeAngelis, Bruce Filgate, Doug- las Grant.
68.....	John M. Clark, Clifton W. Johnson.
69.....	Donn G. DeCoursey, Monroe A. Hart- man, Arlin D. Nicks, Edd D. Rhoades, Russel R. Schoff, Oscar D. Workman.
70.....	Walter G. Knisel, Clarence W. Richard- son.
75.....	Loris E. Asmussen, William C. Mills, John C. Stephens.

ADDITIONAL PUBLICATIONS BY LOCATION

In references 1, 4, 5, 6, 7, 8, 9, and 10 (see pp. 1 and 2), citations to other publications that present watershed data and interpretations of results in various journals, bulletins, and periodicals are given at the end of the introductions for many of the locations. Following is a listing, by location number, of additional references to results reported through 1967. Several items of general application to the overall program of hydrology that could not be tied to a specific location are included at the end of the listing under "General References."

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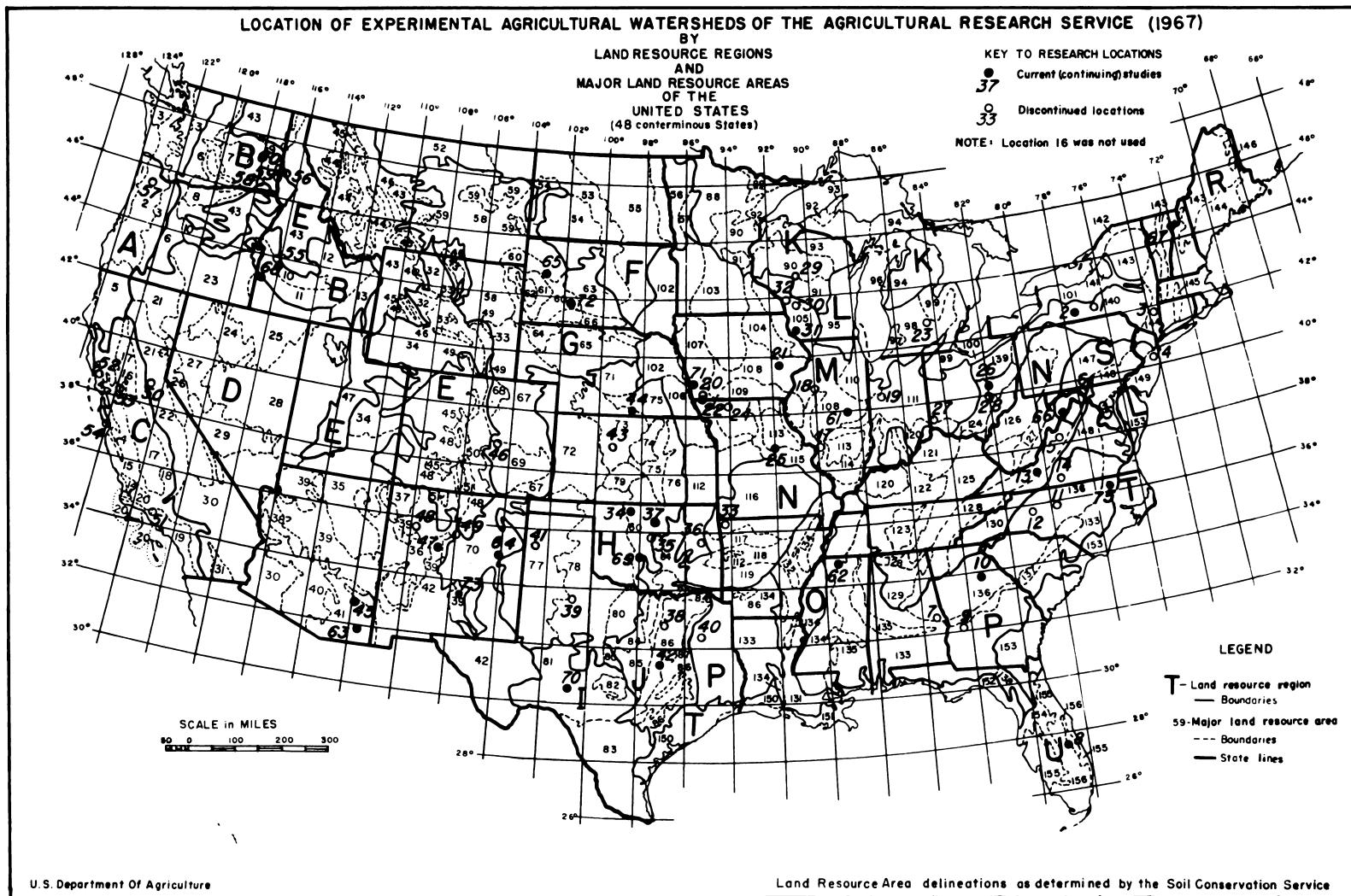
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UNITED STATES INDEX MAP AND RELATED DATA

[Pages 12 through 15]



**LEGEND FOR LAND RESOURCE REGIONS
AND MAJOR LAND RESOURCE AREAS
(of the 48 conterminous States)**

A**NORTHWESTERN FOREST, FORAGE, AND SPECIALTY CROP REGION**

- 1 Northern Pacific Coast Range and Valleys
- 2 Willamette and Puget Sound Valleys
- 3 Olympic and Western Slope Cascade Mountains
- 4 California Coastal Redwood Belt
- 5 Siskiyou-Trinity Area

B**NORTHWESTERN WHEAT AND RANGE REGION**

- 6 Eastern Slope Cascade Mountains
- 7 Columbia Basin
- 8 Columbia Plateau
- 9 Palouse and Nez Perce Prairies
- 10 Upper Snake River Lava Plains and Hills
- 11 Snake River Plains
- 12 Lost River Valleys and Mountains
- 13 Eastern Idaho Plateau

C**CALIFORNIA SUBTROPICAL FRUIT, TRUCK, AND SPECIALTY CROP REGION**

- 14 Central California Valleys
- 15 Central California Coast Range
- 16 California Delta
- 17 Sacramento and San Joaquin Valleys
- 18 Sierra Nevada Foothills
- 19 Southern California Coastal Plain
- 20 Southern California Mountains

D**WESTERN RANGE AND IRRIGATED REGION**

- 21 Klamath and Shasta Valleys and Basins
- 22 Sierra Nevada Range
- 23 Malheur High Plateau
- 24 Humboldt Area
- 25 Owyhee High Plateau
- 26 Carson Basin and Mountains
- 27 Fallon-Lovelock Area
- 28 Great Salt Lake Area
- 29 Southern Nevada Basin and Range
- 30 Sonoran Basin and Range
- 31 Imperial Valley
- 32 Northern Intermountain Desertic Basins
- 33 Semiarid Rocky Mountains
- 34 Central Desertic Basins, Mountains and Plateaus
- 49 (See E below).
- 35 Colorado and Green Rivers Plateaus
- 36 New Mexico and Arizona Plateaus and Mesas
- 37 San Juan River Valley Mesa and Plateaus
- 38 Black, Hualapai, and Cerbat Mountains
- 39 Arizona and New Mexico Mountains
- 40 Central Arizona Basin and Range
- 41 Southeastern Arizona Basin and Range
- 42 Southern Desertic Basins, Plains and Mountains

E**ROCKY MOUNTAIN RANGE AND FOREST REGION**

- 43 Northern Rocky Mountains
- 44 Northern Rocky Mountain Valleys
- 45 Alpine Meadows and Rockland
- 46 Northern Rocky Mountain Foothills
- 47 Wasatch and Uinta Mountains
- 48 Southern Rocky Mountains
- 49 Southern Rocky Mountain Foothills
- 50 San Luis Valley
- 51 High Intermountain Valleys

Compiled by Morris E. Austin
Information from SCS, State, and other Offices

F**NORTHERN GREAT PLAINS SPRING WHEAT REGION**

- 52 Brown Glaciated Plain
- 53 Dark Brown Glaciated Plain
- 54 Rolling Soft Shale Plain
- 55 Black Glaciated Plains
- 56 Red River Valley of the North
- 57 Western Minnesota Forest-Prairie Transition

G**WESTERN GREAT PLAINS RANGE AND IRRIGATED REGION**

- 58 Northern Rolling High Plains
- 59 Northern Smooth High Plains
- 60 Pierre Shale Plains and Badlands
- 61 Black Hills Foothills
- 62 Black Hills
- 63 Rolling Pierre Shale Plains
- 64 Mixed Sandy and Silty Tableland
- 65 Nebraska Sand Hills
- 66 Dakota-Nebraska Eroded Tableland
- 67 Central High Plains
- 68 Irrigated Upper Platte River Valley
- 69 Upper Arkansas Valley Rolling Plains
- 70 Pecos-Canadian Plains and Valleys

H**CENTRAL GREAT PLAINS WINTER WHEAT AND RANGE REGION**

- 71 Central Nebraska Loess Hills
- 72 Central High Tableland
- 73 Rolling Plains and Breaks
- 74 Central Kansas Sandstone Hills
- 75 Central Loess Plains
- 76 Bluestem Hills
- 77 Southern High Plains
- 78 Central Rolling Red Plains
- 79 Great Bend Sand Plains
- 80 Central Rolling Red Prairies

I**SOUTHWESTERN PLATEAUS AND PLAINS, RANGE AND COTTON REGION**

- 81 Edwards Plateau
- 82 Texas Central Basin
- 83 Rio Grande Plain

J**SOUTHWESTERN PRAIRIES, COTTON, AND FORAGE REGION**

- 84 Cross Timbers
- 85 Grand Prairie
- 86 Texas Blackland Prairie
- 87 Texas Claypan Area

K**NORTHERN LAKE STATES FOREST AND FORAGE REGION**

- 88 Northern Minnesota Swampy and Lakes
- 89 Minnesota Rockland Hills
- 90 Central Wisconsin and Minnesota Thin Loess and Till
- 91 Wisconsin and Minnesota Sandy Outwash
- 92 Superior Lake Plain
- 93 Northern Michigan and Wisconsin Stony, Sandy, and Rocky Plains and Hills
- 94 Northern Michigan Sandy Drift

L**LAKE STATES FRUIT, TRUCK, AND DAIRY REGION**

- 95 Southeastern Wisconsin Drift Plain
- 96 Western Michigan Fruit Belt
- 97 Southwestern Michigan Fruit and Truck Belt
- 98 Southern Michigan Drift Plain
- 99 Erie-Huron Lake Plain
- 100 Erie Fruit and Truck Area
- 101 Ontario-Mohawk Plain

M**CENTRAL FEED GRAINS AND LIVESTOCK REGION**

- 102 Loess, Till, and Sandy Prairies
- 103 Central Iowa and Minnesota Till Prairies
- 104 Eastern Iowa and Minnesota Till Prairies

(continued)

- 105 Northern Mississippi Valley Loess Hills
- 106 Nebraska and Kansas Loess-Drift Hills
- 107 Iowa and Missouri Deep Loess Hills
- 108 Illinois and Iowa Deep Loess and Drift
- 109 Iowa and Missouri Heavy Till Plain
- 110 Northern Illinois and Indiana Heavy Till Plain
- 111 Indiana and Ohio Till Plain
- 112 Cherokee Prairies
- 113 Central Claypan Areas
- 114 Southern Illinois and Indiana Thin Loess and Till Plain
- 115 Central Mississippi Valley Wooded Slopes

N**EAST AND CENTRAL GENERAL FARMING AND FOREST REGION**

- 112 (See M Above)
- 116 Ozark Highland
- 117 Boston Mountains
- 118 Arkansas Valley and Ridges
- 119 Ouachita Mountains
- 120 Kentucky and Indiana Sandstone and Shale Hills and Valleys
- 121 Kentucky Bluegrass
- 122 Highland Rim and Pennyroyal
- 123 Nashville Basin
- 124 Western Allegheny Plateau
- 125 Cumberland Plateau and Mountains
- 126 Central Allegheny Plateau
- 127 Eastern Allegheny Plateau and Mountains
- 128 Southern Appalachian Ridges and Valleys
- 129 Sand Mountain
- 130 Blue Ridge

O**MISSISSIPPI DELTA COTTON AND FEED GRAINS REGION**

- 131 Southern Mississippi Valley Alluvium
- 132 Eastern Arkansas Prairies
- 134 (See P Below)

P**SOUTH ATLANTIC AND GULF SLOPE CASH CROP, FOREST, AND LIVESTOCK REGION**

- 86 (See J Above)
- 133 Southern Coastal Plain
- 134 Southern Mississippi Valley Silty Uplands
- 135 Alabama and Mississippi Blackland Prairies
- 136 Southern Piedmont
- 137 Carolina and Georgia Sandhills
- 138 North Central Florida Ridge

R**NORTHEASTERN FORAGE AND FOREST REGION**

- 139 Eastern Ohio Till Plain
- 140 Glaciated Allegheny Plateau and Catskill Mountains
- 141 Tughill Plateau
- 142 St. Lawrence-Champlain Plain
- 143 Northeastern Mountains
- 144 New England and Eastern New York Upland
- 145 Connecticut Valley
- 146 Aroostook Area

S**NORTHERN ATLANTIC SLOPE TRUCK, FRUIT, AND POULTRY REGION**

- 147 Northern Appalachian Ridges and Valleys
- 148 Northern Piedmont
- 149 Northern Coastal Plain

T**ATLANTIC AND GULF COAST LOWLANDS, FOREST AND TRUCK CROP REGION**

- 150 Gulf Coast Prairies
- 151 Gulf Coast Marsh
- 152 Gulf Coast Flatwoods
- 153 Atlantic Coast Flatwoods

U**FLORIDA SUBTROPICAL FRUIT, TRUCK CROP, AND RANGE REGION**

- 154 South Central Florida Ridge
- 155 Southern Florida Flatwoods
- 156 Florida Everglades and Associated Areas

TABLE 1.—Experimental agricultural watersheds, by States, localities, and locations, under study during 1967 and included in this publication

State	Locality	Major land resource area ^{1/}	Assigned location No.	Watershed units Number	Events reported Number	Pages (inclusive)
Arizona.....	{ Safford..... Tombstone.....	D-41, D-42 D-41	45 63	4 <u>2/</u> 6	4 7	205-212 265-279
Florida.....	Vero Beach.....	U-55	8	4	4	18-29
Georgia.....	Watkinsville ^{3/} ..	P-136	10	1	-	---
Idaho.....	Reynolds Creek..	D-23, D-25	68	<u>4/</u> 8	8	353-388
Illinois.....	Monticello ^{3/}	M-108	61	2	-	---
Iowa.....	{ Iowa City..... Treynor.....	M-108 M-107	21 71	1 5	1 10	81,82 601-618
Mississippi.....	Oxford.....	P-133, P-134	62	15	15	222-264
Missouri.....	McCredie.....	M-113	25	1	0	83
Nebraska.....	Hastings.....	H-71, H-73, H-75	44	15	11	178-204
New Mexico.....	{ Albuquerque..... Santa Rosa..... Fort Stanton....	D-42 G-70 D-39	47 64 73	3 <u>5/</u> 1 <u>6/</u> 1	3 - -	213-221 ---
New York.....	Cohocton ^{3/}	R-140	2	1	-	---
North Carolina....	Ahoskie.....	P-133	75	4	4	623-634
Ohio.....	Coshocton.....	N-124	26	35	0	84-101
Oklahoma.....	{ Cherokee..... Chickasha..... Stillwater....	H-80 H-78, H-80, J-84 H-80	34 69 37	6 <u>7/</u> 40 3	18 46 6	111-128 389-523 129-137
South Dakota.....	{ Newell..... Cottonwood.....	G-58, G-60 G-60	65 72	7 3	0 0	280-293 619-622
Texas.....	{ Riesel (Waco)... Sonora.....	J-86 I-81	42 70	20 <u>8/</u> 13	20 35	138-177 524-600
Vermont.....	North Danville..	R-144	67	<u>9/</u> 5	15	302-352
Virginia.....	Blacksburg.....	N-128, S-147, N-130, P-136 S-148	13	14	14	30-80
West Virginia....	Moorefield.....	N-128, S-147	66	4	4	294-301
Wisconsin.....	Fennimore.....	M-105	31	4	4	102-110

^{1/} See location map and legend, pp. 12 and 13.

^{2/} Watersheds 63.001, 63.002, 63.006, 63.008, and 63.011 are being rerated; as soon as these flume ratings are completed, they will be fully reported.

^{3/} Report deferred on watersheds.

^{4/} Includes data on 4 new watersheds, W-4, W-11, W-12, and W-14, for location 68, Reynolds Creek, Idaho.

^{5/} P and Q data for watershed 64.001, Santa Rosa, New Mex. are being reevaluated and when complete, revised data will be reported.

^{6/} P and Q data for 1967 for watershed 73.002, Fort Stanton, New Mex., will be reported later.

^{7/} Includes data on 8 new watersheds, 514, 5141, 5142, 5143, 5144, 5145, 5146, and 311.

^{8/} Includes data on 13 new watersheds, W-14, S-9 through S-13, and W-1 through W-7 for Sonora, Tex. (70).

^{9/} Includes data on 1 new watershed, W-4, for North Danville, Vt. (67).

TABLE 2.—Watersheds, by States, where observations were discontinued during 1966
(For studies discontinued before 1966, see table 1 in previous publication)

State	Locality	Major land resource area ^{1/}	Discontinued watershed unit		
			Number	Record period	Assigned location and watershed No.
Oklahoma.....	Chickasha.....	D-23, D-25	1	1961-66.....	69.4
Wisconsin.....	Colby.....	K-90	1	1949-66.....	29.1

^{1/} See location map and legend, pp. 12 and 13.

TABLE 3.— Additions or revisions, by States, regarding data published before 1967

State	Locality	Location Page	Addition or revision
Arizona.....	Tombstone....	63.3-1; 63.4-1,-2	Monthly precipitation and runoff, annual maximum peak discharges and annual maximum volumes of runoff for selected time intervals previously reported (1954 through 1966) have been reevaluated and are included with the values for 1967.
		63.7-1	Monthly runoff amounts and maximum runoff volumes for selected time intervals previously reported for 1966 have been reevaluated and are included with those values for 1967.
Idaho.....	Reynolds....	68.4;-.11;-12, -.14	Data <u>added</u> for 4 new watersheds, W-4, W-11, W-12, and W-14, beginning in 1967.
New Mexico.....	Albuquerque..	47.1 -1,-2; 47.2 -1,-2; 47.3 -1,-2	Monthly precipitation and runoff, annual maximum peak discharges, and maximum volumes of runoff for selected time intervals previously reported (1939 through 1966) have been reevaluated and are included with the values for 1967.
Oklahoma.....	Chickasha....	69.9-3,4	Data sheet for Watershed 612, which were not reproduced clearly in Ref. 10 (1966) are <u>reprinted</u> .
		69.20;-.21; -.22;-.23; -.24;-.25; -.26;-.27	Data added for 8 new watersheds, 514, 5141, 5142, 5143, 5144, 5145, 5146, and 311, beginning in 1967.
South Dakota.....	Newell.....	65.2-2;-.5-2; -.7-2;-.12-2; -.13-2;-.14-2; -.15-2	Heading for tables listing discharge, "Mean Daily Discharge (Inches)," in ref. 9 (1965) and ref. 10 (1966) <u>should be</u> "Daily Discharge (Inches)."
Texas.....	Sonora.....	70.1 through 70.13	Data <u>added</u> for 13 new watersheds, W-14, S-9 through S-13, and W-1 through W-7.
Vermont.....	North..... Danville	67.4	Data <u>added</u> for one new watershed, W-4, beginning in 1965.

**WATERSHED DATA BY LOCATION NUMBER
AND
DECIMAL PAGING**

[8.1-1 TO 75.4-3, A TOTAL OF 617 DATA SHEETS]

For location by States and Land Resource Areas
and Regions, see U.S. Index Map, page 12.

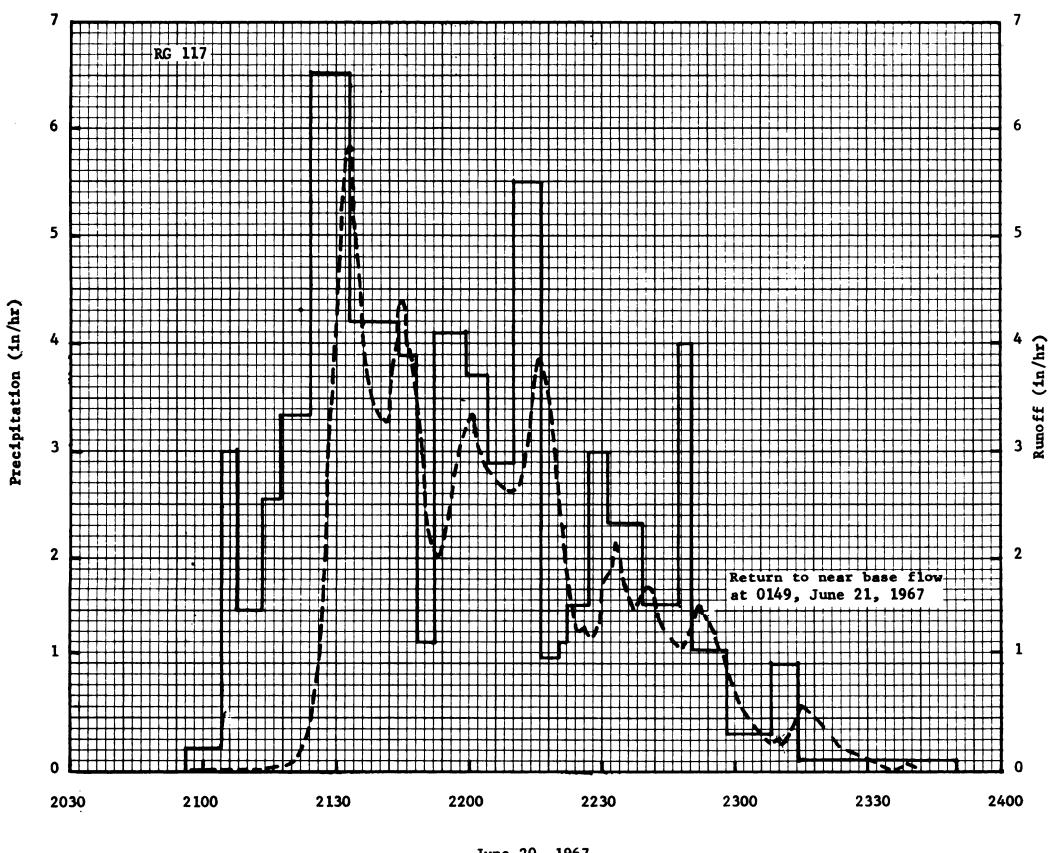
MONTHLY PRECIPITATION AND RUNOFF (inches)						TREYNOR, IOWA						WATERSHED 1				
MONTH YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL			
1967 P ₁ /Q	.69 .17	.10 .26	1.14 .16	2.59 .17	3.78 .18	18.79 11.66	2.10 .27	2.65 .20	3.48 .22	2.39 .20	.09 .20	.45 .16	38.25 13.85			
STA AV 2/P (64-67) Q	.62 .25	.60 .55	1.23 .72	2.94 .41	4.43 .82	9.88 4.20	3.42 .44	3.66 .40	5.61 .91	1.11 .26	.73 .24	.66 .23	34.89 9.43			
MEAN P ₃ /97 YR	.73	.91	1.41	2.60	3.72	4.69	3.72	3.43	3.12	2.01	1.17	.86	28.37			
ANNUAL MAXIMUM DISCHARGES (inches per hour) AND ANNUAL MAXIMUM VOLUMES OF RUNOFF (inches) FOR SELECTED TIME INTERVALS																
YEAR	MAXIMUM DISCHARGE		MAXIMUM VOLUME FOR SELECTED TIME INTERVAL													
	DATE	RATE	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME
1967	6-20	5.84	6-20	3.15	6-20	4.16	6-20	4.22	6-20	4.23	6-20	4.25	6-20	4.26	6-4	5.98
MAXIMUMS FOR PERIOD OF RECORD																
1964 TO 1967	6-20 1967	5.84 1967	6-20 1967	3.15 1967	6-20 1967	4.16 1967	6-20 1967	4.22 1967	6-20 1967	4.23 1967	6-20 1967	4.25 1967	6-20 1967	4.26 1967	6-4 1967	5.98
NOTES: Watershed conditions: 95% contoured corn; 5% gullies and grassed waterways. 1/ Precipitation from gage 117 before Apr. 4 and after Nov. 1; Thiessen average of gages 116, 117, and 118 for remainder of year. 2/ Precipitation records began Jan. 1, 1964. Runoff records began Feb. 10, 1964. Jan. 1 - Feb. 10, 1964 runoff estimated and included in average. 3/ Mean P based on 97-yr (1871-1967) U. S. Weather Bureau record period at Omaha, Nebr.																
1967 SELECTED RUNOFF EVENTS						TREYNOR, IOWA						WATERSHED 1				
ANTECEDENT CONDITIONS				RAINFALL				RUNOFF								
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)						
Event of June 14, 1967																
3 RG 4/ 5-15 5-16 5-17 5-18	.00 .0039 .0041 .0037	.0053 6-14	0510 0513 0518 0521	117 .80 .24 2.00	.00 .04 .06 .16	6-14	0519 0521 0523 0526 0529	.0009 .0010 .0012 .0022 .0045	.000							
5-19 5-20 5-21 5-22 5-23	.00 .0041 .0041 .0041 .0041		0524 0526 0528 0531 0541	2.40 3.00 6.60 1.20 .18	.28 .38 .60 .66 .69		0530 0531 0533 0534 0535	.0062 .0180 .776 1.10 1.36	.000							
5-24 5-25 5-26 5-27 5-28	.00 .0034 .0030 .0040 .0072		0552 0621 0651	.16 .06 .04	.72 .75 .77		0536 0537 0538 0539 0540	2.58 2.84 3.13 2.80 2.23	.081 .126 .177 .226 .268							
5-29 5-30 5-31 6-1 6-2	.24 1.62 .88 .06 .00		RG RG 0120	116 118	.75 .78		0542 0543 0546 0550 0559	1.44 1.14 .682 .295 .0962	.328 .349 .395 .425 .452							
6-3 6-4 6-5 6-6 6-7	.00 1.30 2.46 .00 2.25		0088 1.6156 1.6156 .0096 1.6909	Avg 4/	.77											
6-8 6-9 6-10 6-11 6-12	.00 2.54 .16 .96 .03															
6-13 6-14	.00 5/ .05		.0176 7/.0042													
Watershed conditions:																
95% - Contoured corn, 6-8 in. tall, approx. 8% canopy, rotary hoe'd 10 days prior to event; 5% - gullies and grassed waterways, grass 12-18 in. tall.																

NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 75.121. FOR TOPOGRAPHIC MAP OF WATERSHED, SEE HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1964, P. 71.1-5. 4/ THIESSEN AVERAGE OF THREE RECORDING RAIN GAGES. 5/ BEGINNING OF NEXT EVENT. 6/ RAINFALL FROM 0320 TO 0510. 7/ RUNOFF PRIOR TO 0519.

1967 SELECTED RUNOFF EVENTS			TREYNOR, IOWA					WATERSHED 1		
ANTECEDENT CONDITIONS			RAINFALL				RUNOFF			
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)
<u>Event of June 20 and 21, 1967</u>										
5-21	3 RG 1/		6-20	RG	117		6-20	2057	.0007	.000
5-22	.00	.0041		2056	.00	.00		2101	.0010	.000
5-23	.00	.0041		2104	.22	.03		2104	.0028	.000
5-24	.00	.0037		2107	3.00	.18		2109	.0057	.000
				2113	1.50	.33		2111	.0077	.001
5-25	.00	.0034		2117	2.55	.50		2115	.0129	.001
5-26	.00	.0030		2124	3.34	.89		2119	.0627	.003
5-27	.02	.0040		2133	6.53	1.87		2122	.173	.009
5-28	.52	.0072		2144	4.20	2.64		2125	.647	.029
5-29	.24	.0054		2148	3.90	2.90		2127	1.50	.068
5-30	1.62	.0142		2152	1.20	2.98		2129	3.55	.148
5-31	.88	.0120		2159	4.11	3.46		2131	4.95	.299
6-1	.06	.0088		2204	3.72	3.77		2132	5.52	.381
6-2	.00	.0065		2210	2.90	4.06		2133	5.84	.469
6-3	.00	.0056		2216	5.50	4.61		2134	5.17	.577
6-4	1.30	.1943		2220	1.05	4.68		2135	4.64	.654
6-5	2.46	1.6156		2222	1.20	4.72		2136	4.00	.721
6-6	.00	.0096		2227	1.56	4.85		2138	3.49	.853
6-7	2.25	1.6909		2231	3.00	5.05		2140	3.33	.959
6-8	.00	.0149		2239	2.33	5.36		2141	3.28	1.011
6-9	2.54	1.8484		2247	1.57	5.57		2142	3.55	1.078
6-10	.16	.0216		2250	4.00	5.77		2144	4.03	1.197
6-11	.96	.5408		2258	1.13	5.92		2145	4.38	1.279
6-12	.03	.0483		2308	.36	5.98		2146	4.07	1.345
6-13	.00	.0176		2314	1.00	6.08		2147	3.89	1.407
6-14	.85	.5213		2350	.10	6.14		2150	2.73	1.572
6-15	.60	.2312						2151	2.23	1.611
6-16	.20	.1266						2153	2.02	1.685
6-17	.00	.0149						2154	2.11	1.718
6-18	.00	.0135						2156	2.58	1.791
6-19	.00	.0118						2157	2.89	1.844
6-20	.00	2/ .0121	3 RG	Avg 1/	6.09			2159	3.18	1.939
								2201	3.36	2.054
								2202	3.08	2.104
								2209	2.60	2.437
								2211	2.66	2.519
								2213	3.03	2.619
								2214	3.38	2.669
								2215	3.68	2.738
								2216	3.83	2.796
								2217	3.68	2.855
								2218	3.47	2.911
								2219	3.13	2.976
								2221	2.25	3.060
								2223	1.56	3.127
								2225	1.30	3.171
								2226	1.36	3.192
								2227	1.24	3.218
								2229	1.32	3.257
								2230	1.43	3.284
								2231	1.85	3.309
								2232	1.90	3.339
								2233	2.13	3.370
								2234	1.91	3.410
								2236	1.60	3.465
								2237	1.51	3.489
								2238	1.54	3.519
								2240	1.71	3.570
								2241	1.71	3.597
								2243	1.41	3.652
								2247	1.16	3.738
								2248	1.13	3.756
								2249	1.16	3.778
								2252	1.53	3.840
								2253	1.41	3.869

NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 75.121. 1/ THIESSEN AVERAGE OF THREE RECORDING RAIN GAGES.
 2/ RUNOFF PRIOR TO 2057.

1967 SELECTED RUNOFF EVENTS			TREYNOR, IOWA				WATERSHED 1			
ANTECEDENT CONDITIONS		RAINFALL			RUNOFF					
DATE MO-DAY	RAINFALL: (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE: (in/hr)	ACC. (inches)
<u>Event of June 20, 21-Continued</u>										
								2254	1.46	3.892
								2257	1.14	3.956
								2259	.877	3.988
								2306	.371	4.059
								2308	.289	4.070
								2309	.300	4.075
								2311	.279	4.084
								2314	.494	4.102
								2315	.613	4.113
								2317	.572	4.131
								2319	.486	4.150
								2323	.279	4.175
								2326	.189	4.186
								2331	.0962	4.197
								2338	.0427	4.205
								2339	.0382	4.206
								2341	.0326	4.207
								2400	.0088	4.214
								0149	1/ .0010	4.223
<i>Watershed conditions:</i> 95% - Contoured corn, 7-10 in. tall, 15% canopy, 50% cultivated first time prior to event; 5% - gullies and grassed waterways, grass 18-24 in. tall.										
6-21										
NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 75.121. 1/ RETURN TO NEAR BASE FLOW.										
TREYNOR, IOWA WATERSHED 1										



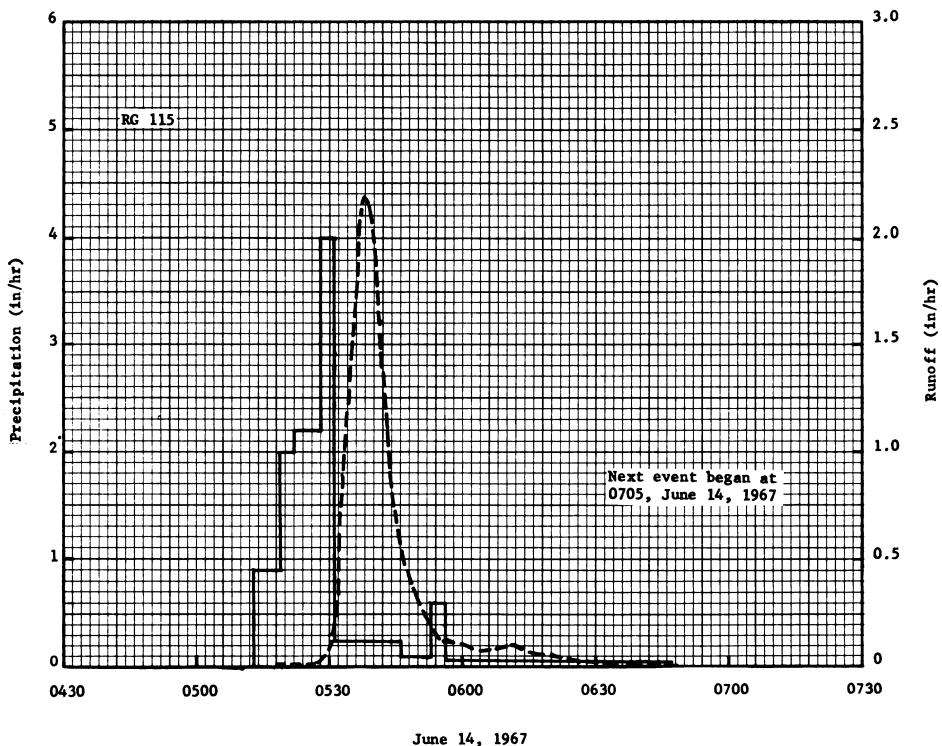
TREYNOR, IOWA WATERSHED 1

1967 SELECTED RUNOFF EVENTS			TREYNOR, IOWA				WATERSHED 2			
ANTECEDENT CONDITIONS			RAINFALL				RUNOFF			
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)
<u>Event of June 20 and 21, 1967</u>										
5-21	3 RG 1/ .00	.0035	6-20	RG 2056	.00	.00	6-20	2102	.0007	.000
5-22	.00	.0034		2101	.24	.02		2106	.0021	.000
5-23	.00	.0035		2110	2.40	.38		2109	.0054	.000
5-24	.00	.0032		2120	3.18	.91		2114	.0187	.001
								2116	.117	.003
5-25	.00	.0024		2124	3.30	1.13		2119	.581	.021
5-26	.00	.0027		2132	6.45	1.99		2121	.989	.045
5-27	.00	.0029		2138	4.10	2.40		2123	1.42	.088
5-28	.53	.0059		2143	5.04	2.82		2124	1.51	.110
5-29	.24	.0057		2147	2.85	3.01		2125	1.46	.134
5-30	1.44	.0167		2151	2.40	3.17		2128	1.35	.204
5-31	.82	.0119		2200	2.73	3.58		2130	1.73	.257
6 -1	.08	.0068		2205	2.28	3.77		2131	2.30	.289
6 -2	.00	.0040		2209	2.70	3.95		2132	3.40	.333
6 -3	.00	.0038		2213	3.30	4.17		2133	4.36	.394
6 -4	1.28	.1862		2217	3.45	4.40		2134	4.87	.484
6 -5	2.43	1.4917		2222	.84	4.47		2135	4.69	.559
6 -6	.00	.0064		2238	1.99	5.00		2137	4.50	.702
6 -7	2.30	1.3569		2246	1.50	5.20		2138	4.31	.788
6 -8	.01	.0117		2251	2.64	5.42		2140	3.78	.914
6 -9	2.44	1.8313		2259	.45	5.48		2142	3.63	1.044
6-10	.18	.0222		2309	.54	5.57		2145	3.99	1.236
6-11	.98	.5915		2320	.16	5.60		2146	4.15	1.299
6-12	.03	.0374		2342	.08	5.63		2148	3.97	1.427
6-13	.00	.0147						2149	3.61	1.501
6-14	.87	.4999		RG 116	5.78			2150	3.09	1.553
6-15	.62	.2410		RG 118	6.20			2151	2.80	1.599
6-16	.20	.1233						2152	2.24	1.638
6-17	.00	.0129	3 RG	Avg 1/	5.82			2155	1.74	1.738
6-18	.00	.0108						2157	1.84	1.800
6-19	.00	.0093						2159	2.36	1.866
6-20	.00	2/ .0086						2201	2.49	1.952
								2202	2.66	1.992
								2203	2.33	2.031
								2205	2.09	2.108
								2206	1.85	2.139
								2210	1.95	2.265
								2213	2.24	2.370
								2215	2.70	2.457
								2216	2.94	2.501
								2218	2.87	2.592
								2224	1.33	2.809
								2226	1.08	2.846
								2229	1.16	2.903
								2231	1.35	2.947
								2233	1.53	2.993
								2235	1.46	3.046
								2237	1.37	3.090
								2242	1.40	3.208
								2243	1.36	3.230
								2245	1.39	3.278
								2246	1.30	3.299
								2249	1.16	3.361
								2251	1.37	3.401
								2252	1.30	3.422
								2253	1.42	3.448
								2254	1.26	3.469
								2255	1.33	3.489
								2256	1.48	3.511
								2258	1.01	3.556
								2300	.801	3.587
								2302	.622	3.609
								2305	.482	3.636
								2306	.394	3.643
								2308	.363	3.656

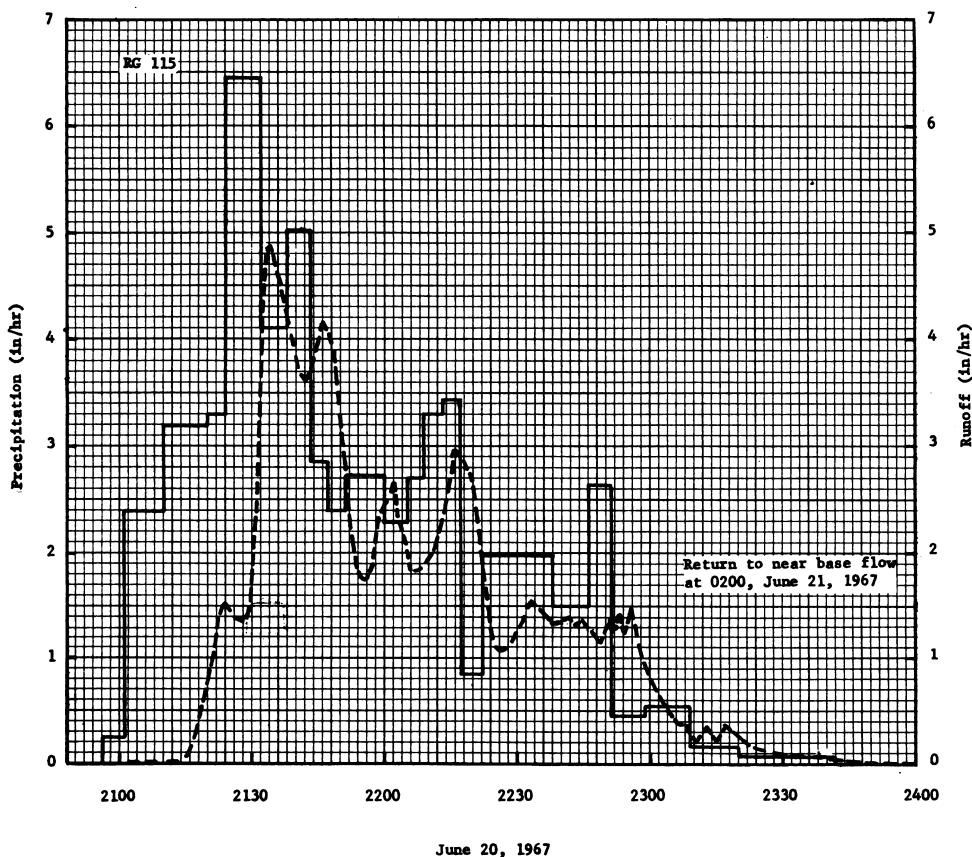
NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 83.490. 1/ THIESSEN AVERAGE OF THREE RECORDING RAIN GAGES.
2/ RUNOFF PRIOR TO 2102.

1967 SELECTED RUNOFF EVENTS			TREYNOR, IOWA				WATERSHED 2			
ANTECEDENT CONDITIONS		RAINFALL			RUNOFF					
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)
<u>Event of June 20, 21-Continued</u>										
							2310	.218	3.666	
							2313	.233	2.677	
							2315	.326	3.686	
							2317	.368	3.697	
							2319	.307	3.709	
							2323	.191	3.726	
							2330	.107	3.743	
							2338	.0594	3.753	
							2342	.0484	3.757	
							2343	.0442	3.757	
							2344	.0204	3.758	
							2345	.0151	3.758	
							2348	.0098	3.759	
							2400	.0088	3.761	
							0006	.0120	3.770	
							0008	.0240	3.771	
							0015	.0282	3.775	
							0028	.0132	3.779	
							0048	.0044	3.782	
							0200	1/ .0033	3.786	

NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 83.490. 1/ RETURN TO NEAR BASE FLOW.



TREYNOR, IOWA WATERSHED 2



June 20, 1967

TREYNOR, IOWA WATERSHED 2

MONTHLY PRECIPITATION AND RUNOFF (inches)						TREYNOR, IOWA AREA—107 ACRES						WATERSHED 3			
MONTH YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL		
1967 P 1/ Q	.64 .16	.09 .24	1.12 .18	2.64 .14	.326 .11	15.61 3.05	2.08 .71	1.88 .50	3.72 .26	2.55 .23	.10 .18	.54 .19	34.23 5.95		
STA AV 2/P (64-67) Q	.58 .20	.61 .54	1.18 .64	3.15 .36	4.34 .32	9.80 1.23	3.12 .46	2.85 .28	5.36 .41	1.18 .31	.71 .26	.64 .21	33.52 5.22		
MEAN P 3/ 97 YR	.73	.91	1.41	2.60	3.72	4.69	3.72	3.43	3.12	2.01	1.17	.86	28.37		

ANNUAL MAXIMUM DISCHARGES (inches per hour) AND ANNUAL MAXIMUM VOLUMES OF RUNOFF (inches) FOR SELECTED TIME INTERVALS

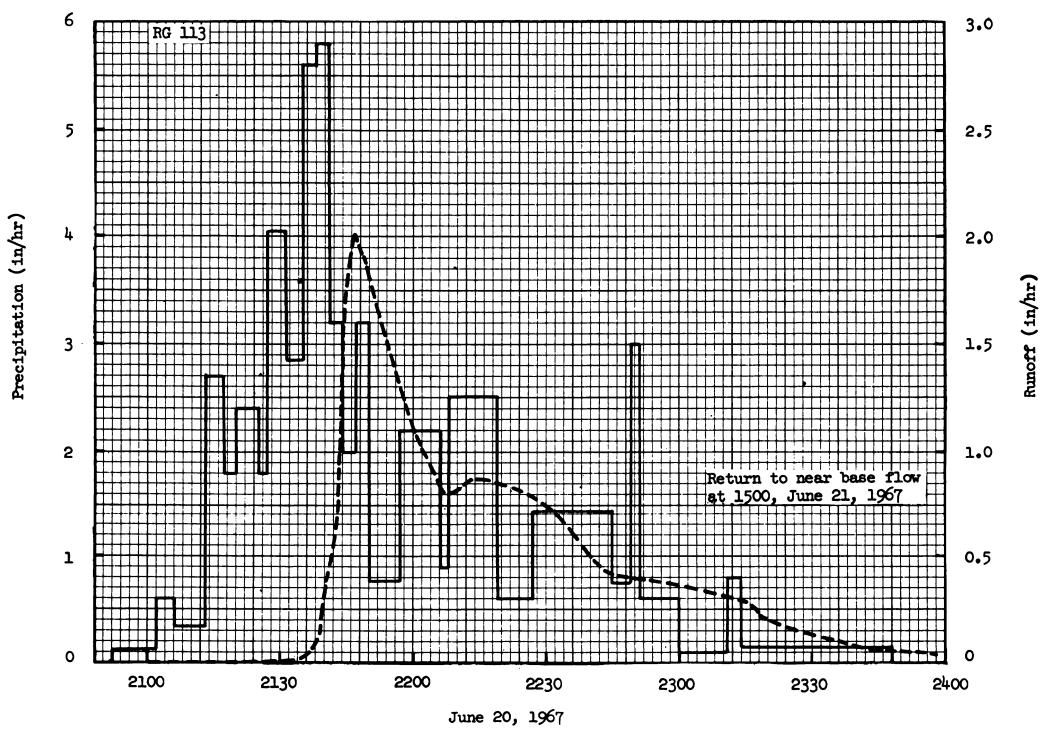
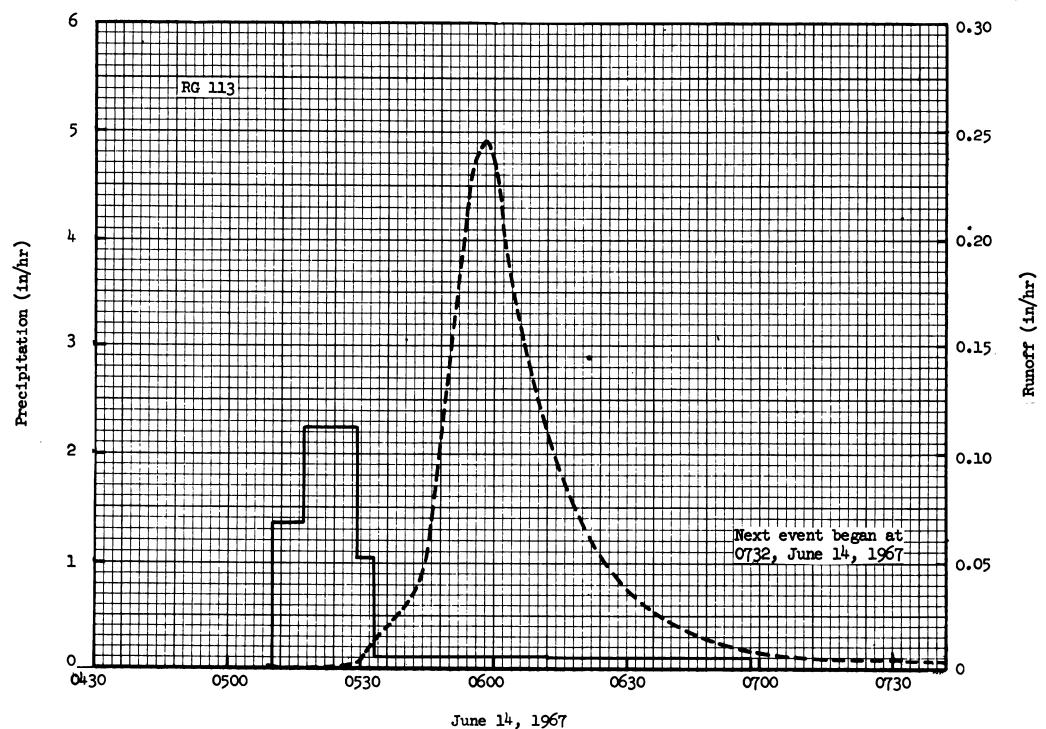
YEAR	MAXIMUM DISCHARGE	MAXIMUM VOLUME FOR SELECTED TIME INTERVAL														
		1 HOUR		2 HOURS		6 HOURS		12 HOURS		1 DAY		2 DAYS		8 DAYS		
		DATE	RATE	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	
1967	6-20	2.01	6-20	1.01	6-20	1.29	6-20	1.34	6-20	1.35	6-20	1.37	6-20	1.41	6-14	1.74
MAXIMUMS FOR PERIOD OF RECORD																
1964 to 1967	6-20	2.01	6-20	1.01	6-20	1.29	6-20	1.34	6-20	1.35	6-20	1.37	2-27	1.54	6-14	1.74

Notes: Watershed conditions: 96% permanent pasture with controlled grazing; 4% gravel roads and farmstead. 1/ Precipitation: Arithmetic average of gages 113 and 114 before Apr. 4 and after Nov. 1; Thiessen average of gages 112, 113, and 114 for remainder of year. 2/ Precipitation records began Jan. 1, 1964. Runoff records began Jan. 2, 1964. Jan. 1, 1964 runoff estimated and included in average. 3/ Mean P based on 97-yr (1871-1967) U. S. Weather Bureau record period at Omaha, Nebr.

1967 SELECTED RUNOFF EVENTS				TREYNOR, IOWA WATERSHED 3							
ANTECEDENT CONDITIONS			RAINFALL				RUNOFF				
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)	
<u>Event of June 14, 1967</u>											
5-15	3 RG 4/ .00	.0035	6-14	RG 0510	.00	.00	6-14	0513	.0008	.0000	
5-16	.00	.0035		0517	1.37	.16		0519	.0009	.0001	
5-17	.00	.0035		0529	2.25	.61		0523	.0012	.0002	
5-18	.00	.0033		0533	1.05	.68		0525	.0012	.0002	
5-19	.00	.0030		0612	.11	.75		0527	.0015	.0002	
5-20	.00	.0031		0658	.10	.83		0528	.0017	.0003	
5-21	.00	.0029						0530	.0045	.0004	
5-22	.00	.0026						0534	.0158	.0010	
5-23	.00	.0026		RG	112	.80		0539	.0269	.0028	
				RG	114	.85		0544	.0457	.0058	
5-24	.00	.0024		3 RG	Avg 4/ .83			0546	.0676	.0077	
5-25	.00	.0020						0550	.141	.0147	
5-26	.00	.0020						0553	.197	.0232	
5-27	.00	.0022						0555	.232	.0303	
5-28	.38	.0034						0558	.246	.0423	
5-29	.33	.0030						0600	.236	.0503	
5-30	1.42	.0070						0602	.203	.0576	
5-31	.74	.0054						0608	.139	.0747	
6-1	.16	.0048						0612	.110	.0830	
6-2	.00	.0032						0625	.0503	.1003	
6-3	.00	.0027						0640	.0217	.1093	
6-4	1.29	.0038						0708	.0064	.1158	
6-5	1.95	.2461						0725	.0045	.1174	
6-6	.00	.0070						0732	5/ .0042	.1179	
6-7	1.78	.2292									
6-8	.01	.0121									
6-9	2.40	.2973									
6-10	.07	.0245									
6-11	.99	.0534									
6-12	.04	.0230									
6-13	.00	.0186									
6-14	6/ .02	1/ .0040									
Watershed conditions:											
96% - Pasture, good stand, moderately grazed, 60% 12-14 in. tall, 40% 4-6 in. tall; 4% - gravel roads and farmstead.											
NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 107.89. FOR TOPOGRAPHIC MAP OF WATERSHED, SEE HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1964, P. 71.3-4. 4/ THIESSEN AVERAGE OF THREE RECORDING RAIN GAGES. 5/ BEGINNING OF NEXT EVENT. 6/ RAINFALL FROM 0320 TO 0510. 1/ RUNOFF PRIOR TO 0513.											

Cooperative Research Project of USDA and Iowa Agriculture and Home Economics Experiment Station

1967 SELECTED RUNOFF EVENTS			TREYNOR, IOWA WATERSHED 3							
ANTECEDENT CONDITIONS			RAINFALL				RUNOFF			
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)
<u>Event of June 20 and 21, 1967</u>										
5-21	3 RG 1/	.0029	6-20	RG	113 .00	.00	6-20	2113	.0010	.0000
5-22	.00	.0026		2052	.00			2116	.0015	.0000
5-23	.00	.0026		2102	.12	.02		2122	.0017	.0002
5-24	.00	.0024		2106	.60	.06		2126	.0020	.0003
				2113	.34	.10		2129	.0042	.0005
5-25	.00	.0020		2117	2.70	.28		2131	.0107	.0007
5-26	.00	.0020		2120	1.80	.37		2137	.0616	.0043
5-27	.00	.0022		2125	2.40	.57		2139	.170	.0082
5-28	.38	.0034		2127	1.80	.63		2140	.343	.0125
5-29	.33	.0030		2131	4.05	.90		2142	.546	.0273
5-30	1.42	.0070		2135	2.85	1.09		2143	.807	.0385
5-31	.74	.0054		2138	5.60	1.37		2144	1.33	.0564
6-1	.16	.0048		2141	5.80	1.66		2145	1.78	.0824
6-2	.00	.0032		2144	3.20	1.82		2146	1.96	.1135
6-3	.00	.0027		2147	2.00	1.92		2147	2.01	.1466
6-4	1.29	.0038		2150	3.20	2.08		2148	1.92	.1793
6-5	1.95	.2461		2157	.77	2.17		2149	1.88	.2110
6-6	.00	.0070		2206	2.20	2.50		2152	1.66	.2995
6-7	1.78	.2292		2208	.90	2.53		2155	1.44	.3769
6-8	.01	.0121		2219	2.51	2.99		2158	1.23	.4436
6-9	2.40	.2973		2227	.60	3.07		2201	1.06	.5010
6-10	.07	.0245		2245	1.43	3.50		2205	.899	.5662
6-11	.99	.0534		2249	.75	3.55		2207	.807	.5946
6-12	.04	.0230		2251	3.00	3.65		2210	.822	.6353
6-13	.00	.0186		2300	.60	3.74		2213	.868	.6776
6-14	.89	.1426		2311	.11	3.76		2216	.868	.7210
6-15	.77	.0818		2314	.80	3.80		2222	.830	.8058
6-16	.19	.0386		2348	.14	3.88		2227	.793	.8734
6-17	.00	.0284						2230	.751	.9121
6-18	.00	.0251						2235	.630	.9696
6-19	.00	.0246		RG	112	3.78		2240	.490	1.0163
6-20	.00	2/ .0199		RG	114	4.15		2243	.434	1.0394
				3 RG	Avg 1/	3.94		2250	.388	1.0873
								2258	.374	1.1381
								2315	.283	1.2311
								2318	.222	1.2437
								2330	.127	1.2787
								2336	.0990	1.2900
								2341	.0692	1.2970
								2344	.0587	1.3002
								2354	.0468	1.3090
								2358	.0348	1.3117
								2400	.0316	1.3128
								0015	.0200	1.3193
								0029	.0117	1.3230
								0035	.0102	1.3240
								0055	.0061	1.3268
								0110	.0048	1.3281
								0117	.0048	1.3287
								0230	.0032	1.3335
								0600	.0023	1.3431
								1000	.0020	1.3518
								1500	2/ .0017	1.3609
Watershed conditions:										
96% - Pasture, good stand, moderately grazed, 6-18 in. tall;										
4% - gravel roads and farmstead.										
NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 107.89. 1/ THIESSEN AVERAGE OF THREE RECORDING RAIN GAGES.										
2/ RUNOFF PRIOR TO 2113. 3/ RETURN TO NEAR BASE FLOW.										



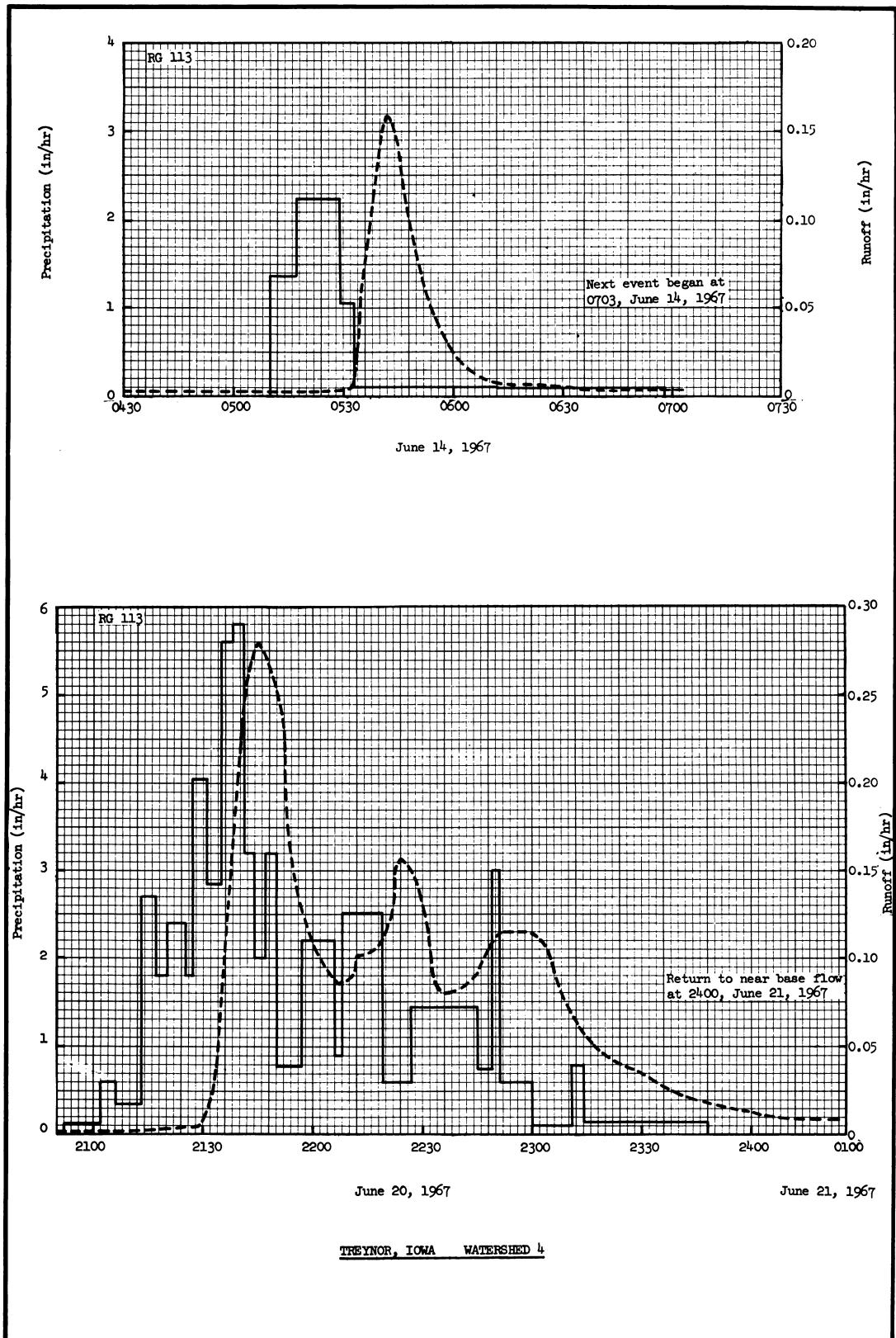
TREYNOR, IOWA WATERSHED 3

MONTHLY PRECIPITATION AND RUNOFF (inches)					TREYNOR, IOWA AREA—150 ACRES								WATERSHED 4			
MONTH YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL			
1967 P 1/ Q	.70	.08	1.04	2.59	3.24	15.70	2.13	1.93	3.88	2.61	.10	.55	34.55			
	.29	.28	.27	.28	.26	2.61	1.34	.71	.55	.52	.47	.43	8.01			
STA AV 2/F (64-67) Q	.58	.61	1.16	3.12	4.28	9.89	3.16	2.78	5.91	1.21	.71	.62	34.03			
	.41	.44	.75	.48	.55	1.47	1.13	.67	.76	.70	.56	.48	8.40			
MEAN P 3/ 97 YR	.73	.91	1.41	2.60	3.72	4.69	3.72	3.43	3.12	2.01	1.17	.86	28.37			
ANNUAL MAXIMUM DISCHARGES (inches per hour) AND ANNUAL MAXIMUM VOLUMES OF RUNOFF (inches) FOR SELECTED TIME INTERVALS																
YEAR	MAXIMUM DISCHARGE		MAXIMUM VOLUME FOR SELECTED TIME INTERVAL													
			1 HOUR		2 HOURS		6 HOURS		12 HOURS		1 DAY		2 DAYS		8 DAYS	
DATE	RATE	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	
1967	6-20	.28	6-20	.15	6-20	.23	6-20	.26	6-20	.29	6-20	.36	6-20	.48	6-20	1.07
MAXIMUMS FOR PERIOD OF RECORD																
1964-67 1966-67	6-25 1966	.30	6-22 1964	.17	6-20 1967	.23	2-28 1965	.35	2-28 1965	.50	2-28 1965	.65	2-28 1965	.76	6-20 1967	1.07
Notes: Watershed conditions: 82% contour corn above level terraces which have a capacity of 2 in. of runoff; 7% contour corn below the bottom terraces; 10% grassed terrace back-slopes; 1% gully. 1/ Precipitation from gage 113 before Apr. 4 and after Nov. 1; Thiessen average of gages 111, 112, and 113 for remainder of year. 2/ Precipitation records began Jan. 1, 1964. Runoff records began Feb. 27, 1964. Jan. 1-Feb. 27, 1964 runoff estimated and included in average. 3/ Mean P based on 97-yr. (1871-1967) U.S. Weather Bureau record period at Omaha, Nebr.																
1967 SELECTED RUNOFF EVENTS					TREYNOR, IOWA WATERSHED 4											
ANTECEDENT CONDITIONS			RAINFALL						RUNOFF							
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)						
<u>Event of June 14, 1967</u>																
5-15	3 RG 4/ .00	.0079	6-14	RG	113		6-14	0511	.0026							
5-16	.00	.0084		0510	.00	.00		0521	.0028							
5-17	.00	.0083		0517	1.37	.16		0532	.0054							
5-18	.00	.0076		0529	2.25	.61		0533	.0095							
				0533	1.05	.68		0535	.0579							
5-19	.00	.0070		0612	.11	.75		0540	.140							
5-20	.00	.0081		0658	.10	.83		0542	.159							
5-21	.00	.0081						0545	.140							
5-22	.00	.0073		RG	111	.81		0546	.125							
5-23	.00	.0069		RG	112	.80		0554	.0489							
5-24	.00	.0069		3 RG	Avg 4/	.81		0600	.0235							
5-25	.00	.0070						0604	.0155							
5-26	.00	.0070						0606	.0132							
5-27	.00	.0075						0608	.0103							
5-28	.40	.0090						0621	.0066							
5-29	.29	.0088						0632	.0043							
5-30	1.45	.0124						0635	.0036							
5-31	.73	.0112						0645	.0034							
6-1	.17	.0105						0658	.0036							
6-2	.00	.0054						0703	5/ .0034							
6-3	.00	.0087														
6-4	1.28	.0105														
6-5	1.96	.1250														
6-6	.00	.0141														
6-7	1.89	.1054														
6-8	.01	.0261														
6-9	2.49	.1495														
6-10	.06	.0671														
6-11	1.02	.0990														
6-12	.05	.0799														
6-13	.00	.0767														
6-14	6/ .02	7/ .0145														
Watershed conditions:																
82% - Contour corn above level terraces;																
7% - contour corn below terraces, all corn 6-8 in. tall, approx. 8% canopy;																
10% - grassed terrace backslopes, grass 14-20 in. tall, terraces wet prior to event;																
1% - gully.																
NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 151.25. FOR REVISED TOPOGRAPHIC MAP OF WATERSHED, SEE HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1966, P. 71.4-3. 4/ THIESSEN AVERAGE OF THREE RECORDING RAIN GAGES. 5/ BEGINNING OF NEXT EVENT. 6/ RAINFALL FROM 0320 TO 0510. 7/ RUNOFF PRIOR TO 0511.																

Cooperative Research Project of USDA and Iowa Agriculture and Home Economics Experiment Station

1967 SELECTED RUNOFF EVENTS			TREYNOR, IOWA WATERSHED 4							
ANTECEDENT CONDITIONS			RAINFALL				RUNOFF			
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)
Event of June 20 and 21, 1967										
5-21	3 RG 1/ .00	.0081	6-20	RG 2052	.113 .00	.00	6-20	2101 2116	.0024 .0030	.0000 .0007
5-22	.00	.0073		2102	.12	.02		2129	.0054	.0016
5-23	.00	.0069		2106	.60	.06		2133	.0280	.0027
5-24	.00	.0069		2113	.34	.10		2135	.0790	.0045
5-25	.00	.0070		2117	2.70	.28		2137	.140	.0082
5-26	.00	.0070		2120	1.80	.37		2140	.217	.0171
5-27	.00	.0075		2125	2.40	.57		2143	.266	.0292
5-28	.40	.0090		2127	1.80	.63		2145	.279	.0383
5-29	.29	.0088		2131	4.05	.90		2148	.266	.0519
5-30	1.45	.0124		2135	2.85	1.09		2152	.222	.0681
5-31	.73	.0112		2138	5.60	1.37		2201	.104	.0926
6-1	.17	.0105		2141	5.80	1.66		2207	.0854	.1021
6-2	.00	.0094		2144	3.20	1.82		2211	.0887	.1079
6-3	.00	.0087		2147	2.00	1.92		2212	.102	.1095
6-4	1.28	.0105		2150	3.20	2.08		2217	.104	.1181
6-5	1.96	.1250		2157	.77	2.17		2220	.116	.1236
6-6	.00	.0141		2206	2.20	2.50		2222	.145	.1279
6-7	1.89	.1054		2208	.90	2.53		2224	.157	.1330
6-8	.01	.0261		2219	2.51	2.99		2228	.145	.1430
6-9	2.49	.1495		2227	.60	3.07		2233	.0870	.1527
6-10	.06	.0671		2245	1.43	3.50		2235	.0806	.1555
6-11	1.02	.0990		2249	.75	3.55		2241	.0838	.1637
6-12	.05	.0799		2251	3.00	3.65		2245	.0921	.1696
6-13	.00	.0767		2300	.60	3.74		2249	.110	.1763
6-14	.94	.1238		2311	.11	3.76		2251	.114	.1800
6-15	.79	.1026		2314	.80	3.80		2255	.116	.1876
6-16	.22	.0869		2348	.14	3.88		2259	.116	.1953
6-17	.00	.0817						2304	.104	.2045
6-18	.00	.0754						2308	.0806	.2107
6-19	.00	2/.0684		RG	111	3.54		2312	.0632	.2154
6-20	.00	2/.0550		RG	112	3.78		2319	.0466	.2218
				3 RG	Avg 1/	3.71		2328	.0370	.2281
								2335	.0280	.2319
								2400	.0132	.2405
								0008	.0095	.2420
								0019	.0076	.2436
								0041	.0060	.2461
								2400	3/.0051	.3753
Watershed conditions:										
82% - Contour corn above level terraces;										
7% - contour corn below terraces corn 6-10 in. tall, approx.										
10% canopy, 10% cultivated prior to event;										
10% - grassed terrace backslopes, grass 18-24 in. tall, some terraces ponded prior to event;										
1% - gully.										

NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 151.25. 1/ THIESSEN AVERAGE OF THREE RECORDING RAIN GAGES.
 2/ RUNOFF PRIOR TO 2101. 3/ RETURN TO NEAR BASE FLOW.



TREYNOR, IOWA WATERSHED 4

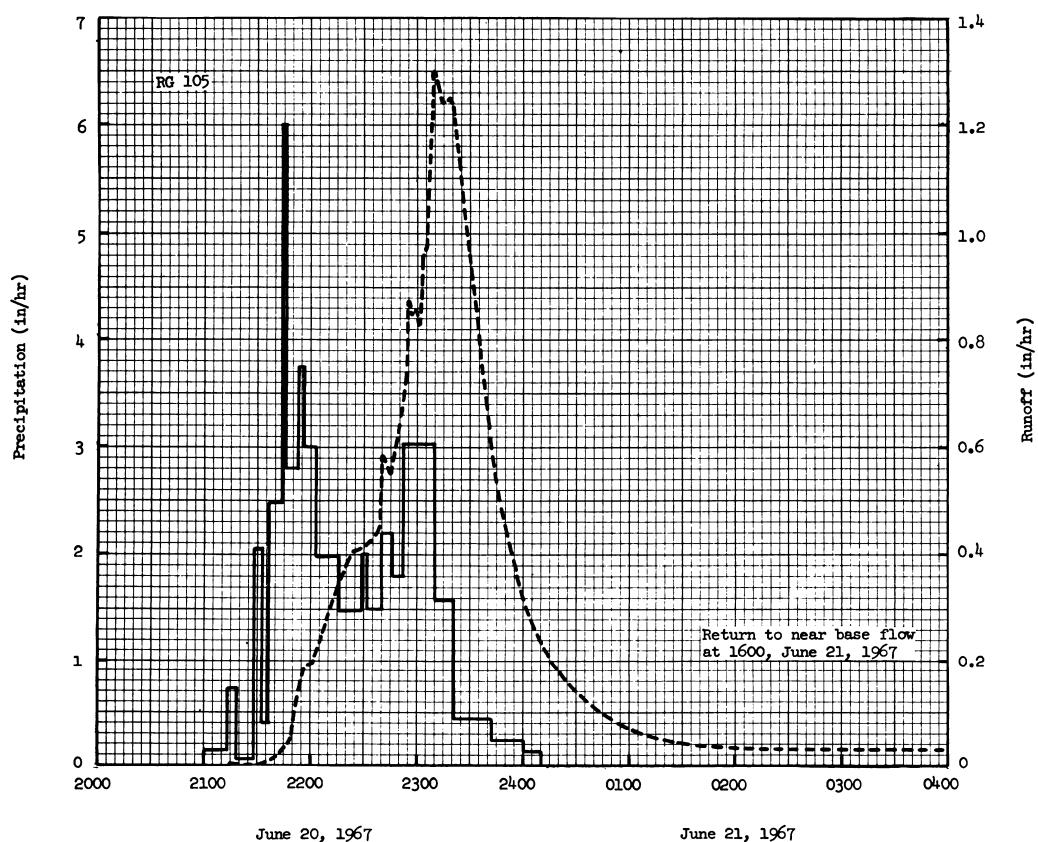
MONTHLY PRECIPITATION AND RUNOFF (inches)						TREYNOR, IOWA AREA—389 ACRES						WATERSHED 5				
MONTH YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL			
1967 P 1/ Q	.68 .10	.16 .17	1.18 .13	2.60 .13	2.69 .11	17.25 4.59	2.29 1.26	1.86 .65	2.85 .42	2.06 .32	.10 .25	.62 .22	34.34 .35			
STA AV 2/P (63-67) Q	.54 .24	.59 .38	1.51 .72	3.04 .35	3.45 .33	8.20 1.53	3.21 .64	3.74 .39	5.14 .61	1.01 .36	1.00 .33	.78 .30	32.21 6.18			
MEAN P 3/ 97 YR	.73	.91	1.41	2.60	3.72	4.69	3.72	3.43	3.12	2.01	1.17	.86	28.37			
ANNUAL MAXIMUM DISCHARGES (inches per hour) AND ANNUAL MAXIMUM VOLUMES OF RUNOFF (inches) FOR SELECTED TIME INTERVALS																
YEAR	MAXIMUM DISCHARGE		MAXIMUM VOLUME FOR SELECTED TIME INTERVAL													
	DATE	RATE	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME	DATE	VOLUME
1967	6-20	1.30	6-20	.93	6-20	1.32	6-20	1.59	6-20	1.63	6-20	1.69	6-20	1.80	6-20	2.52
MAXIMUMS FOR PERIOD OF RECORD																
163 70 19 67	6-20 1967	1.30	6-20 1967	.93	6-20 1967	1.32	6-20 1967	1.59	6-20 1967	1.63	6-20 1967	1.69	6-20 1967	1.80	6-20 1967	2.52
NOTES: Watershed conditions: Percent crop distribution of area above or below level terraces, respectively is; corn, 32 and 3; beans, 25 and 6; small grain, 3 and 0; hay and clover, 19 and 1; pasture, 3 and 4, and roads and farmsteads, 3 and 1. 1/ Precipitation: Before Apr. 4 and after Nov. 1, arithmetic average of gages 101 and 108; Thiessen average of seven recording gages for remainder of year. 2/ Precipitation and runoff records began Feb. 6, 1963. Jan. 1-Feb. 6, 1963 precipitation and runoff estimated and included in average. 3/ Mean P based on 97-yr (1871-1967) U. S. Weather Bureau record period at Omaha, Nebr.																
1967 SELECTED RUNOFF EVENTS						TREYNOR, IOWA WATERSHED 5										
ANTECEDENT CONDITIONS				RAINFALL				RUNOFF								
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)						
<u>Event of June 9 and 10, 1967</u>																
5-10	7 RG 4/ .00	.0032	6 -9	RG 1934	.00	.00	6 -9	1935	.0019	.0000						
5-11	.00	.0031		1943	.40	.06		1957	.0022	.0008						
5-12	.00	.0032		2022	.08	.11		2026	.0031	.0021						
5-13	.00	.0031		2029	.69	.19		2032	.0060	.0025						
5-14	.02	.0031		2038	1.73	.45		2048	.0343	.0075						
5-15	.00	.0032		2051	.69	.60		2051	.0558	.0098						
5-16	.05	.0032		2056	2.88	.84		2055	.0795	.0143						
5-17	.00	.0029		2103	1.54	1.02		2059	.0923	.0200						
5-18	.00	.0027		2107	4.50	1.32		2101	.119	.0235						
5-19	.00	.0023		2115	1.57	1.53		2105	.170	.0332						
5-20	.00	.0023		2142	.20	1.62		2108	.190	.0422						
5-21	.00	.0023		2221	.34	1.84		2112	.209	.0555						
5-22	.00	.0026		2252	.35	2.02		2114	.201	.0623						
5-23	.00	.0024		2323	.08	2.06		2117	.196	.0722						
5-24	.00	.0018	6-10	2400	.06	2.10		2121	.212	.0858						
5-25	.00	.0015		0033	.09	2.15		2123	.229	.0932						
5-26	.00	.0015		0124	.09	2.23		2125	.235	.1009						
5-27	.03	.0015		0204	.01	2.24		2127	.235	.1088						
5-28	.08	.0022		0254	.01	2.25		2130	.257	.1211						
5-29	.36	.0034		RG	101	2.33		2132	.264	.1297						
5-30	.97	.0127		RG	102	2.29		2134	.260	.1385						
5-31	.68	.0116		RG	103	2.16		2136	.251	.1470						
6 -1	.03	.0046		RG	104	2.15		2145	.209	.1815						
6 -2	.00	.0030		RG	106	2.13		2150	.187	.1980						
6 -3	.00	.0025		RG	107	2.15		2157	.160	.2183						
6 -4	.44	.0028						2212	.119	.2532						
6 -5	2.87	.1746	7	RG	AVG 4/	2.19		2223	.101	.2734						
6 -6	.00	.0150						2226	.0956	.2783						
6 -7	2.17	.1687						2248	.0780	.3101						
6 -8	.00	.0399						2321	.0558	.3469						
6 -9	5/ .96	6/ .1124						2324	.0523	.3496						
								2334	.0489	.3580						
								2400	.0335	.3759						
								0020	.0259	.3858						
								0057	.0177	.3993						
								0222	.0104	.4192						
								0223	.0100	.4194						
								0251	.0084	.4236						
								0426	.0055	.4347						
NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 392.24. FOR REVISED TOPOGRAPHIC MAP OF WATERSHED, SEE HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1966, P. 715-3. 4/ THIESSEN AVERAGE OF SEVEN RECORDING RAIN GAGES. 5/ RAINFALL FROM 0123 TO 0700. 6/ RUNOFF PRIOR TO 1935.																

1967 SELECTED RUNOFF EVENTS				TREYNOR, IOWA WATERSHED 5							
ANTECEDENT CONDITIONS		RAINFALL				RUNOFF					
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)	
Watershed conditions:		<u>Event of June 9 and 10, 1967-Continued</u>								0553	.0045
Percent of watershed in:										0734	.0037
Above terraces										1054	.0033
Corn	32	3								1436	.0031
Beans	25	6								1836	.0031
Small grain	3	-								2400	1/ .0029
Alfalfa and clover	19	1									.5015
Pasture	3	4									
Roads and farmsteads	3	1									
Totals	85	15									
Crop heights: Corn, 6 in.; beans, 3 in., small grain 12-18 in.; alfalfa and clover variable; and, pasture, 3-12 in.; some terraced overtopped during previous events and ponding prior to this event.											
<u>Event of June 20 and 21, 1967</u>											
5-21	7 RG 2/		6-20	RG	105		6-20	2103	.0021		.0000
5-22	.00	.0023		2100	.00	.00		2110	.0024		.0003
5-23	.00	.0026		2113	.14	.03		2118	.0024		.0006
5-24	.00	.0024		2118	.72	.09		2124	.0026		.0008
				2128	.06	.10		2129	.0031		.0011
5-25	.00	.0015		2133	2.04	.27		2139	.0132		.0024
5-26	.00	.0015		2136	.40	.29		2145	.0343		.0048
5-27	.03	.0015		2144	2.48	.62		2149	.0535		.0077
5-28	.08	.0022		2147	6.00	.92		2152	.116		.0119
5-29	.36	.0034		2153	2.80	1.20		2157	.187		.0246
5-30	.97	.0127		2157	3.75	1.45		2202	.198		.0406
5-31	.68	.0116		2203	3.00	1.75		2213	.315		.0877
6-1	.03	.0046		2216	1.98	2.18		2223	.405		.1477
6-2	.00	.0030		2229	1.48	2.50		2226	.409		.1680
6-3	.00	.0025		2232	2.00	2.60		2238	.453		.2543
6-4	.44	.0028		2240	1.50	2.80		2241	.586		.2803
6-5	2.87	.1746		2246	2.20	3.02		2245	.550		.3181
6-6	.00	.0150		2252	1.80	3.20		2247	.586		.3371
6-7	2.17	.1687		2310	3.03	4.11		2253	.717		.4022
6-8	.00	.0399		2321	1.58	4.40		2255	.874		.4287
6-9	3.08	.4877		2342	.43	4.55		2257	.846		.4574
6-10	.14	.1251		2400	.23	4.62		2259	.853		.4857
6-11	1.35	.1949	6-21	0010	.12	4.64		2301	.826		.5138
6-12	.12	.1246						2303	.960		.5435
6-13	.00	.0728						2305	.975		.5758
6-14	.58	.1214		RG	101	4.77		2309	1.24		.6496
6-15	.42	.0762		RG	102	4.75		2310	1.30		.6708
6-16	.21	.0846		RG	103	4.86		2312	1.27		.7137
6-17	.00	.0617		RG	104	4.14		2314	1.24		.7555
6-18	.00	.0575		RG	106	4.69		2319	1.25		.8594
6-19	.00	.0517		RG	107	4.15		2321	1.22		.9005
6-20	.00	3/ .0423		7 RG	Avg 2/	4.54		2329	.975		1.0465
								2335	.787		1.1346
								2345	.534		1.2447
								2353	.414		1.3079
							6-21	2400	.322		1.3508
								0003	.290		1.3661
								0017	.193		1.4225
								0033	.132		1.4657
								0048	.0906		1.4935

Continued on next page

NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 392.24. 1/ RETURN TO NEAR BASE FLOW. 2/ THIESSEN AVERAGE OF SEVEN RECORDING RAIN GAGES. 3/ RUNOFF PRIOR TO 2103.

1967 SELECTED RUNOFF EVENTS			TREYNOR, IOWA WATERSHED 5							
ANTECEDENT CONDITIONS			RAINFALL				RUNOFF			
DATE MO-DAY	RAINFALL (inches)	RUNOFF (inches)	DATE MO-DAY	TIME OF DAY	INTENSITY (in/hr)	ACC. (inches)	DATE MO-DAY	TIME OF DAY	RATE (in/hr)	ACC. (inches)
Watershed conditions: Percent of watershed in: Above Below terraces terraces			Event of June 20-21, 1967-Continued							
Corn	32	3					0123		.0454	1.5332
Beans	25	6					0153		.0326	1.5527
Small grain	3	-					0213		.0318	1.5634
Alfalfa and clover	19	1					0227		.0259	1.5701
Pasture	3	4					0249		.0183	1.5783
Roads and farmsteads	3	1					0321		.0149	1.5871
Totals	85	15					0331		.0132	1.5894
Crop heights: Corn, 6-10 in.; beans, 3-6 in.; small grain 16- 24 in.; alfalfa and clover vari- able, and pasture, 6-18 in.							0500		.0088	1.6058
Some terrace overtopping during previous events and ponding prior to this event.							0643		.0066	1.6190
							0753		.0063	1.6265
							0959		.0060	1.6395
							1259		.0055	1.6567
							1600	j/	.0047	1.6721
NOTES: TO CONVERT RUNOFF IN IN/HR TO CFS, MULTIPLY BY 392.24. j/ RETURN TO NEAR BASE FLOW.										
<p>RG 105</p> <p>Return to near base flow at 2400, June 10, 1967</p> <p>June 9, 1967 June 10, 1967</p> <p>TREYNOR, IOWA WATERSHED 5</p>										



TREYNOR, IOWA WATERSHED 5