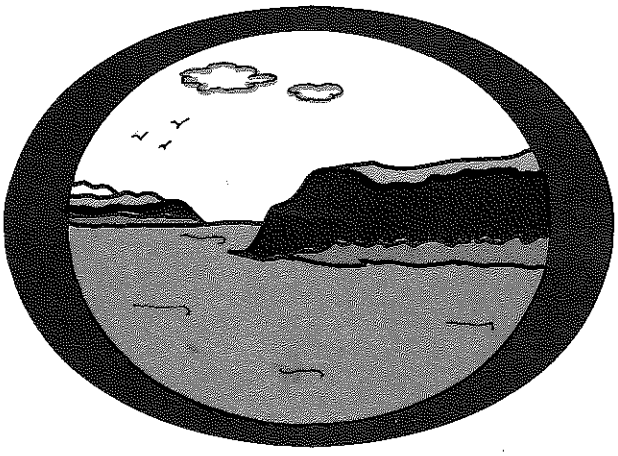
ARKANSAS
STATE WATER PLAN

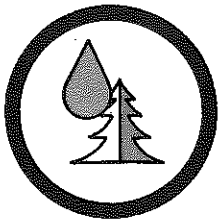
WATER AND RELATED LAND RESOURCES

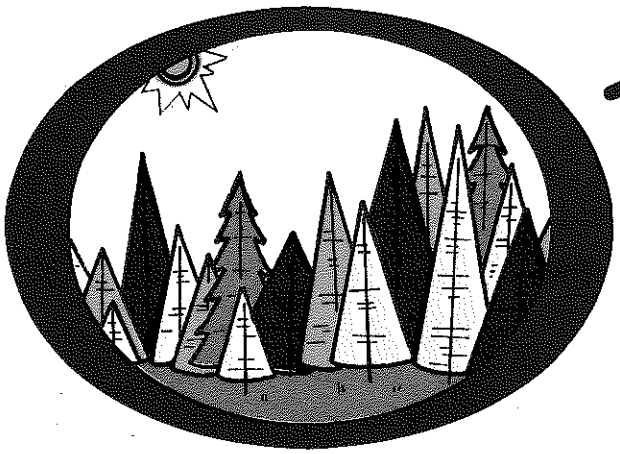


APPENDIX "D"

USER'S MANUAL

ARKANSAS WATER RESOURCE MANAGEMENT INFORMATION SYSTEM
(AWRMIS)





Department of Commerce
Division of Soil & Water Resources

STATE OF ARKANSAS
DEPARTMENT OF COMMERCE
DIVISION OF SOIL AND WATER RESOURCES

DAVID PRYOR, Governor

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1200 Westpark Drive, Third Floor Little Rock 72204

October, 1975

APPENDIX D
USER'S MANUAL
ARKANSAS WATER RESOURCE MANAGEMENT INFORMATION SYSTEM

This manual was prepared with the goal of serving as a guide for those who wish to make use of the currently available features of AWRMIS. This computer program is considered to be a vital tool for water and related land resource planning in Arkansas.

THE UNIVERSITY OF ARKANSAS
COLLEGE OF ENGINEERING
CIVIL ENGINEERING

ABSTRACT

** USERS' MANUAL **
ARKANSAS WATER RESOURCES MANAGEMENT INFORMATION SYSTEM

by Jesse Randal Young

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May, 1975

Fayetteville, Arkansas 72701

A computerized tool for water resource planning has been developed for the Arkansas Division of Soil and Water Resources by the Office of Water Resources Research Center at the University of Arkansas. The system is known as AWRMIS (Arkansas Water Resources Management Information System). The system has been under development for several years. The first such system, known as HISARS (Hydrologic Information Storage and Retrieval System), was developed by E. H. Wiser, Department of Biological and Agricultural Engineering, North Carolina State University, and became operative in July 1969.

The system is running on the IBM System/370 model 155 computer at the University of Arkansas. By making use of an operating system feature known as the indexed sequential access method together with the direct access capabilities of the PL/1 language, AWRMIS can retrieve any one of the hydrologic or climatological records directly.

The following data are now stored by the system:

A) Streamflow;
B) Rainfall;
C) Temperature;
D) Evaporation;
E) Snowfall; and
F) Events (days with occurences of various types of weather phenomena).

Operations in AWRMIS are divided into two divisions: Accessing and Processing. The Accessing function serves to obtain required records for listing or processing. The Processing function performs a number of routine analyses (low flow, statistical, etc.) on the data.

This manual is prepared with the goal of serving as a guide to those who wish to make use of the currently available features of AWRMIS. In it's final form, the system will include the basic data and the means for:

A) Making estimates of projected water availability;
B) Making economic projections and translating these into projected demands for water resources; and
C) Identifying problem areas and considering alternate solutions.

ACKNOWLEDGMENT

This manual describes the procedure for accessing the AWRMIS system which was developed for the Arkansas Division of Soil and Water Resources by the Water Resources Research Center at the University of Arkansas. The project was funded by contract with the Arkansas Division of Soil and Water Resources, also the University of Arkansas contributed, by cost sharing, a portion of the total project cost which is gratefully acknowledged. The support and continuing interest of Mr. John P. Saxton, Director of ADSWR, and Dr. Robert E. Babcock, Director of OWRRC, is gratefully acknowledged.

The system design is an outgrowth of the "Hydrologic Information Storage and Retrieval System (HISARS)", developed by E. H. Wiser, Department of Biological and Agricultural Engineering, North Carolina State University. The cooperation and information furnished by Mr. Wiser is gratefully acknowledged.

Mr. Americ J. Bryniarski, Water Resources Engineering Supervisor, and Mr. Albert Nyitrai, Water Resources Engineering Technician of the ADSWR staff have been extremely helpful during the development of AWRMIS and in preparation of this manual.

Appreciation is expressed to the U.S. Geological Survey, National Weather Service, U.S. Army Corps of Engineers, Missouri Geological Survey and Water Resources, and Arkansas Geological Commission for their cooperation in making the data available.

Appreciation is expressed to Dr. John L. Ballard, Dr. David F. Byrd, Dr. James A. Ferguson, Dr. Jim L. Gattis, Dr. Carl L. Griffis, Dr. Hugh M. Jeffus, Dr. Harold C. MacDonald, Dr. Dee T. Mitchell, Dr. James W. Moore, Dr. David G. Parker, Dr. Ronald W. Skeith, and Dr. Doy Zachry who all have contributed to the development of AWRMIS.

Finally, appreciation is expressed to the fellow students, faculty and staff of the Civil Engineering Department for their many suggestions and contributions.

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Chapter 1

Introduction to AWRMIS

1.1. AWRMIS System

The Arkansas Water Resources Management Information System (AWRMIS) is composed of selected data and associated methodologies for processing the data. The data stored and the methodologies devised are designed to provide decision makers with a computerized tool for water resource planning.

The system design is an outgrowth of the "Hydrologic Information Storage and Retrieval System (HISARS)", developed by E. H. Wiser, Department of Biological and Agricultural Engineering, North Carolina State University. The components of the system are adjusted to reflect the conditions and requirements inherent in the water-related, administrative and operating organizations of the State of Arkansas.

The system employs a geographical framework that provides for the storage and retrieval of data assembled by political boundaries, appropriate river basins, water resources planning areas (WRPAs), and geographic location blocks. AWRMIS also provides mechanisms for statistical manipulations of data.

The system is composed of several programs which are written in PL/I. The PL/I language has both the capability of handling data files and of statistical manipulation of data. The system provides for indexed sequential or random access of data in any of the various files stored on computer disc.

As described in the sections which follow, AWRMIS is composed initially of available data concerning hydrology and climatology. As the system evolves, the data bank will be extended to include economics, groundwater, surface water diversions, and other types of data essential for water resource planning. The data files consist of an index file and a data file for streamflow, rainfall, temperature, evaporation, snowfall, and events. The index file contains data

concerning the status of a recording station and the status of the data recorded by the station. The file contains one record for each recording station in the data bank. For each record in the index file, there is a set of records in the data file. Data recorded at any recording station that is stored in the data bank can be accessed utilizing any combination of the distinguishing features contained in the index file.

In its final form, the system will include the basic data and the means for:

A) Making estimates of projected water availability;

B) Making economic projections and translating these into projected demands for water resources; and

C) Identifying problem areas and considering alternate solutions.

1.2. The User

Act 217, Arkansas Act of 1969, as amended by Act 584 of 1973, charged the Arkansas Soil and Water Conservation Commission with the duty of "preparing, developing, and formulating and engaging in a comprehensive program for the orderly development and management of the state's water and related land resources, to be referred to as the Arkansas Water Plan".

Pursuant to Act 217, the Division of Soil and Water Resources developed AWRMIS. The Division will use this computerized tool as an aid in formulating the State policy for the development of water and related land resources.

In addition to the Division of Soil and Water Resources, any individual, company, city, county, state or Federal agency engaged in the development of the State's water resources will be permitted controlled access to AWRMIS. Therefore, all requests for access should be made to the Division of Soil and Water Resources.

Chapter 2

The Access Facilities

2.1. Introduction

The access facilities of AWRMIS are designed to be user oriented. A user need not be proficient in computer programming in order to obtain data from the system. The access facilities permit ready access to data in many ways which are hydrologically meaningful.

Execution of an AWRMIS program requires a fixed set of IBM JCL cards. See section 2.5. for information regarding the deck setup required by AWRMIS.

Examples are given in section 2.6. which illustrate the various types of access that are available, and the AWRMIS command cards necessary to execute the request.

2.2. AWRMIS Command Language Specifications

The AWRMIS command language consists of a set of English language words. The command language is used to request the action or actions which are to be performed by AWRMIS in order to get a desired output.

The following commands constitute the access facilities of AWRMIS:

ACCESS
ELEMENT
STATION
LOCATION
BASIN
REGION
COUNTY
ELEVATION
AREA
ALTERNATE
PERIOD
LIST
COPY

With the exception of ACCESS, the command words may or may not be followed by a character field called the operand. The command word must be punched starting in column 1, followed by at least one blank before the operand (if any). The following is a partial listing of acceptable operands:

STREAMFLOW
RAINFALL
TEMPERATURE
INDEX
DAILY
MONTHLY
MINIMUM FLOW ANALYSIS
MONTHLY MASS FLOW ANALYSIS

Acceptable operands are listed for each command. For clarity, the operand should be punched starting in column 11, but this is not a requirement.

Only one operand may be punched per card. Additional operands are punched on consecutive cards as required. Repetition of the command word with each additional operand is optional; but if only the operand is punched, column 1 must be blank. Thus, any card with column 1 blank is assumed to contain an operand that is associated with the preceding command word.

An ACCESS request is always begun by an ACCESS card, followed by additional command cards in any order, provided only that at least one ELEMENT card is included. Any number of access requests may be stacked for a single run and is encouraged for efficiency. However, excessive stacking of access requests will increase the total job time and could lend to possible job cutoffs. There is also no limit to the number of command cards or operands included in a single access request. Thus, a large number of stations, counties, river basins, etc. could be accessed as a single request. However, the core storage required by the job is correspondingly increased and, if this is excessive with respect to the REGION size specified for the job, the job will fail with a System Completion Code of 80A.

2.2.1. ACCESS[1/]

The ACCESS command signals the beginning of a series of command cards constituting a single access request. The ACCESS command must always be the first card in the series. Any character(s) punched in the card following the word ACCESS will be ignored.

2.2.2 ELEMENT

The ELEMENT command identifies the element or elements for which access is requested. The operand must give the element in one of the standard forms. The following operands are included in the current implementation:

A) STREAMFLOW or STREFLOW
B) RAINFALL
C) TEMPERATURE or TEMPTURE
D) EVAPORATION or EVAPTION
E) SNOWFALL
F) EVENT

Where two forms are given, either form may be used. Any number of elements can be given for a single access request.

2.2.3 STATION

The STATION command is used to request access for specific stations. Standard agency codes are used, except that only the numbers (without punctuation) are permitted.

The 8-digit code of the U.S. Geological Survey is used for the Streamflow file. To access data for station 07.2570.00 the operand must be formatted as 07257000.

1/ Sections 2.2, 2.3, 3.2, and 3.3 are modifications of material contained in the Hydrologic Information Storage and Retrieval System (HISARS) Reference Manual, by Edward H. Wiser, Department of Biological and Agricultural Engineering, North Carolina State University, Raleigh, N.C.

The 6-digit code of the National Weather Service is used for the Rainfall, Temperature, Evaporation, Snowfall and Event files. To access data for station 03-0196 the operand must be formatted as 030196. Note that the two suffix digits used by the National Weather Service to identify a climatological division are not permitted.

It may be emphasized that the length of the operand is used to define the type of code. Thus, for example, an NWS code with the 2-digit suffix will be classed as USGS code, and applied only to the corresponding files. If ELEMENT RAINFALL was specified for this case, nothing would be accessed.

2.2.4. LOCATION

The LOCATION command is used to request access for stations in a geographic region called a geographic location block. The codes being used are specified according to a system used by the Arkansas Division of Soil and Water Resources. See Appendix II for a map showing the location system. The geographic location system adopted by the Division of Soil and Water Resources was developed by the North Carolina Department of Water and Air Resources. The key unit is the U.S. Geological Survey 7.5-minute quadrangle, of which there are 916, more or less, covering the land area of Arkansas. Approximately 70 percent of Arkansas is covered by 7.5-minute quadrangles; the remainder is covered by 15-minute quandrangles.

A four-digit number defines each one-degree quadrangle, specified by the latitude and longitude, respectively, of the southeast corner. (If the longitude exceeds 100, only the last two digits are used.) This quadrangle may then be divided into four 30-minute quadrangles numbered 1, 2, 3 and 4 taking in order the SE, SW, NW and NE quadrants. Each quadrangle thus obtained may in turn be subdivided repeatedly until the desired accuracy is obtained. AWRMIS uses a ten-digit code to define locations in storage. This is sufficient to define

an area 60/64 minutes square, or approximately one square mile. Figure 2.1 illustrates the Model Grid for numbered degree quadrangles.

The operand for the LOCATION command may contain from one to ten digits, referring to all stations which start with the same group of digits. If, for example, a 7-digit location code 3694110 were used, all stations would be accessed in the 15-minute quadrangle bounded on the south by 36° and on the east by 94°. Similarly, a 1-digit code 3 would result in access to all stations between 30° and 40° latitude, regardless of longitude.

A standard 7.5-minute quadrangle sheet such as Fayetteville may be used to illustrate the system in action. This quadrangle 3694112 is about 7 miles long east and west, and 8.6 miles long north and south. It covers a total area of about 60.2 square miles. All quadrangles in the state are approximately the same size and, for all practical purposes, can be considered as identical.

The areas identified below are from the Tulsa quadrangle. The number of digits in the location number defines the degree of precision used in locating the area, for example:

36941 is sufficient to locate the northern 1/2 of Washington County and the major part of Benton County.

3694112 adequately locates Fayetteville.

3694112422 adequately locates the University of Arkansas at Fayetteville. The Model Grid was applied to the Fayetteville quadrangle and the number corresponding to the campus location was determined.

2.2.5. BASIN

The BASIN command identifies requests by river basin. The codes being used are specified by the Arkansas Division of Soil and Water Resources, and consist of three characters, a letter for the river basin and two letters

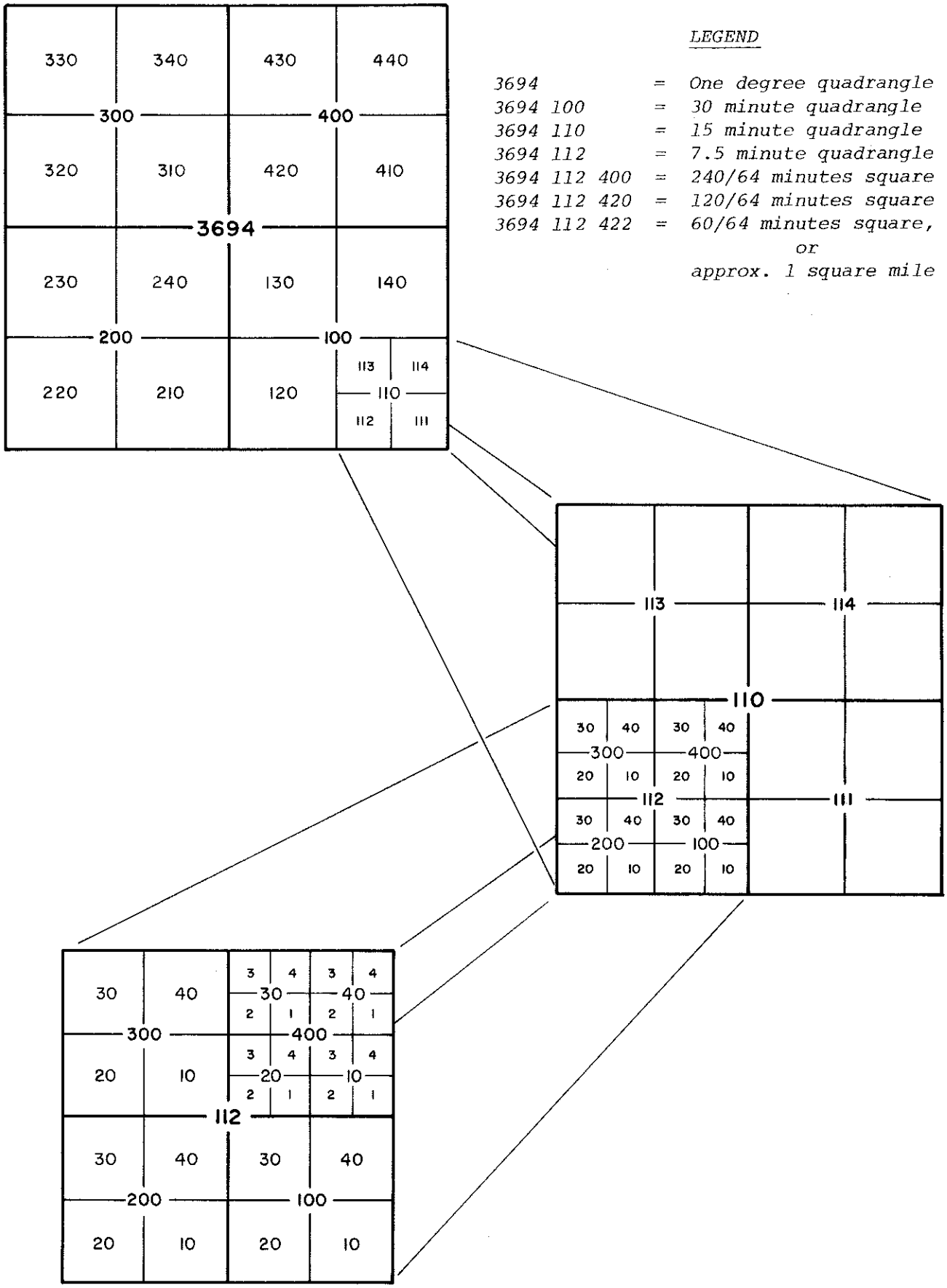


Figure 2.1. MODEL GRID FOR NUMBERED DEGREE QUADRANGLES

for the sub-basin. Appendix I shows the river basin map and codes for Arkansas. Up to three codes may be used to identify a station with more than one basin.

The operand for the basin command may contain from one to three characters. Those stations which have codes starting with the same configuration will be accessed. A single character will access all stations in a major river basin, while all three characters are required to specify a single sub-basin.

2.2.6. REGION

The REGION command identifies requests by Water Resources Planning Areas (WRPAs) as delineated by the Water Resources Council (WRC). The seven WRPAs and corresponding codes that are partly or entirely within Arkansas are delineated in Appendix III. The AWRMIS code used is a two character code, although the WRC uses up to three characters.

2.2.7. COUNTY

The COUNTY command is used to access stations by county. The operand consists of a string of one or more characters. All stations are retrieved which have the same character string in the name of the county. Unlike other comparisons, however, the string does not have to occur at the beginning of the county name, but can occur anywhere in the name. Thus, for example, for the operand FR all stations in Franklin and St. Francis counties would be accessed.

A station may be indexed in two counties. This is most common for streamflow stations and streams that form a county boundary. Stations located in border states can not be accessed using the COUNTY command.

2.2.8. ELEVATION

The ELEVATION command is used to access stations within a given range of elevations. The operand is given in the form MIN TO MAX. For example, the

command card ELEVATION 400 to 500 will access all stations between 400 and 500 feet elevation. Stations with elevations equal to either the upper or lower limit will be included.

The format of the operand is quite free, the only requirement being at least one blank between the two limits. The limits can also be punched with a decimal point, and several decimal places if required. Thus the operand 400.0 500.00 will produce the same results as the example above.

If only a lower limit is desired, only a single limit need be given. A default upper limit of 100,000 feet will be supplied automatically.

For certain stations, the elevation may be unknown or irrelevant, and the elevation in the index will be left blank. These blank values are not interpreted as zeros, and such stations cannot be accessed using the ELEVATION command.

2.2.9. AREA

The AREA command is used to access streamflow stations by drainage area. The format and usage of the operand is identical to that of the ELEVATION command given above, except that the limits are of drainage areas in square miles. Again, if only a lower limit is required, a single limit is sufficient.

Blank values are more common for drainage areas. These occur for springs, and for stations with varying drainage areas such as swamps. Such stations cannot be accessed using the area command.

2.2.10. ALTERNATE

The ALTERNATE command may be used to access stations which have alternate codes included in the index entry for the station. These codes may be any combination of alphabetic and numeric characters. The operand likewise may be a string of one or more characters, and those stations are accessed which contain the string in their coding.

This facility provides considerable flexibility in providing an additional free-form access technique.

2.2.11. PERIOD

The period for which records are included in the data files is recorded in the associated index file. Since records for most files are stored by month, the beginning and ending of a period of record is stored by year and month. Each period which is complete, but which is preceded and followed by a missing month, is defined as a period of record, and is indexed by beginning and ending dates and length in months. Up to 100 such periods can be accessed for a single station; if there are more, only the last 100 are indexed and accessible by the system.

For the Snowfall and Event files which contain data obtained at irregular intervals, the index assumes a single period of record, with the first and last months being the months in which the first and last days of record occurred. The number of months is replaced by the number of records in the file. There is no way to tell from the index whether the record is complete during the period.

If an access group is given without a PERIOD command, the entire period of record is accessed for every station included by the group. The PERIOD command may be used to restrict the period of record for which records are to be accessed.

The format of the operand is BEGIN TO END, where BEGIN and END are months in the form Month/Year. For example, the command

PERIOD 10/70 TO 9/71

would limit access to records in the water year October 1970 to September 1971. The format requires the slash ('/') immediately preceded by month and followed by year without intervening blanks. The same format is required for BEGIN and

END but spacing and words in between are irrelevant.

For some purposes, a complete period of record may be required. If the word COMPLETE is added at the end of the preceding operand, with at least one intervening blank, only stations having complete records for the entire period specified will be accessed. This feature could be used, for example, to obtain averages for all stations which have complete records for a specific period.

2.2.12. LIST

The LIST command directs the system to produce certain listings of the accessed data. The following operands are permitted:

A) INDEX
B) MONTHLY
C) DAILY

The INDEX operand indicates that a listing of the index is to be produced. The MONTHLY operand indicates that data is to be listed for the specified time periods.

Many of these listings are specific to certain files. A DAILY listing can obviously not be obtained for the (MONTHLY) Rainfall file. If invalid requests of this type are made, an error message is printed, and the system will proceed to the next step.

Listings of monthly values for several of the elements normally include such summary information as annual totals, monthly and annual averages for the period, and the ratio of the annual total to the annual average for each year with complete records. In order to print the ratios in a convenient format, the data are actually read twice. If the ratios are not required, the word PARTIAL may be added following the operand MONTHLY. Thus, the command LIST MONTHLY PARTIAL will produce listings, complete except for ratios, at noticeably less cost.

Detailed formats of output listings are given in Section 2.6.

2.2.13. COPY

The COPY command is provided to permit users to copy records from the AWRMIS data files to other formats, for use with other languages. Since AWRMIS files are not accessible to FORTRAN, to PL/C, or to CPS, operands provide for conversions appropriate to these languages. This feature is available, but it has not been implemented to date.

2.3. Optional Features

Several options are permitted beyond the standard specifications described in the previous section. The options are designed to permit either extensions to the access facilities or simplification of the command format.

2.3.1. The complete file option

For certain usage of the system it may be desirable to access the entire file. For example, the user may wish to obtain an index of all records in the file.

This option is obtained by using only an ACCESS card, an ELEMENT card with the requested element or elements as operands, and appropriate LIST cards as required. No other command cards are permitted.

When this option is used, the entire file is scanned, and entries for each station in order are processed as requested. Since such processing may be unacceptably extensive, only limited operations are permitted. For example, operands for the LIST command of INDEX and MONTHLY are permitted, but DAILY is not.

2.3.2. The AND/OR option

The regular access facilities permit retrieval of records that satisfy one or more criteria. For example, if the command cards

```
BASIN APO
      APJ
COUNTY LOGAN
```

are used, then all stations that are either in Basin APO or in Basin APJ or in LOGAN county will be accessed. Note that the word OR is used in the logical sense.

OR command cards could be inserted between the command cards above, without changing the results. These cards are therefore without function to the system, but may help the user to recognize the logic of the retrieval request.

The AND command introduces the requirement that in addition to preceding criteria, the following criterion must be met. For example, if the command cards

```
BASIN APO
      APJ
COUNTY LOGAN
AND
ELEVATION 400
AND
AREA 0 to 300
```

are used, all stations in Basin APO or in Basin APJ or in Logan county and having elevations over 400 feet and having drainage areas of less than 300 square miles will be accessed. Note that the word AND is used in the logical sense also.

This option permits some additional flexibility in making access requests.

2.3.3. Optional abbreviation

Abreviation of the command words and certain operands is possible. The user who is just becoming acquainted with the system should probably use the whole words as given, but a user with more experience may prefer the abbreviated forms.

Abbreviation is possible because the system when reading the command

cards reads only enough of each word to identify it uniquely. Thus, to distinguish between the commands ELEMENT and ELEVATION, only the first four letters need be read. Four letters are sufficient to uniquely identify all other commands. The allowable abbreviations are:

A) Command words - the first four letters of the names given in section 2.2.;

B) Element names - the first three letters of the names given in section 2.2.2; and

C) List operands - the first two letters of the names given in section 2.2.12.

2.4. System Defaults

The various system defaults relevant to the access facilities are described throughout chapter 2 where applicable.

2.5. Access Method

It may be well to note that all the data sets referred to by DD cards in Figure 2.2.a. are stored on a private magnetic disc pack. Since this pack must be mounted before the program can be run, turn-around time may be expected to be relatively slow. Therefore, batching of jobs is desirable.

2.5.1. Batch Access Method

Card formats for the job control language (JCL) are specified by AWRMIS, and must be followed rigorously. Specifically, blanks are permitted only at points that are clear in Figure 2.2.a., and not otherwise.

The JOB card indicates to the system at what point a job begins. The name of the job is coded on the JOB card. This name is used to identify messages to the operator and to identify the program output. By using the parameters allowed on the JOB card, information can be provided for accounting, class specification, CPU time, core requirements, and other parameters.

The JOBLIB card identifies the name of the program library, and should be

```
C   JOB CARD

// CLASS=C,REGION=210K,MSGLEVEL=1,TIME=2,COUNT=0
//JOBLIB DD UNIT=SYSDA,VOL=SER=ARIS,DSN=BMOD,DISP=SHR
// EXEC PGM=ARISGO,TIME=30
//SYSPRINT DD SYSOUT=A

//ISTR DD DSN=INDXSTRE,UNIT=SYSDA,DISP=SHR,VOL=SER=ARIS
//RSTR DD DSN=STREFLOW,VOL=SER=ARIS,DISP=SHR,UNIT=SYSDA

//IRAI DD DSN=INDXRAIN,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR
//RRAI DD DSN=RAIN,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR

//ISNO DD DSN=INDXSNOW,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR
//RSNO DD DSN=SNOW,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR

//IEVE DD DSN=INDXEVEN,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR
//REVE DD DSN=EVEN,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR

//IEVA DD DSN=INDXEVAP,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR
//REVA DD DSN=EVAP,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR

//ITEM DD DSN=INDXTEMP,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR
//RTEM DD DSN=TEMP,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR

//SYSIN DD *


C   THE "AWRMIS DECK" SHOULD BE INSERTED HERE


/*
//
```

Figure 2.2.a. Job Control Language (JCL) requirements for AWRMIS at the University of Arkansas, Fayetteville.

punched exactly as shown in Figure 2.2.a.

The EXEC card identifies the program which is to be executed. When a job has been executed, the output will show the user how much CORE was actually used. If insufficient space has been requested, the job will fail with a System Completion Code of 804 or 80A. However, since costs charged for computing are affected by the core size requested, there is some incentive to request the smallest size that will permit the job to be executed successfully.

The SYSPRINT card identifies the device on which output is to be printed, and should be punched exactly as shown. If omitted, no results will be printed.

A DD card identifies each data set and describes its attributes. For each file which is to be accessed, a pair of cards is required, one card to identify the data file and one card to identify the associated index file. The pairs are listed in Figure 2.2.a. for each file. Only the pair or pairs involving the particular files to be accessed must be provided for any run.

The SYSIN card indicates that the AWRMIS deck is to follow. The AWRMIS deck is thus placed between this card and the delimiter card (/*). The AWRMIS deck is made up of the command cards that are necessary to produce the desired output. The examples in sections 2.6. and 3.6. show the AWRMIS deck used, and the corresponding output.

The delimiter card (/*) and null card (//) are markers in an input stream. The delimiter card indicates that the AWRMIS command cards have all been read. The null card is used to mark the end of the job.

Figure 2.2.b. is a graphical illustration of the deck setup required by AWRMIS. Figure 2.2.c. is an example of a typical access request. The resulting output from this request is the same as in Figures 2.5. and 3.8. As previously mentioned, any number of access requests may be stacked for a single run and is encouraged for efficiency.

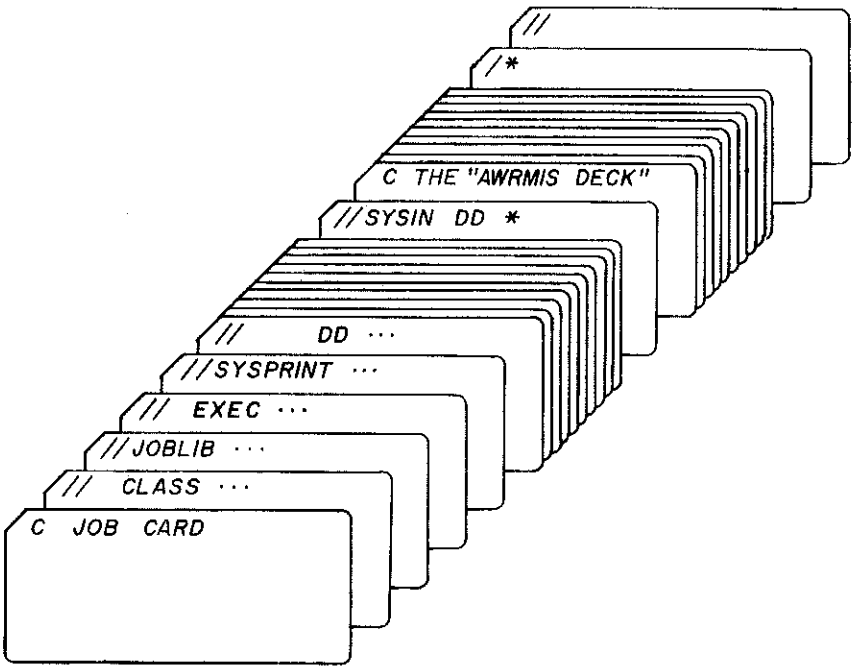


Figure 2.2.b. GRAPHICAL ILLUSTRATION OF "AWRMIS DECK" SETUP

```
//RY040450 JOB (00692,EENGGATT,FFECB,3C,19,28,75181,YFBDX),'YOUNG     ',
// CLASS=C,REGION=210K,MSGLEVEL=1,TIME=2,COUNT=C
//JOBLIB DD UNIT=SYSDA,VOL=SER=ARIS,DSN=BMOD,DISP=SHR
// EXEC PGM=ARISGO,TIME=30
//SYSPRINT DD SYSOUT=A

//ISTR DD DSN=INDXSTRE,UNIT=SYSDA,DISP=SHR,VOL=SER=ARIS
//RSTR DD DSN=STREFLOW,VOL=SER=ARIS,DISP=SHR,UNIT=SYSDA

//IRAI DD DSN=INDXRAIN,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR
//RRAI DD DSN=RAIN,VOL=SER=ARIS,UNIT=SYSDA,DISP=SHR

//SYSIN DD *

ACCESS
ELEMENT    STREFLOW
STATION    07257000
LIST       MONTHLY

ACCESS
ELEMENT    RAINFALL
STATION    030178
           030460
           030806
           030936
           031442
           031632
           031962
           032574
           033235
           036352
PERIOD     1/1963 TO 7/1970
PROCESS
CORRELATION
      ONLY APRIL

/*
//
```

Figure 2.2.c. A typical access request.

2.5.2. Terminal Access Method

The terminal access method has not been implemented to date.

2.6. Output Formats

This section contains examples of the output that may be produced by the Access facilities of AWRMIS. The examples show the AWRMIS deck used, and the corresponding output.

The AWRMIS deck is made up of the command cards that are necessary to produce the desired output. Section 2.5. illustrates the proper interlacing sequence of job control language (JCL) cards with the AWRMIS deck.

All listings that are now available are included. Other listings will be implemented as the development of the system progresses.

2.6.1. The Output Heading Page

At the beginning of the output associated with each access group, a heading page is printed. This contains the system name, for whom the system was developed, by whom the system was developed, version, date and time of execution, and a list of access requests as recognized by the system. A map showing station locations and or location blocks searched is included, except when the action requested is LIST INDEX. The command sequence

```
ACCESS
ELEMENT     RAINFALL
            STREFLOW
LOCATION    3492
COUNTY      POPE
            CONWAY
```

produced the heading page and map shown in Figures 2.3.a. and 2.3.b. respectively.

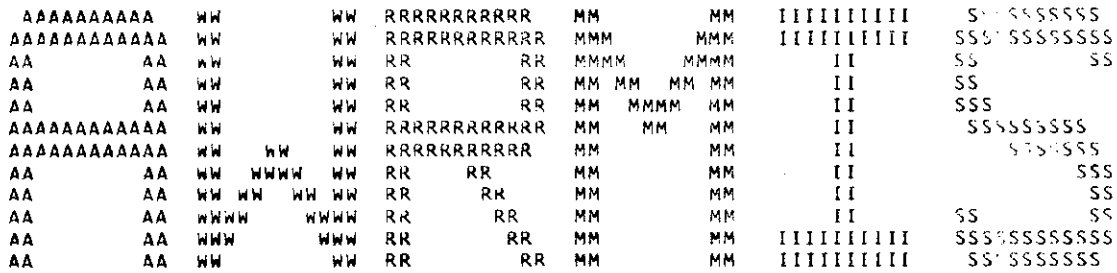


Figure 2.3.a. Sample output heading page.

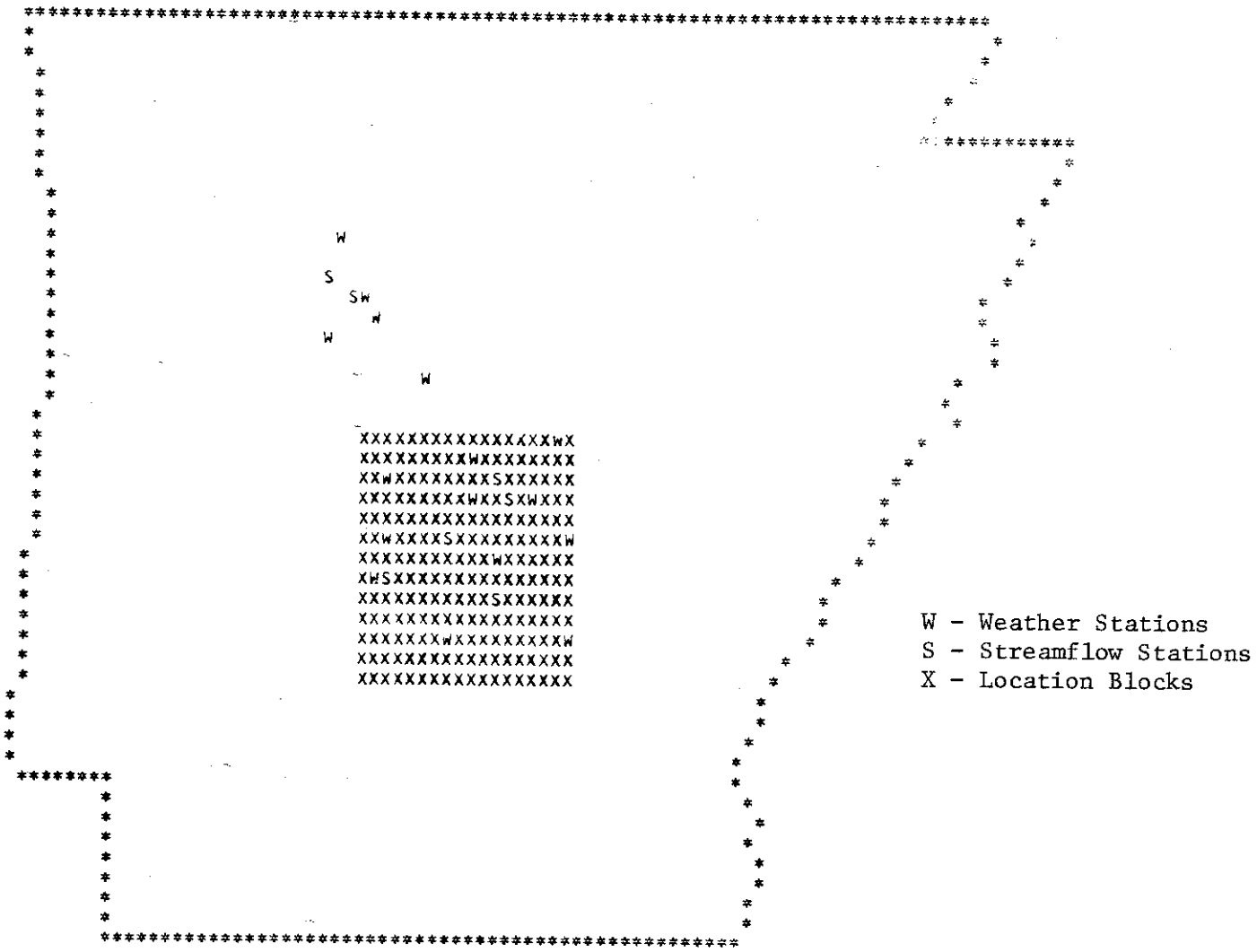


Figure 2.3.b. Sample output heading page map.

2.6.2. Streamflow Index

The command sequence

```
ACCESS
ELEMENT    STREFLOW
COUNTY     POPE
           PULASKI
LIST       INDEX
```

produced the output shown in Figure 2.4.

This form of the index is used for the United States Geological Survey stream gaging stations. See section 2.3.1., if a listing of indexes for all stations in the file is desired. A list of all USGS stream gaging stations available in AWRMIS is given in Appendix IV. See Appendix V for a location map.

STREAMFLOW STATIONS PAGE 1

BIG PINEY CREEK NEAR DOVER, ARK.
LATITUDE 35-32-58 LONGITUDE 93-09-30
ELEVATION 488 FT MSL REGION 52
PERIOD OF RECORDS LENGTH, MONTHS
10/1950 - 09/1971 252

POPE STATION NO. 07.2570.00
GEOGRAPHIC LOCATION BLOCK 3593-412-134
BASIN API AREA 274 SQ MI

ILLINOIS BAYOU NEAR SCOTTSVILLE, ARK.
LATITUDE 35-27-58 LONGITUDE 93-02-28
ELEVATION 448 FT MSL REGION 52
PERIOD OF RECORDS LENGTH, MONTHS
10/1947 - 09/1970 276

POPE STATION NO. 07.2575.00
GEOGRAPHIC LOCATION BLOCK 3593-144-424
BASIN AIB AREA 242 SQ MI

ARKANSAS RIVER AT MURRAY DAM, AT LITTLE ROCK, ARK.
LATITUDE 34-47-27 LONGITUDE 92-21-32
ELEVATION 223 FT MSL REGION 52
PERIOD OF RECORDS LENGTH, MONTHS
10/1970 - 09/1971 12

PULASKI STATION NO. 07.2634.50
GEOGRAPHIC LOCATION BLOCK 3492-431-231
BASIN AAL AREA 158030 SQ MI

ARKANSAS RIVER AT LITTLE ROCK, ARK.
LATITUDE 34-44-58 LONGITUDE 92-16-10
ELEVATION 224 FT MSL REGION 52
PERIOD OF RECORDS LENGTH, MONTHS
10/1927 - 09/1970 516

PULASKI STATION NO. 07.2635.00
GEOGRAPHIC LOCATION BLOCK 3492-424-443
BASIN AAL AREA 158201 SQ MI

Figure 2.4. Sample listing from streamflow index.

2.6.3. Monthly Streamflow

The command sequence

```
ACCESS
ELEMENT   STREFLOW
STATION   07257000
LIST      MONTHLY
```

produced the output shown in Figure 2.5.

Values listed are monthly streamflow totals in cubic feet per second (cfs). Means are computed for each month, and the number of months used in these computations are also listed.

The mean annual discharge is computed by summing the monthly mean values. For those annual totals which contain 12 months of data, the ratio of the annual total to mean annual is computed.

The mean daily discharge is computed and values are given in cubic feet per second (cfs) and in cubic feet per second per square mile (cfsm).

BIG PINEY CREEK NEAR DOVER, ARK. POPE STATION NO. 07.2570.00

TOTAL MONTHLY STREAMFLOW IN CFS-DAYS

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL	% AVE
1950										1905.	1358.	959.	4222.	
1951	16225.	50087&	10319.	25581.	9832.	6424.	9092.	1221.	735.2	5793.8	47569.	15065.	197944.	144
1952	16310.	11276.	48423.	54499.	16989.	1684.4	420.1	468.9	41.9	05.4	10102.8	12416.	172636.5	125
1953	11775.	13993.	54062.	43230.	35922.	636.6	95.6	50.7	06.9	00.	00.	705.3	160477.1	117
1954	12755.4	14569.	8863.	15911.	24555.	1238.3	34.7	01.1	00.	1498.8	713.	9975.	90114.3	65
1955	6427.	31644.	32484.	29264.	11728.	3796.	994.	221.2	782.7	1183.7	880.	871.	120275.6	87
1956	541.1	40004.	4929.	14218.	14139.	1433.	648.1	40.1	09.8	00.1	809.	2454.	79225.2	58
1957	7505.	26766.	15264.	88096.	62862.	34691.	3548.	4187.3	2518.	1728.	24009.	8236.	279410.3	203
1958	8072.	10160.	45810.	20903.	37315.	2179.	6266.	12790.	722.	887.7	23447.	6228.	174779.7	127
1959	5163.	9237.	27233.	31758.	11029.	24156.	4640.	976.3	978.6	15992.	17972.	27572.	176706.9	128
1960	25512.	14466.	17178.	11760.	40905.	3220.	9881.	978.9	163.1	210.4	880.7	22578.	147733.1	107
1961	3508.	8683.	38279.	25997.	58124.	3458.	10615.	2653.	2600.	1992.	14504.	24495.	194908.	142
1962	23636.	14956.	18659.	11926.	3579.	1326.	817.4	1430.5	2912.	11342.	3486.	3387.	97456.9	71
1963	5273.	1341.	18766.	3599.	3155.	586.6	63.8	197.2	219.7	04.3	57.3	445.2	33708.1	24
1964	217.8	2133.4	19714.	28481.	21987.	555.3	64.	307.6	686.3	426.4	1379.5	2003.	77955.3	57
1965	6171.	16267.	16583.	19712.	15970.	8872.	1798.	160.3	3230.7	1015.	1116.	4177.	95072.	69
1966	16875.	47383.	12164.	33724.	12381.	688.7	104.3	198.5	75.2	27.8	86.	1496.9	125204.4	91
1967	1587.	1975.	3861.	15659.	21959.	1511.	6806.	382.	1534.3	11870.	8630.	28836.	104610.3	76
1968	19368.	20795.	46821.	36623.	26948.	3684.	1809.4	755.	774.4	934.	16572.	43303.	218386.8	159
1969	42326.	21986.	23190.	18865.	6953.	3272.	545.9	46.	00.2	527.5	1721.	3941.	123373.6	90
1970	6469.	5502.	21199.	36283.	11094.	6875.	223.8	319.2	14974.5	21405.	14963.	7161.	146468.5	106
1971	17027.	17391.	8004.	6579.	18291.	2608.5	407.4	503.5	48.3				70859.7	
MEAN	12035.	18124.	23419.	27269.	22177.	5375.9	2803.5	1328.0	1572.0	3749.9	9059.7	10776.		
NO. OF MONTHS	21	21	21	21	21	21	21	21	21	21	21	21		
PERCENT ANNUAL	8.7	13.2	17.0	19.8	16.1	3.9	2.0	1.0	1.1	2.7	6.6	7.8		

MEAN ANNUAL DISCHARGE 137691.82 CFS-DAYS
MEAN DAILY DISCHARGE 376.99 CFS
1.38 CFS/SQ MI

Figure 2.5. Sample monthly data listing from the streamflow file.

2.6.4. Monthly Streamflow (partial)

The command sequence

```
ACCESS
ELEMENT    STREFLOW
STATION    02082500
LIST       MONTHLY PARTIAL
```

produced the output shown in Figure 2.6.

The command "LIST MONTHLY PARTIAL" specifies that the ratio of the annual total to mean annual is not computed. This form of output is more efficient and requires less execution time at noticeably less cost than that of example 2.6.3. Therefore, this form of output is preferred unless the ratios are required.

All other values listed are the same as those in figure 2.5., and the computations are similar.

The word PARTIAL can also be used with examples 2.6.7., 2.6.9. , 2.6.11., and 2.6.13. Since the effect is similar to that given here, additional examples using it are not given.

BIG PINEY CREEK NEAR DOVER, ARK. POPE STATION NO. 07.2570.00

TOTAL MONTHLY STREAMFLOW IN CFS-DAYS

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
1950										1905.	1358.	959.	4222.
1951	16225.	50087.	10319.	25581.	9832.	6424.	9092.	1221.	735.2	5793.8	47569.	15065.	197944.
1952	16310.	11276.	48423.	54499.	16989.	1684.4	420.1	468.9	41.9	05.4	10102.8	12416.	172636.5
1953	11775.	13993.	54062.	43230.	35922.	636.6	95.6	50.7	06.9	00.	00.	705.3	160477.1
1954	12755.4	14569.	8863.	15911.	24555.	1238.3	34.7	01.1	00.	1498.8	713.	9975.	90114.3
1955	6427.	31644.	32484.	29264.	11728.	3796.	994.	221.2	782.7	1183.7	880.	871.	120275.6
1956	541.1	40004.	4929.	14218.	14139.	1433.	648.1	40.1	09.8	00.1	809.	2454.	79225.2
1957	7505.	26766.	15264.	88096.	62862.	34691.	3548.	4187.3	2518.	1728.	24009.	8236.	279410.3
1958	8072.	10160.	45810.	20903.	37315.	2179.	6266.	12790.	722.	887.7	23447.	6228.	174779.7
1959	5163.	9237.	27233.	31758.	11029.	24156.	4640.	976.3	978.6	15992.	17972.	27572.	176706.9
1960	25512.	14466.	17178.	11760.	40905.	3220.	9881.	978.9	163.1	210.4	880.7	22578.	147733.1
1961	3508.	8683.	38279.	25997.	58124.	3458.	10615.	2653.	2600.	1992.	14504.	24495.	194908.
1962	23636.	14956.	18659.	11926.	3579.	1326.	817.4	1430.5	2912.	11342.	3486.	3387.	97456.9
1963	5273.	1341.	18766.	3599.	3155.	586.6	63.8	197.2	219.7	04.3	57.3	445.2	33708.1
1964	217.8	2133.4	19714.	28481.	21987.	555.3	64.	307.6	686.3	426.4	1379.5	2003.	77955.3
1965	6171.	16267.	16583.	19712.	15970.	8872.	1798.	160.3	3230.7	1015.	1116.	4177.	95072.
1966	16875.	47383.	12164.	33724.	12381.	688.7	104.3	198.5	75.2	27.8	86.	1496.9	125204.4
1967	1587.	1975.	3861.	15659.	21959.	1511.	6806.	382.	1534.3	11870.	8630.	28836.	104610.3
1968	19368.	20795.	46821.	36623.	26948.	3684.	1809.4	755.	774.4	934.	16572.	43303.	218386.8
1969	42326.	21986.	23190.	18865.	6953.	3272.	545.9	46.	00.2	527.5	1721.	3941.	123373.6
1970	6469.	5502.	21199.	36283.	11094.	6875.	223.8	319.2	14974.5	21405.	14963.	7161.	146468.5
1971	17027.	17391.	8004.	6579.	18291.	2608.5	407.4	503.5	48.3				70859.7
MEAN	12035.	18124.	23419.	27269.	22177.	5375.9	2803.5	1328.0	1572.0	3749.9	9059.7	10776.	
NO. OF MONTHS	21	21	21	21	21	21	21	21	21	21	21	21	
PERCENT ANNUAL	8.7	13.2	17.0	19.8	16.1	3.9	2.0	1.0	1.1	2.7	6.6	7.8	

MEAN ANNUAL DISCHARGE 137691.82 CFS-DAYS
MEAN DAILY DISCHARGE 376.99 CFS
1.38 CFS/SQ MI

Figure 2.6. Sample partial monthly data listing from the streamflow file.

2.6.5. Daily Stream Flow

The command sequence

```
ACCESS
ELEMENT   STREFLOW
STATION   07257000
PERIOD    1/1970 to 9/1970
LIST      DAILY
```

produced the output shown in Figure 2.7.

Values listed are daily totals in cubic feet per second (cfs). Monthly totals are also listed.

BIG PINEY CREEK NEAR DOVER, ARK. POPE 07.2570.00

MEAN DAILY STREAMFLOW IN CFS

1970

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	379.0	200.0	185.0	291.0	2460.0	432.0	25.0	02.6	04.7			
2	287.0	220.0	218.0	281.0	1460.0	625.0	20.0	07.9	06.8			
3	228.0	218.0	2160.0	261.0	1090.0	323.0	18.0	06.8	1150.0			
4	193.0	205.0	1840.0	232.0	866.0	260.0	15.0	04.6	2110.0			
5	175.0	196.0	1370.0	223.0	698.0	508.0	12.0	03.4	1080.0			
6	177.0	198.0	1030.0	237.0	549.0	393.0	10.0	02.9	418.0			
7	173.0	242.0	824.0	232.0	434.0	271.0	09.0	03.2	231.0			
8	173.0	277.0	690.0	217.0	352.0	196.0	08.3	03.7	157.0			
9	173.0	300.0	587.0	208.0	289.0	173.0	07.6	05.8	120.0			
10	173.0	299.0	496.0	199.0	472.0	169.0	06.5	08.3	101.0			
11	173.0	279.0	438.0	189.0	434.0	158.0	05.4	21.0	79.0			
12	171.0	250.0	709.0	184.0	310.0	635.0	05.4	27.0	63.0			
13	169.0	221.0	663.0	177.0	243.0	665.0	04.8	19.0	57.0			
14	168.0	213.0	601.0	167.0	199.0	424.0	04.0	15.0	45.0			
15	166.0	208.0	565.0	153.0	169.0	309.0	03.4	12.0	39.0			
16	147.0	190.0	500.0	145.0	150.0	236.0	03.2	10.0	36.0			
17	143.0	174.0	503.0	172.0	133.0	183.0	02.9	08.6	49.0			
18	297.0	163.0	673.0	235.0	114.0	148.0	03.7	08.3	1960.0			
19	375.0	156.0	808.0	700.0	98.0	122.0	04.8	09.5	1380.0			
20	317.0	142.0	916.0	2000.0	84.0	101.0	07.2	09.0	647.0			
21	266.0	126.0	810.0	1300.0	72.0	87.0	10.0	12.0	398.0			
22	257.0	119.0	728.0	900.0	64.0	74.0	07.6	13.0	287.0			
23	220.0	126.0	624.0	2000.0	56.0	63.0	05.8	31.0	273.0			
24	186.0	142.0	543.0	4500.0	50.0	54.0	04.8	18.0	473.0			
25	185.0	156.0	485.0	10000.0	45.0	54.0	04.3	13.0	274.0			
26	184.0	159.0	473.0	5000.0	38.0	54.0	03.7	10.0	1150.0			
27	183.0	159.0	402.0	2500.0	34.0	51.0	03.2	08.6	1020.0			
28	183.0	164.0	356.0	1400.0	31.0	43.0	02.6	07.5	626.0			
29	183.0		348.0	1160.0	29.0	35.0	02.2	06.6	426.0			
30	183.0		340.0	1020.0	35.0	29.0	01.8	05.8	314.0			
31	182.0		314.0		36.0		01.6	05.1				
TOTAL	6469.0	5502.0	21199.0	36283.0	11094.0	6875.0	223.8	319.2	14974.5			

Figure 2.7. Sample daily data listing from the streamflow file.

2.6.6. Rainfall Index

The command sequence

```
ACCESS
ELEMENT    RAINFALL
COUNTY     POPE
           BAXTER
LIST       INDEX
```

produced the output shown in Figure 2.8.

This form of the index is used for the National Weather Service weather stations. The drainage area is omitted in this form. A list of all NWS stations available in AWRMIS is given in Appendix VI. See Appendix VII for a location map.

The index files for TEMPERATURE, EVAPORATION, SNOWFALL and EVENTS can be accessed by specifying the desired element or elements on the ELEMENT command card. Since the effect is similar to that given here, no further examples using it are given.

APPLETON
LATITUDE 35-25-00 LONGITUDE 92-53-00
ELEVATION 522 FT MSL REGION 52
PERIOD OF RECORDS LENGTH, MONTHS
03/1964 - 11/1966 33
POPE STATION NO. 03-0196
GEOGRAPHIC LOCATION BLOCK 3592-233-141
BASIN ACA

HECTOR
LATITUDE 35-28-00 LONGITUDE 92-58-00
ELEVATION 555 FT MSL REGION 52
PERIOD OF RECORDS LENGTH, MONTHS
01/1963 - 12/1972 120
POPE STATION NO. 03-3235
GEOGRAPHIC LOCATION BLOCK 3592-233-313
BASIN AIB

MOUNTAIN HOME 1 NNW
LATITUDE 36-20-00 LONGITUDE 92-23-00
ELEVATION 800 FT MSL REGION 53
PERIOD OF RECORDS LENGTH, MONTHS
01/1963 - 12/1972 120
BAXTER STATION NO. 03-5036
GEOGRAPHIC LOCATION BLOCK 3692-132-414
BASIN WWM/WNP

MOUNTAIN HOME C OF ENG
LATITUDE 36-20-00 LONGITUDE 92-23-00
ELEVATION 800 FT MSL REGION 53
PERIOD OF RECORDS LENGTH, MONTHS
01/1963 - 12/1972 120
BAXTER STATION NO. 03-5038
GEOGRAPHIC LOCATION BLOCK 3692-132-414
BASIN WWM/WNF

PELSOR
LATITUDE 35-43-00 LONGITUDE 93-06-00
ELEVATION 2000 FT MSL REGION 52
PERIOD OF RECORDS LENGTH, MONTHS
02/1963 - 04/1963 3
10/1963 - 02/1964 5
POPE STATION NO. 03-5664
GEOGRAPHIC LOCATION BLOCK 3593-414-324
BASIN API/WBU

RUSSELLVILLE 4 N
LATITUDE 35-20-00 LONGITUDE 93-09-00
ELEVATION 346 FT MSL REGION 52
PERIOD OF RECORDS LENGTH, MONTHS
01/1963 - 08/1971 104
03/1972 - 12/1972 10
POPE STATION NO. 03-6352
GEOGRAPHIC LOCATION BLOCK 3593-142-413
BASIN AIB

Figure 2.8. Sample listing from the rainfall index.

2.6.7. Monthly Rainfall

The command sequence

```
ACCESS
ELEMENT   RAINFALL
STATION   035036
LIST      MONTHLY
```

produced the output shown in Figure 2.9. Specifying the word PARTIAL after MONTHLY on the LIST command card would delete the last column. (See example 2.6.4.)

The following special symbols are used to qualify the data:

- \- missing data during month;
- * accumulations during month;
- E estimated values during month.

Only one symbol may be printed for a month, and the symbol is selected in the above order. Thus if a minus sign appears, there may also be accumulations or estimated values during the month, but if an E is printed, there are neither missing data nor accumulations.

Monthly means are computed excluding those months with missing data, and the mean annual precipitation is the sum of the monthly means. Annual totals are computed for all years, but the ratio of the annual total to the annual mean is computed only for years with no missing data.

PAGE 1

MOUNTAIN HOME 1 NNW BAXTER STATION NO. 03-5036

TOTAL MONTHLY PRECIPITATION IN INCHES

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL	% AVE
1963	0.54	1.76	2.32	1.19	5.92	4.16	4.21	0.81	1.89	0.70	5.05	1.01	29.56	73
1964	0.85	2.61	8.60	4.47	2.14	5.28	4.05	5.83	3.41	0.82	4.49	1.36	43.91	109
1965	1.74	2.32	2.76	6.83	5.36-	4.08	2.25	4.26	6.17	0.04	1.71	2.18	39.70	
1966	6.03	6.42	1.29	7.86	3.94	1.12	2.49	4.36	3.14	3.51	1.89	3.69	45.74	113
1967	2.52	1.31	1.86	5.30	4.63	5.38	3.51	2.26	3.38	8.88	0.93-	5.74	45.70	
1968	2.32	2.39E	6.28	4.65	5.42	3.76	3.96	0.00-	5.74	0.00-	6.22	6.40-	47.14	
1969	6.33	1.74	3.24	4.25	0.36	2.93	3.68	2.69	2.33	6.80	1.21	3.29	38.85	96
1970	1.01	1.97	4.57	6.55	3.04	5.65	1.28	3.53	5.25	6.45	2.45	1.76	43.51	108
1971	2.90	3.74	0.79	2.36	4.34	1.60	3.49	0.61	1.75	0.92	1.88	9.70E	34.08	85
1972	0.17	0.49	1.84	4.64	3.53	1.73	2.87	2.06	0.00-	0.00-	0.00-	3.04	20.37	
MEAN	2.44	2.48	3.36	4.81	3.70	3.57	3.18	2.93	3.67	3.52	3.11	3.53		
NO. OF MONTHS	10	10	10	10	9	10	10	9	9	8	8	9		
PERCENT ANNUAL	6.1	6.2	8.4	12.0	9.2	8.9	7.9	7.3	9.2	8.8	7.8	8.8		

MEAN ANNUAL PRECIPITATION 40.30 INCHES

Figure 2.9. Sample monthly data listing from the rainfall file.

2.6.8. Daily Rainfall

The command sequence

```
ACCESS
ELEMENT   RAINFALL
STATION   031962
PERIOD    1/1972 to 12/1972
LIST      DAILY
```

produced the output shown in Figure 2.10.

The following special symbols are used to qualify the data:

- \- amount missing;
- * amount accumulated;
- E amount estimated;
- T trace reported;
- X invalid code combination;

combinations of the symbols may be printed as appropriate.

DERMOTT 3 NE CHICOT 03-1962

DAILY PRECIPITATION IN INCHES

1972

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	0.75		2.20				0.25					
2	2.70		0.75		0.40						0.56	
3					0.23						0.03	
4	2.68			0.23			2.25		0.37			
5	0.30						0.02		0.10			0.08
6		0.22										0.12
7		0.09									4.70	
8			0.70		0.08	0.07						
9	0.21					0.03			0.06			1.10
10	0.09							0.90				0.93
11							0.62					0.05
12		0.16			T			0.05				0.10
13			0.03		0.57		0.58	0.08			1.51	0.50
14			T				0.03				0.07	0.73
15		0.06				1.67						1.10
16			1.78	0.72		0.07						
17					0.24							
18		0.08					0.08		1.68		0.70	
19	0.03								0.04	0.13	2.10	0.04
20	T											0.28
21			0.45			0.65						0.48
22		0.12		0.48						T	0.09	0.28
23		0.30						2.25		1.45		
24								0.04				
25	0.23		0.28					0.06			1.23	
26		0.18				0.57	0.08	0.04	0.34			
27			0.08			0.06			0.03	1.82		
28	0.76		0.86			0.29					0.05	
29	0.44		1.08	0.65			1.20			0.03		
30	0.30				0.50		0.07		0.25	0.54	T	0.32
31										0.37		0.80
TOTAL	8.49	1.21	8.21	2.08	2.02	3.41	5.18	3.42	2.87	4.34	11.04	6.91

Figure 2.10. Sample daily data listing from the rainfall file.

2.6.9. Monthly Average Maximum and Minimum Temperatures

The command sequence

```
ACCESS
ELEMENT   TEMPTURE
STATION   030460
LIST      MONTHLY
```

produced the output shown in Figure 2.11. Specifying the word PARTIAL after MONTHLY on the LIST command card would delete the last column. (See example 2.6.4.)

If there are missing daily maximum temperatures during a month, a minus sign is printed to the right of the average maximum. Similarly, missing daily minimum temperatures are identified by a minus sign to the right of the average minimum. If there are any estimated values of either maximum or minimum daily temperatures, an E is printed to the right of the average maximum, provided that there are not also missing maximum temperatures.

Values that are marked with a minus sign are not reliable, since they are computed using only the days for which data are available.

The mean annual temperatures are computed as the average of all complete months. These values may be biased if there are more incomplete records during certain months than during others.

The annual average temperatures are computed using all the monthly averages, and are therefore subject to the same source of unreliability cited above. However, the ratio of the annual average to the mean annual temperature is calculated only for years with complete data.

BATESVILLE L AND D 1 INDEPENDENCE STATION NO. 03-0460

AVERAGE MONTHLY MAXIMUM AND MINIMUM TEMPERATURES IN DEGREES F.

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL	% AVE
1963	44.0	51.4	70.6	77.0	82.0	88.5	90.4	93.8	86.2	86.1	65.3	44.4-	73.4	
	18.3	22.9	39.7	49.7	54.6	62.5	66.5	65.0	57.8	47.4	37.1	20.3-	45.3	
1964	54.4	52.7	64.5	75.5	82.3	89.4	92.6	89.1	83.3	72.6	65.7	51.0	72.8	100
	25.7	24.3	36.1	51.3	57.7	63.8	67.4	65.0-	58.5	41.2	39.3	30.8	46.8	
1965	53.7	54.2	52.9	78.1	82.3	87.0	93.1	92.9	84.8	75.7	68.4	57.5	73.5	101
	30.5	27.1	32.5	50.1	59.0	63.7	66.9	62.3	60.3	40.7	40.7	33.6	47.4	102
1966	44.8	50.5	66.1	73.0	82.2	91.6	97.7	88.0	82.7	73.6	66.1	50.8	72.4	99
	23.9	28.8	37.8	47.3	51.9	58.2	68.4	63.2	54.6	39.6	39.4	28.4	45.2	97
1967	54.3	53.8	72.2	77.7	80.5	90.4	90.5	88.3	81.0	76.0	60.7	52.8	73.3	101
	27.7	26.8	43.9	53.4	52.9	64.6	63.8	60.1	55.6	45.8	32.7	30.1	46.6	100
1968	46.5	48.9	63.2	73.0	80.9	90.5	92.5	93.2	84.5	74.7	58.1	49.2	71.3	98
	26.6	24.2	37.3	47.0	55.3	63.7	66.1	65.4	54.2-	46.5	39.0	28.6	46.2	
1969	49.3	52.0	57.5	74.0	83.7	90.9	97.2	92.5	86.5	74.6	61.1	48.5	72.4	99
	28.4	30.1	30.7	47.2	54.5	62.1	69.6	62.9	59.4	48.0	33.6	28.2	46.3	99
1970	44.8	53.5	56.4	76.2	85.2	88.7	92.4	91.0	87.0	71.2	60.0	54.8	71.8	99
	20.9	28.3	35.4	49.1	55.3	62.5	65.2	68.0	64.6	48.2	37.7	33.5	47.5	102
1971	48.6	53.5	59.5	76.0	80.3	93.8	94.3	88.7-	87.4	80.9	62.3	57.2	73.6	
	27.1	30.4	33.5	43.3	51.4	64.8	66.5	64.3	62.5	52.5	37.4	38.3	47.8	103
1972	51.9	56.7	66.5	75.2	82.4	91.0	90.3	92.8	87.7	71.1	53.7	47.5	72.3	99
	27.3	30.0	38.5	47.6	53.0	60.6	65.4	65.3	64.5	48.5	37.7	29.5	47.4	102
MEANS	49.2	52.7	62.9	75.6	82.2	90.2	93.1	91.3	85.1	75.7	62.1	52.1		
	25.6	27.3	36.5	48.6	54.6	62.7	66.6	64.1	59.8	45.8	37.5	31.2		
NO. OF MONTHS	10	10	10	10	10	10	10	9	9	10	10	9		

MEAN ANNUAL MAXIMUM TEMPERATURE 72.8 DEGREES F.
MEAN ANNUAL MINIMUM TEMPERATURE 46.6 DEGREES F.

Figure 2.11. Sample monthly data listing from the temperature file.

2.6.10. Daily Maximum and Minimum Temperatures

The command sequence

```
ACCESS
ELEMENT    TEMPERATURE
STATION    030936
PERIOD     1/1972 TO 12/1972
LIST       DAILY
```

produced the output shown in Figure 2.12.

Days with missing data are left blank. For months with missing data, the averages are computed using the available data.

BRINKLEY MONROE 03-0936

DAILY MAXIMUM AND MINIMUM TEMPERATURES IN DEGREES F.

1972	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
1	62	34	51	21	68	38	60	31	81	60	85	50	90	68	88	62	92	62	68	46	75	64	64	35
2	55	35	49	28	75	32	62	33	68	55	85	59	92	64	93	65	94	63	72	44	81	47	60	37
3	62	34	50	25	44	30	73	40	72	51	89	59	91	66	93	62	93	60	77	46	63	48	62	36
4	56	37	36	17	45	31	75	39	71	48	90	60	81	67	93	69	94	61	80	52	61	44	67	45
5	39	15	35	20	49	33	56	37	70	49	93	61	79	69	96	68	94	58	82	55	60	43	57	40
6	36	15	53	25	57	38	70	38	82	55	94	63	80	55	85	67	93	61	81	50	66	38	64	20
7	42	17	45	24	59	34	77	55	83	55	93	64	78	53	96	68	87	60	82	49	61	48	30	20
8	43	18	33	20	63	33	83	33	65	55	95	65	85	55	87	69	94	60	83	46	64	39	33	21
9	55	30	47	22	64	34	54	34	76	54	94	63	88	56	95	62	94	70	82	47	51	39	35	24
10	60	40	50	29	65	36	63	40	65	50	95	65	90	62	84	64	90	68	80	47	65		40	30
11	60	37	62	31	65	35	69	49	73		96	66	91	68	85	66	86	60	86	50	59	39	32	25
12	55	34	63	33	67	36	79	66	75		84	60	93	67	87	69	91	62	86	53	62	41	39	23
13	61	36	58	38	66	34	88	67	70		87	62	92	66	90	69	90	66	84	58	69	49	46	25
14	65	23	55	37	68	38	88	68	72		94	68	94	67	92	72	91	67	81	59	59	39	30	25
15	31	11	60	35	77	39	89	65	82	51	90	69	95	68	94	65	90	66	84	50	57	37	31	26
16	18	9	59	32	78	46	88	55	83	53	90	64	96	69	93	62	92	67	85	60	59	39	43	31
17	28	10	60	30	66	40	74	46	93	53	89	64	96	72	98	65	94	69	86	56	49	38	42	30
18	46	26	62	31	68	42	71	47	91	54	90	64	95	71	99	68	95	65	81	57	44	36	42	18
19	61	43	50	27	71	49	84	56	85	58	92	69	97	71	100	69	92	61	76	38	46	36	49	22
20	64	52	51	27	75	39	84	61	86	61	95	62	99	70	99	74	96	68	73	38	48	42	52	38
21	61	43	58	35	78	48	80	60	88	63	99	67	97	69	100	68	93	68	61	36	44	38	50	45
22	55	31	66	33	74	40	83	51	90	62	88	62	100	70	101	69	85	59	65	40	40	39	51	43
23	64	35	54	32	60	41	82	58	89	61	86	54	99	71	100	68	86	60	67	49	40	34	43	31
24	74	56	69	42	61	37	84	46	93	65	87	57	98	69	88	68	87	58	68	47	41	39	43	32
25	80	29	68	43	59	34	71	44	90	64	87	57	97	69	91	69	85	59	59	45	42	40	48	30
26	51	26	67	35	53	32	61	43	87	63	87	60	99	70	90	68	80	70	57	32	41	39	50	32
27	51	24	68	30	59	41	69	49	89	65	88	68	100	72	87	65	81	69	57	35	43	38	51	30
28	41	29	67	30	63	45	73	55	90	66	92	66	101	74	95	60	86	71	62	39	54	31	50	28
29	39	27	69	35	65	45	72	51	94	57	90	65	99	69	87	60	88	70	61	40	50	25	53	30
30	39	25			50	37	75	53	91	58	92	68	87	71	95	61	87	45	62	47	48	32	63	33
31	37	20			51	48			90	57			86	62	94	60			66	56			55	32
AVEMAX	51.3		55.7		63.3		74.6		81.7		90.5		92.4		92.7		90.0		74.0		54.7		47.6	
AVEMIN	29.1		29.9		38.2		49.0		57.1		62.7		66.8		66.2		63.4		47.3		40.0		30.2	

Figure 2.12. Sample daily data listing from the temperature file.

2.6.11. Monthly Evaporation

The command sequence

```
ACCESS
ELEMENT   EVAPTION
STATION   036352
PERIOD    1/1963 TO 12/1972
LIST      MONTHLY
```

produced the output shown in Figure 2.13. Specifying the word PARTIAL after MONTHLY on the LIST command card would delete the last column. (See example 2.6.4.)

The following special symbols are used to qualify the data:

- \- missing data during month;
- * accumulations during month;
- E estimated values during month.

Only one symbol may be printed for a month, and the symbol is selected in the above order. Thus, if a minus sign appears, there may also be accumulations or estimated values during the month, but if an E is printed, there are neither missing data nor accumulations.

Monthly means are computed excluding those months with missing data, and the mean annual precipitation is obtained as the sum of the monthly means. The number of months printed is the number of months with complete records. Annual totals are computed for all years, but the ratio of the annual total to the annual mean is obtained only for years with no missing data.

RUSSELLVILLE 4 N POPE STATION NO. 03-6352

TOTAL MONTHLY EVAPORATION IN INCHES AND WIND MOVEMENT IN MILES

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL	% AVE
1963	0.37-	1.16-	4.07-	4.08*	6.22-	7.51	6.56-	7.37	4.73	4.53*	2.07-	0.97-	49.64	
	513	475	679	495	330	373*	319	214	336	230*	380*	516	4860	51
1964	1.74-	2.53-	4.02-	6.45-	6.13-	6.66-	7.66-	5.89-	4.49-	3.15	1.73-	1.29*	51.74	
	1304	1417	1500*	1428*	752	348-	527*	522*	497	726*	860	1099	10980	
1965	1.14-	1.71-	2.61*	5.40	4.94-	3.14-	6.58	6.23-	3.96-	3.20	1.71*	0.92	41.54	
	1148*	1162	1503	1160	831*	359-	446	544*	636	541	490	622*	9442	
1966	0.92-	0.95-	4.04	4.28-	5.63	5.75*	6.75	4.55-	3.85-	3.19	2.04	1.16-	43.11	
	505	603	1134	955	763	689*	450*	419	478	805	862	1114*	8777	93
1967	1.32-	1.59-	3.65*	4.11-	4.47-	5.29-	5.40-	5.31	3.06-	3.03-	2.00		39.23	
	1269	1188	1182	909	843	597	594	523*	518	846	810*		9279	
1968		1.62-	3.29-	4.58	4.41-	5.67	5.66-	5.30-	4.62	3.38*	1.08-	0.90-	40.51	
		946	1035	997	615	462	510	440	599	774	749	1156-	8283	
1969	0.78-	1.70-	3.39-	4.05*	4.76-	5.73-	6.87-	7.69*	5.35	4.24-	1.89	1.21-	47.66	
	990	928	1251	806	585	692*	622	716	657*	820	907*	929	9903	105
1970		1.76-	2.30-	4.24-	5.62-	4.84-	6.22-	5.52	4.31-	2.59-	1.69-	1.09-	40.18	
		961	1073*	1299	1017	690*	692	675*	753*	955*	1279*	1137*	10531	
1971	0.85-		3.16-	4.35	5.03	5.41-							18.80	
	1042		1510*	1195	938	532							5217	
1972			3.70-	4.58-	5.56-	5.66-	6.63-	6.97-	4.38-	3.38-	1.58-	0.30-	42.74	
			1607-	1348	608*	630-	434	420	352-	486	856	1064	7805	
MEANS	0.00	0.00	3.43	4.49	5.33	6.31	6.67	6.47	4.90	3.49	1.91	1.11		
	967	960	1207	1059	728	576	510	497	559	687	799	926		
NO. OF MONTHS	0	0	3	5	2	3	2	4	3	5	4	2		
PERCENT ANNUAL	0.0	0.0	7.8	10.2	12.1	14.4	15.2	14.7	11.2	8.0	4.4	2.6		
	10.3	10.2	12.8	11.2	7.7	6.1	5.4	5.3	5.9	7.3	8.5	9.8		

MEAN ANNUAL EVAPORATION 44.11 INCHES
MEAN ANNUAL WIND MOVEMENT 9475 MILES

Figure 2.13. Sample monthly data listing from the evaporation file.

2.6.12. Daily Evaporation

The command sequence

```
ACCESS
ELEMENT   EVAPTION
STATION   036352
PERIOD    1/1972 TO 12/1972
LIST      DAILY
```

produced the output shown in Figure 2.14.

Days with missing data are left blank. The following special symbols are used to qualify the data:

* amount accumulated;

E amount estimated.

Only one symbol may be printed for a month, and the symbol is selected in the above order.

Monthly totals are also computed.

RUSSELLVILLE 4 N POPE 03-6352

DAILY EVAPORATION IN INCHES AND WIND MOVEMENT IN MILES

1972

	JANUARY	FEBRUARY	MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
1					0.20	69	0.29	45		12	0.04	6	0.25	22	0.00	2	0.12	7		9	0.00*	14
2			0.09	207	0.26	58		7		12	0.30	12	0.28	4		6	0.25	2		22	0.00*	25
3			0.10	17	0.18	39	0.17	29	0.06	15		8	0.29	28	0.29	11	0.05	12		13	0.14	39
4			0.08	4	0.16	55	0.15	30	0.28	15		4		13	0.00*		0.10	10	0.12	9	0.14	59
5			0.18	40	0.19	41	0.20	12	0.32	23	0.28	38	0.12	22	0.00*	7	0.09	10	0.02	14	0.02	30
6			0.04	38	0.18	22	0.19	34	0.08	11	0.20	25	0.23	10	0.07	1	0.13	3	0.08	17		44
7			0.23	93	0.00*	54	0.00	26	0.36	4	0.24	6	0.20	21	0.24	18	0.14	26		10		50
8			0.17	60	0.35	115	0.23	19	0.16	18	0.23	24	0.46	22	0.20	17	0.21	6	0.07	30		24
9			0.08	46	0.19	37	0.17	47	0.34	10	0.25	13	0.03	6	0.26	13	0.01	17	0.06	8		12
10			0.24	32	0.07	38	0.30	36	0.12	27	0.12	10	0.21	20	0.17	3	0.10	6	0.06	42		30
11				40	0.10	36	0.07	9	0.12	16	0.37	17	0.35	22	0.19	24	0.09	21	0.07	26		6
12			0.20	82	0.14	36	0.15	33	0.17	25		12	0.05	12	0.18	8	0.19	13	0.03	25		50
13			0.11	73	0.25	100	0.00*	1	0.37	31	0.37	5	0.26	7	0.18	2	0.19	7	0.19	30		90
14			0.21	54	0.19	79	0.28	18	0.27	34	0.08	8		11	0.13	5	0.01	0	0.22	53		38
15			0.03	38	0.14	45	0.20	37	0.10	45	0.23	26	0.26	10	0.28	17	0.07	16	0.05	92		41
16			0.14	98	0.34	47	0.26	22	0.34	31	0.13	17	0.20	6	0.27	8	0.25	12	0.00*	15		11
17			0.18	64	0.21	57	0.00	10	0.10	8	0.23	7	0.38	14	0.20	22	0.00*	11	0.14	30		11
18				37	0.10	24	0.15	13	0.20	15	0.32	47	0.36	13		11	0.22	20		0		31
19			0.08	46		36	0.44	2	0.24	19	0.25	12	0.11	1	0.16	11	0.07	47		28		8
20			0.16	27		44	0.22	11	0.38	12	0.29	5	0.25	29	0.31	5	0.08	34		55		32
21			0.15	64		26	0.25	23	0.34	55	0.16	17	0.32	3	0.02	35	0.09	6	0.06	2		38
22			0.32	60	0.02	66	0.25	0*	0.28	29	0.30	19	0.30	17	0.35	23	0.08	33		37		29
23			0.22	53	0.29	14	0.24	11	0.26	21	0.30	15	0.01	5		5	0.05	17	0.00*	20		23
24			0.13	45	0.24	56	0.13	25	0.00	9	0.34	5	0.30	0	0.00*	5	0.09	45	0.00*	6		53
25			0.01	51	0.24	39	0.30	13	0.14	12	0.19	14	0.22	29	0.00*	8	0.10	6	0.07	17		74
26			0.11	49	0.16	24	0.29	19	0.38	14	0.17	11	0.18	12	0.29	20	0.15	8	0.00*	97		19
27			0.06	21	0.22	44	0.17	9	0.25	43	0.42	5	0.32	6	0.12	1	0.35	26	0.23	58		38
28			0.24	42	0.03	17	0.07	11		26	0.22	12	0.19	12	0.25	0		10	0.11	48		5
29			0.04	36	0.13	10	0.18	25		38	0.19	25	0.26	17		21	0.10	6		16		34
30			0.10	61	0.00	20	0.06	11			0.25	9	0.25	18	0.22	43		27		27		46
31			0.00	29			0.15	20			0.16	0	0.33	8				22				60
TOTAL			3.70		4.58		5.56		5.66		6.63		6.97		4.38		3.38		1.58		0.30	
TOTAL			1607		1348		608		530		434		420		352		486		856		1064	

Figure 2.14. Sample daily data listing from the evaporation file.

2.6.13. Monthly Snowfall

The command sequence

```
ACCESS
ELEMENT    SNOWFALL
STATION    032443
LIST       MONTHLY
```

produced the output shown in Figure 2.15. Specifying the word PARTIAL after MONTHLY on the LIST command card would delete the last column. (See example 2.6.4.)

The following special symbols are used to qualify the data:

- \- missing data during month;
- * accumulations during month;
- E estimated values during month;
- T trace total for month.

Only one symbol may be printed for a month, and the symbol is selected in the above order. Thus, if a minus sign appears, there may also be accumulations, estimated values or trace values during the month, but if a T is printed, there are neither missing data, accumulations nor estimated values.

Months during the period of record which are blank are assumed to have no snowfall. Monthly means are computed including these months, but excluding those months with missing data. The number of months printed is the number of months with complete records. The mean annual snowfall is obtained as the sum of the monthly means. Annual totals are computed for all years, but the ratio of the annual total to the annual mean is obtained only for years with no missing data.

FAYETTEVILLE FAA AP WASHINGTON STATION NO. 03-2443

TOTAL MONTHLY SNOWFALL IN INCHES

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL	% AVE
1963	0.2	T	T									4.0	4.2	39
1964	0.8	T	5.4								T	T	6.2	57
1965	3.0	2.7	6.7									T	12.4	114
1966	6.0	6.1	T								T	3.0	15.1	138
1967	T	7.0	5.5								T	0.8	13.3	122
1968	T	0.5	15.0								T	T	15.5	142
1969	T	2.0	0.7								0.2	5.0	7.9	72
1970	5.1	1.2	10.2								T	T	16.5	151
1971	T	3.0	3.0	0.2							4.0	2.5	12.7	116
1972	0.5	1.3									2.0	0.5	4.3	39
MEAN	1.6	2.4	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.6		
NO. OF MONTHS	10	10	10	10	10	10	10	10	10	10	10	10		
PERCENT ANNUAL	14.7	22.1	43.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	14.7		

MEAN ANNUAL SNOWFALL 10.9 INCHES

Figure 2.15. Sample monthly data listing from the snowfall file.

2.6.14. Daily Snowfall

The command sequence

```
ACCESS
ELEMENT    SNOWFALL
STATION    032443
PERIOD     1/1970 TO 12/1970
LIST       DAILY
```

produced the output shown in Figure 2.16.

The following special symbols are used to qualify the data:

M missing data;

* amount accumulated;

E estimated values;

T trace.

Combinations of the symbols may be printed as appropriate.

FAYETTEVILLE FAA AP WASHINGTON 03-2443

DAILY SNOWFALL AND SNOW DEPTH ON GROUND IN INCHES

1970

	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
1	0.0	5																			T	0		
2	0.0	3	1.2	1																				
3	0.0	2																			T	0		
4	0.0	1																						
5	4.0	1																						
6	1.0	7																						
7	0.0	7																						
8	0.0	6																						
9	0.0	6																						
10	0.0	5																						
11	0.0	4			0.2	T																	T	0
12	0.0	2			T	T																		
13	0.0	1																						
14	0.0	T																						
15	0.0	T																						
16					10.0	10																		
17																								
18	T	T																						
19	T	1																						
20	T	1																						
21	0.1	1			T	0																		
22	0.0	1																						
23																								
24																								
25																								
26																								
27																								
28																								
29																								
30																								
31																								
TOTAL	5.1		1.2		10.2																0.0		0.0	

Figure 2.16. Sample daily data listing from the snowfall file.

2.6.15. Daily Event

The command sequence

```
ACCESS
ELEMENT   EVENT
STATION   033165
PERIOD    1/1971 TO 12/1971
LIST      DAILY
```

produced the output shown in Figure 2.17.

Days with occurrences of various types of weather phenomena are listed in this table. Keys identifying the various letter codes are printed at the bottom of the table.

Since the regularity with which this information is collected varies for different observers, the data should be used with caution.

HARRISON FAA AIRPORT BOONE 03-3165

OCCURRENCES

1971	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1					T	T						
2						T			T	T		
3	T	G					T					
4		T										
5												
6			T	B	T				T			
7		G				T						
8							T					
9							T					T
10					T		T	T				
11						T						
12						T						
13												T
14			T				T	T				
15									T			
16		T										
17						T						
18												
19					T							
20				T								
21		T										
22				T	T	T						
23					T	T	T					
24												
25				T			T	T	T			
26						T						
27						T	T				T	
28						T						
29				T		T	T					
30	S					T						
31	S											

KEY:

B - BLOWING SNOW
D - DUST, SANDSTORM
F - FOG
G - GLAZE
H - HAIL
M - SMOKE, HAZE
R - TORNADO
S - SLEET
T - THUNDER
W - HIGH WIND
Z - DRIZZLE

Figure 2.17. Sample daily data listing from the event file.

Chapter 3

The Processing Facilities

3.1. Introduction

The processing facilities of AWRMIS are capable of performing routine types of statistical analysis on the cataloged data stored by the system. Thus, a user may obtain practical results without becoming involved in the complexities of data manipulation and programming.

Processing is performed on data identified by the preceding access request. Therefore, a user must be proficient in the use of the access facilities of AWRMIS in order to utilize the processing facilities (see Chapter 2).

The programs now in the system are revisions of the Hydrologic Information Storage and Retrieval System (HISARS) programs, developed by E. H. Wiser, Department of Biological and Agricultural Engineering, North Carolina State University. Additional programs will be added as specific needs are recognized and as added time and funding becomes available.

3.2. AWRMIS Command Language Specifications for the Processing Facilities

The AWRMIS command language specifications for the processing facilities consist of a set of English language words. The command language is used to request the action or actions which are to be performed by AWRMIS in order to get a desired output.

The following commands constitute the processing facilities of AWRMIS:

PROCESS
(Processing Request Card)
(Optional Parameter Cards)

The command word PROCESS is punched starting in Column 1. Information in the Processing Request card must start in Column 1, but information in the Optional Parameter cards must start in Column 2 or later.

A PROCESS card followed by a Processing Request card and Optional Parameter card constitutes a single process request. Several process requests may follow a single access request, in which case all processing is carried out on the same data.

3.2.1. Processing Request Card

The Processing Request card must contain one or more names that identify the types of processing requested. Permissible names are given with the program specifications in Section 3.6. The only formatting restrictions are that the first name must start in Column 1, and not more than one card may be used. Further information on multiple processing requests is given in Section 3.3.1.

3.2.2. Parameter Cards

Some of the processing programs do not require any parameters for execution, whereas others require one or more parameters. Parameter requirements are given in the program specifications in Section 3.6. The specifications also list default values that will be supplied automatically unless replaced by the user. Thus, if no parameter cards are included in the access group, standard system defaults will be used.

If the user wishes to provide parameter values, he needs to give only those values which are not satisfactory by default. Two further options exist:

A) The same parameter values are to be used in processing the data for all stations. In this case, only one group of parameter cards is used, and the list of parameters applies to all stations.

B) Different parameter values are to be used in processing the data for all stations. In this case, one group of parameter cards is used for each station, and the parameters apply to that station only. The

station number is punched first on the first card, starting in Column 2 or later, and the list of parameters follow. The parameter cards must be ordered so that the station numbers are in the same order as retrieved by the access group.

The list of parameters for either case contains the identifying name and value for each parameter. Column 1 may not be used, but the only other formatting requirement is that the name and value must each be punched without intervening spaces. The parameters may be punched in any order, and punctuation between parameters is optional.

The list of parameters will normally be punched on a single card. However, particularly when using the LENGTH or CLASS parameters, the length of the list may be too long for a single card. In this case, the list can be interrupted at any convenient point and continued on the next card, subject to two conventions:

A) A numerical value cannot be split across two cards;

B) The identification of the parameter being continued must be repeated on the second and following cards, leaving Col. 1 blank.

An example of this usage is shown in example 3.6.10.

3.3. Optional Features

A number of options are available that add flexibility in the use of the processing facilities. While the optional features do not add any features not previously discussed, they do permit somewhat more freedom of use.

3.3.1. Multiple Processing

In section 3.2., the possibility of processing one set of data in several ways was discussed. When this is done using several processing groups, the user retains control of the ordering of the output.

It is also possible, under certain restrictions, to execute several processing programs with a single processing group. This is done by listing

more than one name on the Processing Request card, and putting all parameters together on the Optional Parameter card.

The programs are assumed to fall into several natural categories, and only programs which are in the same category may be used together. The categories are:

A) General statistics

DAILY STATISTICS	(DA TIS)
MONTHLY STATISTICS	(MON TIS)
DAILY FREQUENCY	(DA FRE)
MONTHLY FREQUENCY	(MON FRE)
HIGHEST or MAXIMUM	(HIG or MAX)
LOWEST or MINIMUM	(LOW or MIN)
RANK ORDER	(RAN)
MONTHLY MASS ANALYSIS	(MON MAS)

B) Flow analysis programs

MAXIMUM FLOW ANALYSIS	(MAX FLO)
MINIMUM FLOW ANALYSIS	(MIN FLO)
MONTHLY MASS FLOW ANALYSIS	(MON MAS FLO)
FLOW DURATION TABLE	(FLO DUR TAB)
FLOW DURATION CURVE	(FLO DUR CUR)

C) Multiple-station programs

CORRELATION	(COR)

The occurrence of a single identifiable name applies it to all possible programs on the card. Thus, if the Processing Request card contained

DAILY AND MONTHLY STATISTICS AND FREQUENCY

four programs would be executed. Similarly, if the card contained

DAILY AND MONTHLY STATISTICS AND MASS ANALYSIS

expected results would be obtained, but a warning message would also be printed that the daily mass analysis was not yet supported.

Programs are executed in order as listed above regardless of ordering on the Processing Requests card.

3.3.2. Abbreviations

Since the entire words in the names as listed in Section 3.6. are not required to determine the programs uniquely, only short groups of letters

are used to identify the programs. Consequently, it is possible for the user to use these abbreviations if desired.

Abbreviations of the processing program names are given in parentheses in Section 3.3.1. above. Any occurrence of the letters in the combinations shown will lead to execution of the corresponding program. Thus, the Processing Request card

DAMONTIS FREMAXLOW RANMAS

would lead to execution of every program in the general statistics category (assuming data appropriate to each program were available).

To separate the two distinct uses of the words MAXIMUM and MINIMUM, the word FLO is searched for first. If it is found, only combinations in the flow analysis category will be identified. Otherwise, combinations in the other categories will be identified.

Only the first three letters of the parameter(s) need be specified.

3.4. System Defaults

The various system defaults applicable to the processing facilities are described in detail in section 3.6.

3.5. Access Method

The access method for use of the processing facilities is identical to those for use of the access facilities. For details, refer to section 2.5.

3.6. Processing Programs

The following program specifications are given for each of the processing programs now implemented in AWRMIS:

A) Name - The standardized name to be used on the Processing Request card:

B) Input file(s) - The data files which can be used to provide data for the program;

C) Output - Identification of output results obtained from the program;

D) Options - Optional features that are controlled by parameters;

E) Defaults - Standard system defaults are given;

F) Example - Showing the complete deck of AWRMIS cards required and corresponding output.

The AWRMIS deck is made up of the command cards that are necessary to produce the desired output. Section 2.5. illustrates the proper interlacing sequence of job control language (JCL) cards with the AWRMIS deck.

3.6.1. Statistical Analysis

Name - DAILY STATISTICS or MONTHLY STATISTICS*

Input file(s) - STREAMFLOW or RAINFALL

Output - The following results are tabulated for each month:

A) Number of observations;
B) Proportion of zeros;
C) Mean;
D) Standard deviation;
E) Variance;
F) Third moment;
G) Fourth moment;
H) Serial correlation.

Options - Processing period

Defaults - ONLY JANUARY TO ANNUAL

Example - The command sequence

```
ACCESS
ELEMENT    STREAMFLOW
STATION    07257000
PROCESS
MONTHLY STATISTICS
  ONLY JANUARY TO ANNUAL
```

produced the output shown in Figure 3.1.

* If DAILY STATISTICS is used, the analysis is made on daily values from the input files. If MONTHLY STATISTICS is used, the analysis is made on monthly totals. In the latter case, the serial correlation is between months, and the number of pairs used for calculation is also given.

BIG PINEY CREEK NEAR DOVER, ARK. POPE STATION NO. 07.2570.00

STATISTICAL ANALYSIS OF MONTHLY STREAMFLOW
10/1950 TO 09/1971

MONTH	NUMBER OF OBS.	PROPORTION OF ZEROS	MEAN	STANDARD DEVIATION	VARIANCE	THIRD MOMENT	FOURTH MOMENT	SERIAL CORRELATION
JANUARY	21	0.0000	1.2035E+04	9.8848E+03	9.7710E+07	1.2531E+12	4.5711E+16	0.7786 (21)
FEBRUARY	21	0.0000	1.8124E+04	1.3678E+04	1.8709E+08	2.5597E+12	1.0973E+17	0.2291 (21)
MARCH	21	0.0000	2.3419E+04	1.4829E+04	2.1991E+08	2.2346E+12	1.0947E+17	-0.2569 (21)
APRIL	21	0.0000	2.7270E+04	1.8262E+04	3.3349E+08	1.0248E+13	7.1447E+17	0.3478 (21)
MAY	21	0.0000	2.2177E+04	1.6086E+04	2.5877E+08	4.8591E+12	2.3844E+17	0.4900 (21)
JUNE	21	0.0000	5.3760E+03	8.2574E+03	6.8184E+07	1.4779E+12	4.1265E+16	0.3641 (21)
JULY	21	0.0000	2.8035E+03	3.4978E+03	1.2235E+07	4.8021E+10	4.1294E+14	0.1705 (21)
AUGUST	21	0.0000	1.3280E+03	2.7439E+03	7.5292E+06	7.2031E+10	8.2627E+14	0.3795 (21)
SEPTEMBER	21	0.0476	1.5721E+03	3.1660E+03	1.0024E+07	1.1343E+11	1.5394E+15	-0.0221 (21)
OCTOBER	21	0.0476	3.7499E+03	5.9327E+03	3.5197E+07	3.7277E+11	6.1412E+15	0.7169 (20)
NOVEMBER	21	0.0476	9.0598E+03	1.1744E+04	1.3793E+08	2.7864E+12	1.1222E+17	0.2912 (21)
DECEMBER	21	0.0000	1.0776E+04	1.1620E+04	1.3502E+08	2.0042E+12	6.7946E+16	0.3698 (21)
ANNUAL	252	0.0119	1.1474E+04	1.4241E+04	2.0281E+08	5.2937E+12	2.9042E+17	

Figure 3.1. Sample output of statistical analysis on monthly streamflow data.

3.6.2. Frequency Analysis

Name - DAILY FREQUENCY or MONTHLY FREQUENCY

Input file(s) - STREAMFLOW or RAINFALL

Output - The standard statistics are listed in tabular form, including those listed in the statistical summary, as well as deciles and quartiles. A plot of the cumulative frequency distribution is also printed. There is a separate output for each month, and also for the entire year.

Options - Processing period

RANGE*

Defaults - ONLY JANUARY TO ANNUAL

Daily streamflow - RANGE 0 to 1000

Monthly streamflow - RANGE 0 to 10000

Daily rainfall - RANGE 0 to 1

Monthly rainfall - RANGE 0 to 10

Example - The command sequence

```
ACCESS
ELEMENT    RAINFALL
STATION    033235
PROCESS
DAILY FREQUENCY
   ONLY APRIL          RANGE 0 to 0.75
```

Produced the output shown in Figure 3.2.

* The values of the RANGE parameter are the limits of the plot of the cumulative frequency distribution. Varying the value of the RANGE paremeter does not affect the statistical computations.

HECTOR POPE STATION NO. 03-3235

FREQUENCY ANALYSIS OF DAILY RAINFALL FOR THE MONTH OF APRIL
01/1963 TO 12/1972

MAXIMUM VALUE	=	3.74				S(X)	= 4.2909E+01
UPPER DECILE	=	0.50	NUMBER OF OBS.	=	300	S(X*X)	= 5.2359E+01
UPPER QUARTILE	=	0.05	MEAN	=	0.143	S(X*X*X)	= 1.0397E+02
MEDIAN	=	0.00	STD. DEVIATION	=	0.393	S(X*X*X*X)	= 2.7758E+02
LOWER QUARTILE	=	0.00	SKEWNESS	=	4.589	3RD MOMENT	= 2.7753E-01
LOWER DECILE	=	0.00	KURTOSIS	=	28.475	4TH MOMENT	= 7.4715E-01

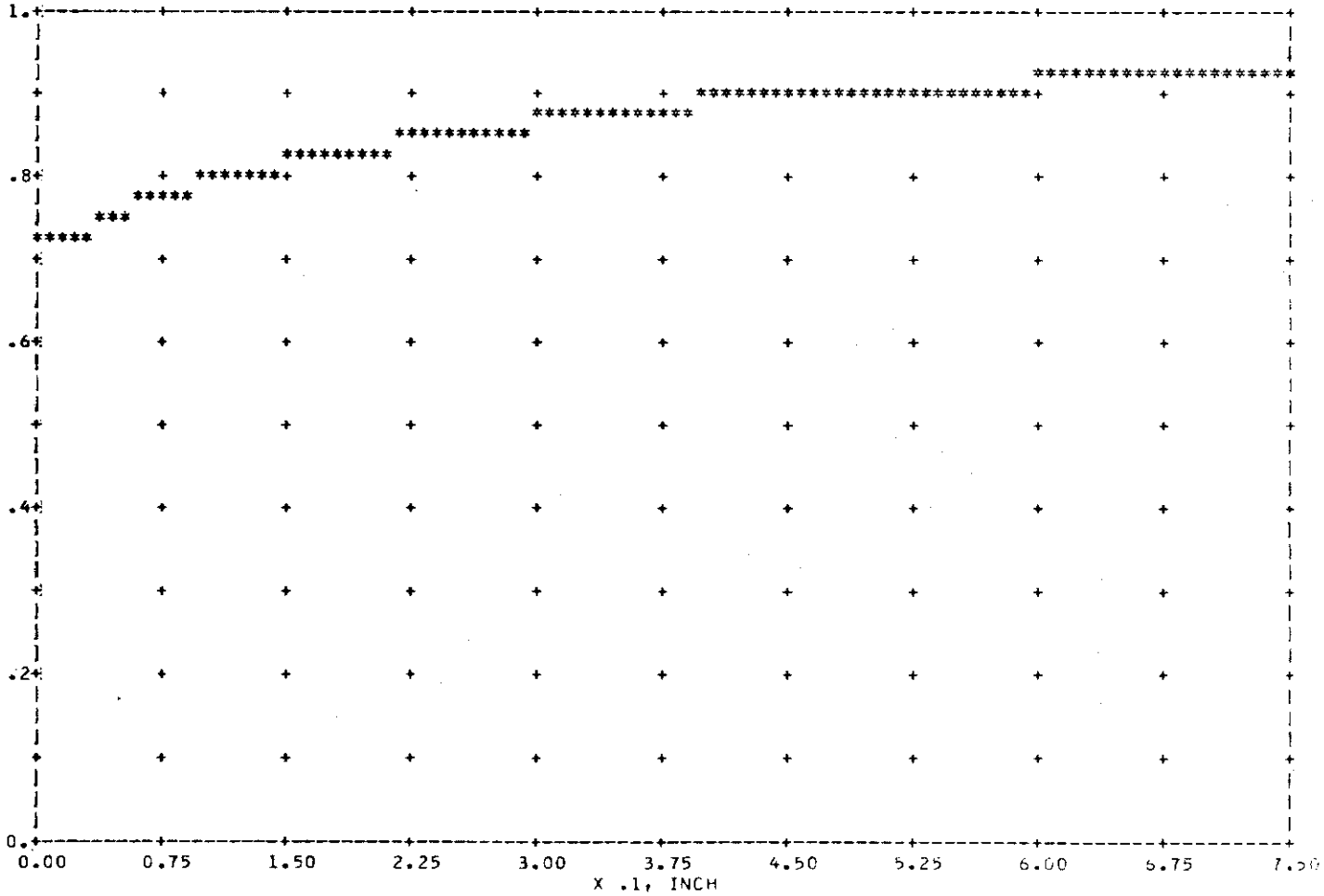


Figure 3.2. Sample output of frequency analysis on daily rainfall data.

3.6.3. Highest/Maximum Value

Name - HIGHEST or MAXIMUM

Input file(s) - RAINFALL or TEMPERATURE

Output - Tabulation of the highest daily maximum and minimum temperatures for each month.

Options - Processing period

Defaults - ONLY JANUARY TO ANNUAL

Example - The command sequence

```
ACCESS
ELEMENT    TEMPERATURE
STATION    036352
PROCESS
MAXIMUM
```

produced the output shown in Figure 3.3.

RUSSELLVILLE 4 N POPE STATION NO. 03-6352

HIGHEST DAILY MAXIMUM AND MINIMUM TEMPERATURES IN DEGREES F.

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
1963	72	73	90	91	93	102	105	103	96	99	83	68	105
	44	42	64	67	70	76	74	75	70	65	67	40	76
1964	75	66	76	86	93	100	105	108	95	86	92	71	108
	50	43	60	68	69	74	73	74	68	58	61	45	74
1965	74	70	76	91	87	96	100	99	98	89	80	74	100
	49	47	52	61	72	69	73	69	70	61	57	54	73
1966	68	68	88	86	90	99	105	99	91	90	78	76	105
	56	50	56	61	65	67	72	73	66	65-	58	60	73
1967	75	76	91	87	94	96	97	97	88	90	78	71	97
	47	45	60	62-	64	68	69	72	69	62	54	53	72
1968	68	67-	83	83	89	94	96	98	94	88	79	63	98
	53	54-	59	67	67	71	72	75	69	65	57	52	75
1969	76	67	83	88	91	98	98-	96-	94	94	75	68	98
	51	42	49	63	63	77	75	74	71	71	57	43	77
1970	77	70	77	87	91	97	101-	101	97	87	78	78	101
	49	46	55	71	67	73	74	77	73	68	55	61	77
1971	71	74	83	85	88	100							100
	47	58	55	65	76	70							76
1972			80	90	91	99	100	103	98	87	72	70	103
			62	71	63	70	72	71	73	64	60	49	73

Figure 3.3. Sample output of highest/maximum value of the daily temperature file.

3.6.4. Lowest/Minimum Value

Name - LOWEST or MINIMUM

Input file(s) - TEMPERATURE

Output - Tabulation of lowest daily maximum and minimum temperatures for each month.

Options - Processing period

Defaults - ONLY JANUARY TO ANNUAL

Example - The command sequence

```
ACCESS
ELEMENT    TEMPERATURE
STATION    036352
PROCESS
MINIMUM
```

produced the output shown in Figure 3.4.

RUSSELLVILLE 4 N POPE STATION NO. 03-6352

LOWEST DAILY MAXIMUM AND MINIMUM TEMPERATURES IN DEGREES F.

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
1963	25	40	57	63	65	82	85	85	76	69	55	27	25
	3	8	27	38	36	59	56	56	39	33	21	2	2
1964	35	42	50	63	66	78	82	69	66	63	44	31	31
	2	13	20	31	44	47	54	44	45	28	12	6	2
1965	38	39	33	69	80	82	87	86	70	67	49	45	33
	9	9	11	34	41	53	56	55	39	27	18	18	9
1966	25	34	42	60	64	81	89	75	70	55	43	36	25
	-5	11	15	25	40	45	61	51	44	27-	18	9	-5
1967	30	33	47	59	67	76	78	82	63	63	4[illegible]	37	30
	7	10	12	36-	36	49	50	48	35	33	26	16	7
1968	25	35-	42	58	69	75	83	80	75	64	40	37	25
	6	17-	17	30	43	53	55	57	46	30	24	15	6
1969	35	38	44	68	70	75	94-	83-	79	51	46	33	33
	10	21	19	36	38	44	61	58	50	32	16	22	10
1970	25	30	38	58	72	67	86-	80	70	62	37	40	25
	1	12	22	30	38	53	53	59	44	34	12	17	1
1971	34	28	42	54	73	85							26
	11	8	16	26	39	61							8
1972			51	54	67	79	77	88	70	53	38	28	28
			26	30	45	48	53	59	44	34	22	18	18

Figure 3.4. Sample output of lowest/minimum value of the daily temperature file.

3.6.5. Extreme Values

Name - EXTREME

Input file(s) - TEMPERATURE

Output - Tabulation of extreme values for each month

Options - Processing period

Defaults - ONLY JANUARY TO ANNUAL

Example - The command sequence

```
ACCESS
ELEMENT   TEMPERATURE
STATION   036352
PROCESS
EXTREME
```

produced the output shown in Figure 3.5.

RUSSELLVILLE 4 N POPE STATION NO. 03-6352

TEMPERATURE EXTREMES IN DEGREES F.

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
1963	72	73	90	91	93	102	105	103	96	99	83	68	105
	3	8	27	38	36	59	56	56	39	33	21	2	2
1964	75	66	76	86	93	100	105	108	95	86	92	71	108
	2	13	20	31	44	47	54	44	45	28	12	6	2
1965	74	70	76	91	87	96	100	99	98	89	80	74	100
	9	9	11	34	41	53	56	55	39	27	18	18	9
1966	68	68	88	86	90	99	105	99	91	90	78	76	105
	-5	11	15	25	40	45	61	51	44	27-	18	9	-5
1967	75	76	91	87	94	96	97	97	88	90	78	71	97
	7	10	12	36-	36	49	50	48	35	33	26	16	7
1968	68	67-	83	83	89	94	96	98	94	88	79	63	96
	6	17-	17	30	43	53	55	57	46	30	24	15	6
1969	76	67	83	88	91	98	98-	96-	94	94	75	68	98
	10	21	19	36	38	44	61	58	50	32	16	22	10
1970	77	70	77	87	91	97	101-	101	97	87	78	78	101
	1	12	22	30	38	53	53	59	44	34	12	17	1
1971	71	74	83	85	88	100							100
	11	8	16	26	39	61							8
1972			80	90	91	99	100	103	98	87	72	70	103
			26	30	45	48	53	59	44	34	22	18	18

Figure 3.5. Sample output of extreme values of the daily temperature file.

3.6.6. Rank Ordering

Name - RANK ORDER

Input file(s) - STREAMFLOW or RAINFALL

Output - Listing of the n largest amounts and their dates ranked from largest to smallest, where n is five times the number of years of record.

Options - Processing period

Defaults - ONLY JANUARY TO ANNUAL (for the historical record)

Example - The command sequence

```
ACCESS
ELEMENT    STREAMFLOW
STATION    07257000
PROCESS
RANK ORDER
```

produced the output shown in Figure 3.6.

BIG PINEY CREEK NEAR DOVER, ARK. POPE STATION NO. 7.2570..0

LARGEST DAILY STREAMFLOW IN DESCENDING ORDER (CFS)
10/1950 TO 09/1971
ANNUAL

27000.0	2/ 9/1966	7980.0	11/ 4/1959	5960.0	5/ 3/1958	4700.0	4/16/1954	4080.0	11/22/1961
22600.0	4/ 3/1957	7820.0	5/ 5/1961	5950.0	3/ 9/1964	4700.0	4/ 4/1968	4060.0	2/21/1951
15400.0	3/20/1968	7720.0	11/25/1951	5920.0	11/25/1952	4670.0	12/ 6/1960	4000.0	2/16/1951
14300.0	1/30/1969	7560.0	4/24/1953	5750.0	4/19/1959	4630.0	4/22/1952	3920.0	5/14/1957
12900.0	5/ 6/1961	7540.0	6/13/1957	5650.0	3/17/1953	4630.0	3/ 6/1961	3880.0	4/ 6/1964
11600.0	1/29/1969	7480.0	4/24/1966	5630.0	4/30/1957	4530.0	5/ 4/1961	3830.0	5/23/1952
10700.0	5/ 2/1954	7300.0	2/10/1966	5610.0	2/ 2/1956	4500.0	4/24/1970	3780.0	5/21/1960
10600.0	2/20/1951	7070.0	3/20/1955	5560.0	4/23/1966	4460.0	5/13/1957	3740.0	4/26/1957
10200.0	5/11/1964	6990.0	3/14/1953	5540.0	3/24/1969	4450.0	5/24/1957	3690.0	2/17/1956
10000.0	4/25/1970	6880.0	5/20/1960	5500.0	4/21/1955	4340.0	1/2[illegible]/1954	3670.0	11/26/1951
9690.0	3/10/1952	6830.0	5/12/1953	5310.0	5/23/1957	4310.0	11/16/1958	3670.0	5/ 7/1961
9560.0	2/20/1955	6630.0	4/27/1957	5190.0	4/29/1953	4290.0	2/ 2/1968	3670.0	12/21/1965
9400.0	5/ 6/1960	6600.0	6/12/1959	5190.0	2/18/1956	4280.0	1/30/1968	3650.0	3/ 8/1958
9170.0	4/12/1952	6550.0	1/ 2/1966	5170.0	12/27/1968	4270.0	4/2[illegible]/1957	3650.0	10/26/1970
9130.0	4/ 5/1964	6540.0	1/29/1968	5010.0	4/13/1952	4270.0	10/ 5/1959	3560.0	3/22/1952
8930.0	4/ 4/1957	6430.0	8/ 2/1958	5000.0	5/25/1957	4270.0	4/2[illegible]/1968	3560.0	11/19/1954
8810.0	11/24/1951	6260.0	3/21/1955	5000.0	4/26/1970	4210.0	4/25/1957	3560.0	3/ 7/1961
8460.0	12/22/1968	6260.0	12/28/1968	4920.0	5/ 9/1958	4160.0	2/19/1951	3480.0	6/10/1957
8400.0	5/14/1968	6230.0	3/11/1952	4910.0	4/29/1957	4150.0	3/ 9/1958	3450.0	3/15/1953
8360.0	3/18/1953	6120.0	11/17/1958	4820.0	5/13/1953	4140.0	3/25/1958	3450.0	5/ 4/1954
8280.0	3/21/1968	5980.0	2/18/1951	4820.0	12/11/1960	4130.0	2/ 1/1968	3450.0	5/1[illegible]/1956

Figure 3.6. Sample output of rank ordering on daily streamflow data.

3.6.7. Mass Analysis

Name - MONTHLY MASS FLOW ANALYSIS or MONTHLY MASS ANALYSIS*

Input file(s) - STREAMFLOW or RAINFALL

Output - A plot through time of the accumulated total

Options - SCALE**

- INTERVAL***

- RATE****

Defaults - Monthly streamflow, SCALE = 100000

- Monthly rainfall, SCALE = 10

- INTERVAL = 1

- RATE = 0

* The name MONTHLY MASS FLOW ANALYSIS applies only to the streamflow file. MONTHLY MASS ANALYSIS may be used with the rainfall file.

** SCALE refers to units per inch of plot. The units are volume units equivalent to the data units. Selection of too small a value for SCALE will cause the axis to be labeled so often that the plot will not be visible.

*** INTERVAL refers to the number of time units per line of plot. The length of the graph, particularly for daily values, may be reduced by varying this parameter. However, corresponding detail will be lost.

**** RATE is a specified constant rate. This parameter is designed primarily for streamflow analysis by the Rippl method, but it can also be used for other purposes such as the effect of moving a rain gage. If RATE = 0, only the basic plot is produced (line formed by *). If RATE > 0, the following additional output is produced:

A) Plots of a constant rate, extending across periods of deficient accumulations (line formed by +);

B) Values of the deficiencies, listed along the right margin in scientific notation.

Examples - The command sequence

```
ACCESS
ELEMENT    STREAMFLOW
STATION    07257000
PROCESS
MONTHLY MASS FLOW ANALYSIS
  SCALE = 70000   RATE = 350
```

produced the output shown in Figure 3.7.

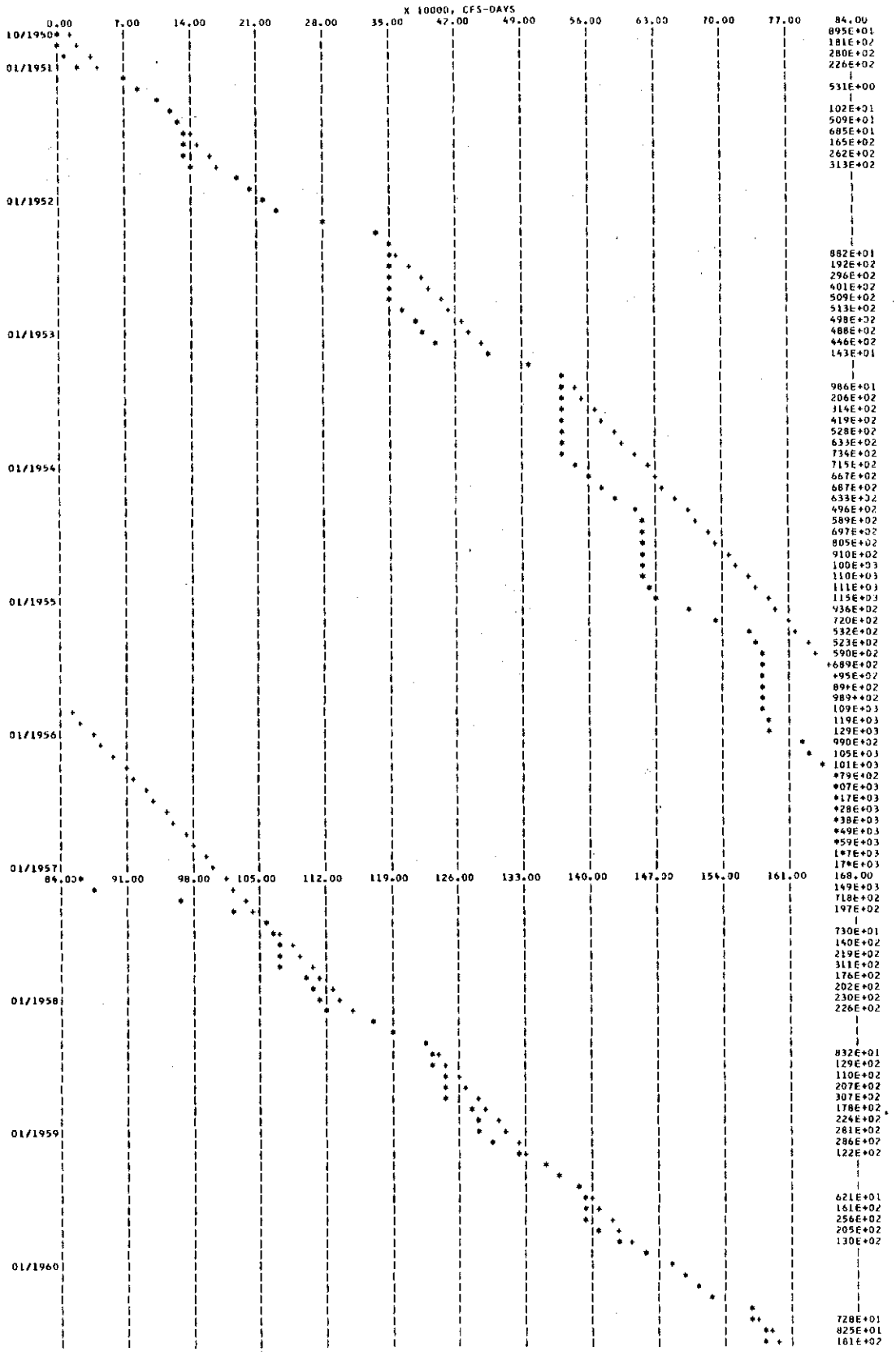


Figure 3.7. Sample output of mass analysis on monthly streamflow data.

3.6.8. Interstation Correlation

Name - CORRELATION

Input file(s) - RAINFALL

Output - Cross-correlations between daily values for each pair of up to 10 stations, with the number of pairs of days used in the calculations. Results are listed in tabular form for each month.

Options - PROCESSING PERIOD

Defaults - ONLY JANUARY TO ANNUAL

Example - The command sequence

```
ACCESS
ELEMENT    RAINFALL
STATION    030178
           030460
           030806
           030936
           031442
           031632
           031962
           032574
           033235
           036352
PERIOD     1/1963 to 7/1970
PROCESS
CORRELATION
   ONLY APRIL
```

produced the output shown in Figure 3.8.

CORRELATION ANALYSIS OF DAILY RAINFALL - APRIL
01/1963 TO 07/1970

STATIONS:

0178	03-0178	ANTOINE	PIKE
0460	03-0460	BATESVILLE L AND D 1	INDEPENDENCE
0806	03-0806	BLYTHEVILLE	MISSISSIPPI
0936	03-0936	BRINKLEY	MONROE
1442	03-1442	CLARENDON	MONROE
1632	03-1632	CORNING	CLAY
1962	03-1962	DERMOTT 3 NE	CHICOT
2574	03-2574	FORT SMITH WB AIRPORT	SEBASTIAN
3235	03-3235	HECTOR	POPE
6352	03-6352	RUSSELLVILLE 4 N	POPE

	0178	0460	0806	0936	1442	1632	1962	2574	3235	6352
0178	1.0000	0.4019 240	0.4323 240	0.6105 240	0.5965 240	0.3839 240	0.2293 210	0.0536 240	0.4459 210	0.3737 240
0460		1.0000	0.6414 240	0.5256 240	0.4967 240	0.7400 240	0.0611 210	0.1012 240	0.6639 210	0.4228 240
0806			1.0000	0.7399 240	0.6852 240	0.5991 240	0.2215 210	-0.0110 240	0.5467 210	0.2259 240
0936				1.0000	0.8748 240	0.4847 240	0.2311 210	-0.0137 240	0.5499 210	0.2632 240
1442					1.0000	0.4743 240	0.2260 210	-0.0132 240	0.4642 210	0.1813 240
1632						1.0000	0.1972 210	0.0490 240	0.5491 210	0.3095 240
1962							1.0000	0.0647 210	0.1017 180	0.0729 210
2574								1.0000	0.1548 210	0.5658 240
3235									1.0000	0.6676 210
6352										1.0000

Figure 3.8. Sample output of interstation correlation of daily rainfall.

3.6.9. Maximum/Minimum Flow Analysis

Name - MAXIMUM FLOW ANALYSIS or MINIMUM FLOW ANALYSIS*

Input file(s) - STREAMFLOW

Output - A listing of the average maximum/minimum flows for each of up to 10 period lengths in days for each year for the period of record. Statistics of the frequency distribution are given, and the 10-year frequency discharge is also listed. Results are in cubic feet per second (cfs), unless an area is given, in which case the results are converted to cubic feet per second per square mile (cfsm).

Options - AREA - The drainage area, if results in cfsm are desired;

LENGTH - Length of periods required.

Defaults - AREA = 1

LENGTH = 7, 30, 60, 90, 120, 183, 274.

Example - The command sequence

```
ACCESS
ELEMENT   STREAMFLOW
STATION   07257000
PROCESS
MINIMUM FLOW ANALYSIS
  Length = 1, 3, 7, 10, 15, 30, 45
```

produced the output shown in Figure 3.9.

* For maximum flow analysis, a water year (October-September) is used. For minimum flow analysis, a climatic year (April-March) is used. Values are listed only for complete years.

BIG PINEY CREEK NEAR DOVER, ARK. POPE STATION NO. 07.2570.00

LOW FLOW ANALYSIS FOR YEAR BEGINNING APRIL 1
MEAN MINIMUM DISCHARGE
CFS
LENGTH OF PERIOD, DAYS

YEAR	1	3	7	10	15	30	45
1951-52	5.70	6.07	6.61	7.32	9.61	23.07	24.09
1952-53	0.00	0.00	0.06	0.10	0.12	0.18	0.18
1953-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1954-55	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1955-56	0.30	0.33	0.46	0.65	0.79	1.71	2.79
1956-57	0.00	0.00	0.00	0.00	0.00	0.00	0.03
1957-58	8.60	9.77	11.76	12.43	16.75	28.16	61.36
1958-59	6.60	7.13	8.86	10.40	13.18	19.17	20.98
1959-60	5.40	5.80	6.71	7.83	9.82	16.84	19.91
1960-61	2.70	2.90	3.17	3.57	4.21	4.83	5.72
1961-62	9.00	10.33	13.14	16.00	24.07	59.1[illegible]	60.71
1962-63	3.70	4.17	5.43	5.85	7.63	23.58	31.92
1963-64	0.00	0.00	0.00	0.00	0.00	0.00	0.02
1964-65	0.00	0.00	0.00	0.00	0.05	0.75	1.14
1965-66	1.10	1.20	1.46	1.74	2.54	5.01	12.38
1966-67	0.30	0.30	0.33	0.35	0.38	0.57	0.77
1967-68	2.90	3.20	3.90	4.42	5.29	9.6[illegible]	10.21
1968-69	1.50	1.53	2.00	2.15	2.43	8.39	17.34
1969-70	0.00	0.00	0.00	0.00	0.00	0.[illegible]	0.[illegible]3
1970-71	1.60	1.87	2.53	3.26	3.63	4.44	6.94
M	-1.26831	-1.24369	-1.03229	-0.97877	-0.76049	-0.50996	-0.01083
S	2.34816	2.36747	2.29209	2.31949	2.22988	2.35224	1.85067
G	-0.59087	-0.58959	-0.76243	-0.78322	-0.94423	-1.01619	-1.39432
Q 10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 3.9. Sample output of minimum flow analysis on daily streamflow data.

3.6.10 Flow Duration Table

Name - FLOW DURATION TABLE

Input file(s) - STREAMFLOW

Output - The first table gives the number of days that the flow was within various class intervals for each complete water year. The second table gives the frequency of discharges greater than or equal to each class interval.

Options - CLASS*

Defaults - CLASS = 1, 10, 100, 1000, 10000, 100000, 1000000

Example - The command sequence

```
ACCESS
ELEMENT    STREAMFLOW
STATION    07257000
PROCESS
FLOW DURATION TABLE
   CLASS 0.1  0.2  0.3  0.5  0.7  1  2  3  5
   CLASS 7  10  15  20  30  40  50  70  100
   CLASS 150  200  250  300  400  500  700  1000 2000
```

produced the output shown in Figure 3.10.

* Refers to upper limits of class intervals. Class intervals are listed in cubic feet per second (cfs), in cubic feet per second per square mile (cfsm), and as a ratio to the mean daily discharge. A maximum of 32 class intervals may be specified. The drainage area for the station is obtained from the index file, the column of class intervals in cubic feet per second per square mile (cfsm) is omitted.

BIG PINEY CREEK NEAR DOVER, ARK. POPE STATION NO. 07.257[illegible]0

FLOW DURATION TABLE

CLASS / WATER YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	NUMBER OF DAYS IN CLASS																										
1951	0	0	0	5	4	9	33	81	19	22	32	14	33	26	19	22	18	13	4	3	2	1	3	1	0	1	0
1952	6	11	19	13	10	31	8	11	6	9	6	12	36	29	28	28	29	21	16	4	4	5	1	2	4	0	0
1953	34	20	9	3	6	8	3	5	4	10	17	9	17	17	22	26	27	22	10	4	2	3	1	5	2	0	0
1954	3	6	5	3	15	25	5	8	10	16	28	18	25	10	7	10	11	7	3	2	0	1	2	0	0	1	0
1955	11	2	15	10	7	51	14	25	16	17	26	31	27	17	13	24	16	9	8	1	5	1	0	2	2	0	0
1956	7	2	3	5	19	72	26	37	14	12	25	16	20	9	9	14	13	7	3	1	0	3	0	2	0	0	
1957	2	0	0	1	11	26	27	32	14	16	21	18	15	9	7	30	26	29	15	7	3	6	5	4	2	0	1
1958	0	0	0	2	3	23	18	32	19	17	23	42	51	18	18	26	22	26	7	6	2	5	3	2	0	0	0
1959	0	0	0	6	9	46	17	17	7	24	44	18	53	26	21	21	23	19	5	2	0	3	1	3	0	0	0
1960	0	3	16	7	4	17	7	21	20	23	26	17	53	30	18	29	29	20	9	6	5	2	1	1	2	0	0
1961	0	0	0	16	17	27	17	26	24	31	49	21	19	11	7	30	23	21	9	3	2	6	4	0	1	1	0
1962	0	0	3	5	7	24	23	49	21	29	24	27	40	24	18	21	20	16	8	0	3	2	1	0	0	0	0
1963	22	14	17	11	11	24	14	23	43	40	34	30	29	13	11	6	6	4	1	0	1	0	0	0	0	0	0
1964	16	7	15	25	38	39	21	20	9	12	13	5	21	11	6	10	7	3	2	1	1	2	0	1	1	1	0
1965	6	4	21	23	13	27	11	24	20	35	34	28	34	25	10	16	10	15	4	2	0	3	0	0	0	0	0
1966	17	15	32	17	6	31	23	33	15	20	26	15	30	17	16	10	9	12	5	1	1	1	0	2	2	0	1
1967	12	9	15	20	16	53	31	40	15	21	24	14	19	11	8	9	9	4	4	0	0	3	0	0	0	0	0
1968	4	6	12	5	8	29	13	16	11	22	59	22	29	22	14	22	15	20	15	4	6	3	5	1	2	1	0
1969	8	3	7	6	5	17	23	19	10	19	15	24	32	25	17	35	21	12	6	2	3	5	0	3	1	2	0
1970	2	5	15	12	18	19	20	43	15	16	19	49	38	15	13	19	10	14	2	5	1	0	1	1	0	1	0
1971	7	4	8	8	15	26	11	12	1	11	39	25	43	36	23	35	25	10	4	0	1	2	0	0	0	0	0

TOTAL CFS-DAYS 289152.83
MEAN DAILY DISCHARGE 37.70

CLASS	CFS	TOTAL COUNTS	ACCUM	PERCENT	CFS/ SQ MI	CFS/ MEAN DAILY	CLASS	CFS	TOTAL COUNTS	ACCUM	PERCENT	CFS/ SQ MI	CFS/ MEAN DAILY
1	01.	157	7128	92.9	0.0	0.0	15	40	305	1801	23.5	0.1	1.1
2	02.	111	6971	90.9	0.0	0.0	16	50	443	1496	19.5	0.2	1.3
3	03.	212	6860	89.4	0.0	0.0	17	70	369	1053	13.7	0.3	1.9
4	05.	203	6648	86.7	0.0	0.0	18	100	304	684	8.9	0.4	2.7
5	07.	242	6445	84.0	0.0	0.0	19	150	140	380	5.0	0.5	4.0
6	1	624	6203	80.9	0.0	0.0	20	200	54	240	3.1	0.7	5.3
7	2	365	5579	72.7	0.0	0.1	21	250	42	186	2.4	0.9	6.6
8	3	574	5214	68.0	0.0	0.1	22	300	57	144	1.9	1.1	8.3
9	5	313	4640	60.5	0.0	0.1	23	400	28	87	1.1	1.5	10.6
10	7	422	4327	56.4	0.0	0.2	24	500	30	59	0.8	1.8	13.3
11	10	584	3905	50.9	0.0	0.3	25	700	19	29	0.4	2.6	18.6
12	15	455	3321	43.3	0.1	0.4	26	1000	8	10	0.1	3.6	26.5
13	20	664	2866	37.4	0.1	0.5	27	2000	2	2	0.0	7.3	53.1
14	30	401	2202	28.7	0.1	0.8							

Figure 3.10. Sample output of flow duration table for daily streamflow data.

3.6.11. Flow Duration Curve

Name - FLOW DURATION CURVE

Input - STREAMFLOW

Output - A plot of the frequency of discharge greater than or equal to given rates plotted in cubic feet per second (cfs), cubic feet per second per square mile (cfsm), and as a ratio to mean discharge.

Options - *

Defaults - *

Example - The command sequence

```
ACCESS
ELEMENT   STREAMFLOW
STATION   07257000
PROCESS
FLOW DURATION CURVE
   CLASS 0.1  0.2  0.3  0.5  0.7  1  2  3  5
   CLASS 7  10  15  20  30  40  50  70  100
   CLASS 150  200  250  300  400  500  700  1000  2000
```

produced the output shown in Figure 3.11.

* (same as for the flow duration table, 3.5.10.)

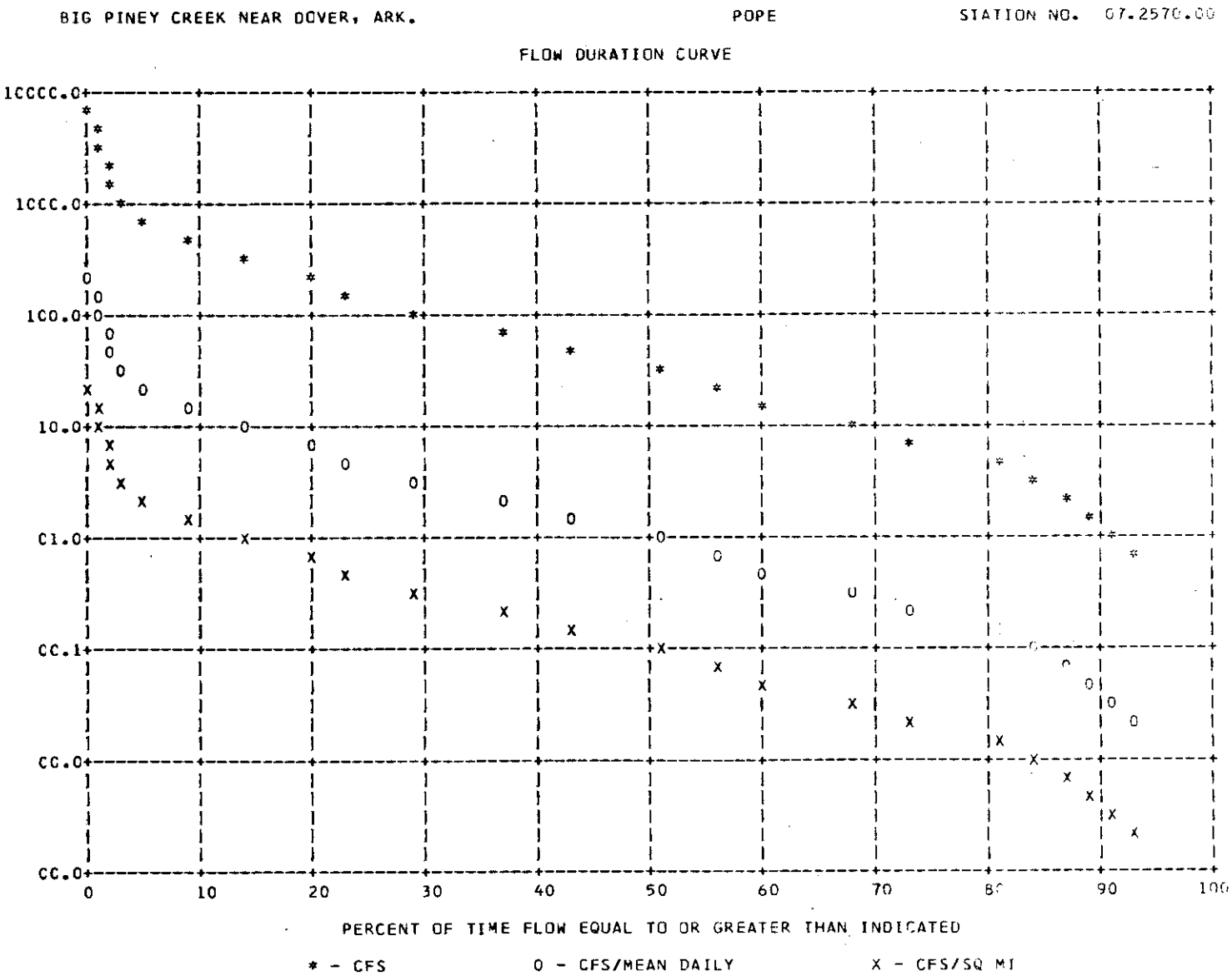


Figure 3.11. Sample output of flow duration curve for daily streamflow data.

ARKANSAS WATER RESOURCES MANAGEMENT INFORMATION SYSTEM

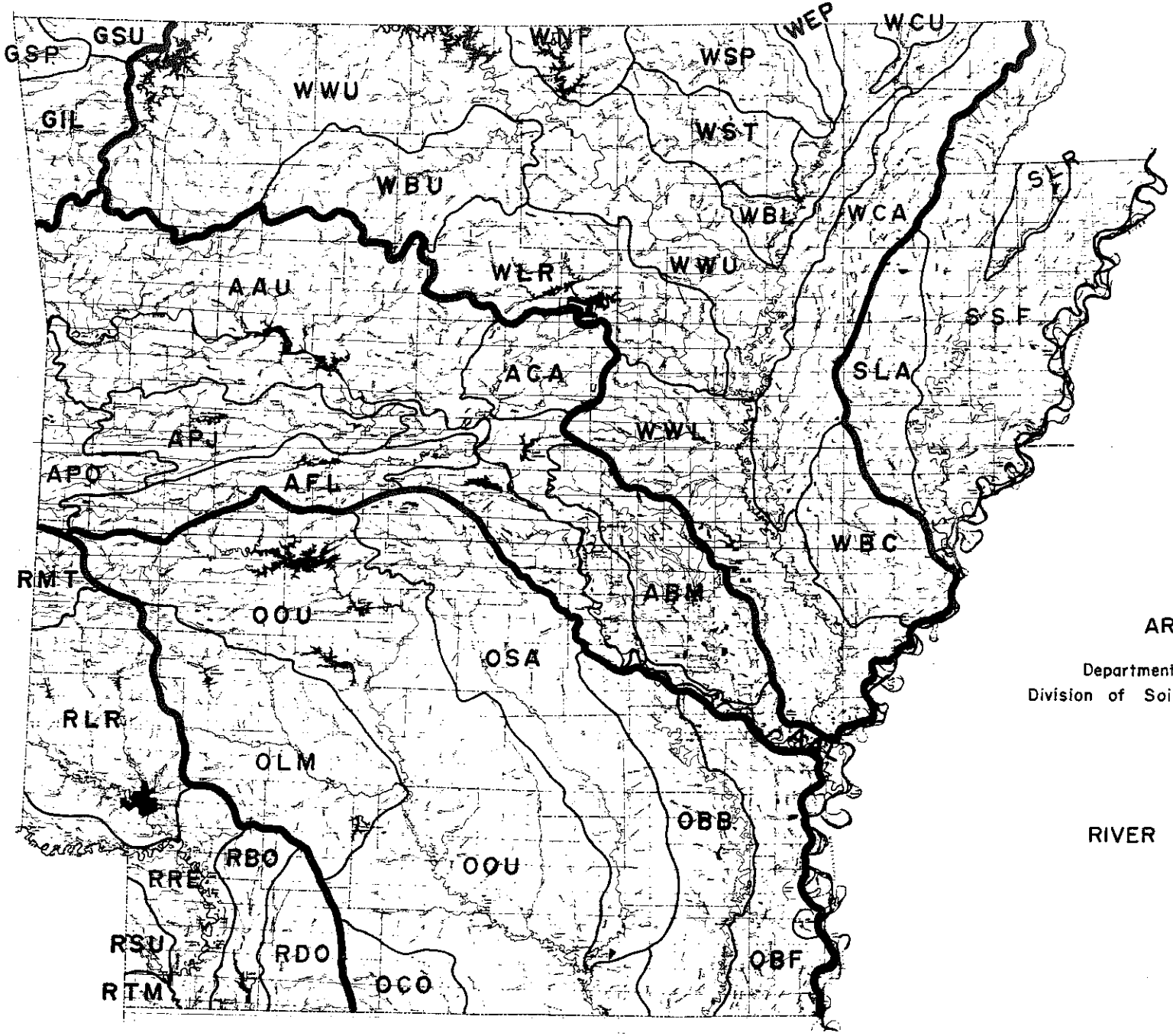
(AWRMIS)

USERS' MANUAL

APPENDIX I.

ARKANSAS DIVISION OF SOIL AND WATER RESOURCES

RIVER BASIN MAP



ARKANSAS

Department of Commerce
Division of Soil and Water Resources

RIVER BASIN MAP

AWRMIS RIVER BASINS AND SYMBOLS

	AWRMIS BASIN	AWRMIS SUBBASIN	NATL. W. S. ATLAS SUBBASIN
Mississippi	M		
All Areas		MMI	
Arkansas	A		
Arkansas (Upper)		AAU	B
Poteau River		APO	B23
Petit Jean Creek		APJ	B24
Fourche LaFave River		AFL	B26
Cadron Creek		ACA	B25
Arkansas (Lower)		AAL	7
Bayou Meto		ABM	7a
White	W		
White (Upper)		WWU	A
Buffalo River		WBU	A2
North Fork River		WNF	A3
Black River		WBL	A4
Spring River		WSP	A4b
Strawberry River		WST	A4c
Current River		WCU	A4a
Little Red River		WLR	A5
Cache River		WCA	6a
Big Creek		WBC	6b
Eleven Point		WEP	A4b(1)
White (Lower)		WWL	6
Red	R		
Red River		RRE	C
Little River		RLR	C12
Mountain Fork		RMT	C12a
Sulphur River		RSU	C13
Twelve Mile Bayou		RTM	C14
Bayou Dorcheat		RDO	C15a
Bayou Bodcau		RBO	C15a(1)

Grand Neosho	G		
Spavinaw Creek		GSP	B20
Sugar Creek		GSU	B20c
Illinois River		GIL	B21
Saint Francis	S		
Saint Francis		SSF	5
Little River		SLR	5a
L'Anguille River		SLA	5b
Ouachita	O		
Ouachita (Main Stem)		OOU	12a1
Little Missouri River		OLM	12a1(a)
Saline River		OSA	12a1(b)
Bayou Bartholomew		OBB	12a1(c)
Cornie Bayou		OCO	12a1(d)
Boeuf-Tensas-Macon		OBF	12a1(e)

ARKANSAS WATER RESOURCES MANAGEMENT INFORMATION SYSTEM

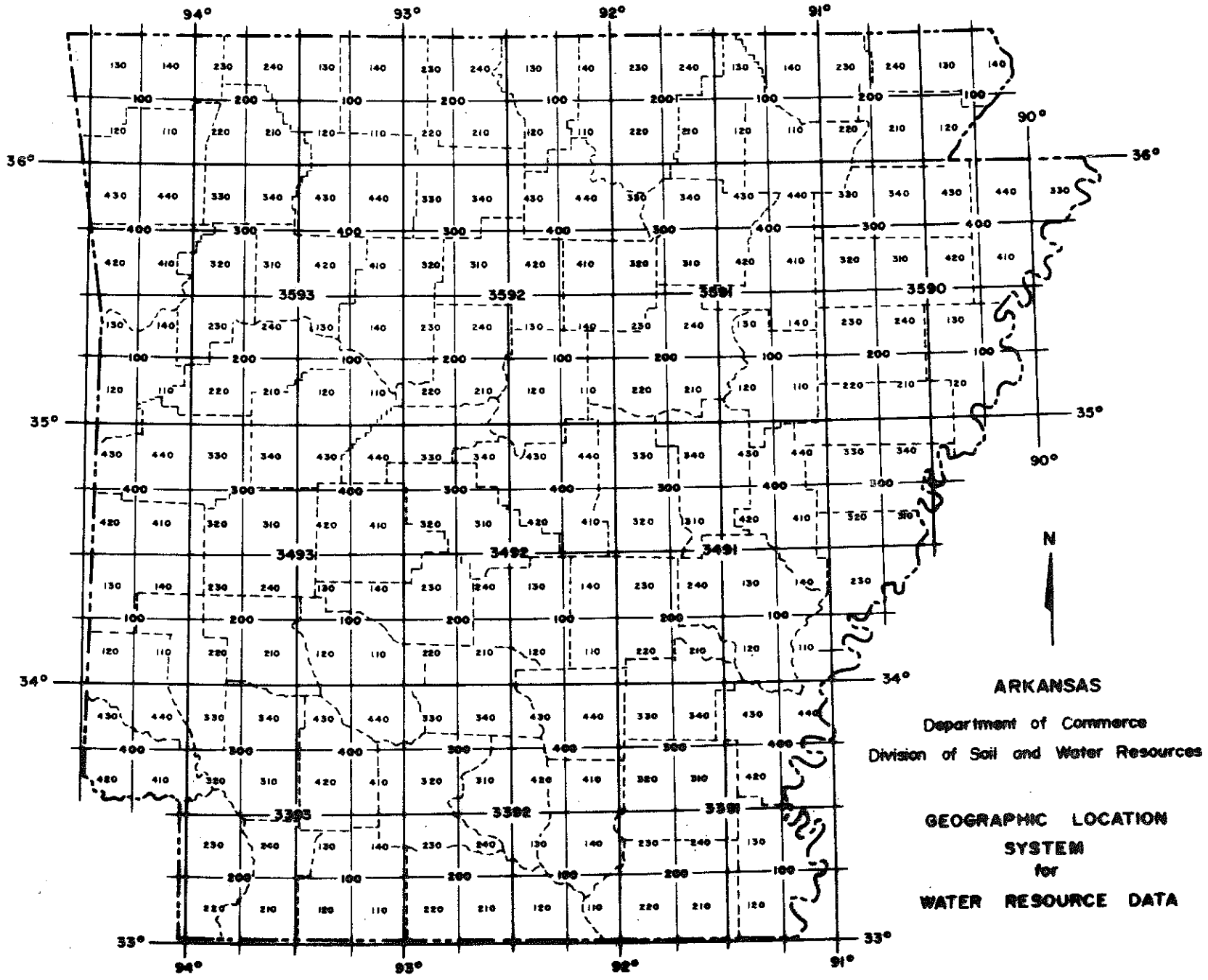
(AWRMIS)

USERS' MANUAL

APPENDIX II.

ARKANSAS DIVISION OF SOIL AND WATER RESOURCES

GEOGRAPHIC LOCATION SYSTEM FOR WATER RESOURCES DATA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ARKANSAS
Department of Commerce
Division of Soil and Water Resources
GEOGRAPHIC LOCATION
SYSTEM
for
WATER RESOURCE DATA

ARKANSAS WATER RESOURCES MANAGEMENT INFORMATION SYSTEM

(AWRMIS)

USERS' MANUAL

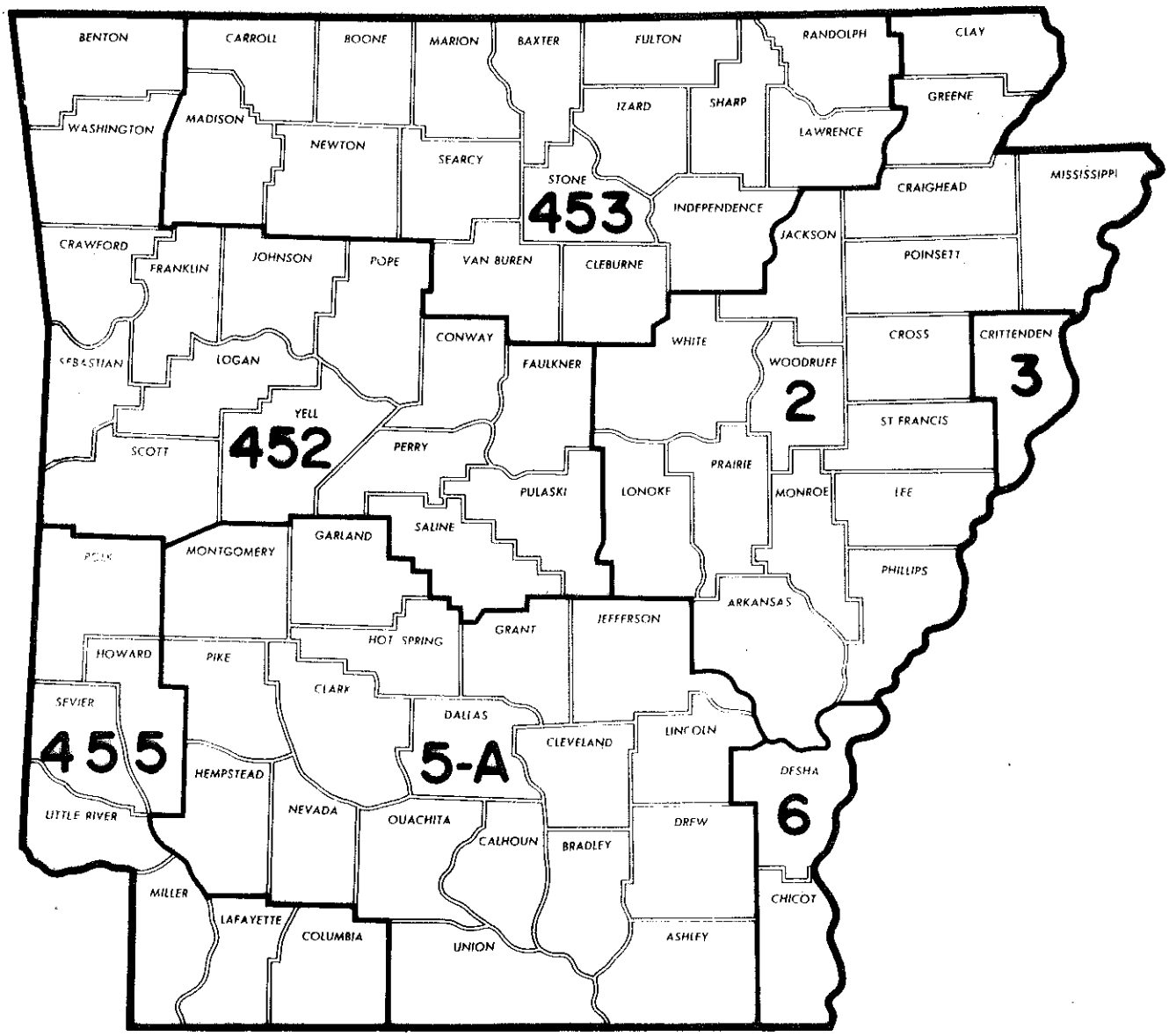
APPENDIX III.

WATER RESOURCES COUNCIL

WATER RESOURCES PLANNING AREAS (WRPAs) IN ARKANSAS

SYMBOL CONVERSIONS

WRC	AWRMIS
2	02
3	03
5-A	5A
6	06
452	52
453	53
455	55



WRC - WATER RESOURCE PLANNING AREAS IN ARKANSAS

ARKANSAS WATER RESOURCES MANAGEMENT INFORMATION SYSTEM

(AWRMIS)

USERS' MANUAL

APPENDIX IV.

UNITED STATES GEOLOGICAL SURVEY

HYDROLOGIC DATA STATIONS AVAILABLE VIA AWRMIS

INDEX

USGS HYDROLOGIC DATA STATIONS

USGS STATION NUMBER	STATION NAME	COUNTY	TYPE OF DATA: STREAMFLOW
07361500	ANTOINE RIVER AT ANTOINE, ARK.	PIKE	*
07258000	ARKANSAS RIVER AT DARDANELLE, ARK.	YELL	*
07263500	ARKANSAS RIVER AT LITTLE ROCK, ARK.	PULASKI	*
07263450	ARKANSAS RIVER AT MURRAY DAM, AT LITTLE ROCK, ARK.	PULASKI	*
07250500	ARKANSAS RIVER AT VAN BUREN, ARK.	CRAWFORD	*
07246500	ARKANSAS RIVER NEAR SALLISAW, OKLA.	SEQUOYAH	*
07196900	BARREN FORK AT DUTCH MILLS, ARK.	WASHINGTON	*
07364500	BAYOU BARTHOLOMEW NEAR BEEKMAN, LA.	ASHLEY	*
07364200	BAYOU BARTHOLOMEW NEAR JONES, LA.	ASHLEY	*
07364150	BAYOU BARTHOLOMEW NEAR MCGEHEE, ARK.	DESHA	*
07364700	BAYOU DE LOUTRE NEAR LARAN, LA.	UNION	*
07077700	BAYOU DEVIEW AT MORTON, ARK.	WOODRUFF	*
07348700	BAYOU DORCHEAT NEAR SPRINGHILL, LA.	COLUMBIA	*
07369700	BAYOU MACON NEAR KILBOURNE, LA.	CHICOT	*
07264000	BAYOU METO NEAR LONOKE, ARK.	LONOKE	*
07077930	BIG CREEK NEAR MORO, ARK.	LEE	*
07077952	BIG CREEK NEAR POPLAR GROVE, ARK.	PHILLIPS	*
07046500	BIG LAKE OUTLET NEAR MANILA, ARK.	MISSISSIPPI	*
07257000	BIG PINEY CREEK NEAR DOVER, ARK.	POPE	*
07072500	BLACK RIVER AT BLACK ROCK, ARK.	LAWRENCE	*
07069000	BLACK RIVER AT POCAHONTAS, ARK.	RANDOLPH	*
07063000	BLACK RIVER AT POPLAR BLUFF, MO.	BUTLER	*
07064000	BLACK RIVER NEAR CORNING, ARK.	CLAY	*
07349500	BODCAU BAYOU NEAR SAREPTA, LA.	WEBSTER	
07349430	BODCAU CREEK AT STAMPS, ARK.	LAFAYETTE	*
07367700	BOEUF RIVER NEAR ARKANSAS-LOUISIANNA STATE LINE	CHICOT	*
07058000	BRYANT CREEK NEAR TECUMSEH, MO.	OZARK	*
07057000	BUFFALO RIVER NEAR RUSH, ARK.	MARION	*
07056000	BUFFALO RIVER NEAR ST. JOE, ARK.	SEARCY	*
07077380	CACHE RIVER AT EGYPT, ARK.	CRAIGHEAD	*
07077500	CACHE RIVER AT PATTERSON, ARK.	WOODRUFF	*
07359910	CADDO RIVER AT DEGRAY DAM NEAR ARKADELPHIA, ARK.	CLARK	*
07359800	CADDO RIVER NEAR ALPINE, ARK.	CLARK	*
07261000	CADRON CREEK NEAR GUY, ARK.	FAULKNER	*
07364300	CHEMIN-A-HAUT BAYOU NEAR BEEKMAN, LA.	ASHLEY	*
07365800	CORNIE BAYOU NEAR THREE CREEKS, ARK.	UNION	*
07340500	COSSATOT RIVER NEAR DEQUEEN, ARK.	SEVIER	*
07340300	COSSATOT RIVER NEAR VANDERVOORT, ARK.	POLK	*
07249500	COVE CREEK NEAR LEE CREEK, ARK.	CRAWFORD	*
07264500	CROOKED CREEK NEAR HUMPHREY, ARK.	ARKANSAS	*
07068000	CURRENT RIVER AT DONIPHAN, MO.	RIPLEY	*
07076850	CYPRESS BAYOU NEAR BEEBE, ARK.	WHITE	*
07260000	DUTCH CREEK AT WALTREAK, ARK.	YELL	*
07071500	ELEVEN POINT RIVER NEAR BARDLEY, MO.	OREGON	*
07072000	ELEVEN POINT RIVER NEAR RAVENDEN SPRINGS, ARK.	RANDOLPH	*
07195800	FLINT CREEK AT SPRINGTOWN, ARK.	BENTON	*
07196000	FLINT CREEK NEAR KANSAS, OKLA.	DELAWARE	*
07261500	FOURCHE LAFAVE RIVER NEAR GRAVELLY, ARK.	YELL	
07262500	FOURCHE LAFAVE RIVER NEAR NIMROD, ARK.	PERRY	*

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USGS HYDROLOGIC DATA STATIONS

USGS STATION NUMBER	STATION NAME	COUNTY	TYPE OF DATA
			STREAMFLOW
07068890	FOURCHE RIVER ABOVE POCAHONTAS, ARK.	RANDOLPH	*
07251500	FROG BAYOU AT RUDY, ARK.	CRAWFORD	*
07251000	FROG BAYOU NEAR MOUNTAINBURG, ARK.	CRAWFORD	*
07255500	HURRICANE CREEK NEAR BRANCH, ARK.	FRANKLIN	*
07256000	HURRICANE CREEK NEAR CAULKSVILLE, ARK.	LOGAN	*
07363000	HURRICANE CREEK NEAR SHERIDAN, ARK.	GRANT	*
07257500	ILLINOIS BAYOU NEAR SCOTTSVILLE, ARK.	POPE	*
07195500	ILLINOIS RIVER NEAR WATTS, OKLA.	WASHINGTON	*
07249400	JAMES FORK NEAR HACKETT, ARK.	SEBASTIAN	*
07347000	KELLY BAYOU NEAR HOSSTON, LA.	CADDO	*
07050500	KINGS RIVER NEAR BERRYVILLE, ARK.	CARROLL	*
07047950	L'ANGUILLE RIVER AT PALESTINE, ARK.	ST. FRANCIS	*
07078000	LAGRUE BAYOU NEAR STUTTGART, ARK.	ARKANSAS	*
07250000	LEE CREEK NEAR VAN BUREN, ARK.	CRAWFORD	*
07366200	LITTLE CORNEY BAYOU NEAR LILLIE, LA.	UNION	*
07361600	LITTLE MISSOURI RIVER NEAR BOUGHTON, ARK.	NEVADA	*
07361000	LITTLE MISSOURI RIVER NEAR MURFREESBORO, ARK.	PIKE	*
07360501	LITTLE MO. RIVER AT NARROWS DAM NEAR MURFREESBORO, ARK.	PIKE	*
07076000	LITTLE RED RIVER NEAR HEBER SPRINGS, ARK.	CLEBURN	*
07341301	LITTLE RIVER AT MILLWOOD DAM NEAR ASHDOWN, ARK.	LITTLE RIVER	*
07340000	LITTLE RIVER NEAR HORATIO, ARK.	SEVIER	*
07075000	MIDDLE FORK LITTLE RED RIVER AT SHIRLEY, ARK.	VAN BUREN	*
07047970	MISSISSIPPI RIVER AT HELENA, ARK.	PHILLIPS	*
07032000	MISSISSIPPI RIVER AT MEMPHIS, TENN.	CRITTENDEN	*
07265450	MISSISSIPPI RIVER NEAR ARKANSAS CITY, ARK.	DESHA	*
07362500	MORO CREEK NEAR FORDYCE, ARK.	DALLAS	*
07252000	MULBERRY RIVER NEAR MULBERRY, ARK.	CRAWFORD	*
07060000	NORTH FORK RIVER AT NORFORK DAM, NEAR NORFORK, ARK.	BAXTER	*
07059000	NORTH FORK RIVER NEAR HENDERSON, ARK.	BAXTER	*
07057500	NORTH FORK RIVER NEAR TECUMSEH, MO.	OZARK	*
07195000	OSAGE CREEK NEAR ELM SPRINGS, ARK.	BENTON	*
07360000	OUACHITA RIVER AT ARKADELPHIA, ARK.	CLARK	*
07360800	OUACHITA RIVER AT ARKADELPHIA, ARK.	CLARK	*
07357501	OUACHITA RIVER AT BLAKELY MTN. DAM NEAR HOT SPRINGS, ARK.	GARLAND	*
07362000	OUACHITA RIVER AT CAMDEN, ARK.	OUACHITA	*
07367000	OUACHITA RIVER AT MONROE, LA.	OUACHITA	*
07364100	OUACHITA RIVER NEAR ARKANSAS-LOUISIANNA STATE LINE	UNION	*
07358000	OUACHITA RIVER NEAR HOT SPRINGS, ARK.	GARLAND	*
07359500	OUACHITA RIVER NEAR MALVERN, ARK.	HOT SPRING	*
07356000	OUACHITA RIVER NEAR MOUNT IDA, ARK.	MONTGOMERY	*
07357000	OUACHITA RIVER NEAR MOUNTAIN PINE, ARK.	GARLAND	*
07361200	OZAN CREEK NEAR MCCASKILL, ARK.	HEMPSTEAD	*
07260500	PETIT JEAN RIVER AT DANVILLE, ARK.	YELL	*
07258500	PETIT JEAN RIVER NEAR BOONEVILLE, ARK.	LOGAN	*
07259500	PETIT JEAN RIVER NEAR WAVELAND, ARK.	YELL	*
07073500	PINEY FORK AT EVENING SHADE, ARK.	SHARP	*
07247000	POTEAU RIVER AT CAUTHRON, ARK.	SCOTT	*
07341500	RED RIVER AT FULTON, ARK.	HEMPSTEAD	*
07337000	RED RIVER AT INDEX, ARK.	MILLER	*

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USGS HYDROLOGIC DATA STATIONS

USGS STATION NUMBER	STATION NAME	COUNTY	TYPE OF DATA: STREAMFLOW
07344400	RED RIVER NEAR HOSSTON, LA.	CADDO	*
07046600	RIGHT HAND CHUTE OF LITTLE RIVER AT RIVERVALE, ARK.	POINSETT	*
07339500	ROLLING FORK NEAR DEQUEEN, ARK.	SEVIER	*
07363000	SALINE RIVER AT BENTON, ARK.	SALINE	*
07341000	SALINE RIVER NEAR DIERKS, ARK.	HOWARD	*
07341200	SALINE RIVER NEAR LOCKESBURG, ARK.	SEVIER	*
07363500	SALINE RIVER NEAR RYE, ARK.	CLEVELAND	*
07364000	SALINE RIVER NEAR WARREN, ARK.	BRADLEY	*
07255000	SIXMILE CREEK AT CAULKSVILLE, ARK.	LOGAN	*
07253000	SIXMILE CREEK AT CHISMVILLE, ARK.	LOGAN	*
07253500	SIXMILE CREEK NEAR BRANCH, ARK.	FRANKLIN	*
07254500	SIXMILE CREEK SUBWATERSHED NO. 2 NEAR CAULKSVILLE, ARK.	LOGAN	*
07255100	SIXMILE CREEK SUBWATERSHED NO. 23 NEAR BRANCH, ARK.	FRANKLIN	*
07254000	SIXMILE CREEK SUBWATERSHED NO. 5 NEAR CHISMVILLE, ARK.	LOGAN	*
07252500	SIXMILE CREEK SUBWATERSHED NO. 6 NEAR CHISMVILLE, ARK.	LOGAN	*
07362100	SMACKOVER CREEK NEAR SMACKOVER, ARK.	UNION	*
07075300	SOUTH FORK LITTLE RED RIVER AT CLINTON, ARK.	VAN BUREN	*
07075500	SOUTH FORK LITTLE RED RIVER NEAR CLINTON, ARK.	VAN BUREN	*
07356500	SOUTH FORK OUACHITA RIVER AT MOUNT IDA, ARK.	MONTGOMERY	*
07263008	SOUTH FOURCHE LAFAVE RIVER NEAR HOLLIS, ARK.	PERRY	*
07256500	SPADRA CREEK AT CLARKSVILLE, ARK.	JOHNSON	*
07191220	SPAVINAW CREEK NEAR SYCAMORE, OKLA.	DELAWARE	*
07069500	SPRING RIVER AT IMBODEN, ARK.	LAWRENCE	*
07047900	ST. FRANCIS BAY AT RIVERFRONT, ARK.	CROSS	*
07040450	ST. FRANCIS RIVER AT LAKE CITY, ARK.	CRAIGHEAD	*
07047902	ST. FRANCIS RIVER AT LATITUDE OF WITTSBURG, ARK.	CROSS	*
07047500	ST. FRANCIS RIVER AT MARKED TREE, ARK.	POINSETT	*
07047800	ST. FRANCIS RIVER AT PARKIN, ARK.	CROSS	*
07040100	ST. FRANCIS RIVER AT ST. FRANCIS, ARK.	CLAY	*
07047C00	ST. FRANCIS RIVER FLOODWAY NEAR MARKED TREE, ARK.	POINSETT	*
07073008	STRAWBERRY RIVER NEAR EVENING SHADE, ARK.	SHARP	*
07074000	STRAWBERRY RIVER NEAR POUGHKEEPSIE, ARK.	SHARP	*
07365900	THREE CREEK NEAR THREE CREEKS, ARK.	UNION	*
07047600	TYRONZA RIVER NEAR TYRONZA, ARK.	POINSETT	*
07049000	WAR EAGLE CREEK NEAR HINDSVILLE, ARK.	MADISON	*
07048000	WEST FORK WHITE RIVER AT GREENLAND, ARK.	WASHINGTON	*
07048500	WEST FORK WHITE RIVER NEAR FAYETTEVILLE, ARK.	WASHINGTON	*
07061000	WHITE RIVER AT BATESVILLE, ARK.	INDEPENDENCE	*
07049691	WHITE RIVER AT BEAVER DAM, NEAR EUREKA SPRINGS, ARK.	CARROLL	*
07050000	WHITE RIVER AT BEAVER, ARK.	CARROLL	*
07060500	WHITE RIVER AT CALICO ROCK, ARK.	IZARD	*
07077800	WHITE RIVER AT CLARENDON, ARK.	MONROE	*
07077000	WHITE RIVER AT DE VALLS BLUFF, ARK.	PRAIRIE	*
07074500	WHITE RIVER AT NEWPORT, ARK.	JACKSON	*
07057250	WHITE RIVER AT SHIPPS FERRY, ARK.	BAXTER	*
07053500	WHITE RIVER NEAR BRANSON, MO.	TANEY	*
07048600	WHITE RIVER NEAR FAYETTEVILLE, ARK.	WASHINGTON	*
07055000	WHITE RIVER NEAR FLIPPIN, ARK.	MARION	*
07049500	WHITE RIVER NEAR ROGERS, ARK.	BENTON	*

ARKANSAS WATER RESOURCES MANAGEMENT INFORMATION SYSTEM

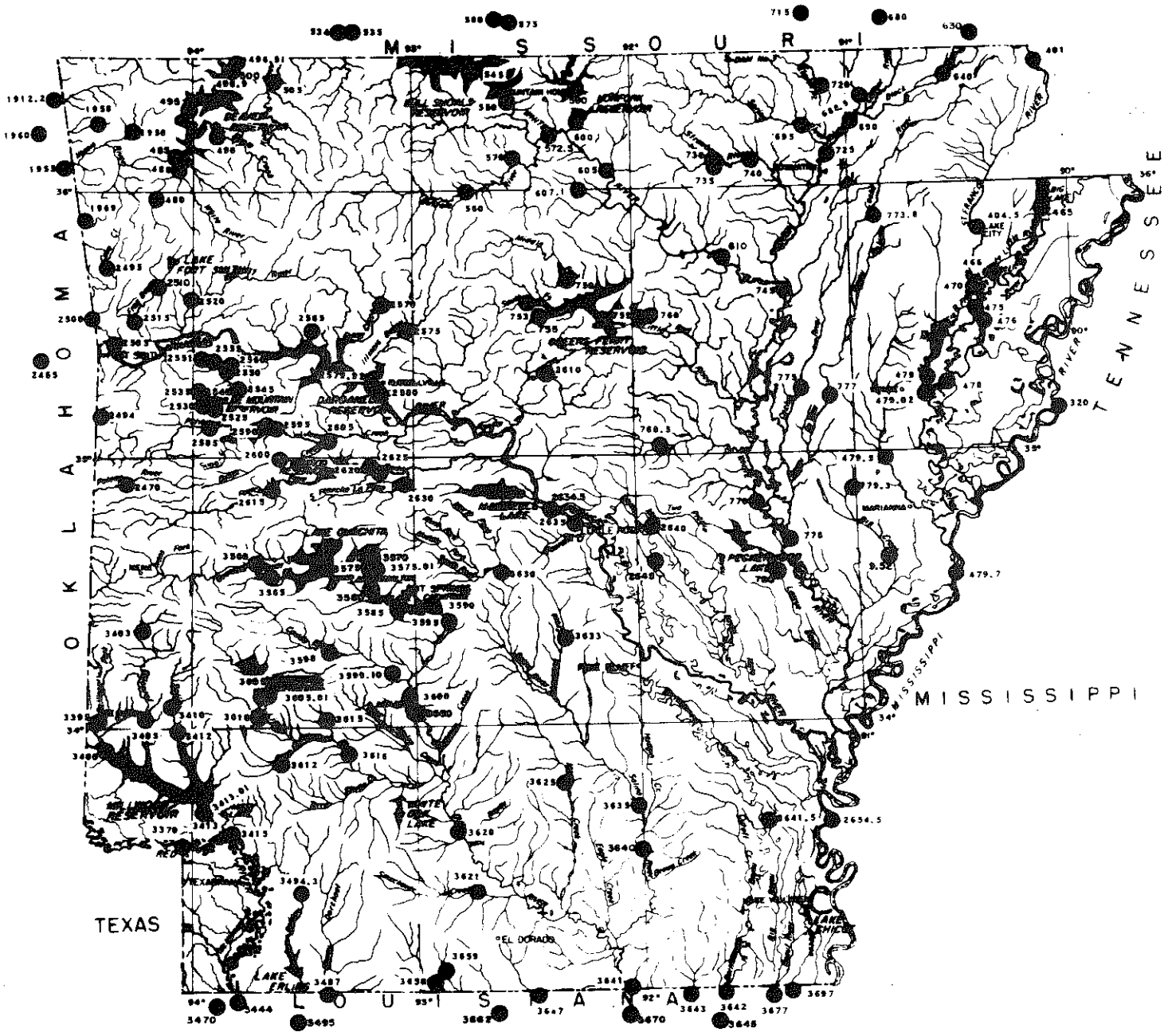
(AWRMIS)

USERS' MANUAL

APPENDIX V.

UNITED STATES GEOLOGICAL SURVEY

HYDROLOGIC DATA STATION LOCATION MAP



USGS HYDROLOGIC DATA STATIONS

ARKANSAS WATER RESOURCES MANAGEMENT INFORMATION SYSTEM

(AWRMIS)

USERS' MANUAL

APPENDIX VI

NATIONAL WEATHER SERVICE

WEATHER STATIONS AVAILABLE VIA AWRMIS

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NWS CLIMATOLOGICAL DATA STATIONS

NWS STATION NUMBER	STATION NAME	COUNTY	TYPE OF DATA				
			RAINFALL	TEMP.	EVAP.	SNOW	EVENT
C30006	ABBOTT	SCOTT	*			*	*
030064	ALICIA	LAWRENCE	*	*		*	*
C30130	ALUM FORK	SALINE	*	*	*	*	*
C30136	ALY	YELL	*			*	
030150	AMITY 3 NE	CLARK	*			*	
C30178	ANTOINE	PIKE	*			*	
C30188	APLIN 1 W	PERRY	*			*	
030196	APPLETON	POPE	*	*		*	
C30220	ARKADELPHIA 2 N	CLARK	*	*		*	*
C30234	ARKANSAS CITY	DESHA	*			*	
C30240	ARKANSAS POST	ARKANSAS	*	*		*	*
C30286	ASHDOWN	LITTLE RIVER	*	*		*	
030300	ATHENS	HOWARD	*	*		*	
C30326	AUGUSTA	WOODRUFF	*			*	
030350	BALD KNOB	WHITE	*	*		*	*
C30355	BALD KNOB 5 N	WHITE	*	*		*	*
C30458	BATESVILLE LIVESTOCK	INDEPENDENCE	*	*		*	*
030460	BATESVILLE L AND D 1	INDEPENDENCE	*	*		*	*
C30524	BEAVER DAM	CARROLL	*	*		*	
C30534	BEECH GROVE	GREENE	*			*	*
030536	BEEDEVILLE	JACKSON	*	*		*	*
C30582	BENTON	SALINE	*	*		*	*
C30586	BENTONVILLE 5 WSW	BENTON	*			*	*
030616	BERRYVILLE 4 NW	CARROLL	*			*	
C30664	BIG FORK	POLK	*			*	
C30724	BISMARCK 2 SE	HOT SPRING	*			*	
C30746	BLACK ROCK	LAWRENCE	*			*	*
C30764	BLAKELY MOUNTAIN DAM	GARLAND	*	*	*	*	*
030798	BLUE MOUNTAIN DAM	YELL	*	*	*	*	
C30800	BLUFF CITY 3 SW	NEVADA	*			*	*
030806	BLYTHEVILLE	MISSISSIPPI	*	*		*	*
030820	BONNERDALE	HOT SPRING	*			*	
C30830	BOONEVILLE	LOGAN	*	*		*	*
030848	BOUGHTON	NEVADA	*			*	
C30936	BRINKLEY	MONROE	*	*		*	*
C31010	BUFFALO TOWER	NEWTON	*			*	*
C31052	BURDETTE	MISSISSIPPI	*			*	*
031102	CABOT 4 SW	PULASKI	*	*		*	*
C31132	CALICO ROCK	IZARD	*	*		*	*
C31152	CAMDEN 1	OUACHITA	*	*		*	
C31224	CARLISLE 1 SW	LONOKE	*			*	*
C31238	CARPENTER DAM	GARLAND	*			*	*
C31442	CLARENDON	MONROE	*	*		*	*
C31455	CLARKSVILLE	JOHNSON	*	*		*	*
C31492	CLINTON	VAN BUREN	*			*	
C31596	CONWAY	FAULKNER	*	*		*	
C31632	CORNING	CLAY	*	*		*	
C31666	COVE	POLK	*			*	*

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NWS CLIMATOLOGICAL DATA STATIONS

NWS STATION NUMBER	STATION NAME	COUNTY	TYPE OF DATA				
			RAINFALL	TEMP.	EVAP.	SNOW	EVENT
031730	CROSSETT 7 S	ASHLEY	*	*		*	*
031750	CRYSTAL VALLEY	PULASKI	*			*	*
031768	CUMMINS FARM	LINCOLN	*	*		*	*
031814	DAISY 1 E	PIKE	*			*	
031829	DAMASCUS	FAULKNER	*			*	
031834	DANVILLE	YELL	*			*	
031838	DARDENELLE	YELL	*	*	*	*	*
031948	DE QUEEN	SEVIER	*	*		*	
031960	DERMOTT	CHICOT	*			*	*
031962	DERMOTT 3 NE	CHICOT	*	*		*	*
031968	DES ARC	PRAIRIE	*	*	*	*	
031982	DEVILS KNOB	JOHNSON	*	*		*	
032015	DIERKS	HOWARD	*	*		*	*
032148	DUMAS	DESHA	*	*	*	*	
032300	EL DORADO FAA AIRPORT	UNION	*	*		*	*
032355	EUDORA	CHICOT	*	*		*	*
032356	EUREKA SPRINGS	CARROLL	*	*		*	*
032366	EVENING SHADE 1 NE	SHARP	*	*		*	
032443	FAYETTEVILLE FAA AP	WASHINGTON	*	*		*	*
032444	FAYETTEVILLE EXP STA	WASHINGTON	*	*		*	*
032540	FORDYCE	DALLAS	*	*		*	*
032564	FORREST CITY	ST FRANCIS	*	*		*	*
032574	FORT SMITH WB AIRPORT	SEBASTIAN	*	*		*	*
032578	FORT SMITH WATER PLANT	CRAWFORD	*	*		*	*
032609	FOURCHE JUNCTION	PERRY	*	*		*	*
032670	FULTON	HEMPSTEAD	*			*	*
032760	GEORGETOWN	WHITE	*			*	
032794	GILBERT	SEARCY	*	*		*	*
032842	GLENWOOD	PIKE	*			*	
032922	GRAVELLY 4 E	YELL	*			*	
032930	GRAVETTE	BENTON	*	*		*	*
032946	GREEN FOREST 4 ESE	CARROLL	*			*	
032962	GREENBRIER	FAULKNER	*	*		*	*
032976	GREENWOOD	SEBASTIAN	*			*	
032978	GREERS FERRY DAM	CLEBURNE	*	*		*	*
033074	GURDON	CLARK	*			*	*
033088	HAMBURG	ASHLEY	*	*		*	*
033164	HARRISON	BOONE	*	*		*	
033165	HARRISON FAA AIRPORT	BOONE	*	*		*	*
033235	HECTOR	POPE	*	*		*	*
033242	HELENA 5 NW	PHILLIPS	*	*		*	*
033428	HOPE 3 NE	HEMPSTEAD	*	*	*	*	
033438	HOPPER 1 E	MONTGOMERY	*			*	*
033442	HORATIO	SEVIER	*			*	
033466	HOT SPRINGS 1 NE	GARLAND	*	*		*	*
033540	HUNTSVILLE	MADISON	*	*		*	*
033584	INDEX	LITTLE RIVER	*			*	
033600	JASPER	NEWTON	*			*	*
033704	JESSIEVILLE	GARLAND	*			*	

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NWS CLIMATOLOGICAL DATA STATIONS

NWS STATION NUMBER	STATION NAME	COUNTY	TYPE OF DATA				
			RAINFALL	TEMP.	EVAP.	SNOW	EVENT
033734	JONESBORO	CRAIGHEAD	*	*		*	*
033821	KEISER	MISSISSIPPI	*	*		*	*
033862	KEO	LONOKE	*	*		*	*
033998	LAKE CITY	CRAIGHEAD	*			*	*
034010	LAKE MAUMELLE	PULASKI	*			*	*
034060	LANGLEY	PIKE	*			*	*
034106	LEAD HILL	BOONE	*	*		*	
034134	LEOLA	GRANT	*	*		*	*
034248	LITTLE ROCK WB AIRPORT	PULASKI	*	*		*	*
034250	LITTLE ROCK FILT PLANT	PULASKI	*	*		*	*
034386	LURTON 2 NNE	NEWTON	*	*		*	
034528	MADISON	ST. FRANCIS	*			*	*
034548	MAGNOLIA 3 N	COLUMBIA	*	*		*	
034562	MALVERN	HOT SPRING	*	*		*	*
034572	MAMMOTH SPRING	FULTON	*	*		*	
034638	MARIANNA 2 S	LEE	*	*		*	*
034654	MARKED TREE	POINSETT	*	*		*	*
034666	MARSHALL	SEARCY	*	*		*	*
034746	MELBOURNE 5 WNW	IZARD	*			*	
034756	MENA	POLK	*	*		*	
034900	MONTICELLO 3 SW	DREW	*	*		*	*
034934	MOROBAY LOCK NO 8	CALHOUN	*	*		*	*
034938	MORRILTON	CONWAY	*	*		*	*
034988	MOUNT IDA	MONTGOMERY	*	*		*	
035010	MOUNT MAGAZINE	LOGAN	*	*		*	*
035036	MOUNTAIN HOME 1 NNW	BAXTER	*	*		*	*
035038	MOUNTAIN HOME C OF ENG	BAXTER	*	*	*	*	*
035046	MOUNTAIN VIEW	STONE	*	*		*	
035072	MULBERRY 6 NNE	FRANKLIN	*			*	
035079	MURFREESBORO NO 2	PIKE	*	*		*	
035110	NARROWS DAM	PIKE	*	*	*	*	
035112	NASHVILLE EXP STATION	HOWARD	*	*		*	*
035158	NATHAN 4 WNW	HOWARD	*			*	
035160	NATURAL DAM	CRAWFORD	*			*	*
035174	NEWHOPE 3 E	PIKE	*			*	*
035186	NEWPORT	JACKSON	*	*		*	*
035200	NIMROD DAM	PERRY	*	*	*	*	*
035354	ODELL 3 N	WASHINGTON	*			*	
035358	ODEN 2 W	MONTGOMERY	*			*	
035376	OKAY	HOWARD	*	*		*	*
035480	OSCEOLA	MISSISSIPPI	*			*	*
035498	OWENSVILLE	SALINE	*	*		*	*
035508	OZARK	FRANKLIN	*	*		*	
035514	OZONE	JOHNSON	*			*	
035562	PARAGOULD RADIO KDRS	GREENE	*	*		*	*
035576	PARIS	LOGAN	*	*		*	*
035586	PARKIN 2 W	CROSS	*			*	
035591	PARKS	SCOTT	*			*	
035664	PELSOR	POPE	*	*		*	

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NWS CLIMATOLOGICAL DATA STATIONS

NWS STATION NUMBER	STATION NAME	COUNTY	TYPE OF DATA				
			RAINFALL	TEMP.	EVAP.	SNOW	EVENT
035691	PERRY	PERRY	*	*		*	
035694	PERRYVILLE	PERRY	*	*		*	*
035754	PINE BLUFF	JEFFERSON	*	*		*	*
035756	PINE BLUFF FAA AIRPORT	JEFFERSON	*	*		*	*
035760	PINE RIDGE	MONTGOMERY	*			*	
035770	PINEY GROVE	CLARK	*			*	
035820	POCAHONTAS 1	RANDOLPH	*	*		*	*
035866	PORTLAND	ASHLEY	*	*		*	*
035908	PRESCOTT	NEVADA	*	*		*	*
036008	RATCLIFF	LOGAN	*			*	*
036102	REMMEL DAM	HOT SPRING	*			*	*
036248	ROGERS	BENTON	*	*		*	*
036253	ROHWER 2 NNE	DESHA	*	*		*	*
036352	RUSSELLVILLE 4 N	POPE	*	*	*	*	
036376	SAINT CHARLES	ARKANSAS	*	*		*	
036380	SAINT FRANCIS	CLAY	*			*	
036403	SALEM	FULTON	*			*	
036506	SEARCY	WHITE	*	*		*	*
036566	SHERIDAN TOWER	GRANT	*	*		*	*
036586	SHIRLEY	VAN BUREN	*			*	*
036624	SILOAM SPRINGS	BENTON	*	*		*	*
036768	SPARKMAN 3 WSW	CLARK	*	*		*	
036804	STAMPS	LAFAYETTE	*	*		*	*
036820	STAR CITY 2 S	LINCOLN	*	*		*	*
036823	STAR CITY 4 ENE	LINCOLN	*	*		*	*
036890	STORY	MONTGOMERY	*			*	
036918	STUTTGART	ARKANSAS	*	*		*	*
036920	STUTTGART 9 ESE	ARKANSAS	*	*	*	*	*
036928	SUBIACO	LOGAN	*	*		*	
037038	TAYLOR	COLUMBIA	*			*	*
037048	TEXARKANA FAA AIRPORT	MILLER	*	*		*	*
037267	TURRELL	CRITTENDON	*	*		*	*
037488	WALDRON	SCOTT	*	*		*	
037530	WALNUT RIDGE FAA AP	LAWRENCE	*	*		*	*
037582	WARREN	BRADLEY	*	*	*	*	*
037592	WASHITA	MONTGOMERY	*			*	
037712	WEST MEMPHIS	CRITTENDON	*	*		*	*
037772	WHITE ROCK	FRANKLIN	*	*		*	*
038052	WYNNE	CROSS	*	*		*	*
038084	YELLVILLE	MARION	*	*		*	*

ARKANSAS WATER RESOURCES MANAGEMENT INFORMATION SYSTEM

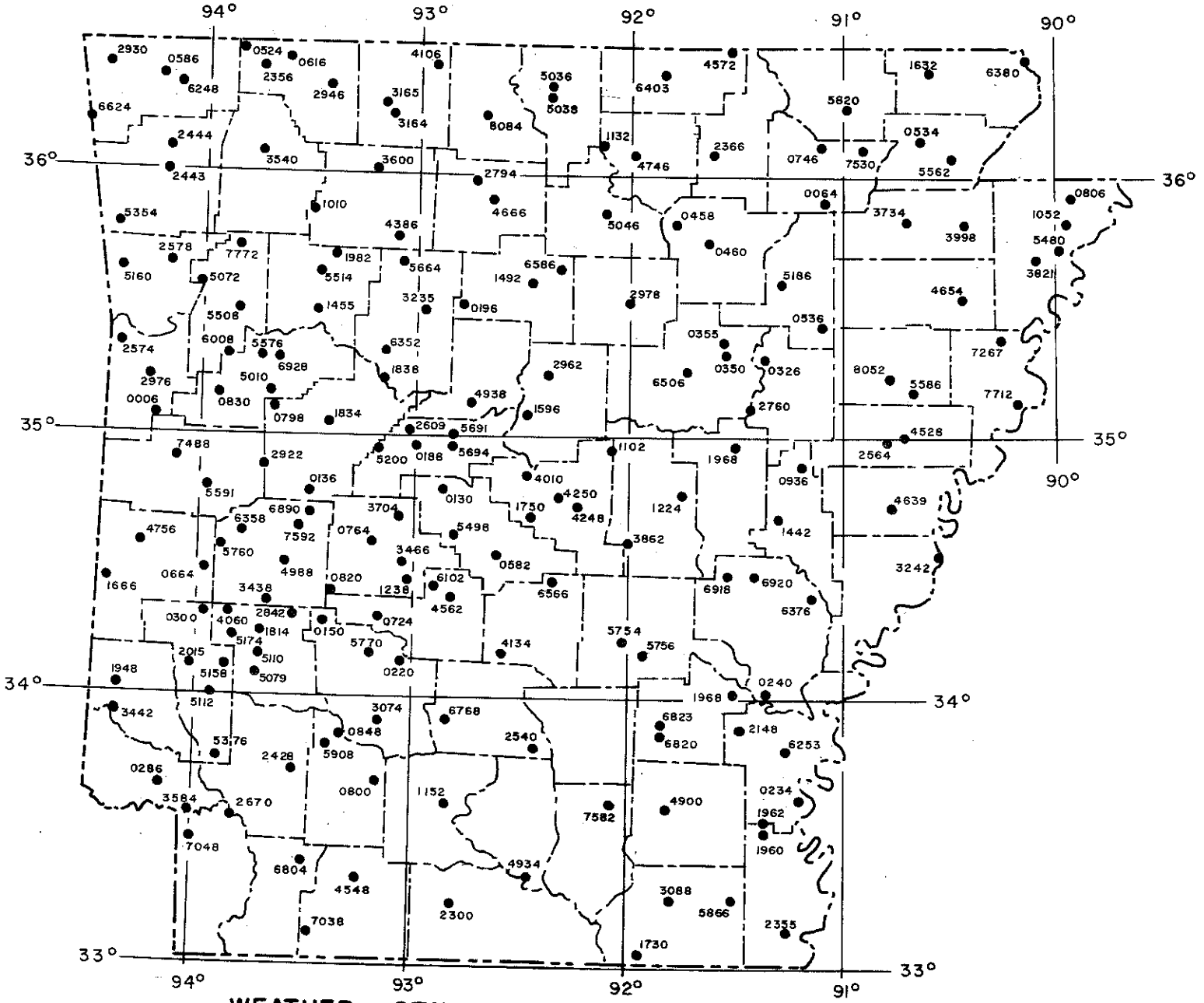
(AWRMIS)

USERS' MANUAL

APPENDIX VII.

NATIONAL WEATHER SERVICE

WEATHER STATION LOCATION MAP



WEATHER STATION LOCATION MAP

(NATIONAL WEATHER SERVICE)