DOCUMENTATION OF A DATA BASE ON LAKE AND RESERVOIR WATER QUALITY IN THE UNITED STATES

By Walter Rast

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CONVERSION FACTORS

Multiply	By	To obtain
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
square foot (ft^2)	929.0	square centimeter
cubic foot (ft^3)	0.02832	cubic meter
mile (mi)	1.609	kilometer
square mile (mi^2)	2.590	square kilometer
acre	4,047	square meter
acre-foot (acre-ft)	0.001233	cubic hectometer
gallon (gal)	3.785	liter

Temperature

degree Fahrenheit (^{o}F)	5/9 ($^\circ$F - 32)	degree Celsius ($^\circ$C)

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ABSTRACT

The report describes the procedures used to select, retrieve, compile, and screen a lake and reservoir data base from the STORET (STOrage and RETrieval) system of the U.S. Environmental Protection Agency. Procedures used to select, compile, and screen the size of the data base also are discussed. The retrieved data comprise 116 water-quality and biological constituents and physical and morphometric factors commonly used to assess the limnology and water quality of lakes and reservoirs.

INTRODUCTION

The public and public officials are becoming increasingly concerned with changes in environmental quality. Much of this concern is directed to environmental stresses such as eutrophication, acid rain, and hazardous chemicals resulting from human activities. Because of the need to provide adequate information for identifying water-related issues in the United States, the U.S. Geological Survey (USGS) has initiated a report, the "National Water Summary." A primary goal of this report is to provide accurate water-resources information for individuals, officials, and agencies of the Federal and State governments involved in the formulation of policy and management of the Nation's water resources. The report also provides information regarding the conditions of our Nation's waters.

Purpose and Scope

A study to provide an overview of the water quality of lakes and reservoirs was undertaken by the USGS as one component of the "National Water Summary." The scope and general objectives of this report are to describe the procedures used to select, retrieve, compile, and screen water-quality data for lakes and reservoirs. The time and resource constraints precluded completion of the water-quality overview study.

Approach for Developing the Water-Quality Data Base

Primary emphasis was on chemical and biological water-quality data. This report consists of the following elements: (1) Select, retrieve, and compile existing water-quality data for the water-quality overview study; and (2) screen the initial data to obtain a more refined and useful data base.

DOCUMENTATION OF THE DATA BASE

Data Selection

The data base was selected from the STORET system (see appendixes 1 and 2 at the end of this report) of the U. S. Environmental Protection Agency (USEPA). STORET is a computerized data base for the STOrage and RETrieval of water-quality data. STORET receives water-quality data from numerous sources within the United States, including the WATSTORE system of the USGS , other Federal and State water agencies, and individual investigators. WATSTORE is a national computerized data base system for the WATer data STOrage and REtreival of water data.

The STORET data base is heterogeneous because of (1) differences in analytical procedures used to measure water-quality parameters in different monitoring and research studies, (2) differences in the temporal and spatial coverage of water-quality sampling programs, (3) differences in the durations of sampling programs, and (4) differences in research or monitoring goals of different studies. It is difficult to accurately assess all of these factors for every waterbody. Nevertheless, each of these factors is of potential significance in regard to conclusions reached about the water quality of lakes and reservoirs.

The focus was on the more traditional water-quality constituents that describe the basic limnological characteristics of lakes and reservoirs. The USEPA classifies STORET water-quality data into 1 of 18 groups (table 1).

The parameter codes for the water-quality constituents examined in this study were obtained from the STORET parameter code catalog. Because STORET is primarily a data repository, it contains no provision for standardizing water-quality data measured with alternative or modified analytical procedures, or for assessing specific research or monitoring needs. Therefore, some water-quality constituents in STORET (aquatic plant nutrients, for example) have more than one parameter code, depending on the agency supplying the data and (or) the analytical procedure used to measure the constituent. Because of

computer space limitations, it was not possible to select or retrieve all STORET data for a given water-quality constituent. Rather, the focus was on parameter codes identifying the maximum quantity of relevant data. Thus, a parameter code that identified hundreds or thousands of data points was selected in preference to a parameter code that identified only several dozen or hundred data points.

Table 1.--STORET data groupings

Group	Type of data
1	Administrative
2	Bacteriological
3	Biological
4	Dissolved oxygen
5	Flow
6	General inorganic
7	General organic
8	Metal
9	Nitrogen
10	Oxygen demand
11	Pesticides
12	Phosphorus
13	Physical
14	Radiological
15	Solids
16	Temperature
17	Miscellaneous
18	(No label)

The physical properties, chemical and biological constituents, and physiographic/morphometric properties selected include the following:

1. Physical propterties:
   - specific conductance--a measure of ionized salts
   - pH--a measure of hydrogen ion activity
   - temperature
   - color--a measure of dissolved organic material
   - turbidity--a measure of water transparency
   - Secchi depth--a measure of water transparency
2. Chemical constituents:
   - salinity--a measure of dissolved salts
   - dissolved oxygen
   - hardness--a measure of divalent metallic cations
   - acidity--a measure of base-neutralizing capacity
   - anions and cations--calcium, magnesium, sodium, potassium, carbonates, sulfate, and chloride

2. Chemical constituents:--continued
  • alkalinity--a measure of acid-neutralizing capacity
  • dissolved solids--a measure of the dissolved materials
  • total solids--a measure of the dissolved + solid particles
  • suspended solids--a measure of the solids particles
  • aquatic plant nutrients--nitrogen, phosphorus, and carbon
3. Biological constituents:
  • primary productivity--a measure of algal photosynthesis
  • chlorophyll--a measure of algal biomass
4. Physiographic/morphometric properties:
  • area of drainage basin
  • area of lake surface
  • lake depth
  • lake volume
  • water detention time

Ultimately, a total of 116 parameters codes was selected, as summarized in table 2. A more detailed description of the properties and constituents is presented in table 3.

Table 2.--Parameter codes retrieved from the STORET system

Type of data	STORET parameter codes

1. **Physical properties**:

Specific conductance	00094, 00095
pH	00400, 00403
Temperature	00010, 00011
Color	00080, 00081
Turbidity	00070, 00074, 00076, 82078, 82079
Transparency	00030, 00031, 00034, 00077, 00078

2. **Chemical constituents**:

Salinity	00480
Dissolved oxygen	00299, 00300
Hardness	00900
Acidity	00435
Anions and cations	00915, 00916, 00925, 00927, 00929, 00930, 00935, 00937, 00440, 00445, 00945, 00946, 00940
Alkalinity	00410
Dissolved solids	70301
Suspended solids/sediments	80154
Total residue	00500, 00505, 00515, 70300, 00530

Table 2.--<u>Parameter codes retrieved from the STORET system</u>--Continued

Inorganic nitrogen	00620, 00618, 71850 , 71851, 00615, 00613, 71855, 71856, 00630, 00610, 71845, 00640
Organic nitrogen,	00605, 00625
Total nitrogen	00600, 71887
Total phosphorus	00665, 71886, 00678, 01070
Soluble phosphorus	00650, 00652, 00666, 70507, 00671, 00660, 00669,00653, 70506, 70505

3. <u>Biological constituents</u>:

Carbon	00690, 00680, 00681, 00685, 00691
Primary productivity	70989, 70990, 70991, 70992, 85209
Chlorophyll	32216, 32234, 32235, 32230, 32210, 32238, 32217, 32209, 32211, 32221, 32212, 32214, 32231, 32232

4. <u>Physiographic/morphometric properties</u>:

Area of drainage basin	81024, 81025
Area of lake surface	00051, 00049, 00053, 70151, 00109
Lake depth	72025, 82015, 82016, 00205
Lake volume	72024, 72022, 00054, 72036, 72023, 70152
Water detention time	72026

Table 3.--Description of water-quality constituents retrieved from the STORET system

[μmhos/cm, micromhos per centimeter at 25 degrees Celsius; mg/L, milligram per liter; °C, degrees Celsius; μg/L, microgram per liter; mg C/m³/h, milligrams carbon per cubic meter per hour; g C/m³/h, grams carbon per cubic meter per hour; g C/m²/d, grams carbon per square meter per day; mμ, millimicron; mg/m³, milligrams per cubic meter]

STORET parameter code	Description of constituent (unit)

1. Physical properties:

00094	Specific conductance, field (μmhos/cm)
00095	Specific conductance (μmhos/cm)
00400	pH, field (standard units)
00403	pH, lab (standard units)
00010	Temperature, water (degrees Celsius)
00011	Temperature, water (degrees Fahrenheit)
00080	Color (platimum-cobalt units)
00081	Color, apparent, unfiltered sample (platinum-cobalt units)
00070	Turbidity, (Jackson turbudity units)
00074	Turbidity, transmissometer (percent transmission)
00076	Turbidity, Hach turbidimeter (formazin turbidity units)
82078	Turbidity, field (nephelometric turbidity units)
82079	Turbidity, lab (nephelometric turbidity units)
00030	Light, incident sunlight radiation intensity
00031	Light, incident (percent remaining at certain depth)
00034	Depth of one percent of surface light intensity (feet)
00077	Transparency, Secchi disc (inch)
00078	Transparency, Secchi disc (meter)

2. Chemical constituents:

00480	Salinity (parts per thousand)
00299	Oxygen, dissolved, analysis by probe (mg/L)
00300	Oxygen, dissolved (mg/L)
00900	Hardness, total (mg/L as $CaCO_3$)
00435	Acidity, total (mg/L as $CaCO_3$)
00915	Calcium, dissolved (mg/L as Ca)
00916	Calcium, total (mg/L as Ca)
00925	Magnesium, dissolved (mg/L as Mg)
00927	Magnesium, total (mg/L as Mg)
00929	Sodium, total (mg/L as Na)
00930	Sodium, dissolved (mg/L as Na)
00935	Potassium, dissolved (mg/L as K)
00937	Potassium, total (mg/L as K)
00440	Bicarbonate ion (mg/L as HCO_3)
00445	Carbonate ion (mg/L as CO_3)
00945	Sulfate, total (mg/L as SO_4)
00946	Sulfate, dissolved (mg/L as SO_4)

STORET para- meter code	Description of constituent (unit)

2. Chemical constituents:--Continued

00940	Chloride, total in water (mg/L)
00410	Alkalinity, total (mg/L as $CaCO_3$)
70301	Solids, dissolved - Sum of constituents (mg/L)
80154	Suspended sediment concentration-evaporated at 110 °C (mg/L)
00500	Residue, total (mg/L)
00505	Residue, total volatile (mg/L)
00515	Residue, total filtrable, dried at 105 °C (mg/L)
70300	Residue, total filtrable, dried at 180 °C (mg/L)
00530	Residue, total nonfiltrable (mg/L)
00620	Nitrogen, nitrate total (mg/L as N)
00618	Nitrogen, nitrate dissolved (mg/L as N)
71850	Nitrogen, nitrate total (mg/L as NO_3)
71851	Nitrogen, nitrate dissolved (mg/L as NO_3)
00615	Nitrogen, nitrite total (mg/L as N)
00613	Nitrogen, nitrite dissolved (mg/L as N)
71855	Nitrogen, nitrite total (mg/L as NO_2)
71856	Nitrogen, nitrite dissolved (mg/L as NO_2)
00630	Nitrogen, nitrite + nitrate total, 1 Det. (mg/L as N)
00610	Nitrogen, ammonia total (mg/L as N)
71845	Nitrogen, ammonia total (mg/L as NH_4)
00605	Nitrogen, organic total (mg/L as N)
00640	Nitrogen, inorganic total (mg/L as N)
00625	Nitrogen, Kjeldahl total, (mg/L as N)
00600	Nitrogen, total (mg/L as N)
71887	Nitrogen, total (mg/L as NO_3)
00665	Phosphorus, total (mg/L as P)
71886	Phosphorus, total (mg/L as PO_4)
00678	Phosphorus, total hydrolyzable + orthophosphate, total, autoanalyzer (mg/L as P)
01070	Phosphorus, total, Spectrograph method (µg/L as P)
00650	Phosphate, total (mg/L as PO_4)
00652	Phosphorus, total dissolved, Whatman GF/F (mg/L as P)
00666	Phosphorus, dissolved (mg/L as P)
70507	Phosphorus, in total orthophosphate (mg/L as P)
00671	Phosphorus, dissolved orthophosphate (mg/L as P)
00660	Phosphate, ortho (mg/L as PO_4)
00669	Phosphorus, total hydrolyzable (mg/L as P)
00653	Phosphate, total soluble (mg/L)

Table 3.--Description of water-quality constituents retrieved from the STORET system--Continued

STORET para- meter code	Description of constituent (unit)

2. Chemical constituents:--Continued

| 70506 | Phosphate, total soluble, colorimetric method (mg/L as P) |
| 70505 | Phosphate, total, Colorimetric method (mg/L as P) |

3. Biological constituents:

00690	Carbon, total (mg/L as C)
00680	Carbon, total organic (mg/L as C)
00681	Carbon, dissolved organic (mg/L as C)
00685	Carbon, total inorganic (mg/L as C)
00691	Carbon, dissolved inorganic (mg/L as C)

70989	Phytoplankton production, carbon-14 method (mg $C/m^3/h$)
70990	Phytoplankton production, carbon-14 method (g $C/m^3/h$)
70991	Phytoplankton production, areal net, oxygen method (g $C/m^2/d$)
70992	Phytoplankton production, areal gross, oxygen method (g $C/m^2/d$)
85209	Algal growth potential, filtered (mg/L)
32216	Chlorophyll, total, Trichromatic uncorrected (μg/L)
32234	Chlorophyll, total A + B + C (mg/L)
32235	Chlorophyll, total, Sargent method [667 mμ] (μg/L)
32230	Chlorophyll A (mg/L)
32210	Chlorophyll-A, trichromatic uncorrected (μg/L)
32238	Chlorophyll-A, phytoplankton, flurometric method (mg/m^3)
32217	Chlorophyll A, fluorometric uncorrected (μg/L)
32209	Chlorophyll A, fluorometric corrected (μg/L)
32211	Chlorophyll-A, spectrophotometric acid method (μg/L)
32221	Chlorophyll A, percent of pheophytin-A + chlorophyll-A, spectrophotometric acid method
32212	Chlorophyll-B, trichromatic uncorrected (μg/L)
32214	Chlorophyll-C, trichromatic uncorrected (μg/L)
32231	Chlorophyll B (mg/L)
32232	Chlorophyll C (mg/L)

4. Physiographic/morphometric constituents:

81024	Drainage area (square mile)
81025	Contributing drainage area (square mile)
00051	Surface area (square feet)
00049	Surface area (square mile)
00053	Surface area (acre)
70151	Surface area of lake or reservoir (square kilometer)
00109	Surface area (percent of total)
72025	Depth of pond or reservoir (feet)
82015	Depth of lake, mean (feet)
82016	Depth, maximum of lake (feet)

Table 3.--Description of water-quality constituents retrieved from the STORET system--Continued

STORET parameter code	Description of constituent (unit)
	4. Physiographic/morphometric constituents:--Continued
00205	Depth, maximum of lake or reservoir (meter)
72024	Reservoir or pond storage (gallon)
72022	Reservoir storage in (million gallons)
00054	Reservoir storage (acre-feet)
72036	Reservoir storage (thousand acre-feet)
72023	Reservoir storage (million cubic feet)
70152	Volume of lake or reservoir (million cubic meters)
72026	Detention time of pond or reservoir (days)

To provide an overview of the water quality of lakes and reservoirs, it was necessary to choose a time period indicative of "current" conditions. In some cases, it is possible to detect changes in water quality in a short period of time. An example would be the initiation of discharges of large quantities of point source pollutants to a waterbody. In the absence of such major perturbations, however, a marked change in water quality in a waterbody normally would not be detected for 1 to 2 decades. Thus, the data collected between 1970 and 1985 were selected for the water-quality study. The STORET retrieval included all relevant water-quality data contained in STORET for this period.

Data Retrieval and Compilation

Data Retrieval Procedure

It was not practical to retrieve water-quality data interactively from the STORET system. The initial data-retrieval showed that the large data sets being requested were difficult to manage. In addition, the retrieved data were not in a format convenient for subsequent computer processing and analyses.

To circumvent these problems, the STORET FCF (Further Computational File) called "MORE=4" was used to retrieve the desired data. The MORE=4 instruction (with the "CONV" option) creates an FCF containing data for as many as 50 constituents for all sites in the STORET water-quality file satisfying the site selection and restriction criteria specified in the retrieval instructions. The FCF stores the retrieved raw data for subsequent processing and analysis. The CONV option converts data values into a format compatible with non-IBM[1] computers. The MORE=4 instruction, with the CONV option, produces a 505-column record in character format, which can be stored on magnetic tape.

The STORET computerized "On-Line Documentation System" provides a listing of all data retrieval options. It contains information regarding the internal content and layout of files that the STORET system can produce. A description of the STORET logic and data flow, including the structure of the MORE=4 and CONV retrieval options, is provided in appendixes 1-3 at the end of this report.

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[1] Use of firm and trade names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

The initial approach used in the data-retrieval was to attempt a single retrieval of data (50 parameter codes per retrieval) for the entire United States. However, this approach resulted in a rapid overflow of data on the magnetic tape on which the data were being stored. To circumvent this problem, subsequent data requests were made by State. The STORET system has no built-in capability to accomplish this goal so that the retrieved data would not exceed the capacity of the magnetic tape. Therefore, the STORET retrieval program was modified to perform a multistep data retrieval. A sample output of this program, SAMPLE.TAPE.JOB, illustrating the magnetic-tape storage requirements of several individual States is illustrated in appendix 4.

The general steps in the data-retrieval process were as follows:
1. A standard retrieval program was entered into the STORET system, containing the following STORET specifications:

<div align="center">

PGM=RET
MORE=4
CONV
STC=cc

</div>

The "cc" designation directed the CPL (computer program language) program following it to copy this program as many times as there are States, replacing the "cc" with each individual State code in turn. The subsequent data-retrieval program was based on the water-quality study requirements. The retrieved water-quality data were stored in a directory for processing. An example of the basic specifications used in this data retrieval (based on 50 parameter codes, the maximum allowed per individual data retrieval) is illustrated in the program TAPE.RET.PGM.O (appendix 5). An illustration of the STORET job control language showing a data retrieval for State number 48 is provided in appendix 6.

2. A subsequent program also was developed to allow selection and manipulation of specific water-quality properties or constituents in the retrieved data set.

A typical iteration of this latter program, MAKE.TAPE.RET, included the following types of information:

```
+ ----------------------------------------------------------------------------- +
| OK, R MAKE.TAPE.RET                                         |
| ENTER THE LAST TWO DIGITS OF THE TAPE NAME: 33             |
| ENTER THE B-NUMBER OF TARGET TAPE: 12345                   |
| WHAT WAS THE LAST LABEL NUMBER ON THIS TAPE?: 0            |
| ENTER A JOB NUMBER (TWO DIGITS): 33                        |
|                   .                                         |
|                   .                                         |
|                   .                                         |
| ENTER THE RETRIEVAL PROGRAM: TAPE.RET.PGM.1                |
| ENTER STATE CODES: 27 05 36 06 20                          |
|                   .                                         |
|                   .                                         |
|                   .                                         |
+ ----------------------------------------------------------------------------- +
```

The data (for the five States) being retrieved from the data storage directory in the above example were designated by the code numbers 27, 05, 36, 06, and 20. The dots represent output from the program not requiring response from the user.

3. The retrieved data listing then was transmitted to the user. The individual State retrievals were listed along with information regarding their block counts and estimated tape footage. The retrieved data were saved successfully if the footage was significantly less than 2,400.

Compilation of Retrieved Water-Quality Data

The retrieved water-quality data were compiled in a fixed-length, 505-character record. For example, if an individual water-quality record contained only one valid data item and 49 missing value codes (represented as -9999E+99), it still required the same amount of space on a magnetic storage tape as a record containing 50 valid data values. The next logical step in this procedure, therefore, was to eliminate the unused space by creating variable-length records.

The general format for a variable length record was:

[agency]|[site.id]|[date.time]|[depth]|[count]|[constituent:value]|
        [constituent:value]|[constituent:value]|...[constituent:value]
Each "count" pair of [constituent:value] corresponded to a nonmissing value from the original data record.

To simplify the data base for subsequent analyses, the data and nondata components of the record for each site were split into two sets, a nondata information set designated as "header" information and a data information set containing the actual water-quality values. Each data set was designated by a two-digit State identification code.

The format for the information in the header file was as follows:

COLUMNS		INFORMATION
LINE 1	1- 8	AGENCY CODE
	9	"|"
	10 - 24	SITE ID CODE
	25	"|"
	26 - 27	LATITUDE DEGREES
	29 - 30	MINUTES
	32 - 35	SECONDS
	37 - 39	LONGITUDE DEGREES
	41 - 42	MINUTES
	44 - 47	SECONDS
	48	"|"
	49 - 98	SITE DESCRIPTION
	99	"|"
	100 -103	BASIN CODES
	104	"|"
	105 -109	STATE AND COUNTY CODE
LINE 2	1- 8	AGENCY CODE
	9	"|"
	10 - 24	SITE ID CODE
	25	"|"

An example of a header file illustrating water-quality data from State number 28 is provided in appendix 7.

Each corresponding record in the data file contained the following information:

COLUMNS	INFORMATION
1-8	AGENCY CODE
9	"|"
10-24	SITE ID CODE
25	"|"
26-31	DATE OF MEASUREMENTS (YYMMDD)
32-35	TIME OF MEASUREMENTS (HHMM)
36	"|"
37-41	SITE DEPTH
42	"|"
43-45	NUMBER OF CONSTITUENTS MEASURED
46	"|"

```
+ ------------------------------------------------------------------
| 5 digits     PARM CODE INDEX NUMBER
| 1 character  COLON ":"
| 8 characters PARAMETER VALUE  S####ES# (E8.0)
| 1 character  VERTICAL BAR "|" or REMARK CODE
+ ------------------------------------------------------------------
```

The last pattern of 15 characters was repeated for each water-quality constituent with data values. An example data file illustrating data from State number 28 is given in appendix 8.

A program called CHEW.F77 (appendix 9) was developed to reduce the data files to a variable length format. In this study, CHEW.F77 resulted in an overall reduction of about 90 percent in computer disk space.

After all the retrieved water-quality data had been converted to the variable-length record format, they were merged into a set of master files, sorted by the selected sites.

Screening of the Data Base

It was necessary to compile and screen the data to provide an overview ("snapshot") of the water quality of lakes and reservoirs in the United States. For example, a single data point over the annual cycle for an aquatic plant nutrient was not adequate to provide an accurate representation of the nutrient-related water quality of a waterbody. In order to obtain the optimal temporal and spatial resolution to produce a representative view of overall water quality, criteria were developed to select the most appropriate values from the retrieved data. The objective was to reduce the data base by eliminating those data that did not meet the selection criteria. The selection criteria consisted of (1) the time of year during which the sample was collected, (2) the sampling depth, (3) the minimum number of samples necessary to provide a representative description of a water-quality constituent during the period of study, (4) the location of the sampling site, and (5) the remarks associated with constituent values.

Temporal Resolution

May to October of each year was chosen as the period from which samples were selected to represent the average water quality of a lake or reservoir. This period was selected for several reasons: (1) This normally is the period of maximum biological productivity (with its attendant water-quality effects) in a lake or reservoir; and (2) it is the period of maximum recreational water use and of thermal stratification. Thus, from the perspective of the public, it is the period of primary water-quality concern and "visibility". In addition, waterbodies in the northern, temperate United States usually have ice cover during the winter months (November-April).

Sample Collection Depth

For most waterbodies, thermal stratification normally occurs sometime during May to October. The thermal stratification period typically is the period of maximum water-quality degradation. This is especially true for the hypolimnion (bottom water layer) of eutrophic waterbodies, which can become depleted of oxygen. There is no universally accepted method for defining water quality on a lake-wide basis in a manner which simultaneously considers the quality of the surface (epilimnion) and bottom (hypolimnion) water layers in thermally stratified waterbodies. Although the STORET system provides information on the depth at which a water-quality sample was taken, it does not necessarily contain information about the specific time period during which a waterbody was thermally stratified. This information could be deduced on the basis of depth profiles of temperature and dissolved oxygen concentrations. However, the relevant profile data often did not exist in the STORET system. Information on the mean and maximum depths also was not available for many waterbodies. Thus, for the purpose of the water-quality study, the data were restricted to samples collected in the top 10 feet of the waterbody. This layer represents the water layer of maximum phytoplankton photosynthesis in most waterbodies and the water layer expected to be most similar from one waterbody to another. A program called TRIMDAV.F77 (appendix 10) was developed to select water-quality data from the top 10 feet of the waterbody.

Minimum Number of Values During Annual Cycle

Because the maximum phytoplankton photosynthesis (and attendant water quality effects) typically occurs in the top 10 feet of most lakes and reservoirs, these surface waters are a dynamic water layer in terms of water-quality and biological characteristics. For example, a phytoplankton (algae) bloom and die-off can occur within 2 weeks. Waters sampled during an algal-bloom period will have distinctly different characteristics than waters sampled between algal blooms. Thus, a single water sample easily could give a misrepresentation of the "average" or overall water quality of a lake or reservoir. Because of this possibility, at least three values between May and October were required before data for any individual water-quality constituent for any sampling site was included in the data set. A program called TRIM3.F77 (appendix 11) was developed to select water-quality data containing a minimum of three samples during the May to October growing season.

Spatial Resolution

The spatial screening procedure used graphically displayed information on the longitude and latitude of the sampling sites to delineate the location of the selected sampling sites. This was done with the use of the geographic information system ARC-INFO. Developed at Environmental Systems Research Institute in Redlands, California, ARC-INFO is a geographic information system for automating, manipulating, analyzing, and displaying geographic data in digital form. Its ability to display geographic data and sampling sites simultaneously, by State and regional basis, was used to select the individual water-quality sampling sites included in the data set. The data used in this selection procedure included

the location of the waterbodies and their tributaries, the individual in-lake sampling sites, and the name of the agency (or agencies) using each site.

Multiple in-lake sampling sites

An assumption of the water-quality study was that it was possible to identify an "average" water-quality condition for a waterbody, based on selected water-quality constituents. However, the STORET data included many waterbodies with water-quality data from multiple in-lake sampling sites. It was necessary, therefore, to develop a procedure to identify and select the single water-quality sampling site in a multiple-site waterbody most likely to provide an "average" value for a water-quality constituent.

Natural lakes typically occupy a bowl-shaped depression in the center of a relatively concentric drainage basin with multiple tributary inputs. Therefore, natural lakes often are sampled at a midlake site, usually the deepest point in the waterbody. For the purposes of the water-quality study, the data from the midlake site was used to describe the water-quality characteristics of the natural lakes in the data base.

Morphometric and hydrodynamic characteristics generally preclude this approach for reservoirs (constructed impoundments). Because a reservoir is created by the damming or impoundment of a river, the major tributary input usually is located at the upstream end. In contrast to natural lakes, therefore, reservoirs often have elongated and dendritic lake basins. Reservoirs also can exhibit a significant water-quality and trophic gradient from the upstream riverine end to the more lake-like downstream end at the dam. The water at the deeper downstream end often has lower concentrations of chemical constituents than water at the shallower upstream end. The problem, therefore, is to identify a reservoir sampling site analogous to the midlake site of a natural lake.

Most reservoir sampling programs include a sampling site located at the downstream dam end of the waterbody. Therefore, the sampling site at the dam was selected as being representative of the water quality of the whole reservoir. As noted above, for example, reservoir water quality at the downstream end usually differs from that at the upstream end. Thus, the use of data from a single sampling site as a "representative" water-quality indicator for the entire reservoir can be questioned. Nevertheless, a sampling site located at the downstream dam end was a common feature of the reservoirs included in the data set. Further, although concentratons of chemical constituents at the shallower upstream end often are greater than those at the downstream end, the upstream end represents only a small portion of the total volume of the reservoir. Thus, the water quality at the dam sampling site usually is representative of the largest volume of water in a reservoir.

Multiple sampling agencies

A related complication was that some lakes and reservoirs were sampled by more than one agency, typically at different sites by different agencies. Furthermore, many agencies used different analytical procedures for the same water-quality constituent or sampled for different constituents. Therefore, if multiple agencies had sampled the same waterbody, the sampling site for each agency that was located closest to the midlake site (for natural lakes) or to the dam site (for reservoirs) was used in the water-quality study. The data from multiple agencies was combined into a single data set for each individual waterbody.

Water-Quality Data With Remark Codes

Some water-quality constituents in STORET were measured by State and Federal agencies using different analytical procedures. The specific goals of the research and monitoring often were as diverse as the agencies collecting the water-quality data. Accordingly, remark codes (table 4) were associated with some STORET data, primarily to describe the nature of the water-quality data.

Table 4.--Meaning of STORET[1] remark codes

STORET code	Meaning
A	Value reported is the mean of two or more determinations
B	Results are based upon colony counts outside the acceptable range
C	Value is calculated
D	Indicates field measurement
E	Indicates extra samples taken at composite stations
F	In the case of species, F indicates female sex
G	Value reported is the maximum of two or more determinations
H	Value is based on field-kit determination; results may not be accurate
J	Estimated value; value not accurate
K	Actual value is known to be less than value given
L	Actual value is known to be greater than value given
M	Presence of material is verified, but not quantified; negative oxygen reduction potential, negative temperature, or male sex
N	Presumptive evidence of presence of material
O	Sampled, but analysis was lost or not performed
S	Laboratory test
T	Value reported is less than criteria of detection
U	Indicates material was analyzed for, but not detected (or undetermined sex)
W	Value observed is less than lowest value reported under "T" code
X	Value is a quasi vertically-integrated sample

[1] A computerized data-base system of the U.S. Environmental Protection Agency for the STOrage and RETrieval of water-quality data.

Most data with a remark code were eliminated from the data set. The exceptions were data with the remark codes A, C, D, E, and S. These codes relate primarily to the analytical procedure used or the manner of calculation of a datum value. They do not indicate that the associated water-quality data were necessarily inaccurate or incorrectly calculated. Hence, they were included in the data base.

Summary of Available Water-Quality Data

The quantity of water-quality data in the final data base is summarized by State in appendix 12. Each selected site had sufficient data for analysis of at least 1 of the 116 possible water-quality constituents that met the screening criteria. The constituents are presented in the order of their retrieval from the STORET system. The number of STORET sites with data for the retrieved water-quality parameters is presented in appendix 13. Finally, summary comments on the post-screened water-quality data set, by State, are presented in appendix 14.

Appendixes 1-13 are exact copies of computer program output and do not conform to USGS editorial standards or reporting order for water-quality properties and constituents. The headnotes in appendixes 12 and 13 were added for the convenience of the reader and do not appear on the computer program output. The comments in appendix 14 include some abbreviations used in the STORET data base that could not be identified.

APPENDIXES

Appendix 1.--Description of STORET logic and data flow

(Excerpted from STORET "On-Line Documentation System," p. 2-4)

(The STORET data request shown here was chosen because it demonstrates
system usage of all the possible user-accessible STORET files)

```
+----------+
|  User    |     (PGM=MSP with QUALMAP option, PLOTC (map) requested)
| Request  |  <----------------------------------------------------
+----------+
     |                              +----------+
+---------------+                   | Control  |   (Passed to the
| DIST Program  |-------------------| Card     |    programs below)
+---------------+                   | Sets     |
     +                              +----------+
+---------------+
|  RET Program  |
+---------------+
     |      \
     |       \
     |        \     ---
     |         \  /      \
     |          |   FCF    |   (Either MORE=3 or
     |          |   File   |    MORE=4 format)
     |          \        /
     |           \     ---
     |            \  /
     |             /
+---------------+ /
| MEAN Program  |
+---------------+
     |      \
     |       \
     |        \     ---
     |         \  /      \
     |          |   OT     |   (Same format
     |          |   File   |    as FCF File)
     |          \        /
     |           \     ---
     |            \  /
     |             /
+---------------+ /
|  MSP Program  |
+---------------+
     |      \
     |       \
     |        \     ---                              ---
     |         \  /      \    +----------+         /      \
     |          |  SOMSP   |--| MAP PREP |-----|   AUX    |
     |          |  File    |  +----------+     |   File   |
     |          \        /                     \        /
     |           \     ---                      \     ---
     |                                           \  /
     |                                            /
+---------------+                                /
|  LOC Program  |------------------------------/
+---------------+
```
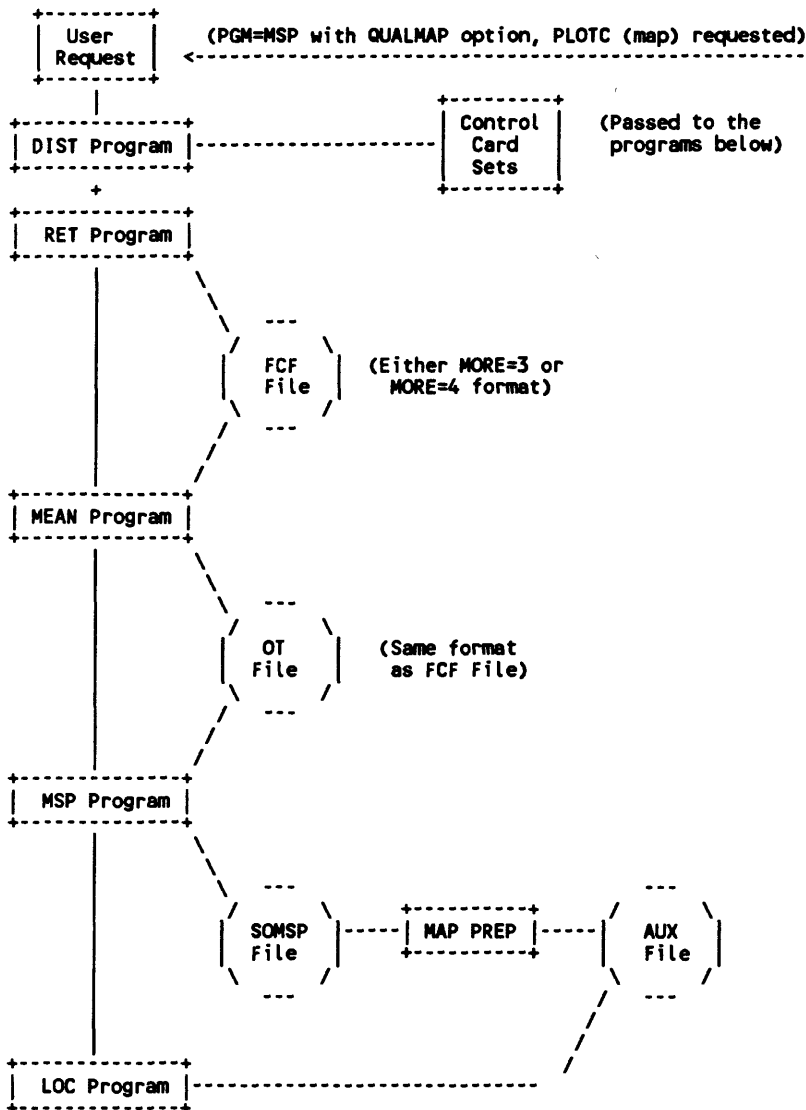
In the STORET retrieval request above, the user has requested a map
of water quality related data using the MSP program, specifying options
QUALMAP and PLOTC. Further information concerning requests of this type
may be found in the dataset named 'STORET.HELP.PGM.MSP'.

The STORET system software handles a request such as this in a
series of steps, each of which provides data to the following step in
the sequence shown in the diagram.

The original request is seen first by the DIST program, which
performs the parsing and syntax checking necessary to determine the
details of the request, and places cryptic data describing the request
in several control card sets, which are placed on scratch disk for use
by the other programs to follow.

17

In the next step, the RET program executes, obtaining from the appropriate control card set the keys needed to read the main water quality data banks of STORET, and to extract the subset of the data which the user has designated. This data subset is placed on scratch disk in the FCF file, using either format MORE=3 or 4. At this point, if data aggregation (AGGR keyword) had been requested, the data within the FCF would be ordered according to the aggregate category specified. The Appendix to this document contains a description of the effects of data aggregation upon the FCF.

The MEAN program runs next, passing through the FCF file, performing conversions of the raw data (where required) to produce such things as logarithms, waste loadings and various parameters such as un-ionized ammonia, whose values may be computed from those of other parameters. The converted data is placed on scratch disk in the OT file, using the same format as the FCF.

The MSP program then executes, reading from the OT file, and summarizes its data by parameter and site location, characterizing each site-parameter combination with up to 9 gross statistics. The results are placed on scratch disk in file SOMSP.

A map preparation program runs next, reading from file SOMSP, creating an AUX file, placing it on scratch disk. This AUX file is then read by the LOC program, which produces the map requested by the user. More information on the use of the LOC program and its AUXFILE capability may be found in the dataset named 'STORET.HELP.PGM.LOC'.

Appendix 2.--Explanation of MORE=4 STORET retrieval instruction

(Excerpted from STORET On-Line Documentation System, p. 17-24)

```
+-------------+
|             |
|   MORE=4,   |
+-------------+
|   PGM=RET,  |
|             |
+-------------+
```
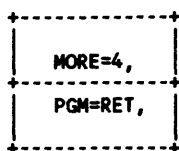
The 'MORE=4,' instruction is used to create an FCF containing data up to 50 parameters for all stations in the WQF that satisfy the station selection and restriction criteria specified in the retrieval. Remark codes, sample depth and composite sample identifiers will be included, if present. A MORE=4 FCF contains parameter heeding records, station heading records, data records and delimiter records as shown in the diagram below. The content and format of the fields within the MORE=4 records are described following the diagram. The types and lengths of records written into a MORE=4 FCF are identical to those written to a MORE=5 FCF, except that station descriptive paragraph information is not included in MORE=4 files. See the appendix of this document for a discussion of the effects of data aggregation upon a MORE=4 FCF.

```
      +--------------------- RECORD LENGTH -------------------------+
0/                            145/                            305/
+-----------------------------+------------------------------------+
| 20 parameter heading records |                                   |
+-----------------------------+------------------------------------+
|        delimiter record      |                                   |
+-----------------------------+------------------------------------+
| 9 station #1 heading records |                                   |
+-----------------------------+------------------------------------+
| station #1 data records                                          |
+-----------------------------+------------------------------------+
|        delimiter record      |                                   |
+-----------------------------+------------------------------------+
| 9 station #2 heading records |                                   |
+-----------------------------+------------------------------------+
| station #2 data records                                          |
+-----------------------------+------------------------------------+
|        delimiter record      |                                   |
+-----------------------------+------------------------------------+
| 9 station #3 heading records |                                   |
+-----------------------------+------------------------------------+
| station #3 data records                                          |
+-----------------------------+------------------------------------+
|        delimiter record                                          |
+-----+-----------------------------------------------------------+
| EOF |
+-----+
```
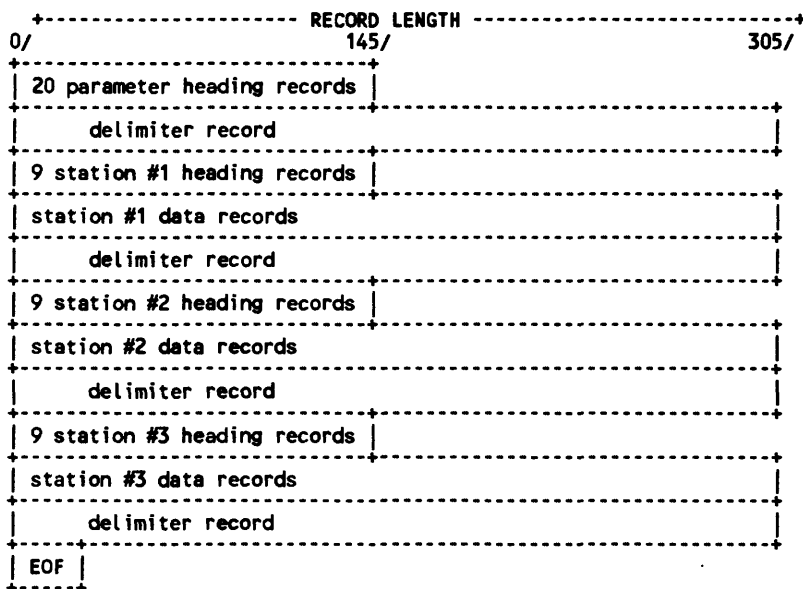
Parameter Heading Record (Format For MORE=4)

Twenty 145-character parameter heading records (5 sets of 4 records each) are written per retrieval. Each set contains the alphanumeric columnar heading information for from one to ten parameters. Parameter heading information is written into the file in the same order that the parameter code keywords appear in the retrieval. A delimiter record follows this group of records, separating it from the first group of station heading records.

columns 1-25   These columns contain an internally-used sort key
                      and can be ignored by the user. (They contain
                      binary zeros for 23 columns and cyclic numbers in
                      columns 24 and 25.)

columns 26-145   This 120-character field contains a printable line of columnar alphanumeric heading information. The first parameter heading record of each set of four contains the top line of heading information, the second parameter heading record of the set the second line, and so forth. The first twenty characters of the record contain to the date, time and depth headings and the remaining ten sets of ten characters contain to the ten individual parameter headings. (The fifth parameter heading record within group 1, therefore, would contain the first line of heading information for the eleventh through twentieth parameters and columns 46 through 55 would contain the first line of heading information for the thirteenth parameter requested.)

Delimiter Record (Format for MORE=4)

A single 305-character delimiter record follows the group of parameter heading records. A single delimiter record will also follow the group of data records for each station, including the last group of data records written into the FCF.

columns 1-25   Ignore.

columns 26-27   '99' Denotes a delimiter record.

columns 28-305 Ignore.

Station Heading Record (Format for MORE=4)

Nine 145-character station heading records are written into the FCF for each station retrieved. Each of the first seven records corresponds to one line of station header information which normally prints at the top of each page of retrieval output.

columns 1-8   This field contains the one-to-eight character alphanumeric agency code assigned to the agency responsible for collecting and entering the data of interest into the WQF. The code will be left-justified, with un-used columns left blank.

columns 9-23   This field contains the one-to-fifteen character alphanumeric primary station code, which uniquely identifies the sampling site of interest for the agency code identified above. The code will be left-justified, with un-used columns left blank.

column 24   This field contains a blank.

column 25   This field contains a one-character numeric value ranging from one to nine (sequentially) used to identify each of the nine station heading records.

columns 26-145   This field contains a 120-character printable alphanumeric line of station header information corresponding to the value in column 25. When the PRMI (print River Mile Index) keyword is specified, records 8 and 9 contain the RMI data, otherwise they are blank.

Data Record (Format For MORE=4)

One 305-character data record is written for each sample that satisfies the data selection criteria specified in the retrieval. The data records for a specific station comprise a group which is written into the FCF immediately after it's associated group of station heading records. A single delimiter record separates the group of data records from the next set of station heading records, or if no more stations are present, signifies the end of the FCF.

columns 1-8   This field contains the one-to-eight character alphanumeric agency code assigned to the agency responsible for collecting and entering the data of interest into the WQF. The code will be left-justified, with un-used columns left blank.

columns 9-23	This field contains the one-to-fifteen character alphanumeric primary station code which uniquely identifies the sampling site of interest for the agency identified above. The code will be left-justified, with un-used columns left blank.
columns 24-25	This field contains the value 99.
columns 26-31	This six-digit field contains the beginning or initial date for a regular composite sample, the ending or final date for a sophisticated composite sample or the sample collection date for a regular grab sample. The format is YYMMDD, with leading zeros supplied where necessary.
columns 32-35	This four-digit field contains the beginning or initial time for a regular composite sample, the ending or final time for a sophisticated composite sample or the sample collection time for a regular grab sample. STORET uses the military 24-hour-day time system (0000-2400), with leading zeros supplied where necessary. If no time was stored in the WQF for the sample, the value of 2500 will be written in this field.
columns 36-235	These 200 columns contain the values of the water quality parameters retrieved, four columns par parameter. Values for parameter codes 84000 through 84999 and for effluent data (i.e. data stored for agency codes beginning with the characters EF) with composite sample value types R, &, =, T and W (see column 287) are in alphanumeric character format while all other parameter values are in IBM binary floating point format. (A FORTRAN program must read this field as 50 A4, into an array whose type is REAL*4.) Missing entries in this field (which occur whenever fewer than 50 parameters were retrieved or whenever no value was stored for a particular parameter within the sample) are coded with a binary number equal approximately to .1E-20. Parameter values appear in the same order that the parameter code keywords were specified in the retrieval.
columns 236-285	These 50 columns contain the stored alphabetic remark codes for the parameters specified in the request, in the same order as the parameter (P=) keywords in the retrieval request. Column 237, for example, contains the remark code stored for the second parameter value (columns 40-43). A blank indicates that no remark was stored. For parameter codes between 84000 and 84999, the single character within this field that corresponds positionally to the parameter value within columns 36-235, is concatenated to that value to provide for up to 5 characters of alphanumeric data per parameter.

column 286	This one-character alphanumeric code describes sophisticated composite samples, indicating for effluent data (i.e. data stored under agency codes beginning with the characters EF), whether the parameter values above represent:
	  C - permit conditions
	  V - actual values
	and for non-effluent data, whether the sophisticated composite is a:
	  S - spatial composite
	  T - time composite
	  B - both spatial and time composite
	  F - flow proportional composite
	  or a numeric character between 1 and 9, that identifies each set of replicate data associated with the original sample (see value type code 'D' below).
	
	A blank indicates that this data record describes a grab sample or, if columns 288-293 contain an ending date, a regular composite sample.

| column 287 | This one-character alphanumeric code contains the sophisticated composite value type, indicating for effluent data (i.e. data stored under agency codes beginning with the characters EF), that the parameter values above represent: |

    I - average concentration
    J - minimum concentration
    K - maximum concentration
    M - average loading (lbs/day assumed)
    P - minimum loading (lbs/day assumed)
    Q - maximum loading (lbs/day assumed)
    R - number of exceptions (data stored as
       alphanumeric values of up to 5 characters)
    T - frequency of analysis (data stored as
       alphanumeric values of up to 5 characters)
    W - type of sample (valid data values are CT
       for continuous, GR for grab, WK for
       weekly, CP for composite and numbers
       between 01 and 24, which represent the
       total hours for the compositing process)
    ! - minimum concentration (30 day mass) *
    ? - maximum concentration (30 day mass) *
    a - maximum loading (30 day mass) *
    & - mass units (valid data values are LB/DY
       for pounds per day, MG/DY for milligrams
       per day, ET/DY for English tons per day,
       GR/DY for grams per day, MT/DY for metric
       tons per day and KG/DY for kilograms per
       day) *
    = - number of analyses (data stored as
       alphanumeric values of up to 5
       characters) *

   * Data from EPA Application Form 2C Waste Water
     Discharge Consolidated Permits Program

and for non-effluent data, that the parameter values above represent:

    A - average
    H - high or maximum
    L - low or minimum
    # - number of individual grab samples
       comprising the composite
    S - standard deviation
    U - sum of squares
    V - variance
    C - coefficient of error
    X - coefficient of variance
    E - skewness
    F - kurtosis
    Z - number of samples comprising the
       composite that exceed established limits
    % - precision
    $ - accuracy
    D - replicate

For sophisticated composite samples, a blank indicates that none of the above apply. Otherwise, a blank indicates that this data record describes a grab sample or, if columns 288-293 contain an ending date, a regular composite sample.

| columns 288-293 | This six-character field contains the beginning or initial date for a sophisticated composite sample, the ending or final date for a regular composite sample or all zeros for a regular grab sample. The date is all numeric, in the format YYMMDD, with leading zeros supplied where necessary. |

| columns 294-297 | This four-digit field contains the beginning or initial time for a sophisticated composite sample, 2500 for a regular composite or all zeros for a regular grab sample. STORET uses the military 24-hour-day time system (0000-2400) with leading zeros supplied where necessary. If no time was stored for a sophisticated composite sample, the value 2500 will be written in this field. |

columns 298-299   This two-character alphanumeric field describes the compositing process and, for data gathered by the U.S. Geological Survey (USGS) (STORET agency code 112WRD), may contain sample level remark codes. Valid values are:

        C - measurements used in the compositing process were collected continuously (column 298)

        G - individual grab samples were composited but the actual number not reported (column 298)

        xx - two-digit number indicating the number of individual grab samples composited

For USGS data only, column 299 may contain one of the following sample level remark codes:

        F - parameter values above represent field measurements

        X - parameter values above represent extra analysis for daily sampled station

Since USGS water quality data transferred to STORET does not contain "the number of individual grab samples composited", column 299 is available for use with the sample level remarks.

columns 300-304   This five-character field contains the depth at which the sample was taken (expressed in whole feet). Leading zeros are supplied where necessary.

column 305   This one-character alphabetic field contains the sample depth type code. Valid values are:

        B - depth to bottom of the water column

        V - vertically-integrated depth from the surface

        C - core sample taken from the bottom

        P - pore sample (water extracted from a core sample)

        D - sediment sample dredged from the bottom

(Excerpted from STORET On-Line Documentation System, pages 43-)

```
+--------------+
|              |
|    CONV,     |
+--------------+
|   PGM=RET,   |
|              |
+--------------+
```
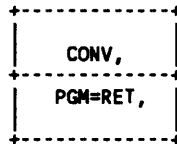
CLASSIFICATION: Program Specific Keyword

USE: The MORE keyword creates a Further Computational File (FCF)
            into which raw data is written for subsequent processing by
            user-written programs or commercial statistical packages. By
            default, numeric parameter values are written in IBM binary
            floating point format. The CONV keyword is used to convert
            these data values into a format compatible with non-IBM
            computers.

KEYWORD FORMAT:

            CONV, There is no value associated with this keyword.

DEFAULT VALUE: None.

NOTES ON USAGE:

            This keyword is only valid with MORE=3 and MORE=4 files. The
            only FCF records modified by the CONV keyword are the data
            and delimiter records. CONV causes all parameter values to
            be converted from IBM binary format (four bytes per value) to
            EBCDIC format (eight bytes per value). The converted values
            should be read as PIC 99999ES9 in COBOL, E8.0 in FORTRAN and
            PIC '99999ES9' in PL/I. Thus the lengths of the data and
            delimiter records are increased by 40 bytes (from 75 to 115)
            for MORE=3 files and by 200 bytes (from 305 to 505) for
            MORE=4 files. The length of the MORE=3 parameter value field
            becomes 80 bytes (columns 36-115). For MORE=4 files, the
            parameter value field becomes 400 bytes (columns 36-435) in
            length and the columnar positions of all fields that follow
            the parameter value field field, within the data record, are
            increased by 200. Missing entries in this field, which occur
            either when fewer than the maximum number of parameters (10
            for MORE=3, 50 for MORE=4) were retrieved or when no data was
            stored for a particular parameter within the sample, are
            coded with the eight character value '-9999E+9'.

            Job Control Language (JCL) defining the output file (DDname
            OUTF) must be supplied in the retrieval request. Reference
            the STORET help dataset named 'STORET.HELP.MORE.EXAMPLE.TAPE'
            for an example MORE=4 CONV retrieval. To transform the
            retrieval to a MORE=3 CONV request, simply change the MORE=
            value from to 3 and modify the JCL to reflect the MORE=3 CONV
            file attributes.

Appendix 4.--Program SAMPLE.TAPE.JOB output

SAS

20:35 FRIDAY, MARCH 22, 1985   1

TAPE LIST FOR DDNAME - T1

OWNER -

CONTENTS OF TAPE VOLUME - RAST22

FILE NUMBER	DSNAME	RECFM	LRECL	BLKSIZE	BLOCK COUNT	EST. FEET	CREATED	EXPIRES	CREATED BY JOB NAME	STEPNAME	TRTCH	DEN	PSWD	UHL	UTL
1	RAST22.STC48	FB	505	5050	3668	339.7	22MAR85	0000098	KYS22	/S1		4	NO	0	0
2	RAST22.STC41	FB	505	5050	686	64.4	22MAR85	0000098	KYS22	/S2		4	NO	0	0
3	RAST22.STC16	FB	505	5050	658	61.8	22MAR85	0000098	KYS22	/S3		4	NO	0	0
4	RAST22.STC32	FB	505	5050	2174	201.7	22MAR85	0000098	KYS22	/S4		4	NO	0	0
5	RAST22.STC49	FB	505	5050	781	73.1	22MAR85	0000098	KYS22	/S5		4	NO	0	0
6	RAST22.STC35	FB	505	5050	805	75.3	22MAR85	0000098	KYS22	/S6		4	NO	0	0
7	RAST22.STC40	FB	505	5050	1260	117.4	22MAR85	0000098	KYS22	/S7		4	NO	0	0
8	RAST22.STC04	FB	505	5050	758	71.0	22MAR85	0000098	KYS22	/S8		4	NO	0	0
9	RAST22.STC39	FB	505	5050	5531	511.7	22MAR85	0000098	KYS22	/S9		4	NO	0	0
10	RAST22.STC24	FB	505	5050	264	25.4	22MAR85	0000098	KYS22	/S10		4	NO	0	0
11	RAST22.STC10	FB	505	5050	31	3.9	22MAR85	0000098	KYS22	/S11		4	NO	0	0

						1545.8									

```
PGM=RET,PURP=FED/EDIT,CONV,PRT=NO,
STC=cc,
EXTRACT=LAKE AND AMBNT AND
(P665 OR P671 OR P666 OR
P600 OR P640 OR P605 OR P610 OR P620 OR P615 OR
P690 OR P685 OR
P32230 OR P32221 OR P32217 OR P32209 OR P32211 OR
P32210 OR P32231 OR P32212 OR P32214 OR
P78 OR P30 OR P34 OR
P400 OR P410 OR P480 OR
P500 OR P515 OR P530 OR P70300 OR
P445 OR P440 OR P940 OR
P945 OR P946 OR
P916 OR P915 OR
P927 OR P925 OR
P937 OR P935 OR
P929 OR P930 OR
P72026 OR P82015 OR P72025 OR P82016 OR
P72023 OR P81025 OR P51),
P=665,P=671,P=666,
P=600,P=640,P=605,P=610,P=620,P=615,
P=690,P=685,
P=32230,P=32221,P=32217,P=32209,P=32211,
P=32210,P=32231,P=32212,P=32214,
P=78,P=30,P=34,
P=400,P=410,P=480,
P=500,P=515,P=530,P=70300,
P=445,P=440,P=940,
P=945,P=946,
P=916,P=915,
P=927,P=925,
P=937,P=935,
P=929,P=930,
P=72026,P=82015,P=72025,P=82016,
P=72023,P=81025,P=51,
BD=700501,ED=841001,
BG=0501,EG=1001,
/*
```

```
//KYS45     JOB (NAWCSTORP,MKYS),STORET,NOTIFY=KYS,TIME=50,
//             MSGLEVEL=(1,1),PRTY=4,PASSWORD=SAC2
/*ROUTE  PRINT RMT232
/*JOBPARM LINES=500
/*TAPE B10001,RASP01
ââââ //* ONE STEP STORET MONITOR        TSO VERSION OF OCT 11,1984 (JLB)
//* BATCH JCL DECK VALID ONLY FOR PGM=RET WITH CONV OPTION
//S1 EXEC PGM=WQROOT,REGION=1500K,COND=(EVEN)
//OUTF DD UNIT=3400-5,VOL=SER=RASP01,DISP=(NEW,PASS,KEEP),
// DCB=(RECFM=FB,LRECL=505,BLKSIZE=5050,DEN=4),
// LABEL=(1,SL,EXPDT=98000),DSN=RASP01.STC48
//STEPLIB DD DSN=CWT.F.STORET.LOADLIB,DISP=SHR
//        DD DSN=CWT.STORET.TESTLIB,DISP=SHR
//        DD DISP=SHR,DSN=SYS2.SAS.LIBRARY
//PRINT DD SYSOUT=A
//* SAS REQUIRES THESE JCL LINES
//TASKLIB DD DISP=SHR,DSN=SYS2.SAS.LIBRARY
//$SORTPARM DD DSN=SYS1.PRODPROC(SASSORTP),DISP=SHR
//MAPS DD DISP=SHR,DSN=SYS2.SAS.MAPS.DATA
//WORK DD UNIT=SYSDA,SPACE=(TRK,(50,50))
//FT12F001 DD SYSOUT=A,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=141)
//FT22F001 DD DUMMY,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=141)
//FT25F001 DD UNIT=SYSDA,SPACE=(400,(100,300)),    PARMCARDS
//            DCB=(RECFM=FB,LRECL=80,BLKSIZE=400,BUFNO=1)
//* END OF SAS ONLY JCL. SEE ALSO FT06F001,SYSOUT
//*       START OF CHANGES
//MEDF DD UNIT=SYSDA,SPACE=(CYL,(30,30)),DSN=&&LDJFHR,
// DISP=(,PASS),
// DCB=(RECFM=FB,LRECL=14,BLKSIZE=13020,BUFNO=1)
//MEANWK01 DD UNIT=SYSDA,SPACE=(CYL,05,,CONTIG),DSN=&&WK1,DISP=(,PASS)
//MEANWK02 DD UNIT=SYSDA,SPACE=(CYL,05,,CONTIG),DSN=&&WK2,DISP=(,PASS)
//MEANWK03 DD UNIT=SYSDA,SPACE=(CYL,05,,CONTIG),DSN=&&WK3,DISP=(,PASS)
//MEANWK04 DD UNIT=SYSDA,SPACE=(CYL,05,,CONTIG),DSN=&&WK4,DISP=(,PASS)
//MEANWK05 DD UNIT=SYSDA,SPACE=(CYL,05,,CONTIG),DSN=&&WK5,DISP=(,PASS)
//MEANWK06 DD UNIT=SYSDA,SPACE=(CYL,05,,CONTIG),DSN=&&WK6,DISP=(,PASS)
//MEANWK07 DD UNIT=SYSDA,SPACE=(CYL,05,,CONTIG),DSN=&&WK7,DISP=(,PASS)
//MEANIN DD VOL=REF=*.MEDF,DCB=*.MEDF,DSN=*.MEDF,DISP=(OLD,PASS),
//SMEDF DD VOL=REF=*.MEDF,DCB=*.MEDF,DSN=*.MEDF,DISP=(OLD,PASS)
//MEANOUT DD VOL=REF=*.MEDF,DCB=*.MEDF,DSN=*.MEDF,DISP=(OLD,PASS)
//CBITFL DD DISP=SHR,
// DSN=STORET.F.CASTSTR.ISAM1
//TCAS DD UNIT=SYSDA,
// SPACE=(TRK,(5,1),RLSE),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=1600,BUFNO=1)
//*     END OF CHANGES
//BITFL DD DSN=CWT.BITSTR.ISAM1,DISP=SHR
//T01 DD UNIT=SYSDA,SPACE=(TRK,(1,1)),DISP=(MOD,PASS),
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=1600,BUFNO=1)
//T99 DD UNIT=SYSDA,SPACE=(TRK,(1,1)),DCB=*.T01
//T23 DD UNIT=SYSDA,SPACE=(TRK,(9,9)),DCB=*.T01
//T24 DD UNIT=SYSDA,SPACE=(TRK,(1,1)),DCB=*.T01
//AREAIDX DD DSN=RXGA036.A208.INDEX,
//      DISP=SHR,DCB=BUFNO=1
//AREAFLE DD DSN=RXGA036.A208.DATA,
//      DCB=KEYLEN=20,DISP=SHR
//SUBAF DD DISP=SHR,DSN=STORET.STC.SA.ASA
//HOLD1 DD SPACE=(TRK,11),UNIT=SYSDA,
//   DCB=(RECFM=FB,BLKSIZE=12000,LRECL=4000,BUFNO=1)
//HOLD2 DD SPACE=(TRK,11),UNIT=SYSDA,
//   DCB=(RECFM=FB,BLKSIZE=12000,LRECL=4000,BUFNO=1)
//OUTFL DD SPACE=(TRK,10),UNIT=SYSDA,
//   DCB=(RECFM=F,LRECL=12500,BUFNO=1)
//SMASK DD VOL=REF=*.OUTFL,DCB=*.OUTFL,DISP=(OLD,PASS),
// DSN=*.OUTFL
//CARDIN DD VOL=REF=*.T23,DCB=*.T23,DISP=(OLD,PASS),DSN=*.T23
//RECIN DD DISP=SHR,DSN=WLMGRAF.SORTBLE.RECSUB
//HEADIN DD DSN=&&OUTFILE,UNIT=SYSDA,
//   SPACE=(TRK,(10,2)),DISP=(MOD,PASS),
//   DCB=(RECFM=VB,BLKSIZE=13030,LRECL=13020,DSORG=PS)
//HEADOUT DD DSN=&&SORTOUT,UNIT=SYSDA,
//   SPACE=(TRK,(10,2)),DISP=(,PASS),
//   DCB=(RECFM=VB,BLKSIZE=13030,LRECL=13020,DSORG=PS)
//SYSPRINT DD SYSOUT=A
//PRINTR DD SYSOUT=A
//TYPF DD DISP=SHR,DSN=CXTA008.WQ.TYPF
//PRINTL DD SYSOUT=A
```

```
//PRINTI DD SYSOUT=A
//PRINTD DD SYSOUT=A,DCB=BLKSIZE=400
//PRINTF DD SYSOUT=A
//FCF DD UNIT=SYSDA,SPACE=(TRK,(95,95)),
//         DCB=(RECFM=VB,LRECL=309,BLKSIZE=6184,BUFNO=1)
//INDEA DD DSN=CWT.F.IND,DISP=SHR
//ABF DD DSN=CWT.F.ABFO,DISP=SHR,DCB=BUFNO=1
//ABB DD DSN=CWT.F.ABR,DISP=SHR,DCB=BUFNO=1
//ASF DD DSN=CWT.F.ASF,DISP=SHR,DCB=BUFNO=1
//ASRF DD DSN=CWT.F.ASRF,DISP=SHR,DCB=BUFNO=1
//RSPF DD DISP=SHR,DSN=CWT.F.RSPF,DCB=BUFNO=1
//RMIF DD DSN=CWT.F.AMF,DISP=SHR,DCB=BUFNO=1
//LATF DD DSN=CWT.F.LATF,DISP=SHR,DCB=BUFNO=2
//STCOF DD DISP=SHR,DSN=CWT.F.COUNTY,DCB=BUFNO=1,UNIT=(3330-1,,DEFER)
//CF DD UNIT=SYSDA,SPACE=(CYL,(20,10))
//PTF DD UNIT=SYSDA,SPACE=(TRK,11),
//       DCB=(RECFM=F,LRECL=7920,BLKSIZE=7920,BUFNO=1)
//BITMAT DD UNIT=SYSDA,SPACE=(TRK,4),
//       DCB=(RECFM=F,LRECL=13030,BLKSIZE=13030)
//WQSTATS DD DSN=CWT.WQSTATS,DISP=SHR
//CSNRF DD DISP=(,PASS),UNIT=SYSDA,DSN=&RCSN,
//  SPACE=(TRK,(10,10)),
//  DCB=(RECFM=FB,BLKSIZE=12000,LRECL=4,BUFNO=1)
//CSNIF DD DISP=(,PASS),UNIT=SYSDA,DSN=&ICSN,
//  SPACE=(TRK,(10,10)),
//  DCB=(RECFM=FB,BLKSIZE=12000,LRECL=4,BUFNO=1)
//CDFTR DD DISP=(,PASS),UNIT=SYSDA,DSN=&FTR,
//  SPACE=(TRK,(10,10)),
//  DCB=(RECFM=FB,BLKSIZE=6400,LRECL=80,BUFNO=1)
//CDFTI DD DISP=(,PASS),UNIT=SYSDA,DSN=&FTI,
//  SPACE=(TRK,(10,10)),
//  DCB=(RECFM=FB,BLKSIZE=6400,LRECL=80,BUFNO=1)
//CARDF DD VOL=REF=*.T99,DCB=*.T99,DSN=*.T99,DISP=(OLD,PASS)
//      DD VOL=REF=*.T01,DCB=*.T01,DSN=*.T01,DISP=(OLD,PASS)
//T01RB DD VOL=REF=*.T01,DCB=*.T01,DSN=*.T01,DISP=(OLD,PASS)
//SYSOUT DD SYSOUT=A
//CARTWK01 DD VOL=REF=*.MEANWK01,DCB=*.MEANWK01,DSN=*.MEANWK01,
//      DISP=(OLD,PASS)
//CARTWK02 DD VOL=REF=*.MEANWK02,DCB=*.MEANWK02,DSN=*.MEANWK02,
//      DISP=(OLD,PASS)
//CARTWK03 DD VOL=REF=*.MEANWK03,DCB=*.MEANWK03,DSN=*.MEANWK03,
//      DISP=(OLD,PASS)
//CARTWK04 DD VOL=REF=*.MEANWK04,DCB=*.MEANWK04,DSN=*.MEANWK04,
//      DISP=(OLD,PASS)
//CARTWK05 DD VOL=REF=*.MEANWK05,DCB=*.MEANWK05,DSN=*.MEANWK05,
//      DISP=(OLD,PASS)
//CARTWK06 DD VOL=REF=*.MEANWK06,DCB=*.MEANWK06,DSN=*.MEANWK06,
//      DISP=(OLD,PASS)
//CARTIN DD VOL=REF=*.CF,DSN=*.CF,DISP=(OLD,PASS),
//   DCB=(RECFM=FB,BLKSIZE=2496,LRECL=78)
//CARTOUT DD VOL=REF=*.CF,DSN=*.CF,DISP=(OLD,PASS),
//   DCB=(RECFM=FB,BLKSIZE=2496,LRECL=78)
//CNTYNMF DD DSN=DGCA062.INITF.FIPSTCO,DISP=SHR
//FT06F001 DD SYSOUT=A
//INF DD VOL=REF=*.FCF,DCB=*.FCF,DSN=*.FCF,DISP=(OLD,PASS)
//CARDFD DD DATA
ââââ  PGM=RET,PURP=FED/EDIT,CONV,PRT=NO,
STC=48,
EXTRACT=LAKE AND AMBNT AND
(P00660 OR
P00650 OR
P00653 OR
P70505 OR
P00669 OR
P71886 OR
P70507 OR
P00678 OR
P01070 OR
P00618 OR
P71851 OR
P71850 OR
P00613 OR
P71856 OR
P71855 OR
P00630 OR
P71845 OR
P00625 OR
P71887 OR
P32232 OR
```

```
P32234 OR
P32216 OR
P00505 OR
P00530 OR
P80154 OR
P00691 OR
P00680 OR
P00681 OR
P00403 OR
P00095 OR
P00094 OR
P00435 OR
P00900 OR
P00070 OR
P00074 OR
P82078 OR
P00076 OR
P82079 OR
P00080 OR
P00081 OR
P00031 OR
P70992 OR
P70991 OR
P70990 OR
P70989 OR
P00299 OR
P00300),
P=00660,
P=00650,
P=00653,
P=70505,
P=00669,
P=71886,
P=70507,
P=00678,
P=01070,
P=00618,
P=71851,
P=71850,
P=00613,
P=71856,
P=71855,
P=00630,
P=71845,
P=00625,
P=71887,
P=32232,
P=32234,
P=32216,
P=00505,
P=00530,
P=80154,
P=00691,
P=00680,
P=00681,
P=00403,
P=00095,
P=00094,
P=00435,
P=00900,
P=00070,
P=00074,
P=82078,
P=00076,
P=82079,
P=00080,
P=00081,
P=00031,
P=70992,
P=70991,
P=70990,
P=70989,
P=00299,
P=00300,
BD=700501,ED=841001,
BG=0501,EG=1001,
/*
```

```
112WRD   |31521709108213531 52 17.0 091 08 21.0|ALCORN LAKE AT ALCORN, MS        072907568   |28021  |
112WRD   |315217091082135
3|00000000000000000000001000000000000000000000000000010000000000000000000000000000000000000000000
1|COEHUN|3PIC2000734 59 19.0 088 12 44.0|YELLOW CREEK EMBAYMENT, MILE 1.0    |0408|28141  |
1|COEHUN|3PIC20007
1|00000000000000000000000000000000000000000000000000000010000000000000000000000000000000000000000
1|COEHUN|3PIC2000834 41 30.0 088 13 18.0|YELLOW CREEK EMBAYMENT, MILE 6.0    |0408|28141  |
1|COEHUN|3PIC20008
1|00000000000000000000000000000000000000000000000000000010000000000000000000000000000000000000000
1|EPALES|28010134 43 46.0 090 04 56.0|ARKABUTLA LAKE    |1011|28033  |
1|EPALES|280101
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28010234 45 45.0 090 08 22.0|ARKABUTLA LAKE    |1011|28033  |
1|EPALES|280102
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28010334 49 40.0 090 06 10.0|ARKABUTLA LAKE    |1011|28033  |
1|EPALES|280103
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28020134 08 52.0 089 47 22.0|ENID LAKE    |1011|28161  |
1|EPALES|280201
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28020234 09 00.0 089 50 55.0|ENID LAKE    |1011|28161  |
1|EPALES|280202
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28020334 08 58.0 089 54 08.0|ENID LAKE    |1011|28161  |
1|EPALES|280203
4|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28040132 23 32.0 090 01 06.0|ROSS BARNETT RESERVOIR    |28121  |
1|EPALES|280401
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28040232 23 52.0 090 03 48.0|ROSS BARNETT RESERVOIR    |28121  |
1|EPALES|280402
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28040332 26 52.0 090 02 42.0|ROSS BARNETT RESERVOIR    |28121  |
1|EPALES|280403
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28040432 29 15.0 089 59 45.0|ROSS BARNETT RESERVOIR    |28121  |
1|EPALES|280404
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28050134 24 30.0 089 47 35.0|SARDIS LAKE    |1011|28107  |
1|EPALES|280501
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28050234 25 22.0 089 45 35.0|SARDIS LAKE    |1011|28107  |
1|EPALES|280502
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28050334 26 25.0 089 43 30.0|SARDIS LAKE    |1011|28107  |
1|EPALES|280503
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28050434 28 30.0 089 40 35.0|SARDIS LAKE    |1011|28071  |
1|EPALES|280504
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28060133 48 35.0 089 45 06.0|GRENADA LAKE    |1011|28043  |
1|EPALES|280601
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28060233 51 25.0 089 42 40.0|GRENADA LAKE    |1011|28043  |
1|EPALES|280602
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
1|EPALES|28060333 49 45.0 089 40 35.0|GRENADA LAKE    |1011|28043  |
1|EPALES|280603
5|110000000000000000000000000000000000000000000000000010000000000000010000000000000000000000000000
```

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Appendix 8.--Sample data file illustrating data for State number 28

```
112WRD  |31521709108213S|8205260950 ...  1|  4|00400: 6399E-3|00095: 1949E-1|00300: 1399E-3|00010: 2549E-2|
112WRD  |31521709108213S|8205260951 ...  5|  4|00400: 6199E-3|00095: 2019E-1|00300: 0000E 0|00010: 2399E-2|
112WRD  |31521709108213S|8205260952 ... 10|  4|00400: 6599E-3|00095: 2389E-1|00300: 0000E 0|00010: 1649E-2|
11COEHUN 3P1C20007  8404171030 ...  0|  1|72025: 3500E-2|
11COEHUN 3P1C20008  8404171015 ...  0|  1|72025: 1900E-2|
11EPALES|280101 |7306131530 ...  0| 10|00665: 1979E-4|00671: 2099E-5|00610: 2099E-5|00410: 1200E-2|00630: 2799E-4|00625: 1199E-
3|00095: 4600E-2|00074:4900E-2
11EPALES|280101 |7306131530 ...  6|  9|00665: 2169E-4|00671: 2799E-5|00610: 2799E-5|00410: 1300E-2|00630: 3399E-4|00625: 5000E-
4|00095: 5000E-2|00074:5200E-2
11EPALES|280101 |7308281115 ...  0| 10|00665: 4899E-5|00671: 7999E-6|00610: 8999E-5|00410: 2400E-2|00630: 9999E-5|00625: 1299E-
3|00095: 5320E-1|00074:7800E-2
11EPALES|280101 |7308281115 ...  5|  9|00665: 4799E-5|00671: 9999E-6|00610: 9999E-6|00410: 2500E-2|00630: 6999E-5|00625: 8999E-
4|00095: 5070E-1|00074:8000E-2
11EPALES|280101 |7311011237 ...  0|  1|72025: 1900E-2|
11EPALES|280102 |7306131610 ...  0|  9|00665: 1659E-4|00671: 2399E-5|00610: 2399E-5|00410: 1599E-4|00630: 2999E-4|00625: 3999E-
4|00074:4800E-2|00010:3059E-2
11EPALES|280102 |7306131610 ...  6|  9|00665: 2309E-4|00671: 2999E-5|00610: 2999E-5|00410: 1699E-4|00630: 3899E-4|00625: 5999E-
4|00074:4900E-2|00300:6000E-3
11EPALES|280102 |7308281035 ...  0| 10|00665: 5799E-5|00671: 8999E-6|00610: 8999E-6|00410: 4999E-5|00630: 3999E-5|00625: 1000E-
3|00300:5199E-3
11EPALES|280102 |7308281035 ... 10|  9|00665: 5399E-5|00671: 8999E-6|00610: 8999E-6|00410: 6999E-5|00630: 4999E-5|00625: 7999E-
4|00300:5399E-3
11EPALES|280102 |7311011252 ...  0|  ...
11EPALES|280103 |7306131730 ...  0|  9|00665: 2269E-4|00671: 2899E-5|00610: 2899E-5|00410: 2500E-4|00630: 4399E-4|00625: 7999E-
4|00074:5000E-2|00010:2739E-2
11EPALES|280103 |7306131730 ...  6|  9|00665: 2329E-4|00671: 2799E-5|00610: 2799E-5|00410: 1999E-4|00630: 4199E-4|00625: 5000E-
4|00074:4700E-2|00300:5399E-3
11EPALES|280103 |7308281005 ...  0| 10|00665: 6499E-5|00671: 5999E-6|00610: 5999E-6|00410: 7999E-5|00630: 6999E-5|00625: 1399E-
3|00300:4399E-3
11EPALES|280103 |7308281005 ...  8|  9|00665: 5399E-5|00671: 7999E-6|00610: 7999E-6|00410: 1099E-4|00630: 1099E-4|00625: 8999E-
4|00300:2799E-3
11EPALES|280103 |7311011308 ...  0|  1|72025: 3000E-3|
11EPALES|280201 |7306121500 ...  0|  9|00665: 1489E-4|00671: 7799E-5|00610: 7799E-5|00410: 1299E-4|00630: 9999E-5|00625: 7999E-
4|00074:8100E-2|00010:2829E-2
11EPALES|280201 |7306121500 ...  6|  9|00665: 6499E-5|00671: 6999E-5|00610: 6999E-5|00410: 9999E-5|00630: 1199E-4|00625: 2999E-
4|00074:8200E-2|00300:6899E-3
11EPALES|280201 |7308271900 ...  0| 10|00665: 3299E-5|00671: 4999E-6|00610: 4999E-6|00410: 6999E-5|00630: 5999E-5|00625: 8999E-
3|00300:8799E-3
11EPALES|280201 |7308271900 ...  5|  9|00665: 1899E-5|00671: 4999E-6|00610: 4999E-6|00410: 3999E-5|00630: 3999E-5|00625: 5999E-
4|00300:7000E-2
11EPALES|280201 |7311011550 ...  0|  1|72025: 6000E-3|
11EPALES|280202 |7306121540 ...  0|  9|00665: 6599E-5|00671: 7999E-6|00610: 7999E-6|00410: 1399E-4|00630: 9999E-5|00625: 1099E-
4|00074:7900E-2|00010:3029E-2
11EPALES|280202 |7306121540 ...  6|  8|00665: 5999E-5|00671: 6999E-6|00610: 6999E-6|00410: 9999E-5|00630: 1199E-4|00625: 3999E-
4|00074:8100E-2|00300:2700E-2
11EPALES|280202 |7308271915 ...  0|  9|00665: 1499E-5|00671: 3999E-6|00610: 3999E-6|00410: 3999E-5|00630: 3999E-5|00625: 7999E-
3|00300:2979E-2
11EPALES|280202 |7308271915 ...  0|  1|72025: 1800E-2|
11EPALES|280203 |7311011540 ...  0|  9|00665: 6499E-5|00671: 5999E-6|00610: 5999E-6|00410: 1499E-4|00630: 9999E-5|00625: 1199E-
4|00074:8300E-2|00010:3050E-2
11EPALES|280203 |7306121615 ...  6|  9|00665: 6099E-5|00671: 4999E-6|00610: 4999E-6|00410: 7999E-5|00630: 8999E-5|00625: 3999E-
4|00074:8200E-2|00300:7799E-3
11EPALES|280203 |7308271940 ...  0| 10|00665: 2399E-5|00671: 4999E-6|00610: 4999E-6|00410: 4999E-5|00630: 4999E-5|00625: 8999E-
3|00300:7799E-3
11EPALES|280203 |7308271940 ... 10|  9|00665: 2199E-5|00671: 5999E-6|00610: 5999E-6|00410: 5999E-5|00630: 5999E-5|00625: 6999E-
4|00300:9100E-2
```

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4|00074: 9000E-2|00300:7599E-3
1|EPALES|280203
1|EPALES|280401  7311011518   0|  1|72025: 2800E-2|         0| 9|00665: 9099E-5|00671: 1799E-5|00610: 1799E-4|00630: 1900E-2|00625: 1399E-4|00625: 1500E-
3|00074: 8000E-2|00010:2959E-2
1|EPALES|280401  7306141630   6|  8|00665: 8999E-5|00671: 2099E-5|00610: 1699E-4|00630: 1800E-2|00625: 1399E-4|00625: 7999E-
4|00074: 7800E-2|00010:2989E-2
1|EPALES|280401  7306141630   0|  9|00665: 4499E-5|00671: 8999E-6|00610: 7999E-5|00630: 2000E-2|00625: 5999E-5|00625: 1099E-
3|00074: 7200E-2|00010:2989E-2
1|EPALES|280401  7308271505   5|  8|00665: 4499E-5|00671: 5999E-6|00610: 5999E-5|00630: 2000E-2|00625: 6999E-5|00625: 7999E-
4|00074: 7500E-2|00010:2950E-2
1|EPALES|280401  7308271505
1|EPALES|280402  7311021010   0|  1|72025: 1600E-2|         0| 9|00665: 6299E-5|00671: 9999E-6|00610: 1599E-4|00630: 1300E-2|00625: 1099E-4|00625: 8999E-
4|00074: 8800E-2|00010:2789E-2
1|EPALES|280402  7306141700   6|  8|00665: 5999E-5|00671: 1099E-5|00610: 1699E-4|00630: 1400E-2|00625: 1299E-4|00625: 5999E-
4|00074: 8800E-2|00010:2779E-2
1|EPALES|280402  7306141700   0|  9|00665: 2499E-5|00671: 4999E-6|00610: 5999E-5|00630: 1600E-2|00625: 5999E-5|00625: 1199E-
3|00074: 8600E-2|00010:2950E-2
1|EPALES|280402  7308271300   5|  8|00665: 2399E-5|00671: 3999E-6|00610: 3999E-5|00630: 1700E-2|00625: 3999E-5|00625: 1099E-
3|00074: 8500E-2|00010:2879E-2
1|EPALES|280402  7308271300
1|EPALES|280403  7311020951   0|  1|72025: 4000E-2|         0| 8|00665: 6099E-5|00671: 9999E-6|00610: 1699E-4|00630: 1099E-4|00625: 1299E-3|00074: 8500E-
4|00074: 2829E-2|72025:1700E-2
2|00010: 2829E-2|72025:1700E-2
1|EPALES|280403  7306151050   6|  8|00665: 5899E-5|00671: 5999E-6|00610: 1499E-4|00630: 9000E-3|00625: 9999E-5|00625: 5000E-
4|00074: 8500E-2|00010:2829E-2
1|EPALES|280403  7306151050   0|  9|00665: 2899E-5|00671: 5999E-6|00610: 6999E-5|00630: 1600E-2|00625: 6999E-5|00625: 1399E-
3|00074: 8200E-2|00010:2819E-2
1|EPALES|280403  7308271215   5|  8|00665: 2899E-5|00671: 4999E-6|00610: 4999E-5|00630: 1800E-2|00625: 5999E-5|00625: 8999E-
3|00074: 8200E-2|00010:2819E-2
1|EPALES|280403  7308271215
1|EPALES|280403  7311020937   0|  1|72025: 2000E-2|         0| 9|00665: 6699E-5|00671: 1799E-4|00610: 1799E-4|00630: 8000E-3|00625: 1199E-4|00625: 8999E-
4|00074: 8200E-2|00010:2869E-2
1|EPALES|280404  7306151130   6|  8|00665: 6799E-5|00671: 2099E-4|00610: 2099E-4|00630: 7699E-3|00625: 1299E-4|00625: 5999E-
4|00074: 8000E-2|00010:2779E-2
1|EPALES|280404  7306151130   0|  9|00665: 2199E-5|00671: 6999E-5|00610: 6999E-5|00630: 7000E-3|00625: 3999E-5|00625: 1199E-
4|00074: 7900E-2|00010:2979E-2
1|EPALES|280404  7308271145   5|  8|00665: 2599E-5|00671: 5999E-6|00610: 5999E-5|00630: 7000E-3|00625: 3999E-5|00625: 8999E-
4|00074: 8200E-2|00010:2909E-2
1|EPALES|280404  7308271145
1|EPALES|280404  7311020922   0|  1|72025: 1800E-2|         0| 9|00665: 7799E-5|00671: 7499E-5|00610: 1299E-4|00630: 1500E-2|00625: 1499E-4|00625: 5999E-
3|00074: 8200E-2|00010:2819E-2
1|EPALES|280501  7306130935   6|  8|00665: 6699E-5|00671: 1899E-5|00610: 1199E-4|00630: 1300E-2|00625: 1599E-4|00625: 5000E-
4|00074: 8000E-2|00010:2779E-2
1|EPALES|280501  7306130935   0|  9|00665: 1899E-5|00671: 1799E-5|00610: 6999E-5|00630: 1700E-2|00625: 3999E-5|00625: 7999E-
4|00074: 7400E-2|00010:2669E-2
1|EPALES|280501  7308271510   0|  2|00074: 9400E-2|00010: 2939E-2|
4|00074: 7900E-2|00010:2909E-2      5|  1|72025: 4100E-2|
1|EPALES|280501  7311011205   0|  9|00665: 6499E-5|00671: 8999E-6|00610: 1299E-4|00630: 1199E-4|00410: 1500E-2|00625: 5000E-
4|00074: 7600E-2|00010:2819E-2
1|EPALES|280502  7306131030   6|  8|00665: 6199E-5|00671: 3999E-5|00610: 7999E-5|00630: 1500E-2|00625: 1299E-4|00625: 3999E-
4|00074: 7800E-2|00010:2700E-2
1|EPALES|280502  7308271555   0|  9|00665: 1399E-5|00671: 6999E-6|00610: 2999E-5|00630: 1800E-2|00625: 1999E-5|00625: 7999E-
4|00074: 9300E-2|00010:3009E-2
1|EPALES|280502  7308271555   5|  2|00074: 9300E-2|00010: 2969E-2|
1|EPALES|280502  7311011149   0|  1|72025: 3500E-2|
1|EPALES|280503  7306131345   0|  9|00665: 6099E-5|00671: 5999E-6|00610: 5999E-6|00630: 9999E-5|00410: 1500E-2|00625: 5000E-
4|00074: 7800E-2|00010:2819E-2
1|EPALES|280503  7306131345   6|  8|00665: 2999E-6|00671: 4999E-6|00610: 4999E-6|00630: 7999E-5|00410: 1600E-2|00625: 3999E-
4|00074: 8000E-2|00010:2819E-2
1|EPALES|280503  7308271625   0|  9|00665: 1599E-5|00671: 6999E-6|00610: 6999E-6|00630: 1999E-5|00410: 2000E-2|00625: 5000E-
```

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4|00074: 9200E-2|00010:2989E-2
1|EPALES|280503          |7308271625|  5|  2|00074: 9200E-2|00010: 2879E-2|
1|EPALES|280503          |7311011129|  0|  1|72025: 3500E-2|
1|EPALES|280504          |7306131430|  0|  9|00665: 6299E-5|00671: 4999E-6|00610: 6999E-5|00410: 4999E-6|00630: 1400E-2|00625: 6999E-5|00625: 5999E-
4|00074: 7600E-2|00010:2939E-2
1|EPALES|280504          |7306131430|  6|  9|00665: 6499E-5|00671: 7999E-6|00610: 7999E-5|00410: 7999E-5|00630: 1300E-2|00625: 1099E-4|00625: 5000E-
4|00074: 7600E-2|00300:6799E-3
1|EPALES|280504          |7308271655|  0| 10|00665: 1699E-5|00671: 4999E-6|00610: 4999E-5|00410: 4999E-5|00630: 2200E-2|00625: 4999E-5|00625: 5999E-
4|00074: 9100E-2|00300:7799E-3
1|EPALES|280504          |7308271655|  6|  9|00665: 1399E-5|00671: 7999E-6|00610: 3999E-5|00410: 7999E-5|00630: 2000E-2|00625: 4999E-5|00625: 5000E-
4|00074: 9000E-2|00300:5399E-3
1|EPALES|280504          |7311011113|  0|  1|72025: 3000E-2|
1|EPALES|280601          |7306141130|  0|  8|00665: 8299E-5|00671: 1099E-5|00610: 2699E-4|00630: 2099E-4|00625: 5999E-4|00074: 6600E-
2|00010: 2669E-2|72025:5400E-2|
1|EPALES|280601          |7306141130|  6|  7|00665: 7999E-5|00671: 7999E-6|00610: 1999E-4|00630: 2399E-4|00625: 3999E-4|00074: 6800E-
2|00010: 2669E-2|
1|EPALES|280601          |7308281000|  0|  8|00665: 4299E-5|00671: 1099E-5|00610: 8999E-5|00630: 7999E-5|00625: 1500E-3|00074: 8500E-
2|00010: 2769E-2|72025:4700E-2|
1|EPALES|280601          |7308281000|  5|  7|00665: 3299E-5|00671: 6999E-6|00610: 7999E-5|00630: 9999E-5|00625: 1000E-3|00074: 8400E-
2|00010: 2750E-2|
1|EPALES|280601          |
1|EPALES|280602          |7311020733|  0|  8|00665: 9999E-5|00671: 1399E-5|00610: 2500E-4|00630: 1999E-4|00625: 1500E-3|00074: 6700E-
2|00010: 2750E-2|7306131220|
2|00010: 2750E-2|72025:3700E-2|
1|EPALES|280602          |7306131220|  6|  7|00665: 8099E-5|00671: 8999E-5|00610: 2099E-4|00630: 2299E-4|00625: 3999E-4|00074: 6800E-
2|00010: 2659E-2|
1|EPALES|280602          |7308281045|  0|  8|00665: 4699E-5|00671: 7999E-6|00610: 8999E-5|00630: 7999E-5|00625: 7999E-4|00074: 8100E-
2|00010: 2900E-2|72025:2700E-2|
1|EPALES|280602          |7308281045|  5|  7|00665: 3399E-5|00671: 5999E-6|00610: 6999E-5|00630: 5000E-4|00625: 5000E-4|00074: 8000E-
2|00010: 2879E-2|
1|EPALES|280602          |
1|EPALES|280603          |7311011613|  0|  9|00665: 9299E-5|00671: 7999E-6|00610: 2199E-4|00410: 7999E-6|00630: 1100E-2|00625: 2399E-4|00625: 6999E-
1|EPALES|280603          |7306141300|  6|  8|00665: 8099E-5|00671: 7999E-6|00610: 2199E-4|00410: 7999E-6|00630: 1000E-2|00625: 2599E-4|00625: 5000E-
4|00074: 7000E-2|00010:2889E-2
1|EPALES|280603          |7306141300|
4|00074: 7400E-2|00010:2589E-2
1|EPALES|280603          |7308281145|  0|  9|00665: 3099E-5|00671: 7999E-6|00610: 7999E-5|00410: 2200E-2|00630: 2200E-2|00625: 7999E-5|00625: 5999E-
4|00074: 8600E-2|00010:2879E-2
1|EPALES|280603          |7308281145|  5|  8|00665: 2899E-5|00671: 3999E-6|00610: 5999E-5|00410: 2300E-2|00630: 5999E-5|00625: 5999E-
4|00074: 8500E-2|00010:2779E-2
1|EPALES|280603          |7311020752|  0|  1|72025: 1500E-2|
```

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Appendix 9.--Program CHEW.F77, for making header and data files
with STORET data

```
**********************************************************************
                              PROGRAM CHEW
**********************************************************************
*
*    +----------------------------------------------------------------+
*      This program reads a STORET-produced file with the following
*      characteristics:
*
*        1. The file has 23 records of parameter code information.
*           These records are ignored
*        2. For each station, there are 9 records of identification
*           information.  These records are read and the most useful
*           items are kept for output to a Header File.
*        3. Following the header records and one dilimeter record
*           are 1 or more data records.  These records are 505 characters
*           long and contain the following:
*           a). An agency code.
*           b). Station code.
*           c). Date_time in YYMMDDhhmm form
*           d). 50 data items in E8.0 format (-9999E+9 indicates a missing
*               or non measured value)
*           e). 50 one-character error codes
*           f). a 5 digit depth code.
*
*      Since most records have fewer than half of the requested parameters,
*      the missing values take up most of the space.  This program reduces
*      the storage requirements by eliminating the missing values.
*
*      The output of this program consists of two files:
*        1. The header file, HDS.## (where ## is the STORET state code),
*           consists of two records:
*           a. The first record contains:
*               1. STATION_ID                      (15 char)
*                  a vertical bar ( )               ( 1 char)
*               2. AGENCY_CODE                      ( 8 char)
*                  a vertical bar ( )               ( 1 char)
*               3. LATITUDE_LONGITUDE deg-min-sec   (22 char)
*                  a vertical bar ( )               ( 1 char)
*                  (each unit is separated by a space)
*               4. SITE_DESCRIPTION anecdotal       (50 char)
*                  a vertical bar ( )               ( 1 char)
*               5. BASIN_CODES                      ( 4 char)
*                  a vertical bar ( )               ( 1 char)
*               6. STATE_COUNTY_CODE                ( 5 char)
*                  a vertical bar ( )               ( 1 char)
*           b. The second record contains:
*               1. STATION_ID   again              (15 char)
*                  a vertical bar ( )               ( 1 char)
*               2. NUMBER_OF_RECORDS                ( 4 digits)
*                  a vertical bar ( )               ( 1 char)
*               3. FLAGS                    (up to  50 digits)
*           All of the fields described are separated by vertical
*           bars ( ).
*        2. The data file (DTS.##) consists of one record for each
*           date-time data record in the source file.  Each record
*           contains:
*           a. STATION_ID                          (15 char)
*              a vertical bar ( )                   ( 1 char)
*           b. DATE_TIME in YYMMDDhhmm form         (10 char)
*              a vertical bar ( )                   ( 1 char)
*           c. DEPTH                                ( 5 digits)
*              a vertical bar ( )                   ( 1 char)
*           d. NUMBER_OF_PARAMETERS                 ( 3 digits)
*              a vertical bar ( )                   ( 1 char)
*           e. One or more (up to 50) of the following:
*               1. PARM_CODE                        ( 5 digits)
*               2. A colon (:)                      ( 1 char)
*               3. PARM_VALUE in E8.0 format        ( 8 char)
*               4. Vertical bar or remark code      ( 1 char)
*    +----------------------------------------------------------------+
*
```

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```
          CHARACTER RET_NUM                /*retrieval number
          CHARACTER   BND(50)              /*error code or vertical bar
          CHARACTER*6 SC                   /*state code
          CHARACTER*2 PRECISION            /*precision code (ignored)
          CHARACTER*2 DELIMITER            /* (ignored)
          CHARACTER*4  B_CODE              /*basin codes
          CHARACTER*5 PCODE(50)            /*parameter codes
          CHARACTER*6 SC_CODE              /*state and county code
          CHARACTER*8 AGENCY               /*agency code
          CHARACTER*15 STATION             /*station id
          CHARACTER*22 LATLONG             /*latitude and longitude of site
          CHARACTER*50 SITE                /*verbal site description
          CHARACTER*50 CMT                 /*comment codes
          CHARACTER*50 FLAG                /*parameter flags
*                                             (1 = presence, 0 = absence)
          CHARACTER*400 DATA_LINE          /*input buffer for data values
          CHARACTER*8 VALU(50)             /*measured values at output
          CHARACTER*8 ITEM(50)             /*measured values at input
          CHARACTER*10 DATE_TIME
          CHARACTER*5  DEPTH
          CHARACTER*8 MISSING /'-9999E+9'/ /*missing value code
          INTEGER P(50) /50*0/             /*pointer to correct parm code
          INTEGER N_REC                    /*number of records from a station
          INTEGER NP                       /*number of parameters in a record
          INTEGER UP, UD, UH, US           /*unit numbers for files
*
*     BEGIN (MAIN PROGRAM)
*
*         ------------------------------------------------------------
*         {Initialize variables}
          CALL INPUT_CHAR('ENTER THE STATE CODE--> ',SC)
          CALL INPUT_CHAR('ENTER THE NUMBER OF THE RETRIEVAL',RET_NUM)
          CALL OPEN_FILE (UP, 'PARM.CODES.'//RET_NUM, 'OLD')
          READ (UP, *) NPARM
          DO 10001 I = 1 , NPARM , 1
              READ(9,'(A)') PCODE(I)
10001     CONTINUE
          CLOSE(UP)
*         ------------------------------------------------------------
*         {Open files}
          LN = INDEX(SC,'.') + 1
          CALL OPEN_FILE (US, 'STC.'//SC(LN:), 'OLD')
          CALL OPEN_FILE (UH, 'HDS.'//SC(LN:), 'NEW')
          CALL OPEN_FILE (UD, 'DTS.'//SC(LN:), 'NEW')
*         ------------------------------------------------------------
*         {Skip over parm code header in data file}
          K = 0
10002     CONTINUE
              K = K + 1
              READ(US,'(T24,A)',END=92) DELIMITER
          IF(.NOT. (DELIMITER .EQ. '99'))GOTO10002
*         PRINT*,K,' HEADER RECORDS READ.'
*         ------------------------------------------------------------
10003     CONTINUE
*         ------------------------------------------------------------
*         {Read header records for one station}
          READ(US,'(T24,A,T92,A)',END=94) DELIMITER,   STATION
          READ(US,'(T24,A,T91,A,T114,A)',END=94)
     &              DELIMETER, LATLONG, PRECISION
          READ(US,'(T24,A,T91,A)',END=94) DELIMITER,   SITE
          READ(US,'(T24,A,T91,A)',END=94)
     &              DELIMITER, SC_CODE
          READ(US,'(T24,A,T116,A)',END=94)
     &              DELIMITER, B_CODE
          READ(US,'(T24,A)',END=94) DELIMETER
          READ(US,'(T24,A,T91,A)',END=94)
     &              DELIMITER, AGENCY
          READ(US,'(T24,A)',END=94)
     &              DELIMITER
          READ(US,'(T24,A)',END=94) DELIMITER
*         ------------------------------------------------------------
*         {Reset all flags and record counter}
          FLAG = '00000000000000000000000000000000000000000000000000'
          N_REC = 0
*         ------------------------------------------------------------
*         {Read, compress, and write data records for one station}
10004     CONTINUE
*             {Read one data record}
              READ (10,
     &            '(A,T9,A,T24,A,T26,A,T36,A,T436,A,T500,A)',
     &            END=99)
     &            AGENCY,STATION,DELIMITER,DATE_TIME,DATA_LINE,
     &            CMT,DEPTH
```

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```fortran
                    IF (DATE_TIME(1:6) .NE. '999999') THEN
*                       (Extract values from buffer (DATA_LINE))
                        READ(DATA_LINE,'(50A8)')(ITEM(I),I = 1,NPARM)
                        NP = 0
                        DO 10005 I = 1 , NPARM , 1
                            IF (ITEM(I) .NE. MISSING) THEN
                                NP = NP + 1
                                VALU(NP) = ITEM(I)
                                P(NP)    = I
                                FLAG(I:I) = '1'
                                IF (CMT(I:I) .EQ. ' ') THEN
                                    BND(NP) = '|'
                                ELSE
                                    BND(NP) = CMT(I:I)
                                ENDIF
                            ENDIF
10005                   CONTINUE
                        IF (NP .GT. 0) THEN
                            N_REC = N_REC + 1
                            WRITE (UD,
     &                      '(A,1H|,A,1H|,A,1H|,A,1H|,I3,1H|,50(A,1H:,A,A))')
     &                          AGENCY, STATION,
     &                          DATE_TIME,DEPTH,NP,
     &                          (PCODE(P(I)),VALU(I),BND(I),I=1,NP)
                        ENDIF
                    ENDIF
                IF(.NOT. (DATE_TIME(1:6) .EQ. '999999'))GOTO10004
*               -------------------------------------------------------
*               (Write selected information to header file)
                IF (N_REC .GT. 0) THEN
                    WRITE (UH,'(6(A,1H|))')
     &                  AGENCY, STATION, LATLONG, SITE, B_CODE, SC_CODE
                    WRITE (UH, '(A,1H|,A,1H|,I5,1H|,A)')
     &                  AGENCY, STATION, N_REC, FLAG(1:NPARM)
                ENDIF
*           -----------------------------------------------------------
            GOTO 10003
*     END (MAIN PROGRAM)
*     ---------------------------------------------------------------
*     BEGIN (I/O ERROR ESCAPE ROUTINES)
*     ---------------------------------------------------------------
92    CONTINUE
          PRINT*,'END OF FILE DURING PARM CODES: ', DELIMITER
          STOP 92
*     ---------------------------------------------------------------
94    CONTINUE
          PRINT*,'END OF FILE DURING HEADER: ', DELIMITER, STATION
          STOP 94
*     ---------------------------------------------------------------
99    CONTINUE
          PRINT*,'END OF FILE DURING DATA',STATION
          STOP 99
*     ---------------------------------------------------------------
      END
*
*===============================================================*
*
      SUBROUTINE INPUT_CHAR (PROMPT, ANSWER)
*
      CHARACTER PROMPT*(*)
      CHARACTER ANSWER*(*)
*
*     BEGIN
          LP = LEN(PROMPT)
          LA = LEN(ANSWER)
          IF (LA + LP .LE. 80) THEN
1             CONTINUE
                  CALL TNOUA (PROMPT, INTS(LP))
              READ (*,'(A)',END=1,ERR=1) ANSWER
          ELSE
2             CONTINUE
                  PRINT*, PROMPT
              READ (*,'(A)',END=2,ERR=2) ANSWER
          ENDIF
      END
*===============================================================*
      SUBROUTINE INPUT_INT (PROMPT, NUMBER)
*
      CHARACTER PROMPT*(*)
*
```

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```
*       BEGIN
            LP = LEN(PROMPT)
1           CONTINUE
               CALL TNOUA (PROMPT, INTS(LP))
               READ (*,*,END=1,ERR=1) NUMBER
        END
*
*==================================================================*
*
        SUBROUTINE OPEN_FILE (U, FILE_NAME, STAT)
*
        IMPLICIT INTEGER      (A-Z)
*
        LOGICAL               IN_USE
        CHARACTER*(*)         FILE_NAME
        CHARACTER*(*)         STAT
*
*       BEGIN
*         print*,'begin open_file: ',stat
          U = 140
10006     CONTINUE
            U = U - 1
            INQUIRE (UNIT=U, OPENED=IN_USE)
            IF (.NOT. IN_USE) THEN
              OPEN (U, FILE=FILE_NAME, STATUS=STAT, IOSTAT=IOS)
              IF (IOS .EQ. 0) THEN
                RETURN
              ELSEIF (STAT .EQ. 'NEW') THEN
                PRINT*, 'THAT FILE ALREADY EXISTS.'
                PRINT*, 'PLEASE CHANGE ITS NAME OR DELETE IT AND'
                PRINT*, 'TRY AGAIN.'
                STOP
              ELSEIF (STAT .EQ. 'OLD') THEN
                PRINT*, 'CANNOT FIND FILE NAMED'
                PRINT*, FILE_NAME
                PRINT*, 'PLEASE CHECK YOUR DIRECTORY'
                STOP
              ELSE
                PRINT*,'UNABLE TO OPEN FILE'
                PRINT*, FILE_NAME
                PRINT*,'REASON UNKNOWN, CHECK PROGRAM'
                STOP
              ENDIF
            ENDIF
          IF(.NOT. (U .LE. 29))GOTO10006
          PRINT*,'UNABLE TO FIND AVAILABLE UNIT FOR ',FILE_NAME
          STOP
        END
```

```
**************************************************************
                    PROGRAM TRIM_DEPTH_GT_10
**************************************************************
*      ----------------------------------------------------------
       IMPLICIT INTEGER (A-Z)
*      ----------------------------------------------------------
*      file units
           INTEGER  CFP, HI, DI, HO, DO
           PARAMETER (CFP=10, HI=11, DI=12, HO=31, DO=32)
           CHARACTER*2  SC
*      ----------------------------------------------------------
*      formats
           CHARACTER*20 FMT_HI /'(A/A,I5,1X ,A)'/
           CHARACTER*20 FMT_HO /'(A/A,I5,1H|,A)'/
           CHARACTER*30 FMT_DI /'(A,I5,1X ,I3,1X ,150A)'/
           CHARACTER*30 FMT_DO /'(A,I5,1H|,I3,1H|,150A)'/
*      ----------------------------------------------------------
*      parameter code tables
           LOGICAL                ZAP(150)
           CHARACTER*5            PARM(150)
           CHARACTER*5            CODE
           INTEGER                P_COUNT(150) /150*0/
*      ----------------------------------------------------------
*      header file variables
           CHARACTER*130          HEAD1
           CHARACTER* 25          HEAD2
           CHARACTER*150          FLAG
*      ----------------------------------------------------------
*      data file variables
           CHARACTER*36           STAT_DATE
           INTEGER                DEPTH
           CHARACTER* 15          ITEM(150)
*
* <++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++>
*
*      BEGIN
*          initialize tables
           CALL OPEN_FILE (CFP, 'RAST/LAKES>CODES.FLAGS.116', 'OLD')
           I = 0
10001      CONTINUE
               I = I + 1
               READ (CFP, '(A5,T16,L1)') PARM(I), ZAP(I)
           IF(.NOT. (PARM(I) .EQ. '99999'))GOTO10001
           NPARM = I - 1
           CLOSE (CFP)
*      ----------------------------------------------------------
*      open files
           READ'(A)', SC
           CALL OPEN_FILE (HI, 'RAST.LAKES>RET.C>HDC.'//SC, 'OLD')
           CALL OPEN_FILE (DI, 'RAST.LAKES>RET.C>DTC.'//SC, 'OLD')
           CALL OPEN_FILE (HO, 'RAST.LAKES>RET.D>HDD.'//SC, 'NEW')
           CALL OPEN_FILE (DO, 'RAST.LAKES>RET.D>DTD.'//SC, 'NEW')
*      ----------------------------------------------------------
*      read a header record
           READ (HI, FMT_HI, END=1, IOSTAT=H_STAT)
     &           HEAD1, HEAD2, N_REC, FLAG
1          CONTINUE
           IF (H_STAT .NE. 0) STOP 'NO HEADER ON FIRST READ'
*          IF (NPARM .NE. INDEX (FLAG,' ') - 1) STOP 'NPARM <> NUM FLAGS'
*      ----------------------------------------------------------
10002      CONTINUE
*          ----------------------------------------------------------
*          initialize counters
           L_REC = N_REC
           DO 10003 I = 1 , NPARM , 1
               P_COUNT(I) = 0
10003      CONTINUE
*          ----------------------------------------------------------
*          process nrec data records
           DO 10004 N = 1 , L_REC , 1
               READ (DI, FMT_DI, END=2, IOSTAT=D_STAT)
     &               STAT_DATE, DEPTH, K, (ITEM(I), I = 1, K)
               IF (DEPTH .LE. 10) THEN
                   WRITE(DO, FMT_DO)
     &               STAT_DATE, DEPTH, K, (ITEM(I), I = 1, K)
                   DO 10005 I = 1 , K , 1
                       CODE = ITEM(I)(1:5)
                       P = 0
```

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```
10006           CONTINUE
                  P = P + 1
                  IF(.NOT. (PARM(P).EQ.CODE .OR. P.GT.NPARM))GOTO10006
                  IF (P .LE. NPARM) P_COUNT(P) = P_COUNT(P) + 1
10005           CONTINUE
              ELSE
                J = 0
                DO 10007 I = 1 , K , 1
                  CODE = ITEM(I)(1:5)
                  P = 0
10008           CONTINUE
                  P = P + 1
                  IF(.NOT. (PARM(P).EQ.CODE .OR. P.GT.NPARM))GOTO10008
                  IF (P .LE. NPARM) THEN
                    IF (.NOT. ZAP(P)) THEN
                      J = J + 1
                      ITEM(J) = ITEM(I)
                      P_COUNT(P) = P_COUNT(P) + 1
                    ENDIF
                  ENDIF
10007           CONTINUE
                K = J
                IF (K .GT. 0) THEN
                  WRITE(DO, FMT_DO)
     &                STAT_DATE, DEPTH, K, (ITEM(I), I = 1, K)
                ELSE
                  N_REC = N_REC - 1
                ENDIF
              ENDIF
10004     CONTINUE
2         CONTINUE
*         ------------------------------------------------------------
*         write modified header record to new header file
          IF (N_REC .GT. 0) THEN
            DO 10009 I = 1 , NPARM , 1
              IF (P_COUNT(I) .GT. 0) THEN
                FLAG(I:I) = '1'
              ELSE
                FLAG(I:I) = '0'
              ENDIF
10009       CONTINUE
            WRITE(HO, FMT_HO) HEAD1, HEAD2, N_REC, FLAG(:NPARM)
          ENDIF
*         ------------------------------------------------------------
*         read a header record
          READ(HI, FMT_HI, END=4, IOSTAT=H_STAT)
     &          HEAD1, HEAD2, N_REC, FLAG
4         CONTINUE
*         ------------------------------------------------------------
        IF(.NOT. (H_STAT .NE. 0))GOTO10002
*         ------------------------------------------------------------
      END
*
*=======================================================================*
*
      SUBROUTINE OPEN_FILE (U, FILE_NAME, STAT)
*
      IMPLICIT INTEGER       (A-Z)
*
      LOGICAL                IN_USE
      CHARACTER*(*)          FILE_NAME
      CHARACTER*(*)          STAT
*
*     BEGIN
*       print*,'begin open_file: ',stat
        U = 140
10010   CONTINUE
          U = U - 1
          INQUIRE (UNIT=U, OPENED=IN_USE)
          IF (.NOT. IN_USE) THEN
            OPEN (U, FILE=FILE_NAME, STATUS=STAT, IOSTAT=IOS)
            IF (IOS .EQ. 0) THEN
              RETURN
            ELSEIF (STAT .EQ. 'NEW') THEN
              PRINT*, 'THAT FILE ALREADY EXISTS.'
              PRINT*, 'PLEASE CHANGE ITS NAME OR DELETE IT AND'
              PRINT*, 'TRY AGAIN.'
              STOP
```

```
      ELSEIF (STAT .EQ. 'OLD') THEN
        PRINT*, 'CANNOT FIND FILE NAMED'
        PRINT*, FILE_NAME
        PRINT*, 'PLEASE CHECK YOUR DIRECTORY'
        STOP
      ELSE
        PRINT*,'UNABLE TO OPEN FILE'
        PRINT*, FILE_NAME
        PRINT*,'REASON UNKNOWN, CHECK PROGRAM'
        STOP
      ENDIF
    ENDIF
  IF(.NOT. (U .LE. 29))GOTO10010
  PRINT*,'UNABLE TO FIND AVAILABLE UNIT FOR ',FILE_NAME
  STOP
END
```

```
****************************************************************************
                          PROGRAM TRIM_LT_3
****************************************************************************
*      This program removes measurements that occur less than 3 times in
*      any year at any given station. It then updates the header records
*      to reflect any measurements that are eliminated entirely at a given
*      station. Date-times which lose all their measurements are eliminated.
*      Header records for stations which lose all their data records are
*      also eliminated.
*      -------------------------------------------------------------------
*      This program has now been revised to read and write records which have
*      the agency code first in every line.
****************************************************************************
*      -------------------------------------------------------------------
       IMPLICIT INTEGER (A-Z)
       LOGICAL NO_MORE
       LOGICAL IN
*      -------------------------------------------------------------------
*      file units
       CHARACTER*2  SC
*      -------------------------------------------------------------------
*      formats
       CHARACTER*20 FMT_HI /'(A/A,I5,1X ,A)'/
       CHARACTER*20 FMT_HO /'(A/A,I5,1H|,A)'/
       CHARACTER*20 FMT_DI /'(A,I3,1X ,120A)'/
       CHARACTER*20 FMT_DO /'(A,I3,1H|,120A)'/
*      -------------------------------------------------------------------
*      parameter code tables
       LOGICAL              ZAP(120)
       CHARACTER*5          PARM(120)
       CHARACTER*5          CODE
       INTEGER              S_COUNT(120) /120*0/
       INTEGER              Y_COUNT(120) /120*0/
*      -------------------------------------------------------------------
*      header file variables
       CHARACTER*130        HEAD1
       CHARACTER* 25        HEAD2
       CHARACTER*120        FLAG
*      -------------------------------------------------------------------
*      data file variables
       CHARACTER*42         IDENT
          CHARACTER*24         AGN_STA
          EQUIVALENCE          (AGN_STA, IDENT( 1:24))
          CHARACTER*2          YEAR, THIS_YEAR
          EQUIVALENCE          (YEAR,    IDENT(26:27))
       CHARACTER* 15        ITEM(120)
       CHARACTER            REMARK
       CHARACTER*10         KEEPERS /'|ACD'/
*
*=====================================================================
*
*      BEGIN                                                           begin
*      -------------------------------------------------------------------
*      initialize tables
       CALL OPEN_FILE (CF, 'CODES.FLAGS.116', 'OLD')
       I = 0
10001  CONTINUE
          I = I + 1
          READ (CF, '(A,T16,L1)') PARM(I), ZAP(I)
       IF(.NOT. (PARM(I) .EQ. '99999'))GOTO10001
       NPARM = I - 1
       CLOSE (CF)
*      -------------------------------------------------------------------
*      initialize list of remarks to keep
       CALL OPEN_FILE (RB, 'REMARK.CODE.BUFFER', 'UNKNOWN')
       IF (RB .GT. 0) THEN
         READ (RB, '(A)', END=1) KEEPERS
         CLOSE(RB)
         IF (.NOT. IN('|',KEEPERS)) THEN
           KP = INDEX(KEEPERS,' ')
           IF (KP .GT. 0) KEEPERS(KP:KP) = '|'
         ENDIF
         print*,'Keepers = ', KEEPERS
1        CONTINUE
       ENDIF
*      -------------------------------------------------------------------
```

```
*          open files
           READ'(A)', SC
           CALL OPEN_FILE (HI, 'RAST.LAKES>RET.D>HDD.'//SC, 'OLD')
           CALL OPEN_FILE (DI, 'RAST.LAKES>RET.D>DTD.'//SC, 'OLD')
           CALL OPEN_FILE (HO, 'RAST.LAKES>RET.E>HDE.'//SC, 'NEW')
           CALL OPEN_FILE (DO, 'RAST.LAKES>RET.E>DTE.'//SC, 'NEW')
*          ------------------------------------------------------------
*          read the first header record
           READ (HI, FMT_HI, END=2, IOSTAT=H_STAT)
     &          HEAD1, HEAD2, NREC, FLAG
*          print*,'header:1 ',head2,nrec
2          CONTINUE
           IF (H_STAT .NE. 0) STOP 'NO HEADER ON FIRST READ'
           IF (NPARM .NE. INDEX (FLAG,' ') - 1) STOP 'NPARM <> NUM FLAGS'
*          ------------------------------------------------------------
*          read the first data record
           READ (DI, FMT_DI) IDENT, K, (ITEM(I), I = 1, K)
*          ------------------------------------------------------------
*          process one complete state
10002      CONTINUE
*          ------------------------------------------------------------
*            zero parm counters
             L_REC = NREC
             R_COUNT = 0
             DO 10003 I = 1 , NPARM , 1
               S_COUNT(I) = 0
10003        CONTINUE
*            ----------------------------------------------------------
*            read in groups of records which have station and year in
*            common.  delete parms with comment codes. count remaining
*            parms.  write records out to temp data file. then read
*            records back in deleting parms which appear less than 3
*            times in the year unless they are flagged for keeping.
*            write modified records out to new data file.
10004        CONTINUE
*            ----------------------------------------------------------
*              open temp file, zero counters, and count first record
               CALL OPEN_FILE (TF, 'TEMP', 'SCRATCH')
               DO 10005 I = 1 , NPARM , 1
                 Y_COUNT(I) = 0
10005          CONTINUE
               R_COUNT = R_COUNT + 1
*              print*,'record:1 ',head2,ident,k,r_count
               THIS_YEAR = YEAR
10006          CONTINUE
*              --------------------------------------------------------
*                delete parms with non-blank comment codes
                 J = 0
                 DO 10007 I = 1 , K , 1
                   REMARK = ITEM(I)(15:15)
                   CODE = ITEM(I)(1:5)
                   P = 0
10008              CONTINUE
                     P = P + 1
                   IF(.NOT. (PARM(P).EQ.CODE .OR. P.GT.NPARM))GOTO10008
                   IF (P .LE. NPARM) THEN
                     IF (IN(REMARK,KEEPERS) .OR. .NOT.ZAP(P)) THEN
                       J = J + 1
                       ITEM(J) = ITEM(I)
                       S_COUNT(P) = S_COUNT(P) + 1
                       Y_COUNT(P) = Y_COUNT(P) + 1
                     ENDIF
                   ELSE
                     PRINT*,'UNKNOWN PARM CODE--> ',CODE
                   ENDIF
10007            CONTINUE
                 K = J
*              --------------------------------------------------------
*                write data records out to a temp file
                 WRITE (TF, FMT_DO) IDENT, K, (ITEM(I), I = 1, K)
                 READ (DI, FMT_DI, END=3, IOSTAT=EHI)
     &                IDENT, K, (ITEM(I), I = 1, K)
3                CONTINUE
                 R_COUNT = R_COUNT + 1
*                print*,'record:N ',head2,ident,k,r_count
*                print*,year, this_year
                 NO_MORE =
     &                (YEAR.NE.THIS_YEAR .OR. R_COUNT.GT.L_REC .OR. EHI.NE.0)
*              --------------------------------------------------------
```

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```fortran
            IF(.NOT. (NO_MORE))GOTO10006
*           -------------------------------------------------------
*           we have read one record too many
            R_COUNT = R_COUNT - 1
*           -------------------------------------------------------
*           place a trailer record in temp file
            WRITE(TF,'(8(1H9),1H|,33(1H9))')
*           -------------------------------------------------------
*           write overflow record past trailer record
            WRITE (TF, FMT_DO) IDENT, K, (ITEM(I), I=1,K)
*           -------------------------------------------------------
*           start reading from top of temp file
*           print*,'start reading from temp file'
            REWIND (TF)
            READ (TF, FMT_DI) IDENT, K, (ITEM(I), I = 1, K)
*           print*,'temp:',ident,k
10009       CONTINUE
*           -------------------------------------------------------
*           zap parms that have counts < 3
*           decrease corresponding counts
            J = 0
            DO 10010 I = 1 , K , 1
              CODE = ITEM(I)(1:5)
              P = 0
10011         CONTINUE
              P = P + 1
              IF(.NOT. (PARM(P).EQ.CODE .OR. P.GT.NPARM))GOTO10011
              IF (P .LE. NPARM) THEN
                IF (Y_COUNT(P).LT.3 .AND. ZAP(P)) THEN
                  S_COUNT(P) = S_COUNT(P) - 1
*                 print*,p, parm(p),' hit'
                ELSE
                  J = J + 1
                  ITEM(J) = ITEM(I)
                ENDIF
              ENDIF
10010       CONTINUE
            K = J
*           print*,'tested:',ident,k
*           -------------------------------------------------------
*           write modified data record to new data file
            IF (K .GT. 0) THEN
              WRITE (DO, FMT_DO) IDENT, K, (ITEM(I), I = 1, K)
            ELSE
              NREC = NREC - 1
            ENDIF
*           -------------------------------------------------------
            READ (TF, FMT_DI, END=4, IOSTAT=ETP)
     &           IDENT, K, (ITEM(I), I = 1, K)
4           CONTINUE
*           print*,'temp:',ident,k
*           -------------------------------------------------------
            IF(.NOT. (AGN_STA .EQ. '99999999|999999999999999'))GOTO10009
*           -------------------------------------------------------
*           recover the overflow record from end of temp file
            READ (TF, FMT_DI) IDENT, K, (ITEM(I), I=1,K)
*           -------------------------------------------------------
*           discard temp file
            CLOSE (TF, STATUS = 'DELETE')
*           -------------------------------------------------------
        IF(.NOT. (R_COUNT .GE. L_REC))GOTO10004
*       -------------------------------------------------------
*       write modified header record to new header file
        IF (NREC .GT. 0) THEN
          DO 10012 I = 1 , NPARM , 1
            IF (S_COUNT(I) .LE. 0) FLAG(I:I) = '0'
10012     CONTINUE
          WRITE(HO, FMT_HO) HEAD1, HEAD2, NREC, FLAG(:NPARM)
        ENDIF
*       -------------------------------------------------------
*       read a header record
        READ (HI, FMT_HI, END=5, IOSTAT=H_STAT)
     &       HEAD1, HEAD2, NREC, FLAG
5       CONTINUE
*       print*,'header----',head2,nrec
*       -------------------------------------------------------
      IF(.NOT. (H_STAT .NE. 0))GOTO10002
*     -------------------------------------------------------
      END
*=================================================================*
```

```
      LOGICAL FUNCTION IN (PART, WHOLE)
*
      CHARACTER*(*) PART, WHOLE
*
*     BEGIN
        IN = INDEX(WHOLE, PART) .GT. 0
      END
*
*=====================================================================*
*
      SUBROUTINE OPEN_FILE (U, FILE_NAME, STAT)
*
      IMPLICIT INTEGER      (A-Z)
*
      LOGICAL               IN_USE
      CHARACTER*(*)         FILE_NAME
      CHARACTER*(*)         STAT
*
*     BEGIN
*       print*,'begin open_file: ',stat
        U = 140
10013   CONTINUE
        U = U - 1
        INQUIRE (UNIT=U, OPENED=IN_USE)
        IF (.NOT. IN_USE) THEN
          OPEN (U, FILE=FILE_NAME, STATUS=STAT, IOSTAT=IOS)
          IF (IOS .EQ. 0) THEN
            RETURN
          ELSEIF (STAT .EQ. 'NEW') THEN
            PRINT*, 'THAT FILE ALREADY EXISTS.'
            PRINT*, 'PLEASE CHANGE ITS NAME OR DELETE IT AND'
            PRINT*, 'TRY AGAIN.'
            STOP
          ELSEIF (STAT .EQ. 'SCRATCH') THEN
            PRINT*,'UNABLE TO OPEN ',FILE_NAME,' AS SCRATCH FILE'
            PRINT*,'CHECK THE DIRECTORY FOR CONFLICTS'
            STOP
          ELSEIF (STAT .EQ. 'OLD') THEN
            PRINT*, 'CANNOT FIND FILE NAMED'
            PRINT*, FILE_NAME
            PRINT*, 'PLEASE CHECK YOUR DIRECTORY'
            STOP
          ELSEIF (STAT .EQ. 'UNKNOWN') THEN
            U = -1
            RETURN
          ELSE
            PRINT*,'UNABLE TO OPEN FILE'
            PRINT*, FILE_NAME
            PRINT*,'REASON UNKNOWN, CHECK PROGRAM'
            STOP
          ENDIF
        ENDIF
      IF(.NOT. (U .LE. 29))GOTO10013
      PRINT*,'UNABLE TO FIND AVAILABLE UNIT FOR ',FILE_NAME
      STOP
      END
```

Appendix 12.--Listing of STORET sampling sites by constituent or property, and State, following the screening of data for time, depth, and number of samples

[Units: mg/L, milligrams per liter; µg/L, micrograms per liter; m, meter; ft, foot; ppt, parts per thousand; °C, degrees Celcius; µmhos/cm, micromhos per centimeter; @, at; g/m^2/d, grams per square meter per day; g/m^3/h, grams per cubic meter per hour; mg/m^3/h, milligrams per cubic meter per hour; in, inch; mg/m^3, milligrams per cubic meter; mµ, millimicron; °F, degrees Farenheit; d, day; sq mi, square mile; acre-ft, acre foot; sq ft, square foot; sq km, square kilometer; %, percent]

States: AL, Alabama; AK, Alaska; AR, Arkansas; AZ, Arizona; CA, California; CO, Colorado; CT, Connecticut; DE, Delaware; FL, Florida; GA, Georgia; HI, Hawaii; ID, Idaho; IL, Illinois; IN Indiana; IA, Iowa; KS, Kansas; KY, Kentucky; LA, Louisiana; ME, Maine; MD, Maryland; MA, Massachusetts; MI Michigan; MN, Minnesota; MS, Mississippi; MO, Missouri; MT, Montana; NE, Nebraska; NV, Nevada;, NH, New Hampshire; NJ, New Jersey; NM, New Mexico; NY, New York; NC, North Carolina; ND, North Dakota; OH, Ohio; OK, Oklahoma; OR, Oregon; PA, Pennsylvania; RI, Rhode Island; SC, South Carolina; SD, South Dakota; TN, Tennessee; TX, Texas; UT, Utah; VT, Vermont; VA, Virginia; WA, Washington; WV, West Virginia; WI, Wisconsin; WY, Wyoming]

| | Number of sites in each State | | | | | | | | | |
| | State | | | | | | | | | |
Water-quality constituent or property	AL	AK	AZ	AR	CA	CO	CT	DE	FL	GA
Phosphorus, Total (mg/L as P)	41	22	4	43	76	54	27	7	107	133
Phosphorus, Dissolved Orthophosphate (mg/L as P)	38	13	2	31	53	20	0	3	19	104
Phosphorus, Dissolved (mg/L as P)	0	3	0	0	18	10	14	0	6	2
Nitrogen, Total (mg/L as N)	0	5	0	1	24	0	8	0	40	46
Nitrogen, Inorganic, Total (mg/L as N)	0	0	0	0	3	0	1	0	0	51
Nitrogen, Organic, Total (mg/L as N)	0	2	0	11	27	0	8	0	96	46
Nitrogen, Ammonia, Total (mg/L as N)	41	2	10	40	66	32	16	5	96	127
Nitrate Nitrogen, Total (mg/L as N)	0	2	10	12	27	27	6	4	99	0
Nitrite Nitrogen, Total (mg/L as N)	0	2	0	9	1	19	5	4	79	0
Carbon, Total (mg/L as C)	0	0	0	0	0	0	2	0	20	0
Carbon, Total Inorganic (mg/L as C)	0	2	0	0	0	0	0	0	20	0
Chlorophyll-A (mg/L)	0	0	2	0	2	0	2	0	19	0
Chlorophyll-A, Percent of Pheophytin-A + Chlorophyll-A, Spectrophotometric Acid Method	0	0	0	0	3	0	0	0	0	0
Chlorophyll-A (µg/L) Fluorometric Uncorrected	0	0	0	0	5	0	0	0	0	0
Chlorophyll-A (µg/L) Fluorometric Corrected	0	6	0	0	0	6	0	0	0	0
Chlorophyll-A (µg/L) Spectrophotometric Acid Method	0	0	0	3	3	2	0	0	5	30
Chlorophyll-A (µg/L) Trichromatic Uncorrected	0	0	7	9	10	0	7	0	76	10
Chlorophyll-A (mg/L)	0	0	0	0	2	0	2	0	16	0
Chlorophyll-B (µg/L) Trichromatic Uncorrected	0	0	0	0	9	0	0	0	17	27
Chlorophyll-C (µg/L) Trichromatic Uncorrected	0	0	0	0	9	0	0	0	17	30

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Water-quality constituent or property	Number of sites in each State									
	State									
	AL	AK	AZ	AR	CA	CO	CT	DE	FL	GA
Transparency, Secchi Disc (m)	0	12	21	15	16	24	6	0	73	33
Light, Incident, Sunlight Radiation Intensity	0	0	0	0	0	0	0	0	0	0
Depth of One Percent of Surface Light (ft)	0	0	0	0	3	0	0	0	0	18
pH (Standard Units)	45	57	73	69	131	102	42	8	175	159
Alkalinity, Total (mg/L as CaCO$_3$)	40	8	41	44	70	38	21	7	158	112
Salinity (ppt)	0	0	0	0	0	0	0	0	7	0
Residue, Total (mg/L)	0	0	2	0	0	8	3	2	38	1
Residue, Total Filtrable Dried at 105 °C (mg/L)	0	0	0	9	1	4	10	0	45	4
Residue, Total Nonfiltrable (mg/L)	0	0	6	13	49	16	1	2	95	56
Residue,Total Filtrable Dried at 180 °C (mg/L)	0	11	0	3	28	8	2	4	10	58
Carbonate Ion (mg/L as CO$_3$)	3	233	6	10	33	56	18	2	213	1
Bicarbonate Ion (mg/L as HCO$_3$)	3	310	6	28	43	65	24	2	244	1
Chloride, Total in Water (mg/L)	4	233	115	33	151	101	27	9	653	58
Sulfate, Total (mg/L as SO$_4$)	3	247	123	17	59	99	29	8	449	34
Sulfate, Dissolved (mg/L as SO$_4$)	0	0	12	0	60	1	0	0	1	17
Calcium, Total (mg/L as Ca)	0	38	17	0	6	11	5	0	95	50
Calcium, Dissolved (mg/L as Ca)	3	222	13	34	95	97	22	2	278	27
Magnesium, Total (mg/L as Mg)	0	38	17	0	6	8	5	0	95	47
Magnesium, Dissolved (mg/L as Mg)	3	222	13	34	94	104	22	2	240	27
Potassium, Total (mg/L as K)	0	10	14	15	5	9	4	0	94	47
Potassium, Dissolved (mg/L as K)	3	222	13	1	93	97	20	2	272	0
Sodium, Total (mg/L as Na)	0	24	17	0	6	13	5	0	94	47
Sodium, Dissolved (mg/L as Na)	3	222	13	0	97	97	20	2	281	0
Phosphate, Ortho (mg/L as PO$_4$)	0	4	35	0	23	0	0	0	44	8
Phosphate, Total (mg/L as PO$_4$)	0	0	31	1	18	2	4	1	72	2
Phosphate, Total Soluble (mg/L)	0	0	0	0	2	1	0	0	0	0
Phosphate, Total, Colorimetric Method (mg/L as P)	0	0	0	0	2	0	0	0	0	0
Phosphorus, Total Hydrolyzable (mg/L as P)	0	0	0	0	24	0	0	0	7	0
Phosphorus, Total (mg/L as PO$_4$)	0	0	0	2	10	0	2	0	18	1
Phosphorus, In Total Orthophosphate (mg/L as P)	0	1	0	6	20	18	0	0	93	0
Phosphorus, Hydrolyzable + Orthophosphate, Total, Autoanalyzer (mg/L as P)	0	0	0	0	0	2	0	0	0	0

Water-quality constituent or property	Number of sites in each State									
	State									
	AL	AK	AZ	AR	CA	CO	CT	DE	FL	GA
Phosphorus, Total, Spectrograph Method (µg/L as P)	0	0	0	0	0	0	0	0	0	0
Nitrate Nitrogen, Dissolved (mg/L as N)	0	4	10	0	41	8	0	0	13	8
Nitrate Nitrogen, Dissolved (mg/L as NO$_3$)	0	4	0	0	30	2	0	0	23	8
Nitrate Nitrogen, Total (mg/L as NO$_3$)	0	0	32	0	9	0	0	0	4	0
Nitrite Nitrogen, Dissolved (mg/L as N)	0	1	0	0	2	13	0	0	10	2
Nitrite Nitrogen, Dissolved (mg/L as NO$_2$)	0	2	0	0	7	0	0	0	23	6
Nitrite Nitrogen, Total (mg/L as NO$_2$)	0	0	0	0	0	0	0	0	2	0
Nitrite + Nitrate, Total 1 Det. (mg/L as N)	41	4	0	31	19	14	23	3	48	138
Nitrogen, Ammonia, Total (mg/L as NH$_4$)	0	2	0	1	13	2	2	0	1	1
Nitrogen, Kjeldahl, Total (mg/L as N)	41	17	4	28	74	30	10	7	115	117
Nitrogen, Total (mg/L as NO$_3$)	0	2	0	1	20	0	8	0	29	1
Chlorophyll-C (mg/L)	0	0	0	0	2	0	0	0	15	0
Chlorophyll, Total A + B + C (mg/L)	0	0	0	0	2	1	0	0	3	0
Chlorophyll, Total, Trichromatic Uncorrected (µg/L)	0	0	0	0	0	2	0	0	4	0
Residue, Total Volatile (mg/L)	0	0	0	0	0	2	0	2	21	0
Suspended Sediment Concentration-Evap. at 110 °C (mg/L)	0	0	0	0	3	0	0	0	7	0
Carbon, Dissolved Inorganic (mg/L as C)	0	0	0	0	20	0	0	0	0	0
Carbon, Total Organic (mg/L as C)	0	1	2	0	5	9	12	0	48	57
Carbon, Dissolved Organic (mg/L as C)	0	2	0	0	10	2	0	0	1	45
pH (Standard Units) Lab	0	14	2	4	51	21	4	0	120	0
Specific Conductance (µmhos/cm @ 25 °C)	41	77	6	52	91	74	29	4	295	94
Specific Conductance, Field (µmhos/cm @ 25 °C)	3	0	16	31	86	23	15	5	23	69
Acidity, Total (mg/L as CaCO$_3$)	0	0	0	0	0	0	0	4	73	0
Hardness, Total (mg/L as CaCO$_3$)	0	2	47	12	51	14	9	4	98	23
Turbidity (Jackson Candle Units)	0	8	33	0	6	3	7	0	98	7
Turbidity, Transmissometer (Percent Transmission)	41	0	0	30	14	10	0	0	4	68
Turbidity, Field Nephelometric Turbidity Units	0	0	6	0	0	0	0	0	1	0
Turbidity, Hach Turbidimeter (Formazin Turbidity Units)	0	0	17	23	53	25	3	4	79	62
Turbidity, Lab Nephelometric Turbidity Units	0	0	13	0	0	2	0	0	0	0
Color (platinum-cobalt units)	0	8	0	5	0	8	4	4	127	58

Water-quality constituent or property	Number of sites in each State									
	State									
	AL	AK	AZ	AR	CA	CO	CT	DE	FL	GA
Color, Apparent, Unfiltered Sample (platinum-cobalt units)	0	0	0	0	0	6	4	0	2	0
Light, Incident (percent remaining at certain depth)	0	0	0	0	10	0	0	0	0	9
Phytoplankton Production, Areal Gross, Oxygen Method (g/m^2/d)	0	0	0	0	1	0	0	0	0	0
Phytoplankton Production, Areal Net, Oxygen Method (g/m^2/d)	0	0	0	0	1	0	0	0	0	0
Phytoplankton Production, C-14 Method (g/m^3/h)	0	0	0	0	0	0	0	0	3	0
Phytoplankton Production, C-14 Method (mg/m^3/h)	0	0	0	0	0	0	0	0	0	0
Oxygen Dissolved, Analysis by Probe (mg/L)	0	8	8	1	11	4	0	0	37	63
Oxygen, Dissolved (mg/L)	10	61	51	48	140	96	39	6	332	44
Transparency, Secchi Disc (in)	0	0	0	28	5	10	0	0	52	0
Phosphate, Total Soluble, Colorimetric Method (mg/L as P)	0	0	0	0	0	0	0	0	3	0
Phosphorus, Dissolved Total, Whatman GF/F (mg/L P)	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A, Phytoplankton, Fluorometric Method (mg/m^3)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total Sargent Method, 667 mμ (μg/L)	0	0	0	0	0	0	0	0	0	0
Solids, Dissolved-Sum of Constituents (mg/L)	0	2	0	0	18	2	0	0	11	0
Algal Growth Potential, Filtered (mg/L)	0	0	0	0	1	0	1	0	0	6
Temperature, Water (°C)	41	80	53	50	163	124	39	8	497	179
Temperature, Water (°F)	6	0	27	24	19	2	5	0	29	5
Detention Time of Pond or Reservoir (d)	0	0	0	0	0	0	0	0	0	0
Contributing Drainage Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Drainage Area (sq mi)	0	0	0	0	0	0	0	0	2	0
Depth of Lake, Mean (ft)	0	0	0	0	0	0	0	0	0	0
Depth of Lake, Maximum (ft)	0	14	0	0	0	0	0	0	0	0
Depth of Pond or Reservoir (ft)	49	18	50	129	102	150	0	8	210	78
Depth, Maximum, of Lake or Reservoir (m)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (million cubic feet)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (acre-ft)	0	0	0	0	2	11	0	0	97	0

Water-quality constituent or property	Number of sites in each State									
	State									
	AL	AK	AZ	AR	CA	CO	CT	DE	FL	GA
Reservoir Storage (thousand acre-ft)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage in (millions of gallons)	0	0	0	0	0	0	0	0	0	0
Reservoir or Pond Storage (gallons)	0	0	0	0	0	0	0	0	0	0
Volume of Lake or Reservoir (million cubic meters)	0	0	0	0	0	0	0	0	0	0
Surface Area (sq mi)	0	1	0	0	0	68	0	0	7	0
Surface Area (acres)	0	14	0	0	0	0	0	0	97	0
Surface Area (sq ft)	0	0	0	0	0	0	0	0	0	0
Surface Area of Lake or Reservoir (sq km)	0	0	0	0	0	0	0	0	0	0
Surface Area (percent of total)	0	0	0	0	0	0	0	0	0	0
Total number of stations with data:	503	2519	1000	991	2565	1889	604	135	7240	2562

Water-quality constituent or property	Number of sites in each State									
	HI	ID	IL	IN	IA	KS	KY	LA	ME	MD
Phosphorus, Total (mg/L as P)	9	96	268	70	25	64	59	38	76	9
Phosphorus, Dissolved Orthophosphate (mg/L as P)	0	59	76	53	16	59	29	27	0	7
Phosphorus, Dissolved (mg/L as P)	0	4	97	10	0	0	12	0	29	0
Nitrogen, Total (mg/L as N)	0	1	0	7	2	0	2	5	3	0
Nitrogen, Inorganic, Total (mg/L as N)	0	0	0	0	0	0	0	0	0	0
Nitrogen, Organic, Total (mg/L as N)	0	3	49	0	27	0	0	11	1	0
Nitrogen, Ammonia, Total (mg/L as N)	0	67	274	67	77	71	44	56	32	15
Nitrate Nitrogen, Total (mg/L as N)	0	6	7	0	85	5	0	48	1	1
Nitrite Nitrogen, Total (mg/L as N)	0	7	5	1	26	1	0	3	0	1
Carbon, Total (mg/L as C)	0	16	0	0	0	0	0	0	0	0
Carbon, Total Inorganic (mg/L as C)	0	16	0	0	0	0	0	0	0	0
Chlorophyll-A (mg/L)	0	2	0	0	5	0	0	11	35	7
Chlorophyll-A, Percent of Pheophytin-A + Chlorophyll-A, Spectrophotometric Method	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A (µg/L) Fluorometric Uncorrected	0	23	0	0	0	19	0	4	0	0
Chlorophyll-A (µg/L) Fluorometric Corrected	0	0	3	3	9	8	1	0	0	0
Chlorophyll-A (µg/L) Spectrophotometric Acid Method	0	16	71	0	102	30	0	0	2	0
Chlorophyll-A (µg/L) Trichromatic Uncorrected	0	10	76	30	170	41	54	0	2	0
Chlorophyll-B (mg/L)	0	2	0	0	0	0	0	2	0	0
Chlorophyll-B (µg/L) Trichromatic Uncorrected	0	0	68	0	9	0	0	0	1	0
Chlorophyll-C (µg/L) Trichromatic Uncorrected	0	0	71	0	9	0	0	0	1	0
Transparency, Secchi Disc (m)	0	24	4	4	118	2	43	0	43	0
Light, Incident, Sunlight Radiation Intensity	0	0	1	0	0	18	0	3	0	0
Depth of One Percent of Surface Light (ft)	0	0	0	0	1	10	0	35	0	0
pH (Standard Units)	12	102	356	118	59	60	260	139	38	13
Alkalinity, Total (mg/L as CaCO3)	0	87	188	84	176	60	90	72	15	8
Salinity (ppt)	0	0	0	0	0	0	0	0	0	0
Residue, Total (mg/L)	0	23	73	22	26	0	56	0	2	3
Residue, Total Filtrable Dried at 105 °C (mg/L)	0	3	2	0	5	4	21	37	0	0
Residue, Total Nonfiltrable (mg/L)	7	58	358	26	155	83	69	0	0	26
Residue, Total Filtrable Dried at 180 °C (mg/L)	0	6	10	0	0	2	0	9	0	1
Carbonate Ion (mg/L as CO3)	0	25	0	6	13	3	0	21	0	0

Water-quality constituent or property	Number of sites in each State									
	State									
	HI	ID	IL	IN	IA	KS	KY	LA	ME	MD
Bicarbonate Ion (mg/L as HCO₃)	0	28	0	6	14	3	2	21	0	0
Chloride, Total in Water (mg/L)	2	57	353	36	235	260	51	82	56	3
Sulfate, Total (mg/L as SO₄)	2	41	334	35	220	43	70	31	55	1
Sulfate, Dissolved (mg/L as SO₄)	0	6	1	0	0	190	4	0	0	0
Calcium, Total (mg/L as Ca)	0	24	42	12	16	17	48	1	57	0
Calcium, Dissolved (mg/L as Ca)	2	19	55	30	7	181	58	19	0	0
Magnesium, Total (mg/L as Mg)	0	35	42	12	13	23	47	0	55	0
Magnesium, Dissolved (mg/L as Mg)	2	19	55	30	7	182	58	18	0	0
Potassium, Total (mg/L as K)	0	22	37	11	209	213	48	11	54	0
Potassium, Dissolved (mg/L as K)	2	20	55	16	7	6	43	8	0	0
Sodium, Total (mg/L as Na)	0	22	36	11	209	225	48	11	55	0
Sodium, Dissolved (mg/L as Na)	2	20	55	16	7	5	43	8	0	0
Phosphate, Ortho (mg/L as PO₄)	0	4	0	0	42	4	0	0	0	7
Phosphate, Total (mg/L as PO₄)	0	0	48	7	166	9	0	1	5	7
Phosphate, Total Soluble (mg/L)	0	0	25	0	17	2	0	0	0	0
Phosphate, Total, Colorimetric Method (mg/L as P)	0	0	0	0	181	0	0	2	0	0
Phosphorus, Total Hydrolyzable (mg/L as P)	0	11	0	0	0	0	0	0	0	0
Phosphorus, Total (mg/L as PO₄)	9	0	0	0	0	0	0	0	0	2
Phosphorus, In Total Orthophosphate (mg/L as P)	0	7	0	0	1	8	0	53	2	0
Phosphorus, Hydrolyzable + Orthophosphate, Total, Autoanalyzer (mg/L as P)	0	0	0	0	0	0	0	0	0	0
Phosphorus, Total, Spectrograph Method (µg/L as P)	0	0	0	0	0	0	0	0	1	0
Nitrate Nitrogen, Dissolved (mg/L as N)	0	2	0	0	0	44	0	0	0	0
Nitrate Nitrogen, Dissolved (mg/L as NO₃)	0	2	0	0	0	1	0	0	0	0
Nitrate Nitrogen, Total (mg/L as NO₃)	0	0	0	0	0	0	0	9	0	0
Nitrite Nitrogen, Dissolved (mg/L as N)	0	1	0	0	0	0	0	0	0	0
Nitrite Nitrogen, Dissolved (mg/L as NO₂)	0	2	0	0	0	0	0	0	0	0
Nitrite Nitrogen, Total (mg/L as NO₂)	0	0	0	0	0	0	0	0	0	0
Nitrite + Nitrate, Total 1 Det. (mg/L as N)	9	34	233	67	37	20	62	33	35	18
Nitrogen, Ammonia, Total (mg/L as NH₄)	0	0	0	0	0	0	0	0	0	0
Nitrogen, Kjeldahl, Total (mg/L as N)	9	76	197	69	11	21	68	32	2	16
Nitrogen, Total (mg/L as NO₄)	0	1	0	0	0	0	0	5	1	0
Chlorophyll C (mg/L)	0	0	0	0	0	0	0	0	0	0

Water-quality constituent or property	Number of sites in each State									
	State									
	HI	ID	IL	IN	IA	KS	KY	LA	ME	MD
Chlorophyll, Total A + B + C (mg/L)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total, Trichromatic Uncorrected (µg/L)	0	0	0	0	0	0	0	0	0	0
Residue, Total Volatile (mg/L)	0	8	0	20	1	0	47	0	0	0
Suspended Sediment Concentration-Evap. at 110 °C (mg/L)	0	0	0	0	0	3	0	5	2	0
Carbon, Dissolved Inorganic (mg/L as C)	0	0	0	0	0	0	0	0	0	0
Carbon, Total Organic (mg/L as C)	0	37	77	8	11	6	22	50	0	1
Carbon, Dissolved Organic (mg/L as C)	0	0	0	1	0	0	0	9	0	0
pH (Standard Units) Lab	0	24	70	3	205	99	14	0	3	5
Specific Conductance (µmhos/cm @ 25 °C)	12	22	239	64	213	163	76	49	18	21
Specific Conductance, Field (µmhos/cm @ 25 °C)	0	106	134	82	38	28	220	112	1	12
Acidity, Total (mg/L as $CaCO_3$)	0	0	0	0	0	0	9	0	0	1
Hardness, Total (mg/L as $CaCO_3$)	0	9	23	24	146	29	63	46	0	1
Turbidity (Jackson Candle Units)	0	2	66	0	187	109	0	38	1	0
Turbidity, Transmissometer (Percent Transmission)	0	49	23	41	33	23	64	31	0	10
Turbidity, Field Nephelometric Turbidity Units	0	0	0	0	0	0	0	0	0	0
Turbidity, Hach Turbidimeter (Formazin Turbidity Units)	9	9	167	26	0	43	75	0	2	6
Turbidity, Lab Nephelometric Turbidity Units	0	19	0	0	0	0	0	0	0	0
Color (platinum-cobalt units)	0	2	62	0	0	2	0	37	2	1
Color, Apparent, Unfiltered Sample (platinum-cobalt units)	0	0	0	0	0	0	0	37	3	0
Light, Incident (percent remaining at certain depth)	0	0	0	0	5	194	45	4	0	0
Phytoplankton Production, Areal Gross, Oxygen Method ($g/m^2/d$)	0	0	0	0	0	0	0	0	0	0
Phytoplankton Production, Areal Net, Oxygen Method ($g/m^2/d$)	0	0	0	0	0	0	0	0	0	0
Phytoplankton Production, C-14 Method ($g/m^3/h$)	0	0	1	0	0	0	0	0	0	0
Phytoplankton Production, C-14 Method ($mg/m^3/h$)	0	0	0	0	0	88	0	0	0	0
Oxygen Dissolved, Analysis by Probe (mg/L)	0	31	320	57	0	149	230	66	1	4
Oxygen, Dissolved (mg/L)	12	137	148	38	267	269	4	53	45	11
Transparency, Secchi Disc (in)	0	35	482	44	8	14	81	23	12	8

Water-quality constituent or property	Number of sites in each State									
	State									
	HI	ID	IL	IN	IA	KS	KY	LA	ME	MD
Phosphate, Total Soluble, Colorimetric Method (mg/L as P)	0	0	0	0	0	0	0	0	0	0
Phosphorus, Dissolved Total, Whatman GF/F (mg/L P)	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A, Phytoplankton, Fluorometric Method (mg/m^3)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total Sargent Method, 667 mμ (μg/L)	0	0	0	0	0	0	0	0	0	0
Solids, Dissolved-SUM of Constituents (mg/L)	0	4	0	2	0	2	0	19	0	0
Algal Growth Potential, Filtered (mg/L)	0	0	0	0	0	0	0	0	0	0
Temperature, Water (°C)	12	168	568	123	242	346	262	137	85	24
Temperature, Water (°F)	0	2	69	12	10	0	1	6	2	0
Detention Time of Pond or Reservoir (d)	0	0	0	0	0	0	0	0	0	0
Contributing Drainage Area (sq mi)	0	12	0	0	0	0	0	0	0	0
Drainage Area (sq mi)	0	0	178	0	0	0	0	0	0	0
Depth of Lake, Mean (ft)	0	12	191	0	0	0	0	0	0	0
Depth of Lake, Maximum (ft)	0	12	298	0	0	19	0	0	0	0
Depth of Pond or Reservoir (ft)	9	54	697	181	39	41	61	111	0	13
Depth, Maximum, of Lake or Reservoir (m)	0	0	0	0	0	0	92	0	0	0
Reservoir Storage (million cubic feet)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (acre-ft)	0	12	187	0	0	4	0	2	0	0
Reservoir Storage (thousand acre-ft)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage in (millions of gallons)	0	0	0	0	0	0	0	0	0	0
Reservoir or Pond Storage (gallons)	0	0	0	0	0	0	0	0	0	0
Volume of Lake or Reservoir (million cubic meters)	0	0	0	0	0	0	0	0	0	0
Surface Area (sq mi)	0	0	0	0	0	1	0	0	0	0
Surface Area (acres)	0	12	298	149	0	19	0	0	0	0
Surface Area (sq ft)	0	0	0	0	0	0	0	0	0	0
Surface Area of Lake or Reservoir (sq km)	0	0	0	0	0	0	0	0	0	0
Surface Area (percent of total)	0	0	0	0	0	0	0	0	0	0
Total number of stations with data:	121	1887	7923	1734	3919	3648	2756	1701	836	263

Water-quality constituent or property	Number of sites in each State									
	MA	MI	MN	MS	MO	MT	NE	NV	NH	NJ
Phosphorus, Total (mg/L as P)	12	118	561	17	39	82	32	24	26	32
Phosphorus, Dissolved Orthophosphate (mg/L as P)	0	1	34	17	27	65	30	28	0	20
Phosphorus, Dissolved (mg/L as P)	10	85	203	0	0	13	16	4	14	7
Nitrogen, Total (mg/L as N)	0	165	55	0	0	12	0	3	16	1
Nitrogen, Inorganic, Total (mg/L as N)	0	3	0	0	0	0	0	0	0	0
Nitrogen, Organic, Total (mg/L as N)	0	42	196	0	4	12	0	0	4	6
Nitrogen, Ammonia, Total (mg/L as N)	24	196	389	17	39	57	31	26	25	144
Nitrate Nitrogen, Total (mg/L as N)	6	25	66	0	3	13	27	11	8	8
Nitrite Nitrogen, Total (mg/L as N)	17	28	26	0	0	0	23	3	1	139
Carbon, Total (mg/L as C)	0	0	0	0	0	0	0	0	0	0
Carbon, Total Inorganic (mg/L as C)	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A (mg/L)	0	1	0	0	0	4	0	0	3	2
Chlorophyll-A, Percent of Pheophytin-A + Chlorophyll-A, Spectrophotometric Acid Method	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A (μg/L) Fluorometric Uncorrected	1	0	8	0	0	43	0	1	0	0
Chlorophyll-A (μg/L) Fluorometric Corrected	0	5	0	0	0	0	0	0	0	0
Chlorophyll-A (μg/L) Spectrophotometric Acid Method	0	243	233	0	0	0	22	3	5	1
Chlorophyll-A (μg/L) Trichromatic Uncorrected	0	261	131	0	0	2	0	1	0	64
Chlorophyll-B (mg/L)	0	1	0	0	0	4	0	0	2	0
Chlorophyll-B (μg/L) Trichromatic Uncorrected	0	0	1	0	0	0	0	0	0	7
Chlorophyll-C (μg/L) Trichromatic Uncorrected	0	0	3	0	0	0	0	0	0	7
Transparency, Secchi Disc (m)	0	2	424	0	17	2	24	12	14	42
Light, Incident, Sunlight Radiation Intensity	0	221	0	0	6	0	0	0	0	0
Depth of One Percent of Surface Light (ft)	0	3	0	0	7	0	0	0	0	0
pH (Standard Units)	32	670	379	2	43	112	50	33	38	170
Alkalinity, Total (mg/L as CaCO3)	5	387	424	14	35	86	36	32	8	191
Salinity (ppt)	0	0	0	0	0	2	0	0	0	3
Residue, Total (mg/L)	0	5	36	0	1	0	0	0	0	36
Residue, Total Filtrable Dried at 105 °C (mg/L)	0	0	3	0	0	8	27	1	0	4
Residue, Total Nonfiltrable (mg/L)	17	311	165	0	44	6	28	4	4	64
Residue, Total Filtrable Dried at 180 °C (mg/L)	0	7	26	0	2	4	0	0	0	3
Carbonate Ion (mg/L as CO3)	1	26	89	0	6	6	5	8	0	2

| Water-quality constituent or property | Number of sites in each State | | | | | | | | | |
| | State | | | | | | | | | |
	MA	MI	MN	MS	MO	MT	NE	NV	NH	NJ
Bicarbonate Ion (mg/L as HCO_3)	1	37	109	0	12	6	27	8	0	2
Chloride, Total in Water (mg/L)	22	1023	937	0	94	23	37	80	13	20
Sulfate, Total (mg/L as SO_4)	3	632	765	0	46	25	32	74	5	18
Sulfate, Dissolved (mg/L as SO_3)	0	409	21	0	0	0	0	0	0	0
Calcium, Total (mg/L as Ca)	6	544	332	0	12	5	24	62	14	0
Calcium, Dissolved (mg/L as Ca)	1	473	134	0	16	31	2	12	0	4
Magnesium, Total (mg/L as Mg)	6	572	217	0	6	5	30	62	6	0
Magnesium, Dissolved (mg/L as Mg)	1	471	123	0	16	31	2	12	0	4
Potassium, Total (mg/L as K)	3	512	217	0	8	4	20	62	5	0
Potassium, Dissolved (mg/L as K)	1	470	518	0	8	21	5	12	0	4
Sodium, Total (mg/L as Na)	5	557	209	0	1	4	20	62	6	0
Sodium, Dissolved (mg/L as Na)	1	470	535	0	5	21	5	11	0	4
Phosphate, Ortho (mg/L as PO_4)	0	70	8	0	2	12	3	1	10	147
Phosphate, Total (mg/L as PO_4)	2	170	182	0	0	0	6	1	7	143
Phosphate, Total Soluble (mg/L)	0	4	0	0	0	0	0	0	0	0
Phosphate, Total, Colorimetric Method (mg/L as P)	2	0	7	0	1	0	0	0	0	0
Phosphorus, Total Hydrolyzable (mg/L as P)	0	6	0	0	0	0	0	18	0	0
Phosphorus, Total (mg/L as PO_4)	0	2	0	0	2	8	0	0	0	0
Phosphorus, In Total Orthophosphate (mg/L as P)	1	10	193	0	21	3	26	0	4	13
Phosphorus, Hydrolyzable + Orthophosphate, Total, Autoanalyzer (mg/L as P)	0	0	0	0	0	2	23	0	0	0
Phosphorus, Total, Spectrograph Method (µg/L as P)	0	0	2	0	0	0	0	0	0	0
Nitrate Nitrogen, Dissolved (mg/L as N)	0	0	0	0	0	11	0	0	0	0
Nitrate Nitrogen, Dissolved (mg/L as NO_3)	0	0	0	0	0	11	0	0	0	0
Nitrate Nitrogen, Total (mg/L as NO_3)	0	2	0	0	0	0	0	3	0	28
Nitrite Nitrogen, Dissolved (mg/L as N)	0	0	0	0	0	6	0	0	0	0
Nitrite Nitrogen, Dissolved (mg/L as NO_2)	0	0	0	0	0	11	0	0	0	0
Nitrite Nitrogen, Total (mg/L as NO_2)	0	0	0	0	0	0	0	0	0	0
Nitrite + Nitrate, Total 1 Det. (mg/L as N)	10	173	246	17	39	45	8	21	18	133
Nitrogen, Ammonia, Total (mg/L as NH_4)	0	3	0	0	0	10	5	0	0	0
Nitrogen, Kjeldahl, Total (mg/L as N)	9	117	326	17	31	57	30	23	4	171
Nitrogen, Total (mg/L as NO_3)	0	8	2	0	0	12	0	0	4	1

Water-quality constituent or property	Number of sites in each State									
	State									
	MA	MI	MN	MS	MO	MT	NE	NV	NH	NJ
Chlorophyll-C (mg/L)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total A + B + C (mg/L)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total, Trichromatic Uncorrected (µg/L)	0	0	0	0	0	2	24	4	0	0
Residue, Total Volatile (mg/L)	0	0	33	0	0	0	0	0	0	0
Suspended Sediment Concentration-Evap. at 110 °C (mg/L)	0	0	4	0	0	0	0	0	0	1
Carbon, Dissolved Inorganic (mg/L as C)	0	0	0	0	0	0	0	0	0	0
Carbon, Total Organic (mg/L as C)	0	6	7	0	15	15	20	1	7	3
Carbon, Dissolved Organic (mg/L as C)	0	0	4	0	0	7	0	1	0	0
pH (Standard Units) Lab	2	288	443	0	5	5	2	5	15	40
Specific Conductance (µmhos/cm @ 25 °C)	26	441	624	2	92	28	28	24	14	18
Specific Conductance, Field (µmhos/cm @ 25 °C)	6	126	32	0	18	79	48	37	14	11
Acidity, Total (mg/L as CaCO$_3$)	0	2	0	0	0	0	0	0	0	0
Hardness, Total (mg/L as CaCO$_3$)	2	146	92	0	15	24	29	3	2	8
Turbidity (Jackson Candle Units)	17	8	16	0	9	0	1	1	8	11
Turbidity, Transmissometer (Percent Transmission)	0	1	5	17	18	44	20	12	3	13
Turbidity, Field Nephelometric Turbidity Units	0	0	0	0	0	0	0	0	0	0
Turbidity, Hach Turbidimeter (Formazin Turbidity Units)	1	284	210	0	14	2	26	4	0	30
Turbidity, Lab Nephelometric Turbidity Units	0	0	0	0	0	2	24	0	0	0
Color (platinum-cobalt units)	11	258	352	0	0	6	4	4	4	23
Color, Apparent, Unfiltered Sample (platinum-cobalt units)	1	115	163	0	0	0	0	0	7	0
Light, Incident (percent remaining at certain depth)	0	3	16	0	0	9	1	0	0	0
Phytoplankton Production, Areal Gross, Oxygen Method (g/m^2/d)	0	0	0	0	0	0	0	0	0	0
Phytoplankton Production, Areal Net, Oxygen Method (g/m^2/d)	0	0	0	0	0	0	0	0	0	0
Phytoplankton Production, C-14 Method (g/m^3/h)	0	12	0	0	0	0	0	0	0	0
Phytoplankton Production, C-14 Method (mg/m^3/h)	0	0	0	0	0	0	0	0	0	0
Oxygen Dissolved, Analysis by Probe (mg/L)	0	270	0	0	0	3	27	12	0	155
Oxygen, Dissolved (mg/L)	33	542	858	6	105	100	27	33	24	55
Transparency, Secchi Disc (in)	0	284	182	0	5	42	25	0	1	5

Water-quality constituent or property	Number of sites in each State State									
	MA	MI	MN	MS	MO	MT	NE	NV	NH	NJ
Phosphate, Total Soluble, Colorimetric Method (mg/L as P)	0	0	0	0	0	0	0	0	0	0
Phosphorus, Dissolved Total, Whatman GF/F (mg/L P)	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A, Phytoplankton, Fluorometric Method (mg/m^3)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total Sargent Method, 667 mµ (µg/L)	0	0	0	0	0	0	0	0	0	0
Solids, Dissolved-Sum of Constituents (mg/L)	0	7	1	0	3	12	0	2	0	1
Algal Growth Potential, Filtered (mg/L)	0	3	0	0	0	0	0	0	0	0
Temperature, Water (°C)	8	849	837	18	153	104	53	51	35	207
Temperature, Water (°F)	27	107	300	0	2	1	1	1	18	21
Detention Time of Pond or Reservoir (d)	0	0	0	0	0	0	0	0	0	0
Contributing Drainage Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Drainage Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Depth of Lake, Mean (ft)	0	0	0	0	0	0	0	0	0	0
Depth of Lake, Maximum (ft)	0	0	0	0	0	0	0	0	0	0
Depth of Pond or Reservoir (ft)	0	40	619	19	44	67	21	82	0	29
Depth, Maximum, of Lake or Reservoir (m)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (million cubic feet)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (acre-ft)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (thousand acre-ft)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage in (millions of gallons)	0	0	0	0	0	0	0	0	0	1
Reservoir or Pond Storage (gallons)	0	0	0	0	0	0	0	0	0	0
Volume of Lake or Reservoir (million cubic meters)	0	0	0	0	0	0	0	0	0	0
Surface Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Surface Area (acres)	0	0	0	0	0	0	0	0	0	0
Surface Area (sq ft)	0	0	0	0	0	0	0	0	0	0
Surface Area of Lake or Reservoir (sq km)	0	0	0	0	0	0	0	0	0	0
Surface Area (percent of total)	0	0	0	0	0	0	0	0	0	0
Total number of stations with data:	333	13333	13333	163	1091	1449	1037	995	416	2277

| | Number of sites in each State | | | | | | | | | |
| | State | | | | | | | | | |
Water-quality constituent or property	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC
Phosphorus, Total (mg/L as P)	37	178	116	48	69	57	18	49	5	64
Phosphorus, Dissolved Orthophosphate (mg/L as P)	37	92	60	47	15	39	18	8	0	55
Phosphorus, Dissolved (mg/L as P)	5	182	0	8	33	3	2	12	5	0
Nitrogen, Total (mg/L as N)	2	8	0	0	5	12	0	14	0	0
Nitrogen, Inorganic, Total (mg/L as N)	2	0	0	0	0	0	0	0	0	0
Nitrogen, Organic, Total (mg/L as N)	2	15	0	0	5	13	1	17	0	0
Nitrogen, Ammonia, Total (mg/L as N)	13	165	111	46	54	55	21	37	5	82
Nitrate Nitrogen, Total (mg/L as N)	14	29	0	7	5	20	8	16	1	0
Nitrite Nitrogen, Total (mg/L as N)	0	12	12	4	4	12	1	12	1	0
Carbon, Total (mg/L as C)	0	0	0	0	0	0	0	0	0	0
Carbon, Total Inorganic (mg/L as C)	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A (mg/L)	0	7	0	1	0	11	0	8	0	0
Chlorophyll-A, Percent of Pheophytin-A +	10	0	0	0	0	0	0	0	0	0
Chlorophyll-A, Spectrophotometric Acid Method										
Chlorophyll-A (µg/L) Fluorometric Uncorrected	6	2	24	4	0	0	0	0	0	0
Chlorophyll-A (µg/L) Fluorometric Corrected	0	73	23	0	0	0	0	0	0	0
Chlorophyll-A (µg/L) Spectrophotometric Acid Method	10	42	1	4	2	13	8	1	0	0
Chlorophyll-A (µg/L) Trichromatic Uncorrected	8	4	2	0	14	0	0	3	0	0
Chlorophyll-B (mg/L)	0	2	0	0	0	0	0	4	0	0
Chlorophyll-B (µg/L) Trichromatic Uncorrected	10	2	0	0	0	0	0	3	0	0
Chlorophyll-C (µg/L) Trichromatic Uncorrected	10	2	0	0	0	0	0	3	0	0
Transparency, Secchi Disc (m)	20	164	162	5	2	21	5	1	0	1
Light, Incident, Sunlight Radiation Intensity	0	0	0	0	6	11	0	0	0	0
Depth of One Percent of Surface Light (ft)	12	0	0	0	0	11	0	2	0	0
pH (Standard Units)	71	251	311	80	198	234	44	75	10	116
Alkalinity, Total (mg/L as CaCO₃)	33	167	212	51	78	67	20	68	3	112
Salinity (ppt)	0	0	0	0	0	0	0	0	0	0
Residue, Total (mg/L)	0	17	41	0	35	0	2	5	1	19
Residue, Total Filtrable Dried at 105 °C (mg/L)	0	4	0	8	7	1	0	5	1	2
Residue, Total Nonfiltrable (mg/L)	17	34	106	5	68	4	11	60	1	62
Residue, Total Filtrable Dried at 180 °C (mg/L)	0	2	4	1	1	14	2	0	0	0

Water-quality constituent or property	Number of sites in each State									
	State									
	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC
Carbonate Ion (mg/L as CO_3)	19	45	0	27	59	5	19	28	0	3
Bicarbonate Ion (mg/L as HCO_3)	19	49	0	38	59	5	29	57	0	5
Chloride, Total in Water (mg/L)	25	170	5	49	131	159	70	67	2	13
Sulfate, Total (mg/L as SO_4)	27	164	7	53	156	145	62	111	0	11
Sulfate, Dissolved (mg/L as SO_4)	0	7	0	0	0	14	4	1	1	0
Calcium, Total (mg/L as Ca)	0	104	67	17	107	72	1	40	2	16
Calcium, Dissolved (mg/L as Ca)	22	53	0	33	61	35	118	56	0	10
Magnesium, Total (mg/L as Mg)	0	104	56	17	106	73	1	40	2	30
Magnesium, Dissolved (mg/L as Mg)	22	53	0	32	61	36	119	56	0	10
Potassium, Total (mg/L as K)	0	49	0	13	107	38	1	40	0	1
Potassium, Dissolved (mg/L as K)	17	49	0	32	57	18	54	55	0	10
Sodium, Total (mg/L as Na)	0	103	20	17	107	62	1	40	1	1
Sodium, Dissolved (mg/L as Na)	17	49	0	31	57	35	55	56	0	10
Phosphate, Ortho (mg/L as PO_4)	0	10	0	5	0	18	4	5	0	0
Phosphate, Total (mg/L as PO_4)	0	8	1	4	3	1	0	11	0	0
Phosphate, Total Soluble (mg/L)	0	0	4	0	0	0	0	0	0	0
Phosphate, Total, Colorimetric Method (mg/L as P)	0	5	0	0	0	0	8	0	0	0
Phosphorus, Total Hydrolyzable (mg/L as P)	0	0	0	0	0	0	0	0	0	0
Phosphorus, Total (mg/L as PO_4)	0	30	0	0	3	0	0	8	0	0
Phosphorus, In Total Orthophosphate (mg/L as P)	0	5	14	4	3	0	9	11	0	34
Phosphorus, Hydrolyzable + Orthophosphate, Total, Autoanalyzer (mg/L as P)	0	0	0	2	0	0	0	0	0	0
Phosphorus, Total, Spectrograph (μg/L as P)	0	0	0	0	0	0	0	0	0	0
Nitrate Nitrogen, Dissolved (mg/L as N)	10	4	0	6	0	9	0	2	0	0
Nitrate Nitrogen, Dissolved (mg/L as NO_3)	0	4	0	0	0	9	0	2	0	0
Nitrate Nitrogen, Total (mg/L as NO_3)	1	27	0	0	0	0	0	0	0	0
Nitrite Nitrogen, Dissolved (mg/L as N)	0	4	0	0	0	8	0	2	0	0
Nitrite Nitrogen, Dissolved (mg/L as NO_2)	0	4	0	0	0	10	0	2	0	0
Nitrite Nitrogen, Total (mg/L as NO_2)	0	0	12	0	0	0	0	0	0	0
Nitrite + Nitrate, Total 1 Det. (mg/L as N)	13	160	144	32	64	46	15	57	5	99
Nitrogen, Ammonia, Total (mg/L as NH_4)	0	0	0	8	3	0	0	10	0	0

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| Water-quality constituent or property | Number of sites in each State | | | | | | | | | |
| | State | | | | | | | | | |
	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC
Nitrogen, Kjeldahl, Total (mg/L as N)	52	135	194	43	75	52	19	60	1	73
Nitrogen, Total (mg/L as NO_3)	0	8	0	0	5	5	0	14	0	0
Chlorophyll C (mg/L)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total A+B+C (mg/L)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total, Trichromatic Uncorrected (µg/L)	0	0	0	1	0	0	0	0	0	0
Residue, Total Volatile (mg/L)	0	7	28	0	29	0	0	2	0	41
Suspended Sediment Concentration-Evap. at 110 °C (mg/L)	0	0	0	0	0	0	0	0	0	0
Carbon, Dissolved Inorganic (mg/L as C)	20	0	0	0	0	0	0	0	0	0
Carbon, Total Organic (mg/L as C)	26	64	0	1	20	6	1	5	0	2
Carbon, Dissolved Organic (mg/L as C)	0	13	0	0	2	0	3	1	0	0
pH (Standard Units) Lab	0	20	8	7	29	3	7	60	0	24
Specific Conductance (µmhos/cm @ 25 °C)	42	185	177	84	127	172	17	12	5	57
Specific Conductance, Field (µmhos/cm @ 25 °C)	38	14	181	52	103	107	33	71	5	93
Acidity, Total (mg/L as $CaCO_3$)	0	6	11	0	26	0	0	59	0	0
Hardness, Total (mg/L as $CaCO_3$)	3	31	1	9	68	19	2	58	1	19
Turbidity (Jackson Candle Units)	29	20	0	1	5	5	5	0	3	0
Turbidity, Transmissometer (Percent Transmission)	33	3	63	42	72	36	16	7	0	56
Turbidity, Field Nephelometric Turbidity Units	0	0	0	0	0	0	0	0	0	0
Turbidity, Hach Turbidimeter (Formazin Turbidity Units)	2	93	68	4	76	16	11	60	0	62
Turbidity, Lab Nephelometric Turbidity Units	0	0	0	4	0	18	0	0	0	0
Color (platinum-cobalt units)	0	26	0	5	32	13	10	60	1	60
Color, Apparent, Unfiltered Sample (platinum-cobalt units)	0	12	0	0	0	2	0	0	0	0
Light, Incident (percent remaining at certain depth)	29	19	0	4	86	1	0	36	0	0
Phytoplankton Production, Areal Gross, Oxygen Method ($g/m^2/d$)	0	0	0	0	0	0	0	0	0	0
Phytoplankton Production, Areal Net, Oxygen Method ($g/m^2/d$)	0	0	0	0	0	0	0	0	0	0
Phytoplankton Production, C-14 Method ($g/m^3/h$)	1	3	0	0	0	0	0	5	0	0
Phytoplankton Production, C-14 Method ($mg/m^3/h$)	0	0	0	0	0	0	0	0	0	0

| Water-quality constituent or property | Number of sites in each State | | | | | | | | | |
| | State | | | | | | | | | |
	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC
Oxygen Dissolved, Analysis by Probe (mg/L)	0	5	0	14	134	105	11	63	0	9
Oxygen, Dissolved (mg/L)	86	235	298	75	65	131	40	21	6	182
Transparency, Secchi Disc (in)	28	5	13	12	53	1	0	32	0	24
Phosphate, Total Soluble, Colorimetric Method (mg/L as P)	0	0	0	0	0	0	0	0	0	0
Phosphorus, Dissolved Total, Whatman GF/F (mg/L P)	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A, Phytoplankton, Fluorometric Method (mg/m^3)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total Sargent Method, 667 mμ (μg/L)	0	0	0	0	0	0	0	0	0	0
Solids, Dissolved-Sum of Constituents (mg/L)	0	8	0	5	1	9	1	0	0	0
Algal Growth Potential, Filtered (mg/L)	0	0	0	0	0	0	0	6	0	0
Temperature, Water (°C)	100	253	336	97	220	253	52	90	1	220
Temperature, Water (°F)	1	0	0	1	1	9	4	0	5	0
Detention Time of Pond or Reservoir (d)	0	0	0	0	0	0	0	0	0	0
Contributing Drainage Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Drainage Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Depth of Lake, Mean (ft)	0	0	0	0	0	0	0	0	0	0
Depth of Lake, Maximum (ft)	0	0	0	0	0	0	0	0	0	0
Depth of Pond or Reservoir (ft)	44	0	64	71	75	128	28	42	0	98
Depth, Maximum, of Lake or Reservoir (m)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (million cubic feet)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (acre-ft)	18	0	0	0	0	8	0	0	0	0
Reservoir Storage (thousand acre-ft)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage in (millions of gallons)	0	0	0	0	0	0	0	0	0	0
Reservoir or Pond Storage (gallons)	0	0	0	0	0	0	0	0	0	0
Volume of Lake or Reservoir (million cubic meters)	0	0	0	0	0	0	0	0	0	0
Surface Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Surface Area (acres)	0	0	0	0	0	0	7	0	0	0
Surface Area (sq ft)	0	0	0	0	0	0	0	0	0	0
Surface Area of Lake or Reservoir (sq km)	0	0	0	0	0	0	0	0	0	0
Surface Area (percent of total)	0	0	0	0	0	0	0	0	0	0
Total number of stations with data:	1063	3879	2957	1271	3049	2495	998	1924	74	1786

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| Water-quality constituent or property | Number of sites in each State | | | | | | | | | |
| | State | | | | | | | | | |
	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY
Phosphorus, Total (mg/L as P)	74	128	145	136	143	50	127	31	170	47
Phosphorus, Dissolved Orthophosphate (mg/L as P)	79	91	58	126	1	39	70	6	14	35
Phosphorus, Dissolved (mg/L as P)	7	31	0	0	20	7	16	9	106	4
Nitrogen, Total (mg/L as N)	0	19	48	0	2	7	6	0	65	6
Nitrogen, Inorganic, Total (mg/L as N)	0	0	0	0	0	0	0	0	0	0
Nitrogen, Organic, Total (mg/L as N)	0	26	15	0	0	13	69	0	35	3
Nitrogen, Ammonia, Total (mg/L as N)	142	102	112	84	63	29	108	12	123	38
Nitrate Nitrogen, Total (mg/L as N)	37	4	41	28	9	9	85	4	44	0
Nitrite Nitrogen, Total (mg/L as N)	11	4	18	4	1	7	36	0	42	0
Carbon, Total (mg/L as C)	0	0	0	0	0	0	2	0	0	0
Carbon, Total Inorganic (mg/L as C)	0	0	0	0	0	0	1	0	0	0
Chlorophyll A (mg/L)	1	0	17	0	167	6	46	0	0	0
Chlorophyll A, Percent of Pheophytin-A +	4	0	0	0	0	0	5	0	0	0
Chlorphyll-A, Spectrophotometric-Acid Method										
Chlorophyll A (µg/L) Fluorometric Uncorrected	0	0	0	53	3	0	4	0	0	24
Chlorophyll A (µg/L) Fluorometric Corrected	0	11	0	0	0	0	0	0	9	0
Chlorophyll-A (µg/L) Spectrophotometric Acid Method	4	0	0	0	0	7	12	0	24	0
Chlorophyll-A (µg/L) Trichromatic Uncorrected	0	43	0	0	0	5	11	0	32	0
Chlorophyll B (mg/L)	0	0	4	0	19	6	0	0	0	0
Chlorophyll-B (µg/L) Trichromatic Uncorrected	0	0	0	0	0	0	0	0	0	0
Chlorophyll-C (µg/L) Trichromatic Uncorrected	0	0	0	0	0	0	0	0	0	0
Transparency, Secchi Disc (m)	21	36	7	8	267	1	25	0	32	0
Light, Incident, Sunlight Radiation Intensity	0	0	0	0	0	0	0	0	2	0
Depth of one percent of Surface Light (ft)	0	13	0	0	0	0	0	0	0	0
pH (Standard Units)	160	154	585	135	163	74	114	89	184	62
Alkalinity, Total (mg/L as CaCO3)	140	132	105	128	121	45	129	44	191	56
Salinity (ppt)	0	0	0	0	0	0	3	0	0	0
Residue, Total (mg/L)	90	22	2	0	18	12	5	36	0	0
Residue, Total Filtrable Dried at 105 °C (mg/L)	70	22	0	29	18	6	3	29	0	0
Residue, Total Nonfiltrable (mg/L)	156	43	148	4	7	15	33	48	22	0
Residue, Total Filtrable Dried at 180 °C (mg/L)	46	0	6	58	0	0	0	0	0	24
Carbonate Ion (mg/L as CO3)	38	0	156	176	0	0	54	0	30	28

Water-quality constituent or property	Number of sites in each State State									
	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY
Bicarbonate Ion (mg/L as HCO_3)	58	0	182	175	0	0	94	0	30	29
Chloride, Total in Water (mg/L)	218	16	498	182	295	16	130	41	499	36
Sulfate, Total (mg/L as SO_4)	215	43	466	8	289	15	118	49	498	35
Sulfate, Dissolved (mg/L as SO_4)	10	0	8	170	0	0	8	0	2	1
Calcium, Total (mg/L as Ca)	39	32	7	1	73	14	11	46	389	0
Calcium, Dissolved (mg/L as Ca)	67	32	214	176	0	9	113	33	73	36
Magnesium, Total (mg/L as Mg)	39	32	5	1	53	12	12	46	389	0
Magnesium, Dissolved (mg/L as Mg)	66	32	216	176	0	9	113	33	72	36
Potassium, Total (mg/L as K)	37	32	5	1	45	12	8	46	398	0
Potassium, Dissolved (mg/L as K)	69	32	199	178	0	9	114	33	71	36
Sodium, Total (mg/L as Na)	37	32	0	1	45	12	11	46	393	0
Sodium, Dissolved (mg/L as Na)	69	32	211	178	0	9	115	33	72	36
Phosphate, Ortho (mg/L as PO_4)	32	0	19	1	9	6	64	0	7	4
Phosphate, Total (mg/L as PO_4)	33	0	35	28	2	0	5	0	40	0
Phosphate, Total Soluble (mg/L)	0	0	0	0	0	0	0	0	2	0
Phosphate, Total, Colorimetric Method (mg/L as P)	69	0	0	0	0	0	8	0	2	0
Phosphorus, Total Hydrolyzable (mg/L as P)	0	0	0	0	0	0	2	0	2	0
Phosphorus, Total (mg/L as PO_4)	0	0	48	0	0	9	4	0	5	0
Phosphorus, In Total Orthophosphate (mg/L as P)	72	0	0	1	39	0	20	0	29	14
Phosphorus, Hydrolyzable + Orthophosphate, Total, Autoanalyzer (mg/L as P)	7	0	0	0	0	0	0	0	1	0
Phosphorus, Total, Spectrograph Method (μg/L as P)	0	0	0	0	0	0	0	0	0	0
Nitrate Nitrogen, Dissolved (mg/L as N)	1	0	0	69	0	6	9	0	2	0
Nitrate Nitrogen, Dissolved (mg/L as NO_3)	0	0	0	0	0	6	1	0	2	0
Nitrate Nitrogen, Total (mg/L as NO_3)	0	0	0	0	0	0	0	0	0	0
Nitrite Nitrogen, Dissolved (mg/L as N)	18	0	0	1	0	6	3	0	0	0
Nitrite Nitrogen, Dissolved (mg/L as NO_2)	0	0	0	0	0	6	2	0	2	0
Nitrite Nitrogen, Total (mg/L as NO_2)	0	0	0	0	0	0	0	0	0	0
Nitrite + Nitrate, Total 1 Det. (mg/L as N)	65	115	94	74	53	26	42	39	133	29
Nitrogen, Ammonia, Total (mg/L as NH_4)	6	0	29	0	0	0	3	0	0	0
Nitrogen, Kjeldahl, Total (mg/L as N)	129	117	115	149	14	57	83	36	52	55
Nitrogen, Total (mg/L as NO_3)	0	0	44	0	0	0	3	0	5	6

| | Number of sites in each State | | | | | | | | | |
| | State | | | | | | | | | |
Water-quality constituent or property	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY
Chlorophyll-C (mg/L)	0	0	4	0	0	6	0	0	0	0
Chlorophyll, Total A+B+C (mg/L)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total, Trichromatic Uncorrected (µg/L)	8	0	0	0	0	0	0	0	0	0
Residue, Total Volatile (mg/L)	11	22	0	0	0	18	3	5	0	0
Suspended Sediment Concentration-Evap. at 110 °C (mg/L)	0	0	0	0	0	0	0	0	0	0
Carbon, Dissolved Inorganic (mg/L as C)	0	0	0	0	0	6	0	0	0	0
Carbon, Total Organic (mg/L as C)	7	10	25	32	2	17	59	24	1	0
Carbon, Dissolved Organic (mg/L as C)	0	0	0	0	0	7	2	0	4	0
pH (Standard Units) Lab	43	8	58	35	0	14	34	10	79	0
Specific Conductance (µmhos/cm @ 25 °C)	121	91	401	54	116	61	97	63	227	26
Specific Conductance, Field (µmhos/cm @ 25 °C)	82	62	382	131	5	42	59	70	8	33
Acidity, Total (mg/L as $CaCO_3$)	0	0	0	0	0	0	0	10	0	0
Hardness, Total (mg/L as $CaCO_3$)	36	32	31	61	80	8	11	41	5	6
Turbidity (Jackson Candle Units)	28	0	44	12	83	0	10	0	0	1
Turbidity, Transmissometer (Percent Transmission)	59	87	131	57	5	36	11	65	0	20
Turbidity, Field Nephelometric Turbidity Units	0	0	0	0	0	0	0	0	0	0
Turbidity, Hach Turbidimeter (Formazin Turbidity Units)	15	25	9	72	0	9	22	63	86	0
Turbidity, Lab Nephelometric Turbidity Units	7	0	0	0	0	0	0	0	0	0
Color (platinum-cobalt units)	8	0	12	0	26	2	57	10	10	0
Color, Apparent, Unfiltered Sample (Platinum-cobalt units)	0	0	0	0	5	0	4	0	49	0
Light, Incident (percent remaining at certain depth)	9	16	4	0	0	17	0	65	0	0
Phytoplankton Production, Areal Gross, Oxygen Method ($g/m^2/d$)	0	0	0	0	0	0	0	0	0	0
Phytoplankton Production, Areal Net, Oxygen Method ($g/m^2/d$)	0	0	0	0	0	0	0	0	0	0
Phytoplankton Production, C-14 Method ($g/m^3/h$)	0	0	0	0	0	0	0	0	3	0
Phytoplankton Production, C-14 Method ($mg/m^3/h$)	0	0	0	0	0	0	0	0	0	0
Oxygen Dissolved, Analysis by Probe (mg/L)	16	56	95	8	0	21	18	81	119	19
Oxygen, Dissolved (mg/L)	163	24	408	135	241	49	126	2	98	34
Transparency, Secchi Disc (in)	26	0	35	48	2	28	4	58	33	23

| Water-quality constituent or property | Number of sites in each State | | | | | | | | | |
| | State | | | | | | | | | |
	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY
Phosphate, Total Soluble, Colorimetric Method (mg/L as P)	13	0	0	0	0	0	0	0	0	0
Phosphorus, Dissolved Total, Whatman GF/F (mg/L P)	0	0	0	0	0	0	0	0	0	0
Chlorophyll-A, Phytoplankton, Fluorometric Method (mg/m^3)	0	0	0	0	0	0	0	0	0	0
Chlorophyll, Total Sargent Method, 667 mu (µg/L)	0	0	0	0	0	0	0	0	0	0
Solids, Dissolved-SUM of Constituents (mg/L)	1	0	25	1	0	0	4	0	0	4
Algal Growth Potential, Filtered (mg/L)	0	0	0	0	0	0	1	0	0	6
Temperature, Water (°C)	178	158	594	139	256	86	167	99	167	63
Temperature, Water (°F)	71	0	234	19	4	6	4	0	99	0
Detention Time of Pond or Reservoir (d)	0	0	0	0	0	0	0	0	0	0
Contributing Drainage Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Drainage Area (sq mi)	0	0	0	0	0	0	0	0	0	0
Depth of Lake, Mean (ft)	0	0	0	0	0	0	0	0	0	0
Depth of Lake, Maximum (ft)	2	0	0	0	0	0	0	0	0	0
Depth of Pond or Reservoir (ft)	70	153	157	126	0	30	47	14	1	52
Depth, Maximum, of Lake or Reservoir (m)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (million cubic feet)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage (acre-ft)	0	0	49	0	0	0	0	0	0	0
Reservoir Storage (thousand acre-ft)	0	0	0	0	0	0	0	0	0	0
Reservoir Storage in (millions of gallons)	0	0	1	0	0	0	0	0	0	0
Reservoir or Pond Storage (gallons)	0	0	0	0	0	0	0	0	0	0
Volume of Lake or Reservoir (million cubic meters)	0	0	0	0	0	0	0	0	0	0
Surface Area (sq mi)	0	0	1	0	0	0	0	0	0	0
Surface Area (acres)	0	0	0	0	0	0	0	0	0	0
Surface Area (sq ft)	0	0	0	0	0	0	0	0	0	0
Surface Area of Lake or Reservoir (sq km)	0	0	0	0	0	0	0	0	0	0
Surface Area (percent of total)	0	0	0	0	127	0	0	0	0	0
Total number of stations with data:	3410	2172	6562	3469	2891	1040	2800	1469	5284	967

[Units: mg/L, milligrams per liter; %, percent; μg/L, micrograms per liter; m, meter; ft, foot; °C, degrees Celsius; μmhos/cm, micromhos per centimeter; g/m²/day, grams per square meter per day; g/m³/hr, grams per cubic meter per hour; mg/m³/hr, milligrams per cubic meter per hour; in, inch; mμ, millimicron; °F, degrees Farenheit; sq mi, square mile; acre-ft, acre-foot; sq ft, square foot; sq km, square kilometer]

Water-quality constituent or property	Total number of sites with data
Phosphorus, Total (mg/L as P)	3863
Phosphorus, Dissolved Orthophosphate (mg/L as P)	1721
Phosphorus, Dissolved (mg/L as P)	1007
Nitrogen, Total (mg/L as N)	590
Nitrogen, Inorganic, Total (mg/L as N)	60
Nitrogen, Organic, Total (mg/L as N)	759
Nitrogen, Ammonia, Total (mg/L as N)	3488
Nitrate Nitrogen, Total (mg/L as N)	868
Nitrite Nitrogen, Total (mg/L as N)	581
Carbon, Total (mg/L as C)	40
Carbon, Total Inorganic (mg/L as C)	39
Chlorophyll A (mg/L)	359
Chlorophyll A, % of Pheophytin A+Chl A, Spec-Acid	22
Chlorophyll A (μg/L) Fluorometric Uncorrected	224
Chlorophyll A (μg/L) Fluorometric Corrected	157
Chlorophyll-A (μg/L) Spectrophotometric Acid Method	899
Chlorophyll-A (μg/L) Trichromatic Uncorrected	1083
Chlorophyll B (mg/L)	66
Chlorophyll-B (μg/L) Trichromatic Uncorrected	154
Chlorophyll-C (μg/L) Trichromatic Uncorrected	162
Transparency, Secchi Disc (m)	1753
Light, Incident, Sunlight Radiation Intensity	268
Depth at which 1% Surface Light Remains (ft)	115
pH (Standard Units)	6657
Alkalinity, Total (mg/L as $CaCO_3$)	4439
Salinity (Parts per Thousand)	15
Residue, Total (mg/L)	642
Residue, Total Filtrable Dried at 105 °C (mg/L)	393

Water-quality constituent or property	Total number of sites with data
Residue, Total Nonfiltrable (mg/L)	2507
Residue,Total Filtrable Dried at 180 °C (mg/L)	352
Carbonate Ion (mg/L as CO_3)	1473
Bicarbonate Ion (mg/L as HCO_3)	1831
Chloride, Total in Water (mg/L)	7390
Sulfate, Total (mg/L as SO_4)	5972
Sulfate, Dissolved (mg/L as SO_4)	948
Calcium, Total (mg/L as Ca)	2476
Calcium, Dissolved (mg/L as Ca)	2978
Magnesium, Total (mg/L as Mg)	2365
Magnesium, Dissolved (mg/L as Mg)	2934
Potassium, Total (mg/L as K)	2467
Potassium, Dissolved (mg/L as K)	2952
Sodium, Total (mg/L as Na)	2616
Sodium, Dissolved (mg/L as Na)	3008
Phosphate, Ortho (mg/L as PO_4)	608
Phosphate, Total (mg/L as PO_4)	1056
Phosphate, Total Soluble (mg/L)	57
Phosphate, Total, Colorimetric Method (mg/L as P)	287
Phosphorus, Total Hydrolyzable (mg/L as P)	70
Phosphorus, Total (mg/L as PO_4)	163
Phosphorus, In Total Orthophosphate (mg/L as P)	735
Phosphorus, Hydrolyzable + Ortho, Total, Autoanalyzer	37
Phosphorus, Total, Spectrograph Method (μg/L as P)	3
Nitrate Nitrogen, Dissolved (mg/L as N)	259
Nitrate Nitrogen, Dissolved (mg/L as NO_3)	105
Nitrate Nitrogen,Total (mg/L as NO_3)	115
Nitrite Nitrogen, Dissolved (mg/L as N)	77
Nitrite Nitrogen, Dissolved (mg/L as NO_2)	77
Nitrite Nitrogen, Total (mg/L as NO_2)	14
Nitrite + Nitrate, Total 1 Det. (mg/L as N)	2884
Nitrogen, Ammonia, Total (mg/L as NH_4)	99
Nitrogen, Kjeldahl, Total (mg/L as N)	3240

Water-quality constituent or property	Total number of sites with data
Nitrogen, Total (mg/L as NO_3)	185
Chlorophyll C (mg/L)	27
Chlorophyll, Total A+B+C (mg/L)	6
Chlorophyll,Total, Trichromatic Uncorrected (µg/L)	45
Residue, Total Volatile (mg/L)	300
Suspended Sediment Concentration-Evap. at 110 °C (mg/L)	25
Carbon, Dissolved Inorganic (mg/L as C)	46
Carbon, Total Organic (mg/L as C)	722
Carbon, Dissolved Organic (mg/L as C)	114
pH (Standard Units) Lab	1883
Specific Conductance (µmhos/cm @ 25 °C)	5072
Specific Conductance, Field (µmhos/cm @ 25 °C)	2946
Acidity, Total (mg/L as $CaCO_3$)	201
Hardness, Total (mg/L as $CaCO_3$)	1444
Turbidity (Jackson Candle Units)	882
Turbidity, Transmissometer (Percent Transmission)	1373
Turbidity, Field Nephelometric Turbidity Units (NTU)	7
Turbidity, Hach Turbidimeter (Formazin Turb Units)	1867
Turbidity, Lab Nephelometric Turbidity Units (NTU)	89
Color (platinum-cobalt units)	1314
Color, Apparent, Unfiltered Sample (platinum-cobalt units)	410
Light, Incident (percent remaining at certain depth)	582
Phytoplankton Production, Areal Gross, Oxygen Method (g/m^2/day)	1
Phytoplankton Production, Areal Net, Oxygen Method (g/m^2/day)	1
Phytoplankton Production, C-14 Method (g/m^3/hr)	28
Phytoplankton Production, C-14 Method (mg/m^3/hr)	88
Oxygen Dissolved, Analysis by Probe (mg/L)	2231
Oxygen, Dissolved (mg/L)	6013
Transparency, Secchi Disc (in)	1771
Phosphate, Total Soluble, Colorimetric Method (mg/L as P)	16
Phosphorus, Dissolved Total, Whatman GF/F (mg/L P)	0
Chlorophyll-A, Phytoplankton, Fluorometric Method (mg/m^3)	0
Chlorophyll, Total Sargent Method, 667 mµ (µg/L)	0

Appendix 13.--<u>Summary of number of STORET sampling sites with screened water-quality data</u>--Continued

Water-quality constituent or property	Total number of sites with data
Solids, Dissolved-SUM of Constituents (mg/L)	145
Algal Growth Potential, Filtered (mg/L)	24
Temperature, Water (°C)	9045
Temperature, Water (°F)	1155
Detention Time of Pond or Reservoir (days)	0
Contributing Drainage Area (sq mi)	12
Drainage Area (sq mi)	180
Depth of Lake, Mean (ft)	203
Depth of Lake, Maximum (ft)	345
Depth of Pond or Reservoir (ft)	4121
Depth, Maximum, of Lake or Reservoir (m)	92
Reservoir Storage (million cubic feet)	0
Reservoir Storage (acre-ft)	390
Reservoir Storage (thousand acre-ft)	0
Reservoir Storage (millions of gallons)	2
Reservoir or Pond Storage (gallons)	0
Volume of Lake or Reservoir (million cubic meters)	0
Surface Area (sq mi)	78
Surface Area (acres)	596
Surface Area (sq ft)	0
Surface Area of Lake or Reservoir (sq km)	0
Surface Area (percent of total)	127
Total number of sites with data for one or more constituents or properties:	128783

[STORET, a computerized data-base system of the U.S. Environmental Protection. Agency for the STOrage
and RETrieval of water-quality data; ARC-INFO[1] is a geographic information system for automating,
manipulating, analyzing, and displaying geographic data in digital form.]
NOTE.--The comments below refer to the water-quality data for lakes and reservoirs which was retrieved from the
STORETdata base. An individual State can contain many waterbodies within its borders, but have few or none
of them included in the STORET date base. The term "site" refers to an individual sampling for a lake or
reservoir contained in the STORET data base. Further, when a lake or reservoir only has one sampling
site, the term "site" also identifies the waterbody. When a waterbody has more than one sampling site,
the term "site" refers to one of the sampling sites within the waterbody. The sample-collection agency
name is identical to that listed in the STORET data base; in all cases, the codes used to designate
sample-collection agencies were not defined.)

ALABAMA--15 lake sites were selected. Except for four sites, all selected sites were in the northern half of the State,
primarily large reservoirs. Thirteen (13) of these lake sites were National Eutrophication Survey (NES) study lakes,
and the remainder were State sampling sites.

ALASKA--311 of 406 sites were selected. There were a large number of small lakes in the STORET data base which do not
appear on USGS Alaska topographic maps. The State contained a large number of small natural lakes. There were
two large spatial concentrations of sampling sites, one in the Anchorage area, the other on the Northern Slope. There
were a large number of one-site lakes titled "UNNAMED LAKE NR...." in the Northern Slope data set. Spatial
coverage was sparse elsewhere, especially in the center of the State. Several lakes have multiple sampling sites,
including Lucile Lake (15 sites) and Lake Wasila (9 sites). The major collection agency was 112WRD (Water
Resources Division). The only other agency (with just a few sites) was 21ADECWQ.

ARIZONA--100 of 217 sites were selected. Most sites were spatially concentrated in the center of the State; there was very
little data for the northern or southern ends of the State. Many of the selected sites appear to be mountain lakes. The
major sampling agencies were NES, AZG&F, and AZSU.

ARKANSAS--52 of 151 sites were selected. There is little spatial coverage in the southeastern end of the State. The
majority of the sampling sites were concentrated in about six large reservoirs. Many of the individual (not multiple-site
lakes) were titled "swimming areas". The major sampling agencies were WRD and NES.

COLORADO--Approximately 200 of 285 sites were selected. There were many small mountain lakes, and some urban lakes
in the Denver area. A large number of the mountain lakes were reservoirs.

CONNECTICUT--37 of 64 sites were selected. Many sites were NES lakes. However, there were some lakes sampled by
State agencies and the U.S. Army Corps of Engineers (COE).

DELAWARE--There were only 17 sites in the entire State. All the data refer either to ponds or small lakes. There are only a
few large lakes in the State. The majority of the data represent NES lakes, although there were a few State agency
data.

DISTRICT OF COLUMBIA--There are no lakes/reservoirs in the District of Columbia.

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[1] Use of trade names in this report is for identification only and does not constitute endorsement by the U.S. Geological
Survey.

FLORIDA--559 of 1,095 sites were selected. The State appears to contain many natural lakes, small and large. There are a number of spatial concentrations of waterbodies in STORET. Several are in the central part of the State, about halfway down a central north-south axis. There are few STORET sites in the southern or panhandle area. There were not many single-site lakes in the data set. The major sample-collection agencies were 112WRD and 21FLA (Florida), as well as a number of NES sites. Many waterbodies had multiple sampling sites, with data from 112WRD, NES, and 21FLA. There also were a number of 1118ATL sites in the Ocala National Forest. Because it is so fragmented, two 112WRD sampling sites were selected for Tsala Apopka Lake.

GEORGIA--29 of 185 sites were selected. There are a few large reservoirs (with many sites per reservoir) in the data set. There also are a large number of Chatahoochee River sampling sites along the border in the southwestern corner of the State. Most selected waterbodies have a combination of NES and one or more State agency sampling sites.

HAWAII--There are only 12 sites for the entire State, all for Wiamaluhia Lake. Because there was no ARC-INFO "STREAMS_B" option for Hawaii, no sites were selected for inclusion in the data set.

IOWA--147 of 414 sites were selected. Because many of the large reservoirs in the State have many sites, only a small number of sites were selected for the data set. Many tributary sites also were eliminated from the data set. Most waterbodies were natural lakes, with the few very large waterbodies and a few smaller ones being reservoirs. About 75 percent of the data was collected by the agency 21 IOWA; many of the sites are the deepest sites in the waterbodies. NES sites were in the minority. Many waterbodies either had three sampling sites labeled "Sampling site" #1, 2 or 3, or else multiple sites not consecutively numbered. Assuming the sites were consecutively numbered from one end of a waterbody to the other, the middle-numbered sites were selected for the data set. Where multiple sites existed in a lake (often with repeating identical names and/or nonconsecutive numbers), several sites (usually near the dam for reservoirs, or in the center for natural lakes) were selected for the data set.

IDAHO--63 of 207 sites were selected. There were several small and large reservoirs in the data set. The natural lakes usually were small, although the large reservoirs had multiple sites. Several large reservoirs (Pend Oreille, Coeur D'Alene) were natural lakes that had been dammed to raise the water level. Thus, the deepest points usually were in the center of the lakes. The most frequently-sampled waterbodies were located in the panhandle or in the southeastern corner of the State. Primary collection agencies were 21IDSURV, 21 IDAHO, and USBR, with few NES lakes. The procedure for multiple-site waterbodies was similar to that for Iowa (the dam site for reservoirs, and the center for natural lakes).

ILLINOIS--245 of 983 sites were selected. There were two spatial concentrations of intensively-sampled waterbodies. One was in the southern end of the State; many waterbodies located near small towns were named "Unnamed Lake X NR... " The other location was the upper northeastern end, primarily Chicago and its environs (including Lake Michigan sites eliminated from the data set). Many reservoirs had three sites, usually one at or near the dam. This latter site was selected in such cases. Where the waterbody appeared to be a natural lake, the middle site usually was selected. Most sampling was done by the agency 21ILLAKE (Illinois lake), with a few NES lakes.

INDIANA--181 of 315 sites were selected. The State has many small lakes and reservoirs. Most sites were located at the northern end of the State (including 20 to 30 Lake Michigan sites near Gary, Indiana, which were eliminated from the data set). The larger reservoirs typically had multiple sampling sites. The agency 21IND (Indiana) collected most samples; some NES and COE sites also were present.

KANSAS--124 of 392 sites were selected. Most sites were located in the eastern side of the State; almost none were on the western side. There are many "X County State Lakes" with three sampling sites, with the middle of the three sites usually selected for the data set. The primary sample-collection agencies were 21KAN## and 121MRBCE##, with only a few NES sites.

KENTUCKY--97 of 281 sites were selected. There were many small lakes in the STORET data base, sufficiently small not to be visible on USGS Kentucky topographic maps. The big reservoirs had multiple sites, including many COE sites. The primary sample-collection agencies were 21KY (Kentucky) and the COE, with only a few NES sites.

LOUISIANA--70 of 217 sites were selected. The top and middle part of the State, as well as the northeastern corner, have a sparse number of sampling sites. The lakes in the upper part of the State generally are freshwater systems, while those in the lower part are affected by Gulf of Mexico tides. The division line generally runs in an east-west axis across the State, approximately along Interstate Highway 10. Lake Ponchatrain and Lake Borgne in the southeastern region of the State are contiguous with the Gulf of Mexico. These two waterbodies, and many others along the southern end of the State, had multiple sampling sites. The primary sample-collection agencies were the COE, 12WRD, and 12ATCHAFF, with a few NES sites. The Atchafalaya Basin extends in a generally southeast-northwest axis in the bottom one-half of the State. Because of its large areal extent, approximately 10 to 12 WRD and COE sites were included in the data set.

MASSACHUSETTS--12(?) of 40 sites were selected. There was sparse areal coverage, consisting of about 12 scattered sites and one multiple-site reservoir. The 40 available sites included 23 sites in Lake Quinsigamond and its tributaries. The major sample-collection agencies were NES and 11COE.

MARYLAND--8 of 47 sites were selected. There was sparse areal coverage, with the sites spatially concentrated in the middle of the State. There were a few large waterbodies in the State. The 47 sites included seven sites in Chesapeake Bay, as well as two holding ponds, both of which were eliminated from the data set. There were approximately a six reservoirs, each with multiple sampling sites. The primary sample-collection agencies were either NES or 21MDMONT. (Additional data on three Baltimore water-supply reservoirs were available from the Baltimore Water Utilities).

MAINE--68 of 108 sites were selected. Although the State has many natural lakes, the areal coverage is relatively sparse, with few sites in the middle of the State. Most samples were collected by 112WRD... and 112CCLK..., with a few NES lakes. There were a number of "Ponds" in the southern part of the State. The larger waterbodies have multiple sampling sites. (Additional data on magnetic tape are available from the State water agency).

MICHIGAN--1,063 of 2,250 sites were selected. Approximately one-half of the sites were Great Lakes open water or near shore sites, and were eliminated from the data set. There is a large spatial concentration of small lakes in the Ontonagan National Forest and Hiawatha National Forest in the Upper Peninsula. The major sample-collection agencies are 21MICH (Michigan), 112WRD, and 14AGNFS, along with a number of NES lakes. Lakes sampled by the USEPA (U.S. Environmental Protection Agency) (NES), 21MICH, and either 112WRD or 14AGNFS (especially for forests) were relatively common in the data set. In such cases, one site from each agency was selected for each lake. A very few unnamed lakes with multiple sites were inadvertently left in the data set. However, this number does not exceed more than 12 lakes; hence, it should not bias the 1,063-site data set.

MINNESOTA--1,573 of 1,905 sites were selected. There were a number of Lake Superior sites eliminated from the data set. There is a large number of natural lakes in the State, with spatial concentrations immediately north and south of the center, and in the northwest, parts of the State. There is little coverage along the western border, or at the northwestern or southeastern corner of the State. The major sample-collection agencies were 21MINN (Minnesota) and 14AGNF (in the Superior and Chippewa National Forests); some of these lakes also were sampled by 12WRD, 12 COOLK, and NES. 21MINN and NES are the major sample-collection agencies outside the national forest. There were many lakes in the Superior and Chippewa National Forests, sampled primarily by 14AGNF, 21 MINN, and NES. Although there is a minute redundancy in the selected data sites, it should not bias the 1,573-site data set.

MISSOURI--38 of 218 sites were selected. There is sparse areal coverage across the State, with most sites concentrated in a few large reservoirs, especially Lake of the Ozarks and Truman Reservoir. The other sites generally are waterbodies too small to appear on USGS Missouri topographic maps. The major sample-collection agencies were 121MBRCE...and 1117MBR..., with a few NES lakes. Because its two arms enter the State separately from Oklahoma along the southern boundary, Bull Shoals Lake is included twice in the data set. (Additional data on magnetic tape are available from the State water agency).

MISSISSIPPI--7 of 20 sites were selected. There is sparse areal coverage across the State, with most sites located in a narrow, north-south corridor down the center of the State. Except for five small waterbodies, five large reservoirs constitute all 20 sites, almost all of which are NES sites.

MONTANA--39 of 122 sites were selected. The areal coverage is uneven across the State, with most sites located in an east-west corridor across the northern part of the State. About 16 percent of the sites are in Flathead Lake. There is little coverage in the southeastern or middle portions of the State. The primary sample-collection agency is 112WRD, with some NES stations.

NORTH CAROLINA--84 of 354 sites were selected. The data set consists primarily of reservoirs, many of which are small waterbodies. There is virtually no coverage in the eastern parts of the State. Several reservoirs in the central and southwestern parts of the State have multiple sites. A large number of sites on the Catawba River were eliminated from the data set. The major sample-collection agency was 21NC01WQF, as well as NES sites in most of the larger reservoirs.

NORTH DAKOTA--65 of 132 sites were selected. Most of the waterbodies in the ARC-INFO system are located in a north-south axis down the center of the State; however, most of the water-quality data are for waterbodies located in the western and eastern one-half of the State. Many waterbodies have a "Shallow" and "Deep" site designation. Because Garrison Reservoir had a large number of sampling sites (about 20 total), sites at both ends of the reservoir were selected. Many waterbodies located in the western part of the State had 1 to 2 sites. The major sample-collection agencies were 12WRDC and NES.

NEBRASKA--26 of 60 sites were selected. The entire data set consists of 15 to 20 reservoirs. Although most waterbodies are located in the western one-half of the State, there were virtually no sampling sites in this region. The areal coverage is sparse, with single sampling sites concentrated in the southeastern corner of the State, and 1 to 3 site combinations over the southwestern part. The major sample-collection agencies were NES and 1117MBR

NEW HAMPSHIRE--27 of 57 sites were selected. The coverage consists mainly of sites in a small area in the center of the State. There is no coverage in the western or southeastern parts of the State. There were a large number of lakes in the ARC-INFO data base which were not sampled. There were several sites in the southeastern corner of the State with the ARC-INFO Site identification "EXAMPLE...". The major sample-collection agencies were 11COE and 14AGNF, as well as a few NES sites. Lake Winnepausakee (the largest lake on the USGS New Hampshire topographic map) contains 8 (about 14 percent) of the 57 sites in the State.

NEW JERSEY--76 of 267 sites were selected. There were multiple sites at each individual site designation on the ARC-INFO system. There also were many small lakes in the southern one-half of the State which do not appear on the USGS New Jersey topographic maps. The major spatial concentrations of waterbodies are around urban areas, especially Camden and the New York City area. A number of sites were identified as "Upper Surface" or "Lower Surface" composites, the meaning of which was unclear. In many cases, the sites were identified by their proximity to a highway or bridge location. The major collection agency was 21INJDEP, with a few REGII.... sites; there were few NES lakes.

NEW MEXICO--52 of 1,332 sites were selected. Although sparse, the areal coverage generally does cover the State, with the exception of the northeastern and southeastern corners. Virtually all waterbodies are multiple site reservoirs. Because a number of the reservoirs were sampled by 2 to 3 agencies, 2 to 3 sites per reservoir generally were selected. There were only a few one-site reservoirs. The major sample-collection agencies were 21NMEX (New Mexico) and NES, as well as a few 11COE and 113FOR sites. Elephant Butte Reservoir was the largest waterbody in the data set.

NEW YORK--118 of 504 sites were selected. Although lakes cover a large part of the State, the spatial coverage of the data set was uneven, except for the Finger Lakes area and perhaps the Adirondack Mountain area. There was little coverage in the western part of the State. There were many sites in several locations along the Lakes Ontario and Erie shoreline, comprising the majority of the 504 sampling sites, which were eliminated from the data set. There also was a spatial concentration of waterbodies (usually two-site ponds) in the New York City area, sampled by REGII, which may be drinking-water supplies. Because there was no "STREAMS_B" ARC-INFO option for New York, the southern-most site was selected in these latter cases. The sampling agency 112WRD sampled many reservoirs around New York City, as well as a number of "WTP" sites. Although there were many NES sites, many of these same waterbodies also were sampled by one or more other agencies.

NEVADA--30 of 188 sites were selected. There were a large number of waterbodies across the State, especially in a northwest-southeast axis along the western side of the State. However, the spatial coverage was uneven. There were a couple of spatial concentrations of many sites, especially Lake Mead (117 sites) and Lake Tahoe (22 sites). There also was a concentration of about 10 small lakes in the Humboldt National Forest. The majority of the sites were sampled by NES, although 112WRD, 21NEV (Nevada), 1119REG, 1115FSCH, and 12TAWI also collected samples on some waterbodies.

OHIO--98 of 524 sites were selected. There were approximately 230 Lake Erie sites which were eliminated from the data set. The data set was mostly uniform; the exception was the northwestern corner, for which little data were available. There were many multiple-site waterbodies, primarily reservoirs. The agencies COE and WRD, as well as NES in many cases, sampled many common lakes. Thus, many waterbodies, especially the larger reservoirs, have multiple sites. The major sample-collection agencies were 112WRD, 11COE, and NES lakes. The agency WRD\ had a number of single-site lakes with the description "..AB DAM NR..." in the title. There also were about 50 14AGNF sites labeled "Stripmine Pond 4M NW Ironton, OH", in a spatial concentration at the southern tip of the State which were eliminated from the data set.

OKLAHOMA--79 of 316 sites were selected. There is a relatively good uniform coverage across the State, except for the panhandle area. Virtually all the waterbodies are reservoirs. There are spatial concentrations of sites, especially for the multiple-site reservoirs. Examples are Eufaula Lake (47 sites) and Keystone Reservoir (40 sites). Many lakes were sampled by multiple agencies, with the major sample-collection agencies being 11COE and 12WRD, along with a number of NES lakes. The COE was the major sample-collection agency for the larger reservoirs. The agency WRD had many reservoirs identified by the latitude and longitude of the waterbodies, along with such names as "#01 Site 1 Stigler West", "Site 3 Holt Mountain", etc. In these cases, the sites designated as "Site 1" were selected. The only exceptions were cases in which there was no "Site 1"; the next lowest-numbered site was selected in these cases. The NES site for Lake Texoma, one of the two sites selected for this lake, was not near the dam; rather, it was located in the northern arm of the lake.

OREGON--134 of 188 sites were selected. Most waterbodies are located in the central and southern parts of the State. Although there was a large spatial concentration of sites in the northwestern corner, as well as a number of single-site waterbodies, the data coverage across the State was not uniform. There were three riverine reservoirs along the northeastern boundary, and 5 "log ponds" in the southcentral part, of the State. The major sample-collection agency in the western part of the State (including the concentration of sites in the northwestern corner) was 112WRD, and the major agencies in the eastern part of the State were 1119USF and 1119USBR. There also were some NES lakes.

PENNSYLVANIA--89 of 238 sites were selected. The data coverage was relatively uniform across the State. Allegheny Reservoir had about 18 sites. Approximately 45 Lake Erie sites were eliminated from the data set. The major sample-collection agency was 112WRD, although the COE and NES also collected samples. There were many single-site, mostly 112WRD, lakes in the data set.

RHODE ISLAND--4 of 11 sites were selected. This State had very sparse data coverage. Scituate Reservoir (the largest in the State) had only one site, and Flat River Reservoir had 5 of the 11 sites in the State. The sample-collection agencies were NES and 11COE.

SOUTH CAROLINA--65 of 256 sites were selected. There is sparse data coverage for the eastern/southeastern parts of the State; much marshland area also exists along the coastline. There are many large, multiple-site reservoirs in the middle and western parts of the State. Examples are the Hartman/Keowee/Jacossee reservoir complex (34 sites) and the Lake Marion/Moultree reservoir complex (87 sites). The major sample-collection agency is 21SC, with some lakes also were sampled by NES and EPRI.

SOUTH DAKOTA--244 of 357 sites were selected. The majority of the waterbodies are reservoirs, although there are many small natural lakes scattered throughout the State. Oahe Reservoir is large, extending in a north-south axis from the northwestern boundary across approximately one-half the length of the State. Many lakes were sampled by 3 to 4 agencies. The major sample-collection agencies were 21SDAK (South Dakota), 21SDLAKE, and NES. There were many single-site 21SDAK waterbodies. There also were many 31BLHIC sites (primarily swimming and campground

areas), which also were sampled by other agencies. Because of a misplaced location in the ARC-INFO system, one extra site probably was selected for Madison, Clear, and Pickerel lakes.

TENNESSEE--26 of 181 sites were selected. The large reservoirs are very dendritic; some were very long, for example Kentucky Lake. Many Tennessee river systems were dammed to create these reservoirs. The COE had some river sites, which were eliminated from the data set. The major sample-collection agencies were NES and COE. The large reservoirs had multiple (5 to 10 per reservoir), mostly NES sites, which is why only 26 sites (about 14 percent of the total) were selected from the 181-site data set.

TEXAS--265 of 742 sites were selected. All the waterbodies were reservoirs. The data coverage was uniform, with the only sparse areas being far west Texas and the southern tip of the State. Most reservoirs had 2 to 4 sites, although some also had 5 to 10+ sites. The major sample-collection agencies were 12WRD, 21TEXWR, 21TXWQB, and NES. Many reservoirs were sampled by all four agencies, thereby having more than one site included in the data set.

UTAH--148 of 349 sites were selected. The data coverage was not uniform, stretching in a northeast-southwest axis across the State. There is little coverage on the east/southeastern part (except for Lake Powell) or the west/northwestern part of the State. There were many National Forest and National Recreation Area sites. Several reservoirs had many multiple sites, including Lake Powell (57 sites) and Scofield Reservoir (33 sites). The two largest waterbodies only had a few sites (Great Salt Lake, 3 sites; Utah Lake, 8 sites), relative to smaller reservoirs in the State. The major sample-collection agencies were 12UTAH, NES, and 113FORS (the latter prominent in the National Forest areas). Lake Powell had only 21TAWI sites.

VERMONT--306 of 643 sites were selected. Most sites were located in the northern and southern ends of the State, with a few in the middle part. Many waterbodies were natural lakes. For lakes with multiple sites, the lowest-numbered site for a given agency was selected, unless it graphically appeared to be the mid-lake station of a natural lake. Several large lakes had many sites, for example Memphremagog (about 20 sites), Lake Bomoseen (about 40 sites), and Lake Champlain (about 65 sites at the upper end and 75 sites at the lower, riverine end). The major sample-collection agency was 11150005, although lakes sampled by 21VTLMP, 12WRD, 14AGNF (prominent in National Forests), 12CLLKO, and NES lakes also scattered throughout the data set. There were many usually 11150005 and 21VTLMP waterbodies named "X Pond - Basin #". Because of its large areal extent, five sites were selected for Lake Champlain (two 21150005 sites, two 21VTMLP sites, and one NES site; all were located in the open-water area at the lake's northern end).

VIRGINIA--24 of 98 sites were selected. The data coverage was sparse. There are about 8 large, multiple-site, reservoirs, as well as a number of scattered, single-site lakes or reservoirs. The sample-collection agencies were 12WRD, 11COE, 118ATL (Jefferson National Forest), 21VASWCB, and several permutations of 21VA (Virginia), with no single agency being dominant.

WASHINGTON--160 of 257 sites were selected. There were many natural lakes and reservoirs in the State. There were many single-site waterbodies located in the central and eastern parts of the State, but few in the southern and western parts. There were several concentrations of sites, primarily around the eastern and southern ends of Puget Sound, or around several large waterbodies, for example Lake Washington and the Potholes Reservoir/Moses Lake complex. There also was a concentration of sites in National Forests running in a north-south axis approximately down the center of the State. There were several multiple-site lakes, including Lake Washington (about 12 sites), Potholes Reservoir/Moss Lake complex (about 20 sites), and Lake Chelan (about 8). The major sample-collection agencies were 112WRD (many single-site lakes), 113FORS (in National Forests), 1119USBR, 12 CLLK, and 1119COE; there were few NES lakes. METRO was a prominent sample-collection agency for Lake Washington.

WEST VIRGINIA--16 of 114 sites were selected. The data coverage was sparse. There were about nine concentrations of lakes (with 4 to 10+ sites per lake), plus about four single-site lakes. The stations were generally located in a northeast-southwest broken axis running down the center of the State. Although the State does not have many waterbodies, almost all the larger waterbodies are dendritic reservoirs. The major sample-collection agencies were 11COE and NES.

WISCONSIN--621 of 802 sites were selected. Most waterbodies are located in the northern part of the State. The data coverage is relatively uniform, except for the southwestern corner of the State. There was a spatial concentration of sites on the north/northeastern side of the State, largely in National Forests. There were many "lagoons" in the Milwaukee area, as well as many "X Flowage" lakes in the northern part of the State. The major sample-collection agencies were 21WISC (Wisconsin), 14AGNF (especially in the National Forests, except that many forest lakes also were sampled by 21WISC), 112WRD (many single-site lakes), NES, and a rare 21COLLK site.

WYOMING--56 of 110 sites were selected. The data coverage was sparse. The State does not appear to have many waterbodies, and the data set consists of a low density of single-site lakes scattered across the State. Several large reservoirs have multiple sites, including Flaming Gorge Reservoir (about 20 sites). The major sample-collection agencies were 12WRD (usually at upstream ends, rather than at the dam), NES (usually at the dam end), and 21WYO (Wyoming). The agency 21UTAH had a single site in Flaming Gorge Reservoir, and 31BLHICDMWL has a single site on the eastern border of the State. There were a number of multiple-site lakes; in some cases, the sampling sites were separated by considerable distances (Seminole Reservoir). (Additional data were available from the Wyoming State Water Agency).