UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

# A PRESENTATION AND EVALUATION OF THE HYDROLOGIC INFORMATION AVAILABLE FOR THE MAJOR FEDERAL COAL LANDS IN SEVEN EASTERN STATES-- SOURCES OF AVAILABLE INFORMATION AND A PLAN FOR FUTURE WORK

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## CONVERSION OF MEASUREMENT UNITS

The following factors may be used to convert the inch-pound units published in this report to International System (SI) of metric units.

| Multiply inch-pound unit | By | To obtain metric unit |
| --- | --- | --- |
| | **Length** | |
| inch (in.) | 25.40 | millimeter (mm) |
| | .0254 | meter (m) |
| foot (ft) | .3048 | meter (m) |
| mile (mi) | 1.609 | kilometer (km) |
| | **Area** | |
| square mile ($mi^2$) | 2.590 | square kilometer ($km^2$) |
| acre | .405 | square hectometer ($hm^2$) |
| | **Volume** | |
| gallon (gal) | 3.785 | liter (L) |
| | .003785 | cubic meter ($m^3$) |
| cubic foot ($ft^3$) | .02832 | cubic meter ($m^3$) |
| | **Flow** | |
| cubic foot per second ($ft^3/s$) | 28.32 | liter per second (L/s) |
| | .02832 | cubic meter per second ($m^3/s$) |
| gallon per minute (gal/min) | .06309 | liter per second (L/s) |
| | .00006309 | cubic meter per second ($m^3/s$) |
| | **Temperature** | |
| degree Fahrenheit ($^{o}F$) | -32 x 0.555 | degree Celsius ($^{o}C$) |

# A PRESENTATION AND EVALUATION OF THE HYDROLOGIC INFORMATION AVAILABLE FOR THE MAJOR FEDERAL COAL LANDS IN SEVEN EASTERN STATES-- SOURCES OF AVAILABLE INFORMATION AND A PLAN FOR FUTURE WORK

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## ABSTRACT

The most abundant and available Federal coal reserves in Eastern United States are in and near the National forests. The National forest areas offering the greatest potential for coal development are in or near the Daniel Boone in Kentucky and Tennessee, Hoosier in Indiana, Jefferson in Virginia, Monongahela in West Virginia, Shawnee in Illinois, and Wayne in Ohio. An evaluation of the available data and published information on coal mining and the water resources of these areas identifies informational needs. Three such needs common to all six National forest areas are for (1) numerical characterization of streamflow, water-quality, and sedimentation characteristics; (2) information about ground-water availability, movement, and quality, before, during and after mining; and (3) a hydrologic reconnaissance of all major lakes and impoundments within the prospective Federal coal-leasing area. Investigations which would address these and other informational needs are outlined for each forest area. A schedule is proposed for completion of these recommended investigations by the U.S. Geological Survey over a 6-year period. The application of sophisticated analytical and interpretive techniques in these studies must be preceded by the collection and preparation of adequate hydrologic data.

# INTRODUCTION

Nationwide, the Federal Government owns the rights to the coal under millions of acres of land. The Federal Coal Leasing Amendments Act of 1976 (P.L. 94-377) as amended, requires that new leases of these reserves be made available for production through a competitive bidding system.

In June 1979, under Presidential order, the Secretary of the Interior announced a program to make Federally owned coal more readily available for competitive leasing. In the program, the Bureau of Land Management (BLM) is charged with the responsibility for leasing Federal coal resources to meet anticipated regional coal demands, and for ensuring that the environmental consequences of the proposed coal-production activities are identified and adequately addressed.

In the 31 Eastern States (those east of the Mississippi River and bordering it on the west), most of the Federally owned coal exists in small, scattered tracts, often under state or privately owned land. Planning extensive regional leasing of Federal coal in the East is a complicated procedure, entailing negotiations with numerous individual surface owners and potential lessees. Because these complications severely inhibit regional activity planning, as is done in the Western States, BLM expects that leasing by application will be the major mode of allocating Federal coal rights to the mining interests in the East.

Although BLM leases Federally owned coal in other areas of the Eastern States, this report addresses the effects of coal mining on the water resources of six specific National forest areas (fig. 1). These are the areas that offer the most readily accessible Federal coal and are likely to be leased first. The six areas of study in this report are composed principally of lands managed by the U.S. Forest Service, but some also contain nearby areas of Federal coal ownership not in the National forest system.

The data in table 1 show ownership of the land surface of the Federal coal estate in the East. Arrangements for leasing of Federal coal reserves existing beneath non-Federal surface will likely entail involved, lengthy planning and environmental analysis. Mineral ownership under U.S. Army Corps of Engineers projects (for example, flood-control impoundments) is undetermined; mining coal under these projects or military reservations probably would be extremely disruptive to established surface activities. The National forests are essentially large parcels of undeveloped land, owned and managed by the Federal Government; leasing of the coal in these areas generally is much less complicated.

The Surface Mining Control and Reclamation Act of 1977 (P.L. 95-87) currently prohibits the surface mining of coal in National forests east of the 100th meridian, although underground mining and some of its associated surface activities are permitted. The pressures to develop fully the Nation's coal resources may force a change to this law in the future. The effects of surface and underground mining on the water resources are very often interrelated and a hydrologic study of one system will lead to a better understanding of the other; often the studies cannot be separated. It is appropriate that this report include mention and analysis of the effects of both types of mining.

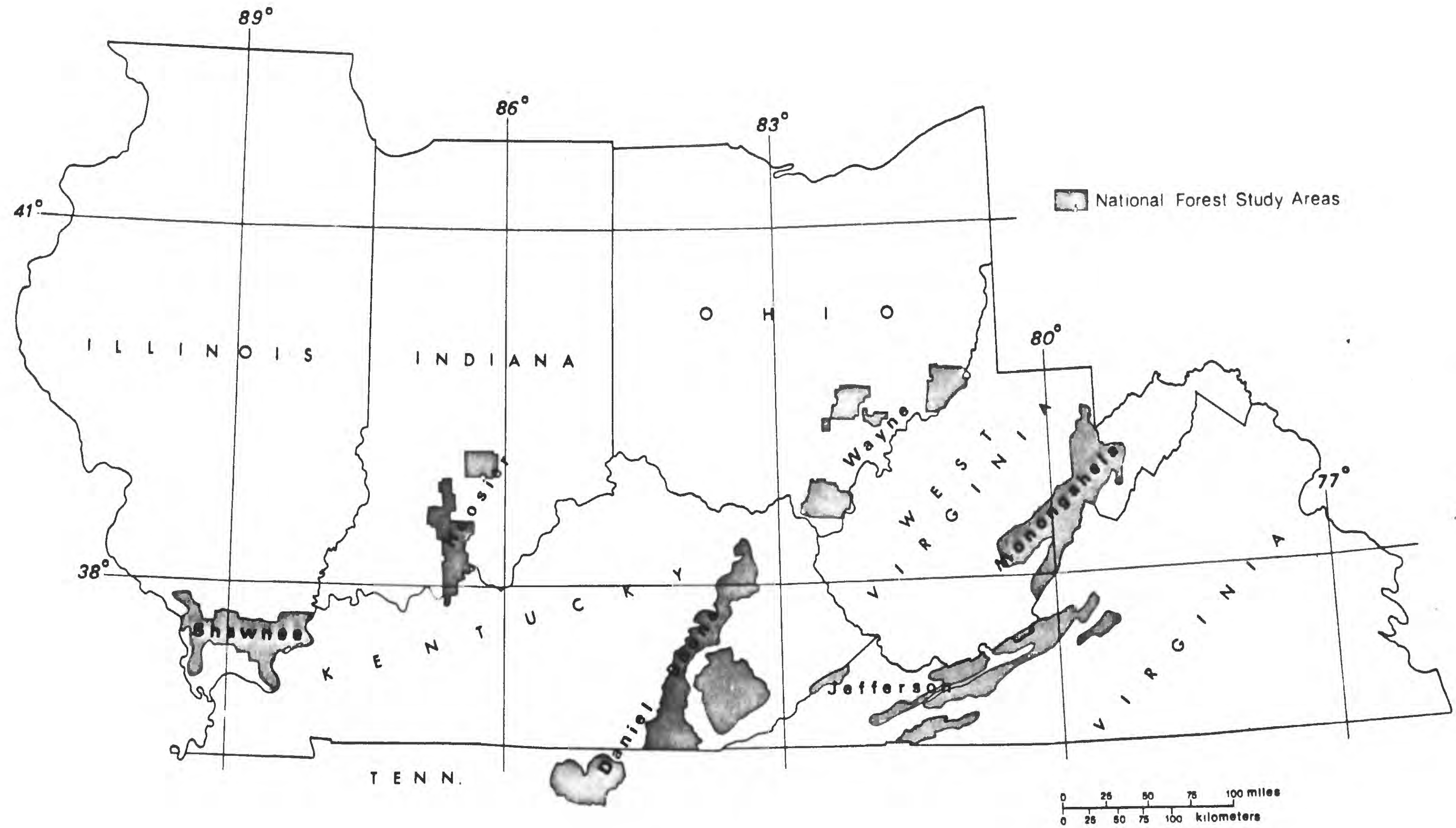


Figure 1.--Location of six National Forest study areas.

Table 1.--Federal coal ownership in the Eastern United States
(All figures in acres)

| State | Federal coal ownership beneath Army Corps of Engineers[1/] projects | Federal coal ownership beneath Military Reservations | Federal coal ownership beneath State-owned land | Federal coal ownership beneath private land | Federal coal ownership in National forests. |
|---|---|---|---|---|---|
| Alabama | 10,252.4 | 0 | - | 91,780 | 183,412 |
| Arkansas | 92,433.4 | 61,975 | - | 1,228 | 35,360 |
| Illinois | 119,828.3 | 4,615 | - | 3,347 | 92,152 |
| Indiana | 14,536.6 | 59,491 | - | 118 | 24,657 |
| Iowa | 72,972.0 | 90 | - | 1,320 | - |
| Kentucky | 72,257.2 | 0 | 23,175 | - | 127,510 |
| Maryland | 43.0 | 0 | 3,662 | - | - |
| Michigan | 0 | 0 | - | 1,225 | - |
| Missouri | 184,994.2 | 10,261 | - | 6,779 | - |
| Ohio | 29,521.3 | 21,419 | 23,442 | 200 | 66,592 |
| Pennsylvania | 32,770.6 | 1,081 | 6,767 | - | 8,104 |
| Tennessee | 0 | 0 | 5,532 | 3,771 | 0 |
| Virginia | 12,686.0 | 0 | - | - | 31,649 |
| West Virginia | 77,771.8 | 0 | 15,539 | - | 55,739 |
| TOTAL | 720,066.8 | 158,932 | 78,117 | 109,768 | 625,175 |

1/ Includes dam projects, impoundments, etc.; mineral ownership status undetermined.

From Van Haveren and Koss, 1980, with updates from Bureau of Land Management, Eastern States Office, June 1981.

## Purpose and Scope

An environmental assessment must be prepared to identify and evaluate the consequences of the proposed leasing of Federal coal lands. The surface management agency (for example, the U.S. Forest Service for the National forest lands) usually has this responsibility, although the assessments must meet BLM's criteria for adequacy. There must also be a basis on which to evaluate the progress and success of reclamation after mining is complete. Planning for the proper management of the proposed mining and reclamation requires detailed hydrologic information that can be applied to tract-specific assessments.

BLM has asked that the U.S. Geological Survey assist in gathering and evaluating hydrologic information for each of the National forest areas. The first step in this task, and one objective of this report, is to review and summarize the sources of available water-resources information for the six study areas in figure 1.

Another objective is to identify the major hydrologic issues and problems that revolve around coal mining and its influence on water resources. These issues are complex and often affected by political, economic, and social considerations; therefore, the more pertinent hydrologic concerns differ from state to state and region to region. In this report, ongoing and completed studies are evaluated in terms of how well they address the pertinent hydrologic problems and issues in each of the areas.

The final objective of this report is to draw from existing hydrologic information and issues and suggest a plan for the hydrologic study of the specified areas during the next 6 years. This includes a proposal for an overall project schedule. The plan should provide a basis for coordination, where needed, among Water Resources Division districts of the Geological Survey, and suggest a sequence and time frame compatible with the Nation's coal-development priorities.

## STUDY AREAS

Figures 2-7 are maps of each of the six National forest areas addressed in this report. In these figures, the boundaries of the study areas do not exactly coincide with the irregular boundaries of the National forests and included adjacent areas of Federal coal ownership. To simplify the computer and literature searches for hydrologic information, in some cases the boundaries of the study areas are placed just outside the forest boundaries so as to include all areas of Federal coal ownership within a polygon of fewer sides. In other cases, areas of the National forests where the Federal Government does not own the coal, or where there are no known reserves, are excluded from the designated study areas.

The study areas of this report are associated with the following National forests:

1. The Daniel Boone National Forest (including the Red Bird Purchase Unit) in eastern Kentucky (fig. 2). Overton and Fentress Counties, Tennessee, are included in this area, even though this National Forest is entirely within the borders of Kentucky.

2. The Hoosier National Forest in south-central Indiana (fig. 3).

3. The Jefferson National Forest in southwestern Virginia, with very small areas in Kentucky and West Virginia (fig. 4). Included with this National Forest are two U.S. Army Corps of Engineers projects in western Virginia—the John W. Flannagan Reservoir and North Fork Pound River Lake.

4. The Monogahela National Forest in eastern West Virginia (fig. 5).

5. The Shawnee National Forest in southern Illinois (fig. 6). Included with this forest is the Crab Orchard National Wildlife Refuge, which encompasses 43,000 acres just north of the east-central section of the forest. Under existing environmental policy, the leasing and mining of coal is not permitted in the refuge.

6. The Wayne National Forest in southeastern Ohio (fig. 7).

## HYDROLOGIC INFORMATION AND SUGGESTED PLANS

The available hydrologic information for each of the six study areas is presented in three parts. The first part contains three listings as retrieved from the U.S. Geological Survey's National Water Data Exchange (NAWDEX). Each of these listings provides a summary of information about the hydrology at data sites located in the study area. For each National forest area, listing 1 includes sites where streamflow and stage data are being or have been collected. Listing 2 contains sites for which surface-water-quality data are available, and listing 3 identifies wells and springs for which ground-water-quality data are available.

The codes used in all listings are explained either directly on the lists themselves, or in tables 2 and 3. Table 2 defines the agency codes and table 3 identifies the state and county codes. The site codes used for all the listngs are explained as follows: GW stands for a well or ground-water data-collection site; LK represents a lake or reservoir station; ME stands for a meteorological data-collection site; SP represents a spring; and SW signifies a river or stream data-collection activity. Eight-digit hydrologic-unit codes are assigned to most of the stations to assist the users in relating these sites to specific drainage basins. The codes refer to the hydrologic catalog units depicted on the U.S. Geological Survey's 1:500,000-scale State Hydrologic Unit Maps. These maps show the surface-drainage boundaries of the units. The State Hydrologic Unit Maps for the areas considered in this report may be obtained from:

Branch of Distribution
U.S. Geological Survey
1200 South Eads Street
Arlington, Virginia 22202

NAWDEX is an especially valuable aid for studies such as this. It provides quick indexing to virtually all relevant hydrologic data-collection sites within the specific area of concern. Although the NAWDEX system has direct access to some large water-data bases, its main strength is in identifying the data sources. The requester is very often referred to 1 or more of over 400 contributing organizations to actually obtain the data. The system can retrieve and sort the source information based on a multitude of hydrological, geographical, and parametrical options. It can also plot data-station locations. Examples of NAWDEX's scope and capabilities for providing and processing large amounts of information about water-resources-data sites are contained in the "Index to Water-Data Activities in Coal Provinces of the United States" (U.S. Department of Interior, Geological Survey, Office of Water Data Coordination, 1979 a and b). This index was prepared by NAWDEX for the Geological Survey's Office of Water Data Coordination (OWDC) and consists of five substantial volumes, each covering a different coal region of the United States. Volumes I and II listed in the references pertain to the Eastern and Interior Coal Provinces, respectively. Further information on NAWDEX capabilities and services is available from:

Program Office
National Water Data Exchange (NAWDEX)
U.S. Geological Survey
421 National Center
12201 Sunrise Valley Drive
Reston, Virginia 22092

Telephone: (703) 860-6031
FTS: 928-6031

The second part of the available hydrologic information for each National forest area presents the major ground-water-data sources. For each study area, the Geological Survey, via NAWDEX, can index varying amounts of well and ground-water-quality data. The Survey's Ground-Water Site Inventory (GWSI) File contains large amounts of these data in computer-accessible form; ground-water information in this file includes well ownership, location, construction, water levels, yields, geological unit, and water-quality data. However, the GWSI File remains incomplete, and a substantial amount of well and ground-water-quality data are still available only from state and local offices.

Finally, the third part consists of three summaries of references. The entries included in the summaries for each National forest area are chosen so as to provide the reader with a concise bibliography of information most pertinent to his or her needs. Included are only those references and studies which present or analyze field hydrologic data. Not included are feasibility studies, planning reports, and legal decisions. Also excluded are studies not mentioning the water resources (for example, assessments of strictly a geological nature), or which do not investigate actual field conditions (for example, laboratory studies of mine-drainage treatment processes).

Bibliographic summary 1 contains relevant information about any hydrologic study or report that assesses an area of less than 1,000 $mi^2$, either wholly or partially within the boundaries of the particular National forest study area. The entries in summary 1 are the most useful for preparing tract hydrologic assessments and evaluating impacts of coal mining and reclamation. Summary 2 contains similar information for ongoing or completed work for areas less than 1,000 $mi^2$, but not within the boundaries of the National forest. Two further stipulations of summary 2 references are that they address only the effects of coal mining on area water resources and that at least part of their area(s) of coverage lies within the same state as the specific National forest area under consideration. The references in summary 2 are somewhat less useful for the intended environmental analyses than those in summary 1. Summary 3 includes source information and abstracts of completed reports which address areas of study larger than 1,000 $mi^2$ in the same state as the forest, and which (1) address coal mining as it effects the water resources, or(and) (2) present methods of hydrologic analyses directly applicable to the specific National forest area. The references in summary 3 will be of lesser utility for tract-specific assessments, but may provide a means for approximating the gross effects of mining on larger water systems or techniques for estimating unmeasured parameters. The references in each summary are arranged in reverse chronological order; those that are yet to be published are listed first.

Table 2.--Agency codes used in NAWDEX listings

| CODE | AGENCY |
|---|---|
| | Federal |
| USEPA | Environmental Protection Agency |
| USCE | Corps of Engineers |
| USFS | Forest Service |
| USFWS | Fish and Wildlife Service |
| USGS | Geological Survey |
| USNWS | National Weather Service |
| USTVA | Tennessee Valley Authority |
| | Illinois |
| IL 001 | Illinois Department of Public Health |
| IL 003 | Illinois State Water Survey |
| IL 004 | Division of Water Resources, Illinois Department of Transportation |
| IL 006 | State of Illinois, Environmental Protection Agency |
| | Indiana |
| IN 001 | Indiana State Board of Health, Division of Stream Pollution Control |
| | Kentucky |
| KY 001 | Kentucky Department of Natural Resources and Environmental Protection |
| KY 003 | Division of Sanitary Engineering, Kentucky Department of Human Resources |
| | Ohio |
| OH 004 | Ohio Environmental Protection Agency |
| | Tennessee |
| TN 001 | Tennessee Wildlife Resources Agency |
| | Virginia |
| VA 001 | Virginia State Water Control Board |
| | West Virginia |
| WV 001 | Division of Water Resources, West Virginia Department of Natural Resources |
| WV 002 | Sanitary Engineering Division, West Virginia Department of Health |

Table 3.--State and county codes used in NAWDEX listings

| Code | State |
|---|---|
| 017 | Illinois (IL) |
| | **Counties** |
| 003 | Alexander |
| 059 | Gallatin |
| 069 | Hardin |
| 077 | Jackson |
| 087 | Johnson |
| 151 | Pope |
| 165 | Saline |
| 181 | Union |
| 199 | Williamson |

| Code | State |
|---|---|
| 018 | Indiana (IN) |
| | **Counties** |
| 013 | Brown |
| 025 | Crawford |
| 037 | Dubois |
| 071 | Jackson |
| 093 | Lawrence |
| 105 | Monroe |
| 117 | Orange |
| 123 | Perry |

| Code | State |
|---|---|
| 021 | Kentucky (KY) |
| | **Counties** |
| 013 | Bell |
| 051 | Clay |
| 065 | Estill |
| 109 | Jackson |
| 125 | Laurel |
| 129 | Lee |
| 131 | Leslie |

| Code | State |
|---|---|
| | Kentucky--Con. |
| | **Counties- Con.** |
| 133 | Letcher |
| 147 | McCreary |
| 165 | Menifee |
| 175 | Morgan |
| 189 | Owsley |
| 193 | Perry |
| 197 | Powell |
| 199 | Pulaski |
| 203 | Rockcastle |
| 205 | Rowan |
| 235 | Whitley |
| 237 | Wolfe |

| Code | State |
|---|---|
| 039 | Ohio (OH) |
| | **Counties** |
| 009 | Arthens |
| 053 | Gallia |
| 073 | Hocking |
| 079 | Jackson |
| 087 | Lawrence |
| 111 | Monroe |
| 115 | Morgan |
| 127 | Perry |
| 145 | Scioto |
| 167 | Washington |

| Code | State |
|---|---|
| 047 | Tennessee (TN) |
| | **Counties** |
| 049 | Fentress |
| 133 | Overton |

| Code | State |
|---|---|
| 051 | Virginia (VA) |
| | **Counties** |
| 019 | Bedford |
| 021 | Bland |
| 023 | Botetourt |
| 045 | Craig |
| 051 | Dickenson |
| 071 | Giles |
| 121 | Montgomery |
| 163 | Rockbridge |
| 173 | Smyth |
| 185 | Tazewell |
| 191 | Washington |
| 195 | Wise |
| 197 | Wythe |

| Code | State |
|---|---|
| 054 | West Virginia (WV) |
| | **Counties** |
| 023 | Grant |
| 025 | Greenbrier |
| 063 | Monroe |
| 071 | Pendlegon |
| 075 | Pocahontas |
| 083 | Randolph |
| 093 | Tucker |

Several bibliographies are available which contain extensive lists of references on all the influences of coal mining. These include:

Averitt, P., and Lopez, L., 1972, Bibliography and index of U.S. Geological Survey publications relating to coal, 1881-1970: U.S. Geological Survey Bulletin 1377, 173 p.

Gleason, V. E., 1980, Coal and the environment abstract series, mine drainage bibliography 1929-1980: Environmental Protection Agency doc. no. EPA-600/7-80-113, 184 p.

Gleason, V. E., and Russell, H. H., 1977, Coal and the environment abstract series, mine drainage bibliography 1910-1976: U.S. Environmental Protection Agency doc. no. EPA-600/2-77-082, 288 p.

Patricoski, M. L., Daniels, L. K., and Sobek, A. A., 1979, A. selective bibliography of surface coal mining and reclamation literature, Vol. 2, Interior Coal Province: Argonne National Laboratory, Argonne, Illinois, 152 p.

Walker, F. K., 1976, Bibliography and index of U.S. Geological Survey publications relating to coal, 1971-1975: U.S. Geological Survey Circular 742, 32 p.

Weiss, N. E., Sobek, A. A., and Streib, D. L., 1977, A selective bibliography of surface coal mining and reclamation literature, Vol. I, Eastern Coal Province: Argonne National Laboratory, Argonne, Illinois, 158 p.

U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980, An annotated bibliography of surface-mined area reclamation research: Berea, Kentucky, 59 p.

To provide a basis for evaluating the topical coverage of ongoing or completed hydrologic investigations for each area, a matrix of investigation categories is presented (table 4). Each reference in each of the forest area's bibliographic summaries is placed in one or more of the investigation categories listed vertically in the left column of table 4. Categorization of the references is based on the information in the annotated bibliography.

At the end of the section on available hydrologic information is a brief section presenting sources of precipitation data. These data provide the chemical quality of the water resource before it enters the terrestrial part of the hydrologic system, and they are needed input for rainfall-runoff modeling. Since most of the precipitation information relevant to the study areas is associated with relatively few regional networks, it is more appropriate to provide a single discussion of availability of these data, rather than to address the issue for each study area individually.

Table 4.—Number of hydrologic investigations pertinent to each major investigation category for each National forest study area.

(Some investigations are counted in more than one category. All investigations used in formulating this matrix are contained in supplemental data B, D, F, H, J, and L)

| Investigation category | Daniel Boone | | Hoosier | | Jefferson | | Monongahela | | Shawnee | | Wayne | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Within boundaries | Outside of boundaries | Within boundaries | Outside of boundaries | Within boundaries | Outside of boundaries | Within boundaries | Outside of boundaries | Within boundaries | Outside of boundaries | Within boundaries | Outside of boundaries |
| STREAM SYSTEMS | | | | | | | | | | | | |
| Streamflow | 8 | 20 | 1 | 6 | 3 | 6 | 2 | 7 | 3 | 7 | 0 | 1 |
| Water quality | 11 | 24 | 9 | 15 | 5 | 4 | 10 | 26 | 8 | 12 | 4 | 20 |
| Sediment | 4 | 13 | 4 | 5 | 3 | 2 | 2 | 4 | 1 | 5 | 1 | 4 |
| Biology | 7 | 5 | 4 | 2 | 3 | 2 | 2 | 6 | 3 | 1 | 3 | 4 |
| Modeling | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 3 | 1 | 1 | 0 | 0 |
| GROUND-WATER SYSTEMS | | | | | | | | | | | | |
| Flow systems | 3 | 6 | 2 | 5 | 4 | 0 | 4 | 5 | 5 | 11 | 1 | 7 |
| Water quality | 3 | 7 | 2 | 8 | 4 | 1 | 3 | 4 | 5 | 13 | 1 | 8 |
| Modeling | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 |
| LAKES AND RESERVOIRS | | | | | | | | | | | | |
| Water quality | 1 | 1 | 3 | 4 | 2 | 0 | 3 | 2 | 3 | 5 | 0 | 4 |
| Biology | 2 | 0 | 2 | 2 | 0 | 0 | 1 | 0 | 2 | 3 | 1 | 1 |
| RECLAMATION | 0 | 2 | 1 | 1 | 0 | 0 | 2 | 2 | 0 | 5 | 2 | 9 |

## The Daniel Boone National Forest Area

### Setting

The Daniel Boone National Forest, located in eastern Kentucky, is comprised of two distinct sections (fig. 2). The western section forms a narrow strip 140 mi long on the western edge of the Cumberland Plateau. The other section, the Redbird Purchase Unit, is made up of portions of Clay, Knox, Leslie, and Towsley Counties, and lies in the eastern part of the plateau.

The geographic information that follows in this section is taken from a report published by the U.S. Department of Agriculture, Forest Service (1978). Over 2,000,000 acres of land lie within the boundaries of the forest; however, only 660,000 acres are administered by the Forest Service. Almost 97 percent of the Federally owned National Forest area is classified as forest land. The privately owned lands within the boundaries are mostly forested or small farms.

The surface of Daniel Boone National Forest is characterized by steep slopes, narrow valleys, and cliffs. It is underlain by layers of sedimentary rocks that slope gently toward the southeast. The Mountains and Eastern Coal Fields physiographic region, part of the Cumberland Plateau section of the Appalachian Plateau Province, encompasses most of the area of the forest. Altitudes range from 800 to 2,300 ft, with steeper slopes and more sharply peaked ridgetops in the northern sections. Soils vary from strongly acidic to calcareous and clayey, and fertilities range from low to high, depending on location.

The forest is drained by three major rivers; the Licking, Kentucky, and Cumberland River basins encompass areas in the northern, central (including the Redbird Purchase Unit), and southern parts, respectively.

Rainfall over the forest is evenly distributed throughout the year. Average annual precipitation is 46 in., and average yearly snowfall ranges from less than 6 in. to over 4 ft. Variations in elevation and terrain affect the quantity and character of the precipitation falling in different parts of the forest.

All the main streams in the area flood aperiodically. The soils are relatively shallow and they become quickly saturated during periods of rain. The steep slopes quickly direct the rainfall to intermittent stream channels, and very rapidly, often within minutes, the major tributaries begin to swell. The shallow soils and steep slopes also prevent storage of substantial amounts of precipitation in the ground-water system. During periods of sparse rainfall, when streams are fed solely by ground water, flows in the rivers and creeks of the forest drop significantly; this is especially apparent in the fall of the year.

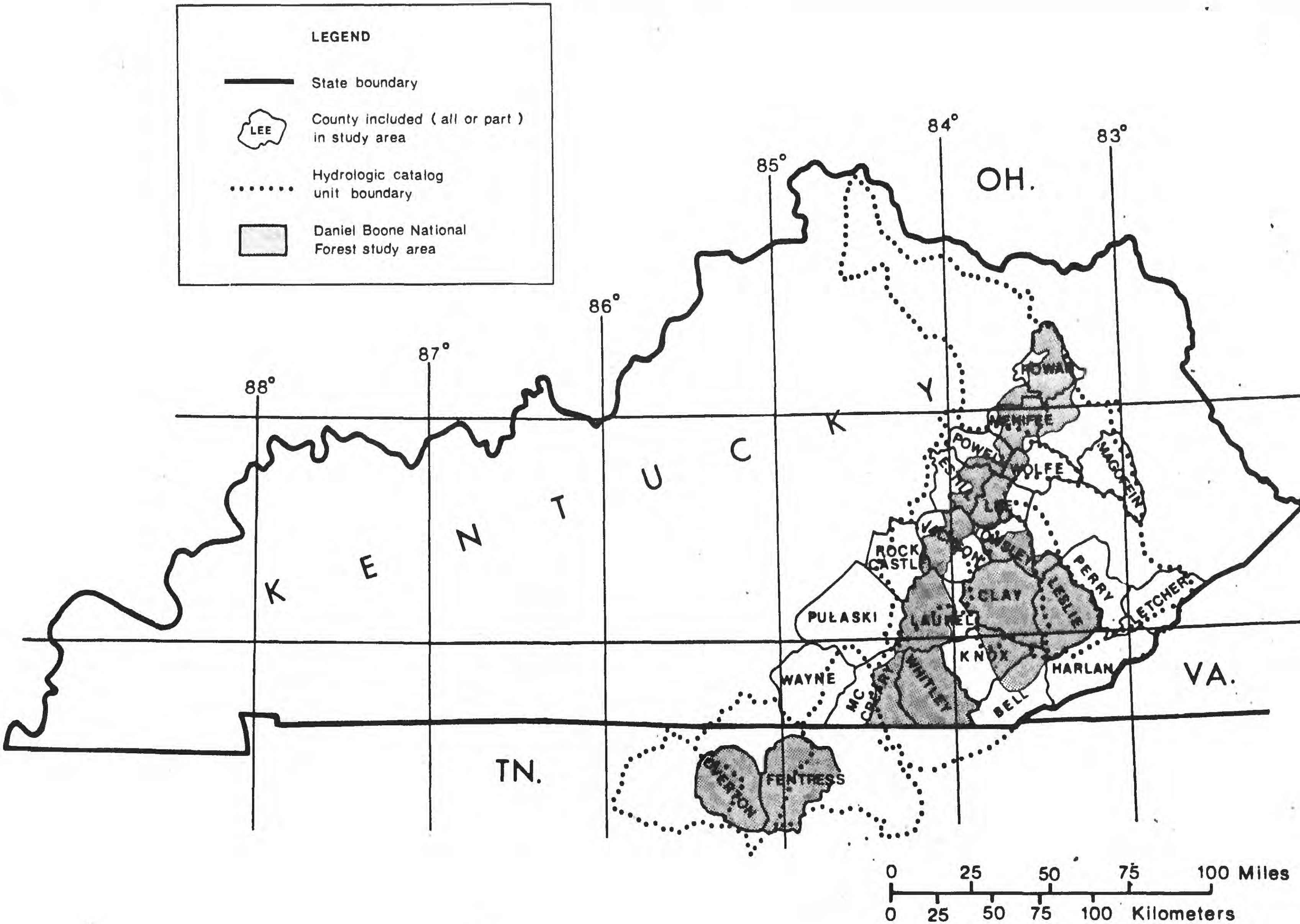


Figure 2.--Location of Daniel Boone National Forest study area and relevant hydrologic catalog units.

## Available Hydrologic Information

Supplemental data A (p. 67) contains NAWDEX listings 1, 2, and 3 for the Daniel Boone National Forest study area. Supplemental data B (p. 91) is an annotated bibliography of hydrologic studies pertinent to the Daniel Boone National Forest study area. Refer to the discussion on pages 7 and 8 for an explanation of the criteria for selecting and including stations, studies, and publications in each of the listings and summaries. Stations and references relevant to the Tennessee areas within the study area immediately follow those for Kentucky in each listing and summary.

A significant amount of ground-water-quality data for the Daniel Boone National Forest area can be obtained from the Kentucky and Tennessee district offices of the U.S. Geological Survey. Listing 3 in supplemental data A indexes more than 90 wells and springs for which ground-water data are available through the Survey's National Water Data Storage and Retrieval System (WATSTORE) Water-Quality File and from Faust and others (1980).

No ground-water or well data are available in the U.S. Geological Survey's GWSI File for the study area. However, both the Kentucky District of the U.S. Geological Survey (Water Resources Division) and the Tennessee Division of Water Resources have a considerable amount of these data in their office files. Information such as well-water levels, lithologic descriptions, hydraulic measurements, pumpage records, and well descriptions are available. The Tennessee Division of Water Resources has an estimated 1,000 well-completion reports dating back to 1963 for Fentress and Overton Counties. The information in the Kentucky and the Tennessee files is not computerized.

To obtain ground-water information for the Tennessee parts of this study area, direct the request to:

Director, Tennessee Division of Water Resources
4721 Trousdale
Nashville, Tennessee 37219

Telephone: (615) 741-6860
FTS: 835-6860

## Evaluation of Coverage

A sizable hydrologic data base exists for the Daniel Boone National Forest area (supplemental data A, p. 67). The U.S. Army Corps of Engineers and U.S. Geological Survey are responsible for collecting most of the surface-water-flow-and-quality data. The ground-water-quality data available in the Geological Survey's WATSTORE Water-Quality File can be readily retrieved and manipulated.

A number of investigations address the effects of coal mining on the flow, water quality, and sediment characteristics of streams within this study area. The U.S. Forest Service's Northeastern Forest Experiment Station in Berea, Ky., has completed many such studies in eastern Kentucky, especially in the Breathitt County area (supplementary data B, p. 91; references DB/S2-1, 5, 9, 12, 16, 19, 20, 22, and 23). Perhaps the most extensive and best known small-stream study in the area is the U.S. Geological Survey's investigation of the Beaver Creek basin (supplemental data B; reference DB/S1-1, p. 93). There are also 12 studies that investigate the biological organisms in the streams within or near the coal-mined areas. Most of the biological studies in Tennessee are authored by persons associated with Tennessee Technological University in Cookeville (supplemental data B, p. 91; references DB/S1-7, 9, 10, 11, and DB/S3-15).

Several deficiencies are apparent from an examination of the references in table 4 and supplemental data B:

1. There is little information on the ground-water hydrologic systems in eastern Kentucky, or how they are influenced by surface or deep mining.

2. Analysis and prediction of the hydrologic conditions in small basins and in ground-water systems by modeling techniques are just now being initiated. These techniques will probably not be ready for broad-scale application in this forest area for several more years.

3. Few studies address the hydrologic impacts of mining in the larger stream basins in this forest area.

4. Although there are several sizable lakes and impoundments within or near the Daniel Boone National Forest area, there are few studies which address the influence of coal mining on these water bodies.

## Suggested Plan for Future Hydrologic Study

A regional study of ground-water characteristics before, during, and after mining is needed in the Daniel Boone National Forest area. However, the existing data base must first be evaluated, organized, and put into a form which can be readily utilized before a study of the ground-water resources of the forest as a whole is undertaken. It is therefore suggested that the Kentucky District of the U.S. Geological Survey first study only a representative portion of the forest with known coal reserves. This study can be designed to define natural ground-water flow and quality conditions, evaluate the existing influences of coal mining on the ground-water resources, and predict hydrologic conditions in the future, if coal mining proceeds as planned. Based on results of this intensive areal study, a strategy can be developed to obtain the data and evaluate the ground-water resources in the rest of the Daniel Boone National Forest.

Because of the extensive hydrologic investigation in the Beaver Creek basin (supplemental data B; reference DB/S1-1, p. 93), this watershed is an excellent location to begin a study which identifies and assesses the hydrologic effects of mining and reclamation by means of numerical modeling techniques. These techniques can be applied to predict runoff in response to rainfall, and to predict small-stream sedimentation and water-quality characteristics. As with any effort of this type, the existing data base may initially need to be supplemented or reworked to fit the input requirements of the chosen models.

Of the six National forest areas addressed in this report, the Eastern States Director of BLM lists the Daniel Boone National Forest (Kentucky) as the area of highest priority for technical investigations activities and Federal coal leasing in the East (Hildebeidel, R. L., Director, Eastern States Office, Bureau of Land Management, June 1981, in memorandum to the Chief Hydrologist, U.S. Geological Survey, Water Resources Division). To fully understand the surface-water resources in this coal-producing area, specific large drainages of the forest need to be studied more intensively. Areas for this study would be smaller than those addressed in the Geological Survey's areal assessments in the Eastern Coal Province (supplemental data B, p. 91; references DB/S3-1 and 14), but large enough to include all areas of the forest in three to five separate studies. The purpose of these investigations is to define the water resources of each drainage and to highlight and investigate water-quality problems related to coal mining. These types of studies would provide an in-depth evaluation of coal mining and reclamation in the larger watersheds. Furthermore, they could serve as a basis for evaluating how well small-basin investigations and modeling can be extended to predict impacts on larger streams.

## The Hoosier National Forest Area

### Setting

Woodland makes up 53 percent of the Hoosier National Forest, located in south-central Indiana (fig. 3). Although there are 645,000 acres of land within the forest boundaries, only 186,000 acres are Federally owned and managed.

The rest of the information and data in this section is taken from the Hoosier National Forest Land System Soil Resource Inventory (Garner, 1979). The Hoosier National Forest lies in the Norman Upland, Mitchell Plain, and Crawford Upland systems of the unglaciated portion of the Highland Rim Section of the Interior Low Plateau province. The Norman Upland, which includes the northern section of the forest, is characterized by narrow, flat-topped ridges and deep, V-shaped valleys. The Mitchell Plain includes some of the central portion of the forest and is marked by sinkhole depressions and knob or ridge-like divides. The southern section of the Crawford Upland contains a diversity of land-surface features including ridges, hills, trench-like valleys, wall-like bluffs, sinkholes, waterfalls, gorges, and caves. Altitude in the forest ranges from about 350 to 1,000 ft.

Hoosier Forest is underlain by alternating units of sandstone, shale, and limestone of Mississippian and Pennsylvanian age. Limestone caves play a significant role in the forest drainage and make the construction of reservoirs difficult in certain areas. Gypsum, oil and gas, limestone, sand and gravel, quartz, whetstone, and coal are minerals of potential commercial value found in the forest.

Over the entire forest, the average annual precipitation is 44 in.; annual snowfall averages 18 in. Temperatures range from a July average daily maximum of 88.5$^{\circ}$F to an average daily minimum of 22.1$^{\circ}$F in January.

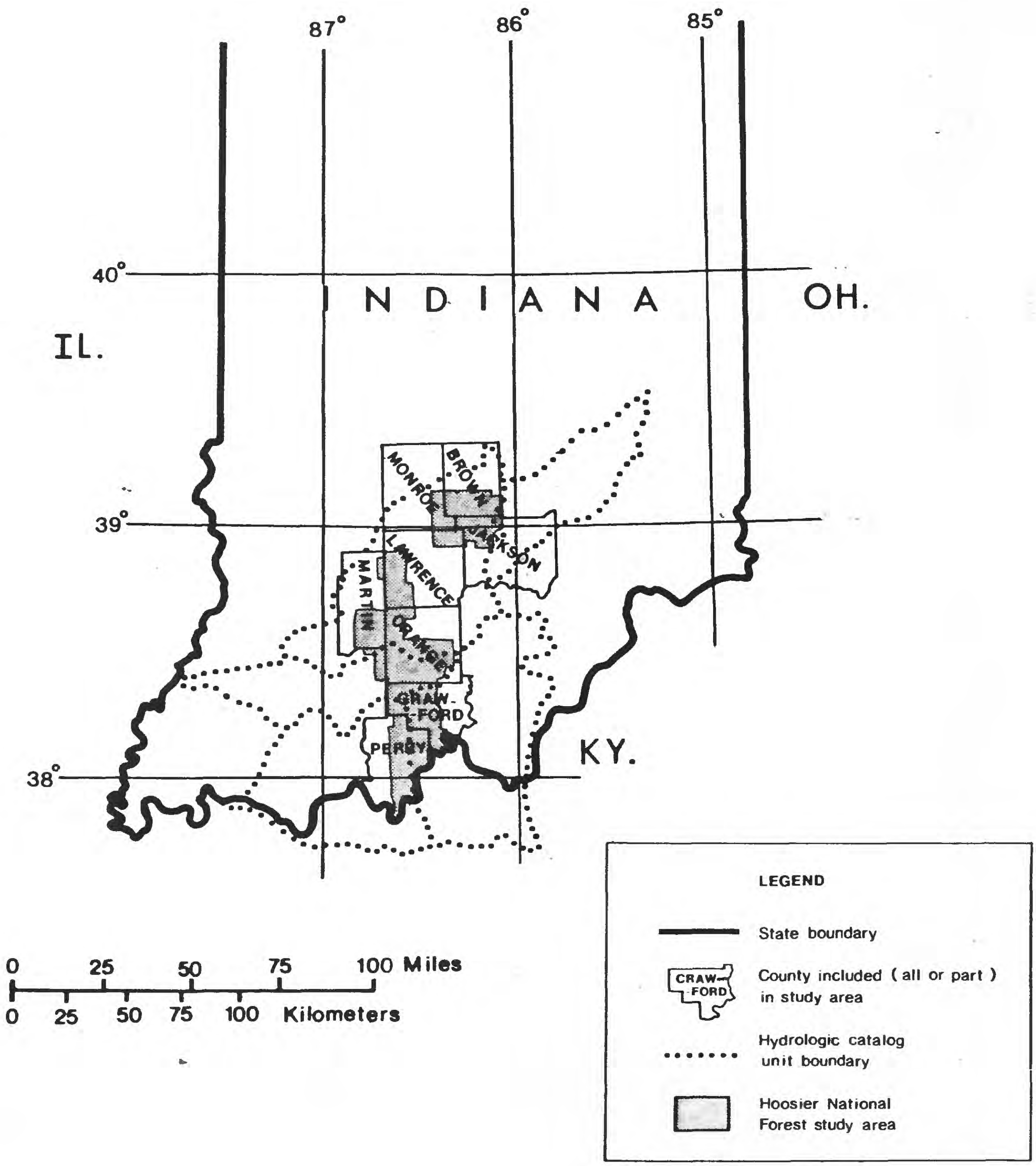


Figure 3.--Location of Hoosier National Forest study area and relevant hydrologic catalog units.

## Available Hydrologic Information

Supplemental data C (p. 135) presents the three listings of hydrologic data stations for the Hoosier National Forest area. Supplemental data D (p. 147) is an annotated bibliography of references pertinent to hydrology and the influences of coal mining in this area. See pages 7 and 8 for an explanation of the types of data stations, references, and studies included in each listing and summary.

For this forest area, little ground-water information is currently available in machine-readable form; listing 3 in supplemental data C (p. 144) indexes only four wells. However, the Indiana District of the U.S. Geological Survey is now in the process of reviewing ground-water information from 26 counties in southwestern Indiana and preparing it for the GWSI File. Although data from only the western portions of the Hoosier National Forest are included in this review, these are the principal sections of the study area where coal mining is considered feasible. Sources of this information are the Indiana Geological Survey in Bloomington, Ind., and the State Board of Health, State Department of Natural Resources, and U.S. Geological Survey in Indianapolis, Ind. Even though, collectively, these sources have records for approximately 10,000 wells in this 26-county area, data from only about one-tenth of that number are being entered into the GWSI File because of data-selection criteria. Until all the ground-water information is processed into this file, or if more than just the GWSI information is desired, an investigator must contact the above agencies individually to gain access to their in-house files; machine processing of the data from the in-house files is not possible.

A report by the U.S. Geological Survey evaluates the present scope of the State's ground-water data network and indexes a considerable amount of ground-water data collected since 1935 (Marie, 1976). To obtain current information about the status of ground-water-data availability in the Hoosier National Forest area and southwestern Indiana, contact the District Chief of the U.S. Geological Survey's Water Resource Division office in Indianapolis.

## Evaluation of Coverage

Relatively little monitoring-site data are indexed by NAWDEX for this study area (supplemental data C, p. 135). Streamflow and ground-water-quality data are especially sparse (listing 1, p. 136; and listing 3, p. 144). The U.S. Forest Service and the U.S. Geological Survey are the major sources of the data which are available. The ground-water systems of the Hoosier National Forest are addressed in only a few general, broad-areal investigations in supplemental data D (p. 147). The data being compiled by the U.S. Geological Survey for entry into the GWSI File should greatly facilitate more intensive study of the ground-water resources in the coal-mining areas of Indiana.

A number of studies (supplemental data D, p. 147; references H/S1-1, 4, 8, 9, 10, and H/S2-7, 8, 10, 11, and 13) addressing the water resources in or near the Hoosier National Forest are available from the Water Resources Research Center at Indiana University in Bloomington, Ind. Most of these are concerned with the water quality, sedimentation, and biological characteristics of Monroe Reservoir and the Potoka River and Busseron Creek watersheds. Eight reports by the U.S. Geological Survey (supplemental data D, p. 147; references H/S1-2, 3, 5, 6, 7, and H/S2-2, 3, and 4) evaluate mining's impact on the hydrology of small-stream basins.

## Suggested Plan for Future Hydrologic Study

What is needed now is to extend the analysis in these small-area studies to include numerical techniques which model and predict the influences of coal mining on streamflow characteristics and ground-water quality. The Indiana District of the U.S. Geological Survey is currently participating in a project to verify surface-water hydrologic simulation models for basins in the southeastern section of the state. Areas of the Hoosier National Forest need to be included in this verification as well.

The ground-water systems of the Hoosier National Forest need better definition. After the ground-water information in the forest areas is evaluated and put into a machine-readable form, there needs to be a regional assessment of the impacts of deep and strip mining on aquifer characteristics and ground-water flow.

Lake systems in southern Indiana, including last-cut lakes, which are highly visible, lasting hydrologic disturbances left by strip mining, require more investigation. Located near Bloomington and Indiana University, Monroe Lake is well studied, but the lakes and impoundments of lesser size are investigated much less extensively. Study of their water, its origin and nature, and the factors influencing it, may provide information that could lead to more effective reclamation and management practices.

Studies which specifically address reclamation and its influence on hydrologic resources are also deficient for this study area. Reclamation is usually studied as one of several land-use classifications found in areas of active coal mining. Instead, reclamation practices need to be investigated separately and more intensively; the consequences of following specific land-reclamation scenarios need to be better understood.

## The Jefferson National Forest Area

### Setting

The information that follows is obtained from the U.S. Soil Conservation Service, Agricultural Handbook (Austin, 1965). There are approximately 700,000 acres of Federally owned land in the Jefferson National Forest, located principally in western Virginia (fig. 4); a small portion of the forest extends into Monroe County, West Virginia. The northeastern two-thirds of the forest lie in the Blue Ridge physiographic province, with the rugged Blue Ridge Mountains traversing from the southwest to the northeast. In the north, the mountains have steep slopes and sharp ridges and the valleys between are narrow and also steep. Elevations in the forest range from about 1,500 to 5,729 ft, the latter being the height of Mt. Rogers in western Grayson County.

The southwestern portion of Jefferson National Forest is in the Southern Appalachian Ridge and Valley physiographic province. In this portion, the valleys and ridgetops are broader and flatter than in the north or west, and elevations range from 1,000 to just over 4,000 ft. The extreme western section of the forest is in the Appalachian Plateau.

Most of the mountainous areas are forested, with many small and medium-sized farms in the valleys and coves and also in the hilly plateau of the western section of the forest. The cleared land is used for grazing cattle and growing feed crops, fruits, and vegetables. These farms can usually provide only a part-time livelihood for their occupants.

Variations in elevation and terrain significantly influence the weather conditions in different locations of the forest. Average annual precipitation ranges from 35 to 50 in., with the greatest quantities in the midsummer and midwinter months, and the least in the autumn. Average annual temperature is $50^{\circ}$ to $60^{\circ}$F, depending on elevation.

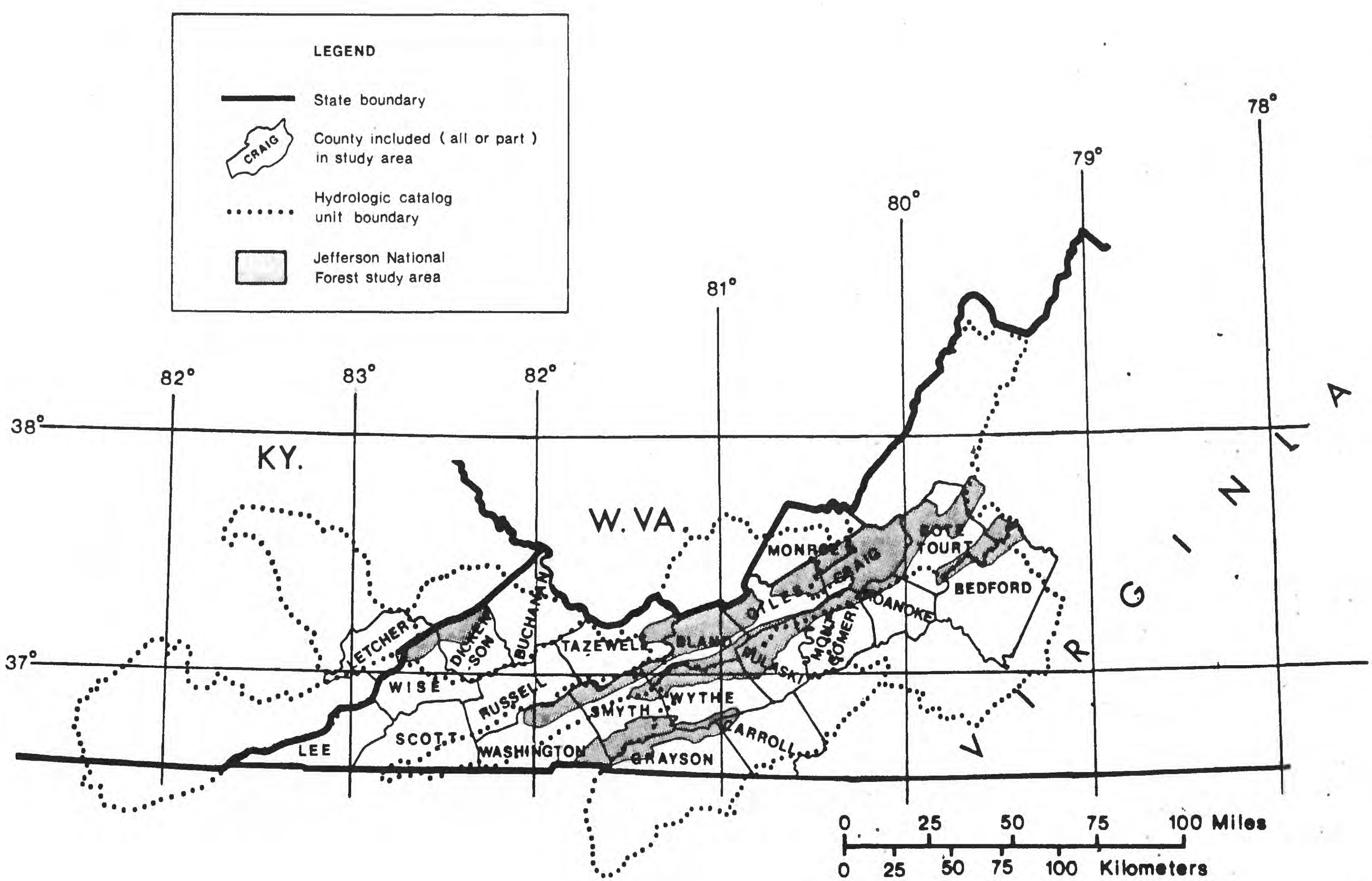


Figure 4.--Location of Jefferson National Forest study area and relevant hydrologic catalog units.

## Available Hydrologic Information

Streamflow and water-quality data stations for the Jefferson National Forest study area are indexed in supplemental data E (p. 179). Annotated bibliographies of references germane to coal mining and water resources in this area are found in supplemental data F (p. 193). For an explanation of the selection criteria for stations and references in each of the three listings and summaries, refer to the discussion on pages 7 and 8.

There are 63 wells for which data are available in the Geological Survey's GWSI File. Two Virginia State agencies also have a substantial amount of ground-water data. They are:

The Virginia State Water Control Board
P.O. Box 11143
2111 North Hamilton Street
Richmond, Virginia 23220

The Virginia State Health Department
Division of Water Program
P.O. Box 1096
Abingdon, Virginia 24210

The Virginia State Water Control Board can provide information for about 100 wells per county in the western part of the State. Available from this agency are well depths, lithological information, and, for about 60 percent of the wells, water-quality data. These computerized files are developed mainly from drillers' logs and are now being updated to include data on the location of water-bearing zones. The files of the Virginia State Health Department contain only well locations and ground-water-quality data. Some of the data from the latter agency are stored in an in-house computer system.

One particularly notable study conducted by the U.S. Forest Service inventories all phases of the water resource within the Jefferson National Forest (supplemental data F; reference J/S3-2, p. 204). Also notable are the three Planning Bulletins issued by the Virginia State Water Control Board, which address the quantity and quality of ground water in Buchanan, Carroll, and Dickenson Counties (supplemental data F, p. 193; references J/S1, 2, and J/S2-2).

## Evaluation of Coverage

NAWDEX indexes 27 streamflow and 33 water-quality-data stations for the Jefferson National Forest area, but lists only three sites where ground-water data have been collected (supplemental data E, listing 3, p. 190). The main source of streamflow and stage data is the U.S. Geological Survey, but surface-water-quality data can be obtained from seven different agencies. The Virginia State Water Control Board and the U.S. Environmental Protection Agency are the sources of most of the water-quality data.

Although there is little ground-water data from this study area indexed in NAWDEX, the U.S. Geological Survey, the Virginia State Water Control Board, and the Virginia State Board of Health can all provide substantial quantities of well and ground-water information. The Survey's data in the GWSI File are mostly from wells in the extreme western portion of Virginia, near the tri-state boundary with Kentucky and West Virginia. However, for the study area as a whole, the Virginia State Water Control Board and Health Department retain a large amount of ground-water data, most of which can be easily accessed from a computerized storage system.

Deficiencies in all areas topical coverage of water-resources investigations pertinent to the Jefferson National Forest area are apparent from an examination of table 4 (p. 12) and the references in supplemental data F (p. 193).

1. Although a few studies address the condition of the ground water in the study area, there are no reports that present a regionalized picture of the ground-water system of western Virginia or of Jefferson National Forest area.

2. There are few references which assess the hydrology of the Jefferson National Forest study area, or which assess the impact of coal mining on the water resources of Virginia.

3. Several references address small-stream water quality and flow. These are too few, however, to provide the base of information necessary to predict hydrologic conditions in unmonitored basins.

4. Hydrologic modeling, lake (reservoir), and reclamation studies are lacking.

## Suggested Plan for Future Hydrologic Study

One of the most pressing needs for the Jefferson National Forest area is to conduct a regional ground-water-systems study based on the existing substantial data base. The study can investigate ground-water levels, movement, and quality, and predict direction and rate of travel of ground-water contamination. An investigation of this nature cannot only characterize ground-water conditions as they are influenced by coal mining, but can also depict the natural conditions and the effects of the reclamation process as well.

To characterize streamflow and water-quality conditions in all coal areas of the forest, it is suggested that a project be undertaken to calibrate and verify hydrologic models for small watersheds in the study area. Stream sedimentation processes need to be especially emphasized in the modeling project. It is important to address the effects of mining activities on stream-channel structure and geometry, as well as the amount and size of sediment that is transported.

One investigation suggested by U.S. Geological Survey personnel in Virginia entails identifying aquifer properties of typical coal-bearing rocks around a reservoir system. Field data would be compared to numerical simulation results, which would predict aquifer response to fluctuations in reservoir stage. In this investigation, the interactions of reservoirs and the ground-water system would be studied, and, if mining was taking place in the vicinity, the subsurface effects of mining or reclamation on the reservoir could be monitored.

A second suggestion is to monitor sedimentation and water-quality processes in reservoirs located in areas of coal mining. This investigation could possibly be blended with the previous one to make a larger, integrated study of coal mining and its total effect on a reservoir system.

## The Monongahela National Forest Area

### Setting

All geographic information presented in this section is taken from the Monongahela National Forest Land Management Plan (U.S. Department of Agriculture, Forest Service, 1977). The Monongahela National Forest lies entirely in eastern West Virginia (fig. 5). The total area within the boundaries of the forest is about 1,650,000 acres, and of that, about 850,000 acres are Federally owned.

The Monongahela Forest is divided between two physiographic provinces. The eastern portion lies in the Ridge and Valley province and is characterized by mountainous terrain and long, narrow ridges. Elevations in this portion range from about 900 to over 4,000 ft, with a mean of about 2,500 ft. The western portion of the forest, where most of the coal reserves are located, falls in the Allegheny Plateau province. The mountains in the western portion are broader, more massive, and separated by narrow valleys.

Coal is the most abundant mineral resource of economic value found in the forest. Oil, gas, limestone, and some iron and silica are also found in lesser amounts.

The Monongahela National Forest is underlain by a variety of sedimentary rocks of Ordovician to Pennsylvanian age. The natural water associated with these rocks ranges from buffered alkaline to highly acidic.

Precipitation in the western areas of the forest has a notable acidity (pH 3.5 to 4.5). In all areas of the forest, the character and frequency of rainfall affect the pH and buffering capacity of stream water.

Major streams in the Ridge and Valley province of the forest flow mainly to the northeast or southwest, with numerous short tributaries. In the Allegheny Plateau province, the numerous streams are typically very winding and do not have a dominant direction of flow. There are no natural lakes in the National Forest, but there are six artificial impoundments, ranging in size from 3 to 164 acres.

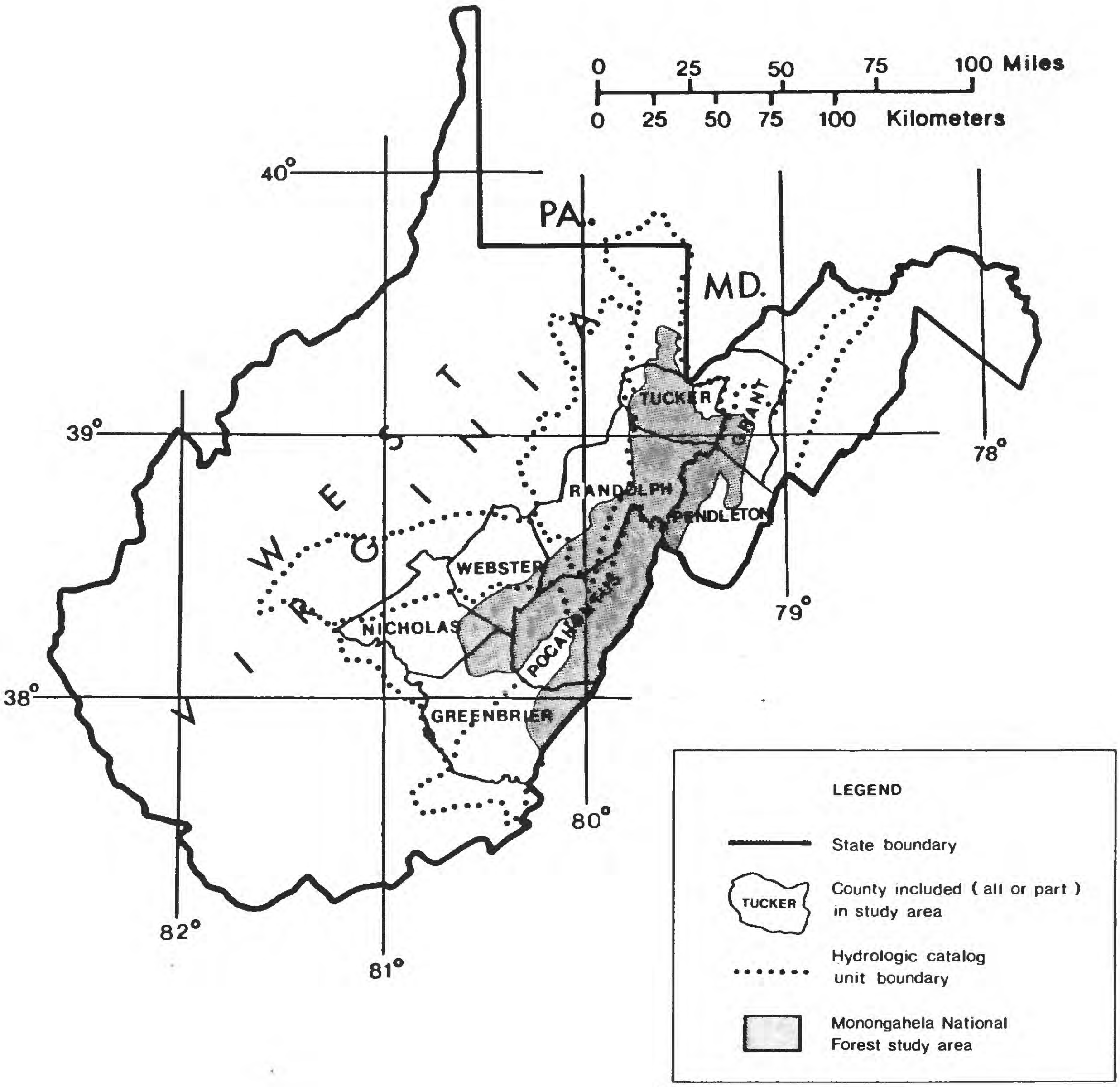


Figure 5.--Location of Monongahela National Forest study area and relevant hydrologic catalog units.

## Available Hydrologic Information

Supplemental data G (p. 208) indexes 27 streamflow, 195 surface-water-quality, and 38 ground-water-quality monitoring sites. Although a total of eight different agencies are listed as data sources, the majority of the surface- and ground-water-quality information is available from the U.S. Forest Service and U.S. Geological Survey. The latter agency is the only source of area streamflow data.

Supplemental data H (p. 230) contains references (with abstracts) of hydrologic studies pertinent to Monongahela National Forest area. For an explanation of the types of data stations, references, and studies included in supplemental data G and H, refer to the discussion on pages 7 and 8.

The West Virginia District of the U.S. Geological Survey has catalogued hundreds of wells into the Survey's GWSI File for this study area. Most of these wells also have at least one comprehensive water-quality analysis stored in the Geological Survey's WATSTORE Water-Quality File (indexed in supplemental data G, listing 3, p. 225). Water-quality data for wells in the Greenbrier-Upper New, Little Kanawha, and Potomac River basins are not stored in WATSTORE, but are available in three reports published by the West Virginia Geological and Economic Survey (Chisholm and Frye, 1976; Friel and Bain, 1971; and Friel and others, 1975).

## Evaluation of Coverage

Together, the West Virginia Geological and Economic Survey and the U.S. Geological Survey can provide a very large body of ground-water data for the Monongahela National Forest area. If properly interpreted, these data should be sufficient to provide a regional overview of ground-water conditions. Because they are in a published or machine-readable form, the data are easily accessible.

There are 16 instances in which references listed in supplemental data H (p. 230) analyze or interpret ground-water flow or ground-water quality. These studies, along with the existing availability of sizable ground-water-data bases, provide a strong basis for undertaking more advanced ground-water investigations in the Monongahela Forest area.

Numerous references concerned with the streamflow, water-quality, biological, and sediment characteristics of small and large streams are available for the Monongahela National Forest area. Relative to the other forest areas, this is considered to be adequate coverage of in-stream processes, and no more of this type of investigation is suggested.

There are only six impoundments in the Monongahela National Forest; however, not all of the impoundments have been investigated. An environmental assessment of a tract identified for coal leasing would require some specific information about all water bodies within its borders.

Only four investigations in supplemental data H (p. 230) deal directly with the mine reclamation in this forest area. More definitive study of the reclamation process is needed.

## Suggested Plan for Future Hydrologic Study

A study to investigate and separate the different hydrologic effects of surface and deep mining is suggested for the Monongahela National Forest area. Factors that need to be investigated include streamflow characteristics and quality, ground-water flow and quality, suspended sediment, and benthic invertebrates. The areal extent of this investigation can probably be limited to relatively small, specific, mined areas.

A second, related study can be initiated to consolidate existing ground-water information into a comprehensive regional assessment of ground-water resources in the Monongahela Forest area as a whole. The study can be designed to predict (1) ground-water movement in various physiographic terrains and geological conditions, (2) direction and rate of travel of ground-water contamination, and (3) the impact of mining on ground-water levels and yields. If computer modeling can be successfully applied here, the techniques may be transferable to other coal-producing areas in the Ridge and Valley and Appalachian Plateau provinces. Study of this complex system before, during, and after mining would extend the application of the modeling to the natural system and to reclamation.

There is a need for a computer-modeling investigation to predict the flow and water quality of small streams in the Monongahela Forest area. Two goals need to be especially emphasized in the modeling process: (1) to characterize sedimentation processes, and (2) to evaluate fully reclamation's influences on streamflow and quality.

## The Shawnee National Forest Area

### Setting

Together, the Shawnee National Forest and the Crab Orchard Wildlife Refuge encompass an area of 256,000 acres in southern Illinois (fig. 6). This is a region "characterized by rugged topography, extensive forest, and numerous streams and rivers. As such, the Shawnee provides a varied landscape not found elsewhere in Illinois. Extensive complex rock formations, bluffs, and associated waterfalls occur throughout the forest" (R. H. Mason, Lands and Watershed Staff Officer, Shawnee National Forest; written commun., 1981).

The Federally owned lands within the forest boundaries are mostly forested. Since the Shawnee Forest's establishment in the mid-1930's, many acres of formerly cultivated land have reverted to forests, either naturally or with man's help. The open spaces are mostly privately owned and are used to grow corn and soybeans or to graze livestock.

Mason also mentions that the Shawnee National Forest is underlain with rocks of Pennsylvanian, Mississippian, and Devonian age. Mineral resources of the area include oil, gas, coal, fluorspar, lead, zinc, barite, tripoli, refractory clay, sand, gravel, and limestone.

### Available Hydrologic Information

Supplementary data I (p. 270) contains listings 1, 2, and 3 NAWDEX retrievals for the Shawnee National Forest study area. Supplemental data J (p. 282) presents references (with abstracts) which are pertinent to coal mining and water resources in this area. Pages 7 and 8 describe the criteria used for selection of stations and references in each of the three listings and summaries.

The U. S. Geological Survey is the source of data for all but two of the 30 streamflow measurement stations indexed for the Shawnee National Forest area; however, the data at 14 of these Survey stations span a period of less than 1 year (supplemental data I, listing 1, p. 271). Surface-water-quality data collected by seven different State and Federal agencies at 39 stations are indexed in listing 2 (p. 274).

NAWDEX indexes 29 wells in the Shawnee National Forest area for which ground-water-quality data are available. The U.S. Forest Service in Harrisburg, Ill., maintains a substantial file of ground-water-quality data from water-supply wells in the Shawnee National Forest. The U.S. Geological Survey's GWSI File contains no well data for this area.

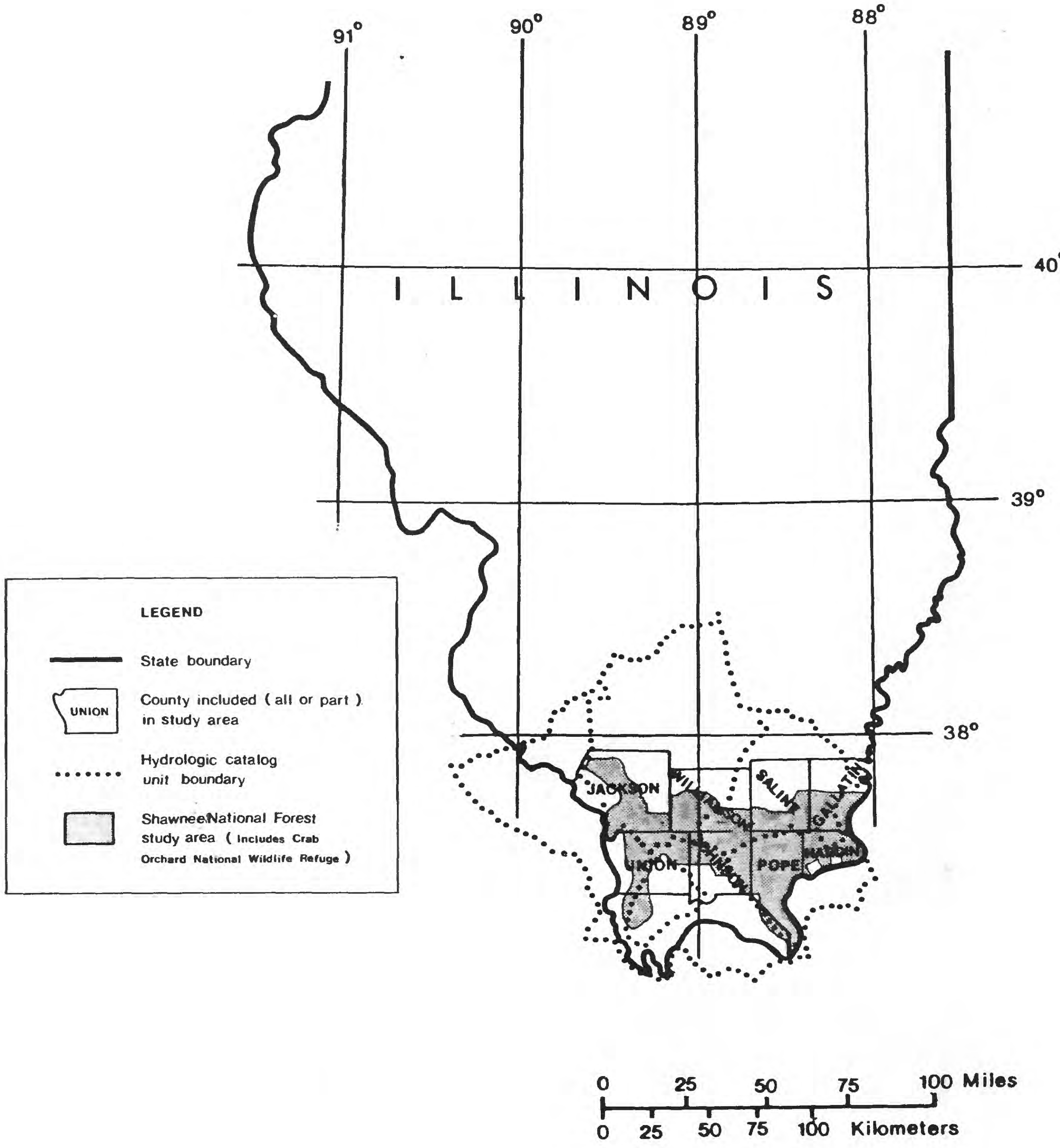


Figure 6.--Location of Shawnee National Forest study area and relevant hydrologic catalog units.

The most complete source of ground-water-quality information is made up of contributions from three Illinois State agencies. The files of the Illinois State Water Survey, the Illinois State Department of Public Health, and the Illinois Environmental Protection Agency contain about 28,000 analyses that are available in a single, computerized, storage-and-retrieval system. The analyses are of samples collected from water-supply, industrial, irrigation, and domestic wells. Although over 90 years of records are on file, 83 percent of the data are from samples collected since 1940. Data are available for major inorganic constituents, trace elements, physical parameters, and gases, although the actual parametric coverage varies from sample to sample. Virtually no data are available for synthetic organic compounds in Illinois ground water. Three noteworthy limitations to these data are: (1) they represent over 90 years of sample collection and analysis by seven different laboratories, leading to questions of analytical consistency; (2) since some wells were sampled specifically because of their water-quality problems, the data base is not a random sampling of existing ground-water conditions; and (3) source-aquifer information is lacking.

This ground-water data system can be accessed by contacting:

Illinois State Water Survey
P.O. Box 5050, Station A
Champaign, Illinois 61820

The Illinois State Water Survey also has available water-level data from 101 observation wells measured since the early 1940's, but they are not yet in machine-readable form.

## Evaluation of Coverage

The Shawnee National Forest study area has an extensive and well organized base of available ground-water data and information. The availability of ground-water data maintained by the U.S. Forest Service, and the sizable, computerized file maintained by the Illinois State Water Survey should greatly simplify the ground-water-data acquisition tasks for future studies. Ground-water-flow and quality conditions in and near coal-mining areas of the State have been studied extensively by the Illinois State Water Survey, Illinois Geological Survey, and others (supplemental data J, p. 282).

Table 4 shows that a large number of water-quality investigations have been conducted in coal-mining sections of Illinois, considering the relatively small size of this forest study area. However, comprehensive information on small-stream sedimentation and biota is deficient, as is the application of techniques to predict stream conditions in unmonitored watersheds.

The effects of reclamation on local hydrology, and of mining on area lakes, including last-cut lakes, have been studied in Illinois. Many of the cited reclamation studies, however, investigated the application of treated sewage sludge on formerly strip-mined lands. These investigations therefore do not represent the naturally occurring conditions which may be encountered in southern Illinois. Also, not all lakes and impoundments on Federal lands within the forest area were studied. Because of the large number of last-cut lakes in this area's landscape and their potential utility, studies of the salient water-resources features of these water bodies are still deficient.

## Suggested Plan for Future Hydrologic Study

With such a large and accessible base of ground-water information, it is suggested that an investigation be undertaken in the near future to assess the ground-water resources in Shawnee National Forest area. The investigation needs to address the impact of strip mining and reclamation on ground-water flow, aquifer characteristics, and contaminant movement.

Similarly, small-basin, hydrologic modeling can be applied to watersheds in the Shawnee Forest. Computer models can be used to predict streamflow, water quality, and sedimentation characteristics in small streams affected by deep and surface mining.

An investigation which attempts to identify the major processes influencing the chemistry of last-cut lakes in the forest would have wide application in Illinois and other areas. The effort should focus on relating local stratigraphy and geology to lake-water quality. Knowledge of these factors could lead resource planners to sound decisions on how to manage these water bodies to make them suitable for a greater variety of post-mining uses.

Finally, the influences of mining activities on stream life in this area are documented in only a few instances (table 4, p. 12). It is suggested that stream biological populations of the Shawnee National Forest area be identified prior to coal leasing and compared to similar data collected during and after mining. The purpose of this is to evaluate how well stream biota can serve to monitor the impact of different stages of mining.

## The Wayne National Forest Area

### Setting

The geographic information that follows is all derived from written communication with R. G. Moss, Watershed Scientist, Wayne-Hoosier National Forest (July 1981). The Wayne National Forest is divided into three major units and encompasses a total area of 833,000 acres in southeastern Ohio; 175,000 acres of this land are Federally owned and managed (fig. 7). Woodland makes up 64 percent of the forest area.

All three units of the Wayne National Forest lie within the Allegheny Plateau physiographic province. The forest is underlain by rock of Pennsylvanian and Permian age. The bedrock is composed of sandstones, siltstone, mudstones, shales, clays, limestones, and coals. All strata slope gently to the southeast at approximately 20-30 ft/mi.

Most of the land surface is dissected by drainage erosion, which cuts steep, V-shaped valleys and leaves narrow ridgetops. Elevations range from 485 to 1,400 ft, with the steepest relief occurring near the forest's major rivers. The larger river valleys, which are broad and filled with glacial sands and gravels, are the only reliable sources of ground water in the forest.

The climate of the Wayne National Forest is classified as continental, with large annual and daily ranges in air temperature. Summer high temperatures normally exceed $90^{\circ}F$ for about 15 days, and, during an average winter, low temperatures drop to $0^{\circ}F$ for about 5 days. Precipitation over the forest averages about 40 in. yearly, only a small fraction of which falls in the form of snow. Rainfall during the summer months is slightly greater than at other times of the year due to an increase in thunderstorm activity.

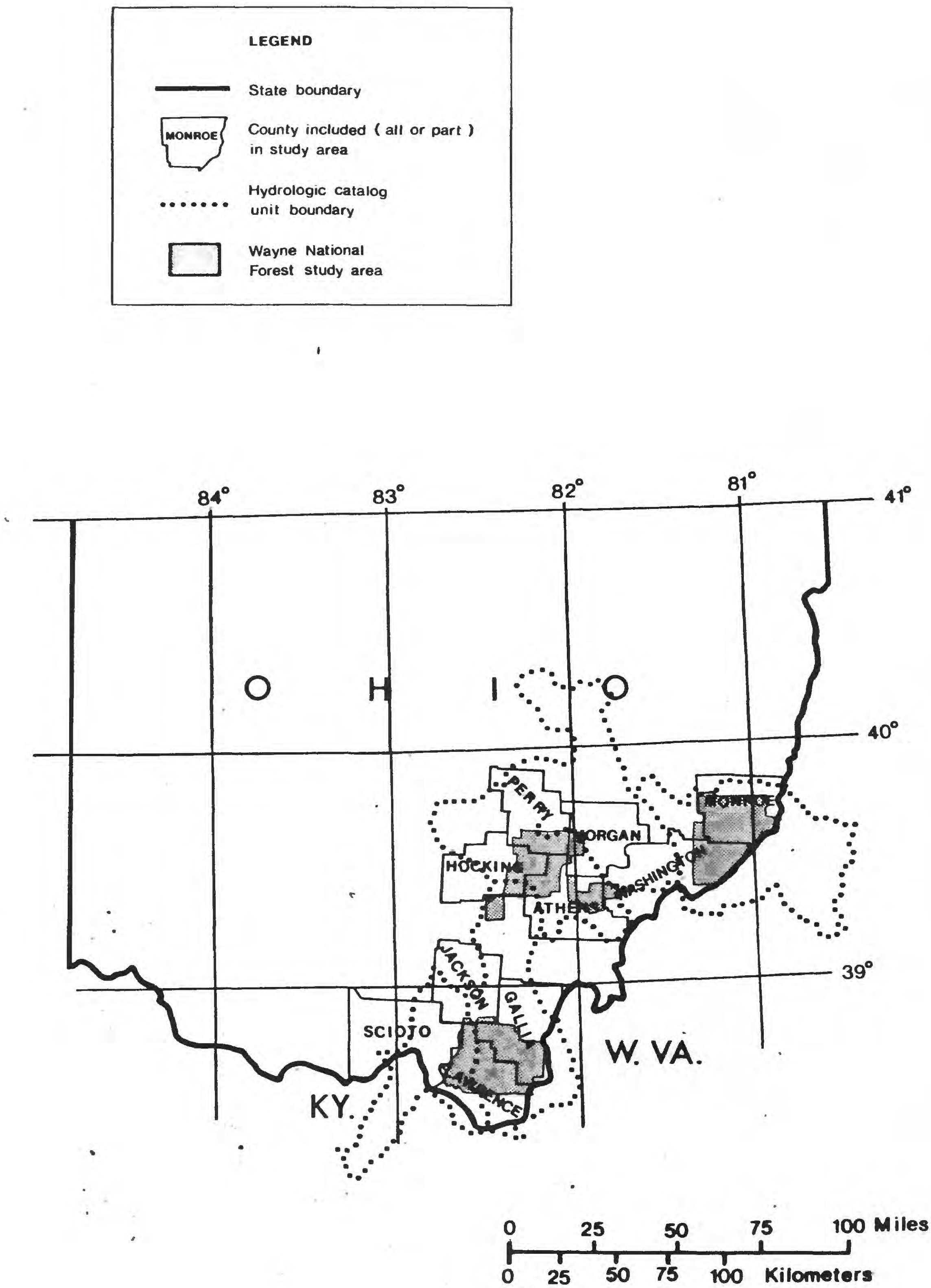


Figure 7.--Location of Wayne National Forest study area and relevant hydrologic catalog units.

## Available Hydrologic Information

Supplemental data K (p. 308) contains NAWDEX listings 1, 2, and 3 for the Wayne National Forest study area. These listings index the sources of the available data on streamflow and stage, the quality of surface water, and the quality of ground water. Annotated bibliographies of references pertinent to coal mining and water resources in this area are found in supplemental data L (p. 328). Refer to page 8 for an explanation of criteria for selection of the references in each of these three summaries.

NAWDEX indexes five wells for the Wayne National Forest area in supplemental data K, listing 3 (p. 325). The U.S. Geological Survey's GWSI File contains information for 15 wells, and the files of the Survey's Ohio District office contain ground-water-quality analyses for 12 wells sampled from 1964 to 1972. Records for over 500,000 wells in Ohio are maintained in the Ground-Water Inventory Section of the Ohio Department of Natural Resources, Division of Water. These data are not in machine-readable form, but the Section has demonstrated its capability for locating and supplying information by filling over 4,000 requests each year. The Section has on file well-completion logs, water-level records, and unpublished theses and dissertations on ground water in Ohio. To obtain information from this agency, contact:

The Ohio Department of National Resources
Division of Water
Fountain Square, Building B
Columbus, Ohio 43224

Telephone: (614) 466-7896

## Evaluation of Coverage

For the Wayne National Forest area, streamflow and stream-water-quality data are not as extensive as the lengths of listings 1 and 2 in supplemental data K (p. 309 and p. 312) would seem to indicate. Only 9 of the 28 streamflow stations indexed in supplemental data K, listing 1 (p. 309), have data collected before 1980. Of the 188 surface-water-quality stations indexed by NAWDEX for this study, 93 are associated with intensive data-collection efforts by the U.S. Environmental Protection Agency at the Hocking River and Raccoon Creek abandoned mine sites in 1970 and 1971.

The bulk of the available ground-water information managed by the Ohio Department of Natural Resources, Division of Water, is not stored on automatic data-processing equipment. Collating and organizing the ground-water data for the Wayne National Forest area may require significant effort before analysis and interpretation can begin.

Studies of the effects of mining and reclamation on small-basin, lake, and subsurface water resources are relatively abundant for areas in Ohio outside the Wayne National Forest area. Generally, however, studies of any kind that assess the hydrologic systems within the forest area are lacking.

Other deficiencies are apparent from a study of the references in supplemental data L (p. 328) and table 4 (p. 12):

(1) Investigations that apply numerical simulation techniques to the modeling of the flow and quality of both ground and surface water are lacking.

(2) Studies which regionalize the availability, flow, and quality of the groundwater resource are nonexistant.

## Suggested Plan for Future Hydrologic Study

To extend the available resources and expertise, it is suggested that a study be undertaken to apply, calibrate, and verify small-basin, streamflow and water-quality models. The purpose of this study would be to predict runoff in response to rainfall and to model small-stream sedimentation and water-quality characteristics. This effort would probably require adding to the existing base of streamflow, rainfall, and water-quality data available for the Wayne National Forest area.

Ground-water and well data need to be inventoried, organized, and evaluated before a portion of the forest can be intensively studied. That portion can be an area of known, mineable coal resources, and be representative of a sizable fraction of the entire forest. The study needs to define natural ground-water quality and flow, evaluate the existing influences of coal mining (including those of the mine spoils) on the ground-water resources, and provide a basis on which to predict future conditions, possibly by using computer models. Based on the findings and the experiences in conducting this study, a strategy can be developed to obtain the data and evaluate the ground-water resources for the other areas of the forest.

An intensive investigation of reclamation and water resources in the Wayne National Forest area is also suggested. The investigation can (1) determine the chemical-quality, benthic-invertebrate, and sedimentation characteristics of streams before mining; (2) evaluate the changes that occur in these characteristics during mining and reclamation; and (3) evaluate the effectiveness of reclaiming long-abandoned surface mines in improving stream water quality.

## Sources of Available Precipitation Information

Precipitation data are not as plentiful for the National forest areas as are other hydrologic data. Precipitation characteristics have a significant effect on the impacts of surface or deep mining on the terrestrial water resources of the National forests.

A multitude of agencies and programs collect precipitation data in the six National forest study areas addressed in this report. Probably the single most comprehensive set of climatological data for this Nation is available from the National Climatic Center (NCC). This agency can supply data on air temperature, dew point, heating and cooling degree days, rainfall, snowfall, barometric pressure, wind direction and speed, solar radiation, and sky cover for approximately 300 National Weather Service stations nationwide. In addition, daily maximum and minimum and total daily precipitation data are available from some 12,000 cooperative observer stations. NCC offers a variety of services such as data and map reproduction, monthly and yearly summaries, preparation and analysis of special statistical summaries, and the evaluation of data records for specific analytical requirements. Information about data and services may be obtained by contacting NCC:

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Data and Information Service
National Climatic Center
Federal Building
Asheville, North Carolina 28801

Telephone: (703) 258-2850 Extension 683
FTS: 672-0683

Two reports are available which reference the major sources of precipitation-quality data for the Nation (U.S. Department of Interior, Geological Survey, Office of Water Data Coordination, 1977; and Wisniewski and Kinsman, 1982). These reports provide descriptions of the major recent-past, present, and near-future precipitation monitoring efforts. The report by Wisniewski and Kinsman (1982) is especially useful because it is current and indexes information for 71 precipitation-quality networks. For each network, this report lists sponsoring agency, person to contact, parameters monitored, location, areal coverage, period of operation, and methods of sampling and analysis.

The Illinois State Water Survey can provide additional precipitation data not referenced in the preceding publications. This agency has available data from two network investigations it conducted in southern Illinois--the Shawnee Rain Guage Network (1967-70), and the Little Egypt Rain Gauge Network (1957-67). For further information about these and other precipitation data and services available from the Illinois State Water Survey contact:

Mr. John Vogel, Assistant Section Head, Meteorology
Illinois State Water Survey
P.O. Box 5050
Station A
Champaign, Illinois 61820

Telephone: (217) 333-4261
FTS: 957-4261

## SUMMARY OF SUGGESTED PLANS

A summary of suggested plans for future hydrologic work in all six National forest areas is presented in table 5. Note that the final suggestion is to be considered for all the forest areas. In general, hydrologic information specific to the water quality of the lakes and impoundments in these National forests is deficient. These are highly visible, hydrologically important water bodies, but there is little knowledge about the water quality of most of them. To provide at least a minimal basis for evaluating the potential impacts of mining, a reconnaissance of all natural, last-cut, and other man-made lakes and impoundments in all six National forest areas is therefore suggested.

At least two other investigations are suggested for every National forest area: (1) application of numerical techniques to model streamflow, water-quality, and sedimentation characteristics in small watersheds, and (2) regional ground-water assessments (with or without the use of numerical simulation techniques) specific to each of the forest areas. The objective of both of these studies is to evaluate the hydrologic systems as they are affected or potentially affected by coal mining and reclamation. Both are fundamental to any further detailed analysis of the hydrologic regime, such as would be done in a tract environmental assessment.

At this time, there are not sufficient resources to conduct surface-water modeling and ground-water assessments independently in each National forest study area. It is suggested that pairs of Geological Survey districts jointly undertake these two efforts for their areas, thereby combining manpower and expertise, and extending the areas of application. Because Kentucky and Ohio do not have automated ground-water-data bases, it is suggested that initially these districts independently conduct the ground-water assessments in their forest areas on a small scale. For assessment of the ground water in the other forest areas and for surface-water modeling in all the study areas, it is suggested that the forest areas be combined into the following three pairs:

(1) The Daniel Boone and the Wayne National Forest areas (involving the Kentucky, Tennessee, and Ohio Districts of the Geological Survey).

(2) The Hoosier and the Shawnee National Forest areas (involving the Indiana and Illinois Districts of the Geological Survey).

(3) The Jefferson and Monongahela National Forest areas (involving the Mid-Atlantic and West Virginia Districts of the Geological Survey).

Pairing of the forests in this manner is based on the proximity to one another and physiographic similarities.

In addition to those discussed above, there are one or two additional investigations recommended for each forest area (table 5). These additional studies reflect the peculiar hydrologic informational needs of particular geographic areas, or take into account the special talents, strengths, or interests of the specific districts.

Table 5.-- Summary of investigations suggested for each National forest area

A. Daniel Boone National Forest

(1) Intensively study ground-water systems in a representative portion of forest.
(2) Develop a regional ground-water investigation of the entire forest.
(3) Kentucky-Ohio joint application of numerical models to streamflow, water quality, and sedimentation characteristics in selected small basins of the forests.
(4) Intensively study the net effects of coal mining and reclamation on the forest's larger watersheds.

B. Hoosier National Forest

(1) Indiana - Illinois joint investigation to define ground-water resources in forest areas.
(2) Indiana - Illinois joint investigation to study the water quality in last-cut lakes and flow interrelationships between ground-water and lake systems.
(3) Indiana - Illinois joint application of numerical models to streamflow, water quality, and sedimentation characteristics in selected small basins of the forests.

C. Jefferson National Forest

(1) Virginia - West Virginia joint investigation to evaluate ground-water systems in forest lands.
(2) Evaluate aquifer properties, water quality, and sediment characteristics in and around a reservoir system located in a coal-producing area of the forest.
(3) Virginia - West Virginia joint application of numerical models to streamflow, water quality, and especially sedimentation characteristics in selected mined and reclaimed basins of the forests.

D. Monongahela National Forest

(1) Separate the effects of surface and deep mining on the hydrologic system.
(2) West Virginia - Virginia joint investigation to evaluate ground-water systems in forest lands.
(3) West Virginia - Virginia joint application of numerical models to streamflow, water quality, and especially sedimentation characteristics in selected mined and reclaimed basins of the forests.

Table 5.--Summary of investigations suggested for each National forest area--Continued

E. Shawnee National Forest

(1) Illinois - Indiana joint investigation to define ground-water resources in forest areas.
(2) Illinois - Indiana joint application of numerical models to streamflow, water quality, and sedimentation characteristics in selected small basins of the forests.
(3) Illinois - Indiana joint investigation to study the water quality in last-cut lakes and flow interrelationships between ground water and the lake systems.
(4) Identification and estimating the populations of biota in forest streams.

F. Wayne National Forest

(1) Ohio - Kentucky joint application of numerical models to streamflow, water quality, and sedimentation characteristics in selected small basins of the forests.
(2) Intensively study ground-water systems in a representative portion of the forest.
(3) Develop a regional ground-water investigation of the entire forest.
(4) Evaluate the effects of mine reclamation on the water resources of selected sites.

G. All Forest Areas

(1) Hydrologic reconnaissance of all major lakes and impoundments.

Figure 8 suggests a sequence and estimates a duration for the investigations presented in table 5. Since the scope of each of these investigations must yet be developed, cost estimates for the work in this report can only be considered rough approximations. For project years 2 to 4, the sum total of estimated project costs is 1.5 million dollars per year. For project years 1, 5, and 6, the funding required is about half that amount. Timing and duration suggestions for these projects are also approximate, and are very dependent upon district schedules and competing priorities.

The hydrologic investigations suggested in this report are not fully developed with regard to scope and approach; only very general descriptions of the purposes and objectives of the suggested studies are presented. The tasks of gathering, organizing, and evaluating all existing information and developing a sound and thorough project plan remain. These are time-consuming tasks that require considerable effort be spent studying existing information. However, only after such effort is expended can a proposed investigation truly take shape.

The NAWDEX listings in supplemental data A, C, E, G, I, and K index more monitoring-station data for some National forest areas than for others. This report cannot analyze how many of these data are needed; it can only identify relative deficiencies. However, it is safe to say that all the data necessary to perform the suggested investigations are not now available.

There is a tendency to rely heavily on computer modeling techniques to gain an understanding of the hydrology of an area where little or no water resources data are available. However, to be applied properly, these techniques still require the user to pay strict attention to the type, form, amount, and quality of data applied to the anlysis. Even with these powerful analytical tools, a significant portion of the effort in the proposed hydrologic studies must still be for design of the networks, and the collection, verification, organization, and processing of the data.

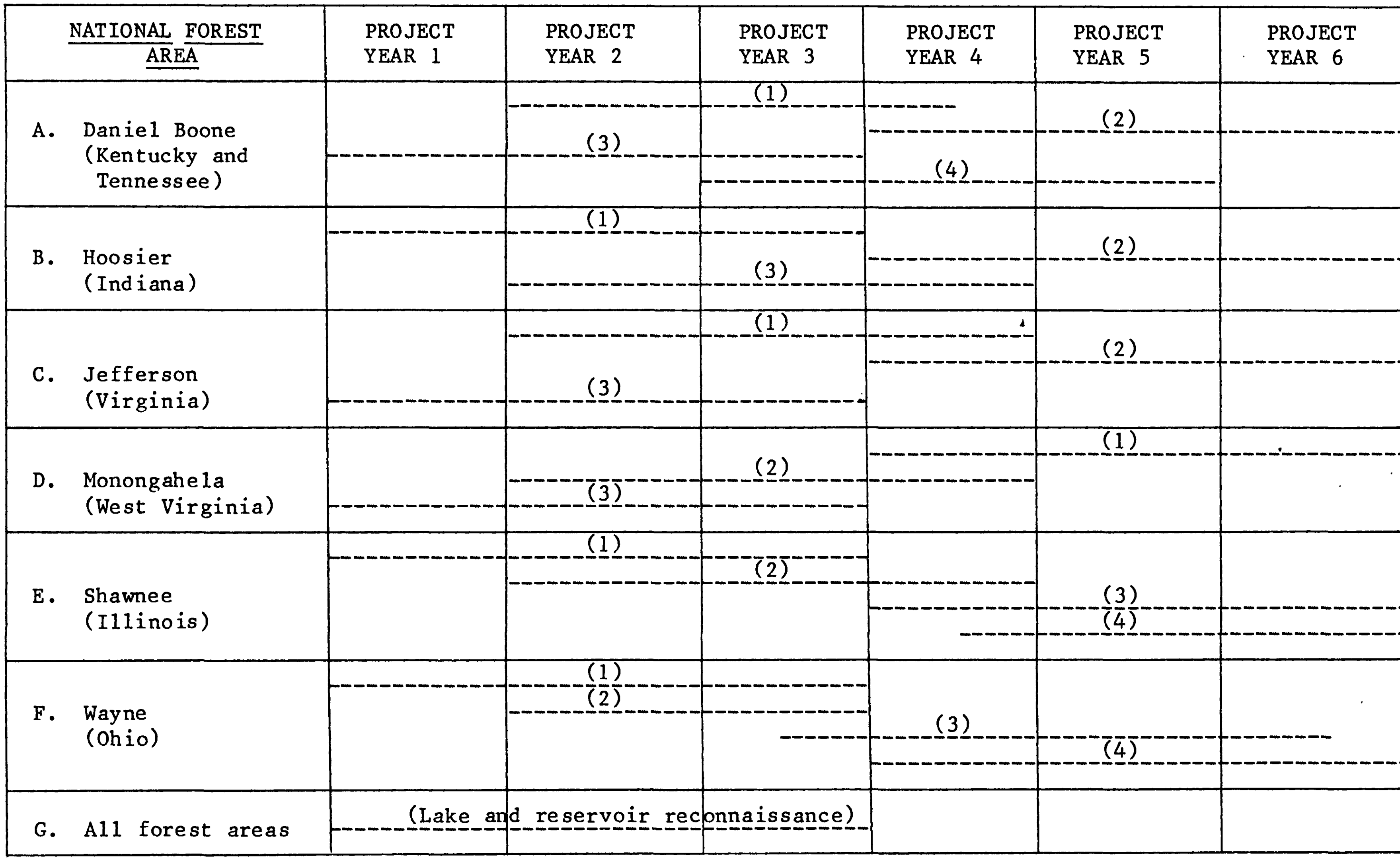


Figure 8.--Approximate sequence and durations of the hydrologic investigations suggested for six National forest areas. (Investigations are identified by number above each time line.) (Refer to table 5 for identification of each recommended investigation.)

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Pages 47-65 deleted
Page 66 follows

# SUPPLEMENTAL DATA

SUPPLEMENTAL DATA A

NAWDEX listings of sources of monitoring-site data found in the Daniel Boone National Forest study area.

SUPPLEMENTAL DATA A: LISTING 1

Sources of streamflow and stage data in the Daniel Boone National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05100203 | DL1-1 | USGS | 03281065 | GOOSE CR NR GOOSEROCK, KY. | 370450 | 0834133 | 021 | 051 | SW | 1975 | | | | |
| 05100203 | DL1-2 | USGS | 03281090 | PACES CREEK NEAR GARRARD,KY | 370817 | 0834201 | 021 | 051 | SW | 1975 | | | .47 | |
| 05100203 | DL1-3 | USGS | 03281030 | RED BIRD RIVER AT BIG CREEK, KY. | 370924 | 0833522 | 021 | 051 | SW | 1954 | 1972 | | 125.00 | |
| 05100203 | DL1-4 | USGS | 03281040 | RED BIRO RIVER NEAR BIG CREEK, KY. | 371043 | 0833535 | 021 | 051 | SW | 1972 | | Y | 155.00 | Y |
| 05100203 | DL1-5 | USGS | 03281200 | SOUTH FORK KENTUCKY RIVER AT ONEIDA, KY. | 371623 | 0833850 | 021 | 051 | SW | 1957 | | | 486.00 | |
| 05100203 | DL1-6 | USNWS | 15-6028-46 | ONEIDA KY ON SF KENTUCKY R | 371623 | 0833850 | 021 | 051 | SW | 1957 | | | 486.00 | |
| 05130102 | DL1-7 | USGS | 03405842 | HORSE LICK C NR LAMERO KY | 371912 | 0840818 | 021 | 109 | SW | 1975 | | | 61.70 | |
| 05100204 | DL1-8 | USGS | 03282135 | SF STATION CAMP C NR DRIP ROCK KY | 373340 | 0835801 | 021 | 109 | SW | 1959 | 1976 | | | |
| 05130101 | DL1-9 | USGS | 03405500 | LAUREL R NR VOX KY | 365705 | 0841330 | 021 | 125 | SW | 1929 | 1931 | N | 245.00 | |
| 05130101 | DL1-10 | USCE | | LAUREL R DAMSITE KY | 365742 | 0841614 | 021 | 125 | SW | 1956 | | | 282.00 | |
| 05130102 | DL1-11 | USGS | 03407000 | ROCKCASTLE R A ROCKCA SPS KY | 370035 | 0841855 | 021 | 125 | SW | 1921 | 1931 | Y | 745.00 | |
| 05100204 | DL1-12 | USCE | | KY R LOCK 13 KY | 373607 | 0835000 | 021 | 129 | SW | 1906 | | | 2784.00 | |
| 05100201 | DL1-13 | USGS | 03280728 | BULL C NR HYDEN KY | 371030 | 0832616 | 021 | 131 | SW | 1975 | | | | |
| 05130101 | DL1-14 | USGS | 03404390 | MARSH C NR WHITLEY CITY | 364438 | 0842216 | 021 | 147 | SW | 1960 | | | | |
| 05130101 | DL1-15 | USGS | 03404500 | CUMBERLAND R AT CUMBERLAND FALLS,KY. | 365014 | 0842036 | 021 | 147 | SW | 1907 | | Y | 1977.00 | Y |
| 05130104 | DL1-16 | USGS | 03411000 | SOUTH FORK CUMBERLAND RIVER AT NEVELSVILLE, | 365025 | 0843500 | 021 | 147 | SW | 1915 | 1950 | Y | 1271.00 | |
| 05130103 | DL1-17 | USGS | 03407200 | WEST FORK CANE BR NEAR PARKERS LAKE KY. | 365149 | 0842708 | 021 | 147 | SW | 1956 | | | .26 | |
| 05130103 | DL1-18 | USGS | 03407100 | CANE BRANCH NEAR PARKERS LAKE | 365205 | 0842657 | 021 | 147 | SW | 1956 | | Y | .67 | |
| 05130103 | DL1-19 | USGS | 03407300 | HELTON BRANCH AT GREENWOOD, KY. | 365307 | 0842855 | 021 | 147 | SW | 1955 | | N | .85 | |
| 05100101 | DL1-20 | USGS | 03248855 | NF LICKING R NR WRIGLEY KY | 380239 | 0831815 | 021 | 175 | SW | 1973 | | | 33.70 | |
| | DL1-21 | USCE | | BUCKHORN LAKE KY | 372023 | 0832815 | 021 | 193 | LK | 1960 | | N | | N |
| 05100202 | DL1-22 | USCE | | BUCKHORN RE KY | 372023 | 0832815 | 021 | 193 | LK | 1960 | | | 408.00 | Y |
| 05100202 | DL1-23 | USGS | 03280800 | BUCKHORN LK AT BUCKHORN KY | 372024 | 0832813 | 021 | 193 | LK | 1960 | | | 408.00 | |
| 05100202 | DL1-24 | USGS | 03280900 | MIDDLE FORK KENTUCKY RIVER AT BUCKHORN, KY | 372045 | 0832807 | 021 | 193 | SW | 1939 | 1975 | Y | 420.00 | |
| 05130102 | DL1-25 | USCE | | ROCKCASTLE NARROWS DAMSITE KY | 370157 | 0841828 | 021 | 199 | SW | 1961 | 1967 | | 721.00 | |
| 05130102 | DL1-26 | USGS | 03406330 | SKEGG C NR BILLOWS KY | 371348 | 0841637 | 021 | 203 | SW | 1975 | | | | |
| 05130102 | DL1-27 | USGS | 03405900 | ROUNDSTONE CR AT LIVINGSTDN,KY. | 371755 | 0841250 | 021 | 203 | SW | 1953 | 1976 | | 144.00 | |
| 05100101 | DL1-28 | USGS | 03249505 | LICKING R AUXILIARY AT FARMERS KY | 380824 | 0833326 | 021 | 205 | SW | 1915 | | | 831.00 | |
| 05100101 | DL1-29 | USGS | 03250000 | TRIPLETT CREEK AT MOREHEAD, KY. | 381104 | 0832548 | 021 | 205 | SW | 1941 | | Y | 47.50 | Y |
| 05100101 | DL1-30 | USGS | 03250080 | JACKS B NR MOREHEAD KY | 381312 | 0832703 | 021 | 205 | SW | 1975 | | | .19 | |
| 05130101 | DL1-31 | USGS | 03404600 | LAKE CUMBERLAND AT BARK CAMP KY | 365640 | 0841744 | 021 | 235 | LK | 1965 | 1980 | | 2025.00 | |
| 05130101 | DL1-32 | USGS | 03405000 | LAUREL R AT CORBIN,KY. | 365809 | 0840738 | 021 | 235 | SW | 1910 | 1973 | Y | 201.00 | |
| 05100201 | DL1-33 | USGS | 03283305 | MF RED R AT ZACHARIAH KY | 374235 | 0834012 | 021 | 237 | SW | 1974 | | | .58 | |
| 05100204 | DL1-34 | USGS | 03283100 | RED RIVER NEAR PINE RIDGE, KY. | 374911 | 0833429 | 021 | 237 | SW | 1969 | 1976 | | 142.00 | |

| CODE NUMBER | TYPES OF DATA* STAGE (A) COMPLETE | STAGE (B) PEAK | STAGE (B) LOW | STAGE (C) STORAGE MEDIA | FLOW (D) COMPLETE | FLOW (B) PEAK | FLOW (B) LOW | FLOW (A) MISCELLANEOUS | FLOW (C) STORAGE MEDIA | VOLUME (E) TOTAL | VOLUME (E) CHANGE | VOLUME (C) STORAGE MEDIA | (F) TELEMETRY | (G) OTHER HYDROLOGIC DATA | (H) OTHER RELATED DATA | (I) DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL1-1 | | | | | | | 9 | | P | | | | | 4 | | C |
| DL1-2 | | 1 | | D | E | 9 | | | D | | | | | 8 | 1 | C |
| DL1-3 | | | | | | E | E | | P | | | | | 1 | | C |
| DL1-4 | I | 1 | 1 | | 1 | 1 | | | D | | | | | 14568 | 6 | C |
| DL1-5 | | 1 | | C | | 9 | | | C | | | | | 1578 | 6 | C |
| DL1-6 | O | | | C | 1 | | | | C | | | | | | 6 | C |
| DL1-7 | | | | | | | 9 | | P | | | | | | | C |
| DL1-8 | | | | | | | E | | P | | | | | | | |
| DL1-9 | E | | | | E | | | | D | | | | | | | C |
| DL1-10 | O | | | | | 9 | | | | | | | | 5 | 6 | C |
| DL1-11 | E | E | | C | E | E | | | C | | | | | | 6 | C |
| DL1-12 | O | | | | 1 | | | | | | | | | | 6 | |
| DL1-13 | | 1 | | D | | 9 | | | D | | | | | 58 | | C |
| DL1-14 | | | | | | | 9 | | P | | | | | | | C |
| DL1-15 | W | 1 | | C | 1 | E | | | D | | | | | 167 | 6 | C |
| DL1-16 | E | E | | C | E | E | | | C | | | | | | 6 | C |
| DL1-17 | | 1 | | C | | 9 | E | | C | | | | | 7 | 6 | C |
| DL1-18 | I | 1 | | C | E | 9 | | | C | | | | | 1467 | 6 | C |
| DL1-19 | | 1 | | C | E | 9 | E | | C | | | | | 167 | 6 | C |
| DL1-20 | | | | | | | 9 | | P | | | | | | | |
| DL1-21 | C | | | | | 8 | | | C | 9 | 9 | C | | | 16 | C |
| DL1-22 | I | | | D | 1 | | | | D | 9 | 9 | D | | C14 | 6 | C |
| DL1-23 | I | | | P | | | | | | 3 | 3 | P | | | 1 | C |
| DL1-24 | I | 1 | | C | 1 | E | | | D | | | | 8 | 158 | 6 | C |
| DL1-25 | Z | | | | | 9 | | | | | | | | 5 | 6 | C |
| DL1-26 | | | | | | | 9 | | P | | | | | | | C |
| DL1-27 | | | | | | | | | | | | | | | | C |
| DL1-28 | I | 1 | | | | | | | | | | | 1 | 1 | | |
| DL1-29 | I | 1 | | C | 1 | E | 1 | | D | | | | 1 | 1 | 6 | |
| DL1-30 | | | | D | | 1 | | | D | | | | | 58 | | |
| DL1-31 | I | | | | | E | | | | | | | | | 6 | C |
| DL1-32 | E | E | | C | E | E | | | C | | | | | | 6 | C |
| DL1-33 | | 1 | | D | | 9 | | | D | | | | | 58 | | |
| DL1-34 | | | | | | | | | | | | | | | | |

* USE CODE TABLES (See right margin) indicated by letter in () in column heading

# CODE TABLES

### TABLE (A)-COMPLETE STAGE and MISCELLANEOUS FLOW

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual (twice per year) |
| A | | 9 | Annual (once per year) |
| B | | | Other periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### TABLE (B)-STAGE and FLOW, PEAK or LOW

| Code | Meaning |
|---|---|
| 1 | Year-round |
| 2 | Seasonal |
| 8 | Annual maximum or minimum |
| 9 | Irregular |
| E | Eliminated activity |

### TABLE (C)-STORAGE MEDIA

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TABLE (D)-COMPLETE FLOW

| Code Year-Round | Code Seasonal | Meaning |
|---|---|---|
| 1 | 2 | Daily flow |
| 3 | 4 | Monthly flow determined |
| E | E | Eliminated activity |

### TABLE (E)-VOLUME

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Daily values | 9 | Irregular |
| 3 | Monthly values | E | Eliminated activity |

### TABLE (F)-TELEMETRY

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Telemeter-land lines | 5 | DARC |
| 2 | Telemeter-radio network | 6,8 | Other or type unspecified |
| 3 | Landsat | 7 | Two or more types |
| 4 | GOES | | |

### TABLE (G)-OTHER HYDROLOGIC DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | QW recurring | 7 | Flood frequency |
| 2 | QW nonrecurring | 8 | Coef. of roughness |
| 3 | Flood hydrograph | 9 | Time of travel |
| 4 | Sediment studies | A | Flood plain maps |
| 5 | Cross section | B | Tides |
| 6 | Flow duration | C | Surface inflow-outflow |

### TABLE (H)-OTHER RELATED DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Precipitation | 4 | Radiation (solar) |
| 2 | Wind | 5 | Soil moisture |
| 3 | Evaporation | 6 | Datum (mean sea level) |

### TABLE (I)-DATA BANK SOURCE

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05130105 | DL1-35 | USGS | 03414346 | HURRICANE CREEK AT CAMP GROUND, TN. | 361142 | 0850406 | 047 | 049 | SW | 1979 | | N | 15.85 | Y |
| 05130104 | DL1-36 | USGS | 03408600 | LONG BRANCH NEAR GRIMSLEY, TENN | 361532 | 0845740 | 047 | 049 | SW | 1976 | | | 1.11 | |
| 05130105 | DL1-37 | USGS | 03414430 | EAST FORK OBEY RIVER NEAR WILDER, TN. | 361624 | 0850240 | 047 | 049 | SW | 1979 | | N | 116.51 | Y |
| 05130104 | DL1-38 | USGS | 03408550 | NORTH PRONG CLEAR FORK NEAR GRIMSLEY,TN | 361825 | 0845435 | 047 | 049 | SW | 1979 | | N | 27.10 | N |
| 05130104 | DL1-39 | USGS | 03408815 | CROOKED CREEK NEAR ALLARDT,TENN | 362259 | 0845450 | 047 | 049 | SW | 1976 | | | 3.62 | |
| 05130104 | DL1-40 | USGS | 03408810 | CROOKED CREEK TRIBUTARY NEAR ALLARDT, TENN | 362330 | 0845443 | 047 | 049 | SW | 1976 | | | .25 | |
| 05130105 | DL1-41 | USGS | 03414500 | EAST FORK OBEY RIVER NEAR JAMESTOWN, TENN. | 362458 | 0850135 | 047 | 049 | SW | 1928 | | Y | 202.00 | Y |
| 05130105 | DL1-42 | USGS | 03415960 | WOLF RIVER AT WOLF RIVER, TN | 363214 | 0845709 | 047 | 049 | SW | 1979 | | N | 41.00 | Y |
| 05130105 | DL1-43 | USGS | 03415975 | ROTTEN FORK WOLF RIVER NEAR PALL MALL, TN. | 363220 | 0845656 | 047 | 049 | SW | 1979 | | N | 21.61 | Y |
| 05130105 | DL1-44 | USGS | 03414340 | EAST FORK OBEY RIVER AT OBEY CITY, TN | 361102 | 0850953 | 047 | 133 | SW | 1975 | | | 34.60 | Y |
| 05130106 | DL1-45 | USGS | 03418030 | SPRING CREEK NEAR ALGOOD, TN | 361446 | 0852314 | 047 | 133 | SW | 1929 | | | 13.80 | Y |
| 05130105 | DL1-46 | USGS | 03414680 | WEST FORK OBEY RIVER NEAR ALLRED, TN | 361852 | 0851053 | 047 | 133 | SW | 1975 | | | 70.80 | Y |
| 05130106 | DL1-47 | USGS | 03417695 | ROARING RIVER AT OKALONA, TN | 361908 | 0852030 | 047 | 133 | SW | 1929 | | | 15.30 | Y |
| 05130105 | DL1-48 | USGS | 03414700 | PUNCHEON CAMP CREEK AT ALLRED, TENN | 361935 | 0851110 | 047 | 133 | SW | 1954 | | | 15.50 | N |
| 05130106 | DL1-49 | USGS | 03417700 | MATHEWS BR TRIBUTARY NEAR LIVINGSTON, TENN. | 362004 | 0852023 | 047 | 133 | SW | 1954 | | | .49 | |
| 05130106 | DL1-50 | USGS | 03418000 | ROARING RIVER NEAR HILHAM, TENN. | 362027 | 0852535 | 047 | 133 | SW | 1930 | | N | 78.70 | Y |
| 05130105 | DL1-51 | USGS | 03415000 | WEST FORK OBEY RIVER NEAR ALPINE, TENN. | 362349 | 0851028 | 047 | 133 | SW | 1941 | | N | 115.00 | Y |
| 05130105 | DL1-52 | USGS | 03415700 | BIG EAGLE CREEK NEAR LIVINGSTON, TENN | 362657 | 0851627 | 047 | 133 | SW | 1954 | | | 7.98 | Y |

| CODE NUMBER | STAGE (A) COMPLETE | STAGE (B) PEAK | STAGE (B) LOW | STAGE (C) STORAGE MEDIA | FLOW (D) COMPLETE | FLOW (B) PEAK | FLOW (B) LOW | FLOW (A) MISCELLANEOUS | FLOW (C) STORAGE MEDIA | VOLUME (E) TOTAL | VOLUME (E) CHANGE | VOLUME (C) STORAGE MEDIA | (F) TELEMETRY | (G) OTHER HYDROLOGIC DATA | (H) OTHER RELATED DATA | (I) DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL1-35 | Z | 2 | 2 | D | | 9 | 9 | Z | D | 9 | | | | 24 | | |
| DL1-36 | | | | | 3 | | | | D | | | | | | 1 | |
| DL1-37 | Z | 2 | 2 | D | | 9 | 9 | Z | D | 9 | | | | 24 | | |
| DL1-38 | Z | 2 | 2 | D | | 9 | 9 | Z | D | 9 | | | | 24 | | |
| DL1-39 | | | | | 1 | | | | D | | | | | | 1 | |
| DL1-40 | | | | | 3 | | | | D | | | | | | 1 | |
| DL1-41 | I | 1 | | C | 1 | 1 | | | D | | | | | 1567 | 6 | |
| DL1-42 | Z | 2 | 2 | D | | 9 | 9 | Z | D | 9 | | | | 24 | | |
| DL1-43 | Z | 2 | 2 | D | | 9 | 9 | Z | D | 9 | | | | 24 | | |
| DL1-44 | | | | | | | 9 | | P | | | | | | | |
| DL1-45 | | | | | | | 9 | | P | | | | | | | |
| DL1-46 | | | | | | | 9 | | P | | | | | | | |
| DL1-47 | | | | | | | 9 | | P | | | | | | | |
| DL1-48 | Z | 1 | | C | | 9 | | | D | | | | | | 6 | |
| DL1-49 | Z | 1 | | C | | 1 | | | C | | | | | 578 | 6 | |
| DL1-50 | E | 1 | | C | 2 | 1 | | | C | | | | | 15678 | 6 | |
| DL1-51 | E | E | | C | 2 | E | | | C | | | | | 167 | 6 | |
| DL1-52 | Z | 1 | | C | | 1 | | | C | | | | | 58 | 6 | |

* USE CODE TABLES (See right margin) indicated by letter in () in column heading

# CODE TABLES

### TABLE (A)-COMPLETE STAGE and MISCELLANEOUS FLOW

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual (twice per year) |
| A | | 9 | Annual (once per year) |
| B | | | Other periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### TABLE (B)-STAGE and FLOW, PEAK or LOW

| Code | Meaning |
|---|---|
| 1 | Year-round |
| 2 | Seasonal |
| 8 | Annual maximum or minimum |
| 9 | Irregular |
| E | Eliminated activity |

### TABLE (C)-STORAGE MEDIA

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TABLE (D)-COMPLETE FLOW

| Code: Year-Round | Code: Seasonal | Meaning |
|---|---|---|
| 1 | 2 | Daily flow |
| 3 | 4 | Monthly flow determined |
| E | E | Eliminated activity |

### TABLE (E)-VOLUME

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Daily values | 9 | Irregular |
| 3 | Monthly values | E | Eliminated activity |

### TABLE (F)-TELEMETRY

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Telemeter-land lines | 5 | DARC |
| 2 | Telemeter-radio network | 6,8 | Other or type unspecified |
| 3 | Landsat | 7 | Two or more types |
| 4 | GOES | | |

### TABLE (G)-OTHER HYDROLOGIC DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | QW recurring | 7 | Flood frequency |
| 2 | QW nonrecurring | 8 | Coef. of roughness |
| 3 | Flood hydrograph | 9 | Time of travel |
| 4 | Sediment studies | A | Flood plain maps |
| 5 | Cross section | B | Tides |
| 6 | Flow duration | C | Surface inflow-outflow |

### TABLE (H)-OTHER RELATED DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Precipitation | 4 | Radiation (solar) |
| 2 | Wind | 5 | Soil moisture |
| 3 | Evaporation | 6 | Datum (mean sea level) |

### TABLE (I)-DATA BANK SOURCE

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA A: LISTING 2

Sources of surface-water-quality data in the Daniel Boone National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05100203 | DL2-1 | USGS | 03281065 | GOOSE CR NR GOOSEROCK, KY. | 370450 | 0834133 | 021 | 051 | SW | 1979 | | | | |
| 05100203 | DL2-2 | USGS | 03281090 | PACES CREEK NEAR GARRARD,KY | 370817 | 0834201 | 021 | 051 | SW | 1975 | 1978 | | .47 | |
| 05100203 | DL2-3 | USGS | 03281030 | RED BIRD RIVER AT BIG CREEK, KY. | 370924 | 0833522 | 021 | 051 | SW | 1970 | 1972 | | 125.00 | |
| 05100203 | DL2-4 | USGS | 03281035 | BIG CREEK NEAR BIG CREEK, KY | 370942 | 0833416 | 021 | 051 | SW | 1979 | | N | | |
| 05100203 | DL2-5 | USGS | 03281040 | RED BIRD RIVER NEAR BIG CREEK, KY. | 371043 | 0833535 | 021 | 051 | SW | 1973 | | | 155.00 | Y |
| 05100203 | DL2-6 | USGS | 03281045 | HECTOR BRANCH NEAR ERILINE, KY | 371118 | 0833639 | 021 | 051 | SW | 1979 | | N | | |
| 05100203 | DL2-7 | USGS | 03281175 | BULLSKIN CREEK NEAR BRUTUS, KY | 371437 | 0833506 | 021 | 051 | SW | 1979 | | N | | |
| 05100201 | DL2-8 | USCE | 2BNV19001 | 5.0 RED BIRD RIVER | 371454 | 0833753 | 021 | 051 | SW | 1972 | 1976 | N | | |
| 05100203 | DL2-9 | USCE | 2BNV18001 | 1.0 GOOSE CR | 371545 | 0833930 | 021 | 051 | SW | 1972 | 1975 | N | | |
| 05100203 | DL2-10 | USCE | 2BNV10005 | S FK KY RIVER NEW ONEIDA | 371609 | 0833915 | 021 | 051 | SW | 1972 | 1976 | N | | |
| 05100203 | DL2-11 | USCE | 2BNV17001 | 1.2 BULLSKIN CREEK | 371623 | 0833748 | 021 | 051 | SW | 1972 | 1975 | N | | |
| 05100203 | DL2-12 | USGS | 03281200 | SOUTH FORK KENTUCKY RIVER AT ONEIDA, KY. | 371623 | 0833850 | 021 | 051 | SW | 1970 | 1972 | | 486.00 | |
| 05100203 | DL2-13 | USCE | 2BNV14005 | 14.4 SEXTON CR | 371706 | 0834710 | 021 | 051 | SW | 1972 | 1974 | N | | |
| 05100203 | DL2-14 | USGS | 03281340 | SEXTON CREEK NEAR CHESTNUTBURG, KY | 371724 | 0834743 | 021 | 051 | SW | 1979 | | N | | |
| 05130102 | DL2-15 | USGS | 03405780 | LAUREL FORK NEAR MCKEE, KY | 372247 | 0835921 | 021 | 109 | SW | 1979 | | N | | |
| 05130102 | DL2-16 | KY003 | | IMPOUNDMENT BILLS B MCKEE W P KY | 372554 | 0835958 | 021 | 109 | LK | 1965 | | Y | | |
| 05130101 | DL2-17 | USCE | 3LAU20004 | | 365636 | 0840945 | 021 | 125 | LK | 1974 | 1978 | Y | | |
| 05130101 | DL2-18 | USCE | 3LAU20003 | | 365652 | 0841417 | 021 | 125 | LK | 1974 | 1978 | Y | | |
| 05130101 | DL2-19 | USCE | 3LAU20002 | | 365753 | 0841547 | 021 | 125 | LK | 1973 | 1978 | Y | | |
| 05130101 | DL2-20 | USCE | 3LAU20007 | | 365802 | 0840728 | 021 | 125 | LK | 1974 | 1978 | Y | | |
| 05130101 | DL2-21 | USCE | 3LAU20006 | | 365859 | 0841433 | 021 | 125 | LK | 1974 | 1978 | Y | | |
| 05130102 | DL2-22 | USGS | 03407000 | ROCKCASTLE R A ROCKCA SPS KY | 370035 | 0841855 | 021 | 125 | SW | 1965 | 1965 | | 745.00 | |
| 05130101 | DL2-23 | USGS | 03405550 | CRAIG CR NR HIGHTOP KY | 370108 | 0841049 | 021 | 125 | SW | 1979 | | N | | |
| 05100202 | DL2-24 | USCE | 2BHR10008 | | 371140 | 0832200 | 021 | 131 | SW | 1971 | 1978 | Y | | |
| 05100202 | DL2-25 | USCE | 2BHR15001 | | 371310 | 0832223 | 021 | 131 | SW | 1971 | 1977 | Y | | |
| 05100202 | DL2-26 | USGS | 03280750 | HELL FOR CERTAIN CK NR KALIOPI,KY. | 371351 | 0832430 | 021 | 131 | SW | 1979 | | N | | |
| 05100202 | DL2-27 | USCE | 2BHR10007 | MILE 63.1 M FK KY R | 371542 | 0832248 | 021 | 131 | SW | 1973 | | | | |
| 05100202 | DL2-28 | USCE | 2BHR20005 | BUCKHORN RE 55.9 M FK KY R | 371705 | 0832424 | 021 | 131 | LK | 1971 | 1978 | N | | |
| 05130101 | DL2-29 | USGS | 03404350 | MARSH CK NR DUCKRUN,KY. | 364255 | 0842118 | 021 | 147 | SW | 1979 | | N | | |
| 05130101 | DL2-30 | USGS | 03404500 | CUMBERLAND R AT CUMBERLAND FALLS,KY. | 365014 | 0842036 | 021 | 147 | SW | 1948 | 1977 | | 1977.00 | Y |
| 05130104 | DL2-31 | USGS | 03411000 | SOUTH FORK CUMBERLAND RIVER AT NEVELSVILLE, | 365025 | 0843500 | 021 | 147 | SW | 1960 | 1975 | N | 1271.00 | |
| 05130103 | DL2-32 | USGS | 365132084263701 | POOL 9 | 365132 | 0842637 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-33 | USGS | 365137084264701 | POOL 4 | 365137 | 0842647 | 021 | 147 | LK | 1973 | 1973 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

**PHYSICAL**

| CODE NUMBER | Temperature | Specific conductance | Turbidity | Color | Odor | pH | Suspended solids | Storage media |
|---|---|---|---|---|---|---|---|---|
| DL2-1 | A | A | | | | A | | D |
| DL2-2 | | | | | | | | |
| DL2-3 | A | A | | | | A | | D |
| DL2-4 | Y | Y | | | | Y | | |
| DL2-5 | A | A | | | | R | | D |
| DL2-6 | Y | Y | | | | Y | | |
| DL2-7 | Y | Y | | | | Y | | |
| DL2-8 | K | R | Q | | | Q | Q | D |
| DL2-9 | N | R | Q | | | Q | Q | D |
| DL2-10 | N | R | Q | | | Q | Q | D |
| DL2-11 | A | R | 5 | | | R | A | D |
| DL2-12 | A | A | | | | A | | D |
| DL2-13 | M | M | M | | | M | M | C |
| DL2-14 | Q | Q | | | | Q | | |
| DL2-15 | Y | Y | | | | Y | | |
| DL2-16 | | | B | B | B | B | | |
| DL2-17 | A | A | N | | | A | A | D |
| DL2-18 | A | A | N | | | A | A | D |
| DL2-19 | A | A | K | | | A | K | D |
| DL2-20 | A | A | K | | | N | A | D |
| DL2-21 | A | A | A | | | A | A | D |
| DL2-22 | | | | | | | | |
| DL2-23 | Y | Y | | | | Y | | |
| DL2-24 | R | R | | | | R | E | D |
| DL2-25 | K | K | K | | | K | A | D |
| DL2-26 | Q | Q | | | | Q | | |
| DL2-27 | M | M | M | | | M | M | C |
| DL2-28 | K | R | A | | | R | A | D |
| DL2-29 | Q | Q | | | | Q | | |
| DL2-30 | E | A | | | | E | | D |
| DL2-31 | A | K | | | | | | D |
| DL2-32 | A | A | | | | A | | D |
| DL2-33 | A | A | | | | A | | D |

**CHEMICAL**

| CODE NUMBER | Dissolved solids | Major ions | Hardness | Silica | Phosphorus | Phosphorus species | Nitrogen | Nitrogen species | Detergents | Other minor elements | Radioactivity | Radiochemical species | Carbon | Organic groups | Pesticides species | Other organic species | Biochemical oxygen demand | Chemical oxygen demand | Dissolved oxygen | Other dissolved gases | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-1 | | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-2 | | | | | | | | | | | | | | | | | | | | | |
| DL2-3 | A | A | A | | A | | | A | | | | | | | | | | | | A | D |
| DL2-4 | | Y | | | | | | | | Y | | | | | | | | | | | D |
| DL2-5 | A | R | A | | A | | | A | | R | | | | | | | | | | E | D |
| DL2-6 | | Y | | | | | | | | Y | | | | | | | | | | | D |
| DL2-7 | | Y | | | | | | | | Y | | | | | | | | | | | D |
| DL2-8 | Q | Q | K | | E | | | | | E | | | | | | | | | Q | | D |
| DL2-9 | Q | Q | K | | | | | | | E | | | | | | | | | Q | | D |
| DL2-10 | Q | Q | Q | | Q | | Q | Q | | Q | | | | | | | R | | Q | | D |
| DL2-11 | A | A | K | | | | | | | E | | | | | | | | | A | | D |
| DL2-12 | A | A | A | | A | | | A | | | | | | | | | | | | A | D |
| DL2-13 | M | M | M | | | | | | | | | | | | | | | | M | | C |
| DL2-14 | | Q | | | | | | | | Q | | | | | | | | | | | D |
| DL2-15 | | Y | | | | | | | | Y | | | | | | | | | | | D |
| DL2-16 | B | B | | | B | | | | | | | | | | | | | | | | |
| DL2-17 | A | A | A | | A | | A | A | | A | | | G | | | | E | E | A | | D |
| DL2-18 | A | A | A | | A | | A | A | | A | | | G | | | | E | E | A | | D |
| DL2-19 | A | A | A | | A | | A | A | | A | | | A | | | | E | E | A | | D |
| DL2-20 | A | A | A | | A | | A | A | | A | | | A | | | | E | E | A | | D |
| DL2-21 | A | A | A | | A | | A | A | | A | | | E | | | | E | E | A | | D |
| DL2-22 | | | | | | | | | | | | | | | | | | | | | |
| DL2-23 | | Y | | | | | | | | Y | | | | | | | | | | | D |
| DL2-24 | E | N | E | | A | | A | A | | E | | | | | | | A | | R | | D |
| DL2-25 | E | K | A | | E | | E | E | | A | | | | | | | A | | K | | D |
| DL2-26 | | Q | | | | | | | | Q | | | | | | | | | | | D |
| DL2-27 | M | M | M | | M | | M | | | | | | | | | | M | | M | | C |
| DL2-28 | 5 | A | A | | | | | | | E | | | | | | | E | | R | | D |
| DL2-29 | | Q | | | | | | | | Q | | | | | | | | | | | D |
| DL2-30 | E | E | E | | E | | | E | | A | | | | | | | | | | E | D |
| DL2-31 | | | | | | | | | | | | | | | | | | | | | |
| DL2-32 | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-33 | A | A | A | A | | | | | | A | | | | | | | | | | A | D |

**BIOLOGIC**

| CODE NUMBER | Enteric bacteria | Native bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro invertebrates | Macro invertebrates | Vertebrates | Fungi | Viruses | Primary productivity | Secondary productivity | Chemosynthetic activity | Biostimulatory activity | Toxicity test | Other bioassay test | Chemical tissue test | Histopathological analysis | Other tissue analysis | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-1 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-2 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-3 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-4 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-5 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-6 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-7 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-8 | A | | E | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-9 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-10 | K | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-11 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-12 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-13 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-14 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-15 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-16 | B | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-17 | | | N | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-18 | | | N | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-19 | | | N | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-20 | | | K | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-21 | | | E | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-22 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-23 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-24 | N | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-25 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-26 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-27 | M | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | C |
| DL2-28 | A | | A | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-29 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-30 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-31 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-32 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-33 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |

**SEDIMENT** / **OTHER**

| CODE NUMBER | Bed load | Concentration (suspended) | Sediment discharge (suspended) | Concentration (total) | Sediment discharge (total) | Particle size (suspended) | Particle size (bed material) | Storage media | Telemetry | S W station Y=Yes N=No | G W station Y=Yes N=No | Data bank source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-1 | | A | A | | | | | D | | | | S |
| DL2-2 | | | | | | | | | | | | W |
| DL2-3 | | | | | | | | | | | | S |
| DL2-4 | | Y | Y | | | | | | | | | |
| DL2-5 | | R | R | | | | | D | | | | SW |
| DL2-6 | | Y | Y | | | | | | | | | |
| DL2-7 | | Y | Y | | | | | | | | | |
| DL2-8 | | | | | | | | | | | | S |
| DL2-9 | | | | | | | | | | | | S |
| DL2-10 | | | | | | | | | | | | S |
| DL2-11 | | | | | | | | | | | | S |
| DL2-12 | | | | | | | | | | | | SW |
| DL2-13 | | | | | | | | | | | | |
| DL2-14 | | Q | Q | | | | | | | | | |
| DL2-15 | | Y | Y | | | | | | | | | |
| DL2-16 | | | | | | | | | | | | |
| DL2-17 | | | | | | | | | | | | S |
| DL2-18 | | | | | | | | | | | | S |
| DL2-19 | | | | | | | | | | | | S |
| DL2-20 | | | | | | | | | | | | S |
| DL2-21 | | | | | | | | | | | | S |
| DL2-22 | | | | | | | | | | | | SW |
| DL2-23 | | Y | Y | | | | | | | | | |
| DL2-24 | | | | | | | | | | | | S |
| DL2-25 | | | | | | | | | | | | S |
| DL2-26 | | Q | Q | | | | | | | | | |
| DL2-27 | | | | | | | | | | | | |
| DL2-28 | | | | | | | | | | | | S |
| DL2-29 | | Q | Q | | | | | | | | | |
| DL2-30 | | | | | | | | | | | | SW |
| DL2-31 | | | | | | | | | | | | W |
| DL2-32 | | | | | | | | | | | | S |
| DL2-33 | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05130103 | DL2-34 | USGS | 365138084263801 | POOL 11 | 365138 | 0842638 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-35 | USGS | 365139084264501 | SITE 3GW | 365139 | 0842645 | 021 | 147 | SW | 1973 | 1973 | | | |
| 05130103 | DL2-36 | USGS | 365139084264801 | POOL 3 | 365139 | 0842648 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-37 | USGS | 365140084263501 | SITE P | 365140 | 0842635 | 021 | 147 | SW | 1973 | 1973 | | | |
| 05130103 | DL2-38 | USGS | 365142084263801 | SITE M | 365142 | 0842638 | 021 | 147 | SW | 1973 | 1973 | | | |
| 05130103 | DL2-39 | USGS | 03407200 | WEST FORK CANE BR NEAR PARKERS LAKE KY. | 365149 | 0842708 | 021 | 147 | SW | 1957 | 1973 | | .26 | |
| 05130103 | DL2-40 | USGS | 365149084264701 | POOL2 | 365149 | 0842647 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-41 | USGS | 365150084262001 | POOL 13 | 365150 | 0842620 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-42 | USGS | 365150084262301 | POOL 12 | 365150 | 0842623 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-43 | USGS | 365152084263301 | SITE O | 365152 | 0842633 | 021 | 147 | SW | 1973 | 1973 | | | |
| 05130103 | DL2-44 | USGS | 365152084265301 | SITE G | 365152 | 0842653 | 021 | 147 | SW | 1973 | 1973 | | | |
| 05130103 | DL2-45 | USGS | 365159084264401 | SITE N | 365159 | 0842644 | 021 | 147 | SW | 1973 | 1973 | | | |
| 05130103 | DL2-46 | USGS | 03407100 | CANE BRANCH NEAR PARKERS LAKE | 365205 | 0842657 | 021 | 147 | SW | 1955 | 1974 | | .67 | |
| 05130103 | DL2-47 | USGS | 365207084264801 | POOL 19 | 365207 | 0842648 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-48 | USGS | 365208084263401 | POOL 16 | 365208 | 0842634 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-49 | USGS | 365208084263901 | POOL 17 | 365208 | 0842639 | 021 | 147 | LK | 1973 | 1973 | | | |
| 05130103 | DL2-50 | USFS | 020502 | HELTON BRANCH < | 365241 | 0842922 | 021 | 147 | SW | 1979 | | | | |
| 05130103 | DL2-51 | USGS | 03407300 | HELTON BRANCH AT GREENWOOD, KY. | 365307 | 0842855 | 021 | 147 | SW | 1955 | 1966 | | .85 | |
| 05130103 | DL2-52 | USGS | 365318084271601 | HUGHES FORK NEAR MC CREARY,KY. | 365318 | 0842716 | 021 | 147 | SW | 1973 | 1973 | | | |
| 05130103 | DL2-53 | USGS | 365325084280801 | HURRICANE BRANCH NEAR MC CREARY,KY. | 365325 | 0842808 | 021 | 147 | SW | 1973 | 1973 | | | |
| | DL2-54 | USFS | 020202 | RED RIVER GORGE AT KY HWY 77 | 375000 | 0833936 | 021 | 165 | SW | 1979 | | | | |
| 05100101 | DL2-55 | USCE | 2CRR10005 | BEAVER C AT FRENCHBURG | 375704 | 0833748 | 021 | 165 | SW | 1974 | | N | | |
| 05100101 | DL2-56 | USCE | 2CRR11001 | | 380222 | 0832931 | 021 | 165 | SW | 1972 | 1976 | Y | | |
| 05100101 | DL2-57 | USCE | 2CRR21001 | LAKE STATION NR BEAVER CR | 380222 | 0832931 | 021 | 165 | LK | 1974 | | | | |
| 05100101 | DL2-58 | USGS | 03248900 | N F LICKING R AT BANGOR | 380222 | 0832603 | 021 | 175 | SW | 1965 | 1965 | | | |
| 05100202 | DL2-59 | USCE | 2BHR20003 | | 371750 | 0832707 | 021 | 193 | LK | 1971 | 1978 | Y | | |
| 05100202 | DL2-60 | USCE | 2BHR10000 | BUCKHORN RE TAILWTR 39.9 M F KY R | 372043 | 0832807 | 021 | 193 | SW | 1971 | | | | |
| 05100204 | DL2-61 | KYOO1 | | MF RED R KY | 374629 | 0834039 | 021 | 197 | SW | 1968 | | N | | |
| 05100204 | DL2-62 | USCE | 2RER10005 | 57.3 RED RIVER | 374938 | 0833556 | 021 | 197 | SW | 1972 | 1975 | N | | |
| 05100204 | DL2-63 | USCE | 2RER10000 | 42.0 RED RIVER DAMSITE | 375044 | 0834452 | 021 | 197 | SW | 1972 | 1975 | N | | |
| 05130104 | DL2-64 | KYOO1 | 02006900 | LK CUMBERLAND BURMSIDE | 365348 | 0843603 | 021 | 199 | SW | 1977 | | N | | |
| 05130102 | DL2-65 | USGS | 03405900 | ROUNDSTONE CR AT LIVINGSTON,KY. | 371755 | 0841250 | 021 | 203 | SW | 1960 | 1972 | | 144.00 | |
| 05100101 | DL2-66 | USCE | 2CRR20002 | LAKE STA NR ZILPO | 380414 | 0832745 | 021 | 205 | LK | 1974 | 1978 | N | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL: TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA | CHEMICAL: DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-34 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-35 | A | A | | | | | | D | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL2-36 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-37 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-38 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-39 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-40 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-41 | A | A | | | | A | | D | | | | | | | | | | A | | | | | | | | | | | D |
| DL2-42 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-43 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-44 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-45 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-46 | | W | W | W | | W | | D | R | R | R | A | A | | | R | | R | | | | | | | | | | N | D |
| DL2-47 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-48 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL2-49 | A | A | | | | A | | D | | | | | | | | | | A | | | | | | | | | | | D |
| DL2-50 | | | A | | | | | D | | | | | | | | | | A | | | | | | | | | | | D |
| DL2-51 | | N | E | Q | | Q | | D | Q | Q | Q | Q | | | | R | | K | | | | | | | | | | R | D |
| DL2-52 | | A | | | | A | | D | A | A | A | | | | | A | | A | | | | | | | | | | A | D |
| DL2-53 | | A | | | | A | | D | A | A | A | | | | | A | | A | | | | | | | | | | A | D |
| DL2-54 | M | | M | | | M | M | D | | A | | | | A | A | A | | | | | | | | | | | | | D |
| DL2-55 | M | M | M | | | M | M | C | M | M | M | | M | | M | | | | | | | | | | M | | M | | C |
| DL2-56 | E | E | E | | | E | E | D | E | E | E | | A | | A | A | | E | | | | | | | | | E | | D |
| DL2-57 | M | M | M | | | M | M | C | M | M | M | | M | | M | | | | | | | | | | M | | M | | C |
| DL2-58 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DL2-59 | E | E | E | | | E | E | D | E | E | E | | | | | | | G | | | | | | | | | E | | D |
| DL2-60 | M | M | M | | | M | M | C | M | M | M | | M | | M | | | | | | | | | | M | | M | | C |
| DL2-61 | | | | | | | | | | B | | | | | | | | | | | | | | | | | | | |
| DL2-62 | Q | Q | Q | | | R | Q | D | R | Q | R | | Q | | Q | Q | | R | | | | | | | R | | Q | | D |
| DL2-63 | M | M | M | | | M | M | C | M | M | M | | M | | M | | | | | | | | | | M | | M | | C |
| DL2-64 | M | M | M | | | M | M | | M | M | M | | M | | M | | | M | | | M | | A | | M | | M | M | |
| DL2-65 | A | A | | | | A | | D | A | A | A | | A | | | A | | | | | | | | | | | | A | D |
| DL2-66 | K | K | K | | | K | K | D | 5 | K | K | | | | | | | | | | | | | | E | | K | | D |

| CODE NUMBER | BIOLOGIC: ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-34 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-35 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-36 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-37 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-38 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-39 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-40 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-41 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-42 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-43 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-44 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-45 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-46 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-47 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-48 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-49 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-50 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-51 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-52 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-53 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-54 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-55 | M | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | C |
| DL2-56 | E | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-57 | M | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | C |
| DL2-58 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-59 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-60 | M | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | C |
| DL2-61 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-62 | Q | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-63 | M | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | C |
| DL2-64 | M | A | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-65 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-66 | E | | A | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |

| CODE NUMBER | SEDIMENT: BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA | OTHER: TELEMETRY | S W STATION YES NO | G W STATION YES NO | DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-34 | | | | | | | | | | | | S |
| DL2-35 | | | | | | | | | | | | S |
| DL2-36 | | | | | | | | | | | | S |
| DL2-37 | | | | | | | | | | | | S |
| DL2-38 | | | | | | | | | | | | S |
| DL2-39 | | | | | | | | | | | | SW |
| DL2-40 | | | | | | | | | | | | S |
| DL2-41 | | | | | | | | | | | | S |
| DL2-42 | | | | | | | | | | | | S |
| DL2-43 | | | | | | | | | | | | S |
| DL2-44 | | | | | | | | | | | | S |
| DL2-45 | | | | | | | | | | | | S |
| DL2-46 | | 2 | 2 | | | E | | D | | | | SW |
| DL2-47 | | | | | | | | | | | | S |
| DL2-48 | | | | | | | | | | | | S |
| DL2-49 | | | | | | | | | | | | S |
| DL2-50 | | | | | | | | | | | | S |
| DL2-51 | | 2 | 2 | | | E | | D | | | | SW |
| DL2-52 | | | | | | | | | | | | S |
| DL2-53 | | | | | | | | | | | | S |
| DL2-54 | | | | | | | | | | | | S |
| DL2-55 | | | | | | | | | | | | |
| DL2-56 | | | | | | | | | | | | S |
| DL2-57 | | | | | | | | | | | | |
| DL2-58 | | | | | | | | | | | | S |
| DL2-59 | | | | | | | | | | | | S |
| DL2-60 | | | | | | | | | | | | |
| DL2-61 | | | | | | | | | | | | |
| DL2-62 | | | | | | | | | | | | S |
| DL2-63 | | | | | | | | | | | | |
| DL2-64 | | M | | | | | | | | | | |
| DL2-65 | | | | | | | | | | | | S |
| DL2-66 | | | | | | | | | | | | S |

PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |

| Code: Year-Round | Code: Seasonal | Code: Eliminated | MEANING |
|---|---|---|---|
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05100101 | DL2-67 | USFS | 020103 | CAVE RUN LK - MAIN BODY OF LK | 380424 | 0833048 | 021 | 205 | LK | 1975 | | | | |
| 05100101 | DL2-68 | USFS | 020101 | CAVE RUN LK - TWIN KNOBS BEACH | 380454 | 0833044 | 021 | 205 | LK | 1975 | | | | |
| 05100101 | DL2-69 | USFS | 020102 | CAVE RUN LK OVER STO OUTFALL | 380506 | 0833105 | 021 | 205 | LK | 1975 | | | | |
| 05100101 | DL2-70 | KY003 | | RES AND TRIPLETT C MOREHD U WAT PL | 381053 | 0832550 | 021 | 205 | SW | 1946 | | Y | | |
| 05100101 | DL2-71 | USGS | 03250000 | TRIPLETT CREEK AT MOREHEAD, KY. | 381104 | 0832548 | 021 | 205 | SW | 1978 | 1979 | | 47.50 | Y |
| 05130101 | DL2-72 | USCE | 3LAU20004 | LAUREL R MI 15.1 | 365636 | 0840945 | 021 | 235 | LK | 1974 | | N | | |
| 05130101 | DL2-73 | USCE | 3LAU20003 | LAUREL R MI 7.7 | 365652 | 0841417 | 021 | 235 | LK | 1974 | | N | | |
| 05130101 | DL2-74 | USCE | 3LAU20002 | LAUREL R MI 2.8 | 365753 | 0841547 | 021 | 235 | LK | 1974 | | N | | |
| 05130101 | DL2-75 | USCE | 3LAU20007 | LAUREL R MI 21.0 | 365802 | 0840728 | 021 | 235 | LK | 1974 | | N | | |
| 05130101 | DL2-76 | KY001 | 02029900 | LAUREL R RESERVOIR HGWY 312 | 365809 | 0840738 | 021 | 235 | SW | 1977 | | N | | |
| 05130101 | DL2-77 | USGS | 03405000 | LAUREL R AT CORBIN,KY. | 365809 | 0840738 | 021 | 235 | SW | 1949 | 1973 | N | 201.00 | |
| 05100204 | DL2-78 | USGS | 03283100 | RED RIVER NEAR PINE RIDGE, KY. | 374911 | 0833429 | 021 | 237 | SW | 1968 | 1976 | | 142.00 | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

### PHYSICAL and CHEMICAL

| CODE NUMBER | PHYSICAL: Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media | CHEMICAL: Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-67 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DL2-68 | N | | | | | N | | D | | | | | | | | | | | | | | | | | | | | | |
| DL2-69 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DL2-70 | | | B | B | B | B | | | B | B | | | B | | | | | | | | | | | | | | | | |
| DL2-71 | K | K | | | | | | D | | | | | | | | | | | | | | | | | | | | | |
| DL2-72 | Q | Q | Q | | | Q | Q | C | Q | Q | Q | | Q | | Q | | | | | | | | | | | | Q | | C |
| DL2-73 | Q | Q | Q | | | Q | Q | C | Q | Q | Q | | Q | | Q | | | | | | | | | | | | Q | | C |
| DL2-74 | Q | Q | Q | | | Q | Q | | Q | Q | Q | | Q | | Q | | | | | | | | | | | | Q | | |
| DL2-75 | Q | Q | Q | | | Q | Q | C | Q | Q | Q | | Q | | Q | | | | | | | | | | | | Q | | C |
| DL2-76 | M | M | M | | | M | M | | M | M | M | | M | | M | | | M | | | M | | A | | M | | M | | |
| DL2-77 | 4 | A | E | E | | A | | D | A | A | A | | A | | | A | | E | | | | | | | | | | A | D |
| DL2-78 | O | M | | R | | E | | D | Q | Q | Q | Q | A | E | | R | | R | | | | | | | | | | E | D |

### BIOLOGIC

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-67 | N | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-68 | N | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-69 | N | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | D |
| DL2-70 | B | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-71 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-72 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-73 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-74 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-75 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-76 | M | A | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-77 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL2-78 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |

### SEDIMENT and OTHER

| CODE NUMBER | SEDIMENT: Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size Bed Material | Storage Media | OTHER: Telemetry | S W Station Y-Yes N-No | G W Station Y-Yes N-No | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-67 | | | | | | | | | | | | S |
| DL2-68 | | | | | | | | | | | | S |
| DL2-69 | | | | | | | | | | | | S |
| DL2-70 | | | | | | | | | | | | |
| DL2-71 | | | | | | | | | | | | WS |
| DL2-72 | | | | | | | | | | | | |
| DL2-73 | | | | | | | | | | | | |
| DL2-74 | | | | | | | | | | | | |
| DL2-75 | | | | | | | | | | | | |
| DL2-76 | | M | | | | | | | | | | |
| DL2-77 | | | | | | | | | | | | SW |
| DL2-78 | | | | | | | | | | | | SW |

### PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

### DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05130105 | DL2-79 | USGS | 03414346 | HURRICANE CREEK AT CAMP GROUND, TN. | 361142 | 0850406 | 047 | 049 | SW | 1979 | | N | 15.85 | Y |
| 05130105 | DL2-80 | USGS | 03414400 | EF OBEY R NR CLARKRANGE, TENN. | 361403 | 0850406 | 047 | 049 | SW | 1965 | 1965 | | | |
| 05130104 | DL2-81 | USGS | 03408600 | LONG BRANCH NEAR GRIMSLEY, TENN | 361532 | 0845740 | 047 | 049 | SW | 1976 | | N | 1.11 | |
| 05130104 | DL2-82 | USTVA | 600054 | TRIB. TO S.PRONG CLEAR FORK R. | 361532 | 0845740 | 047 | 049 | SW | 1976 | | | | |
| 05130105 | DL2-83 | USGS | 03414430 | EAST FORK OBEY RIVER NEAR WILDER, TN. | 361624 | 0850240 | 047 | 049 | SW | 1979 | | N | 116.51 | Y |
| 05130104 | DL2-84 | USGS | 03408550 | NORTH PRONG CLEAR FORK NEAR GRIMSLEY,TN | 361825 | 0845435 | 047 | 049 | SW | 1979 | | N | 27.10 | N |
| 05130104 | DL2-85 | USGS | 03408815 | CROOKED CREEK NEAR ALLARDT,TENN | 362259 | 0845450 | 047 | 049 | SW | 1976 | | N | 3.62 | |
| 05130104 | DL2-86 | USTVA | 600049 | TRIB. TO CLEAR FK. R. NR ALLARDT | 362259 | 0845450 | 047 | 049 | SW | 1975 | 1979 | | | |
| 05130105 | DL2-87 | USGS | 03414470 | BUFFALO COVE C NR BOATLAND, TENN. | 362306 | 0850034 | 047 | 049 | SW | 1965 | | | 23.40 | Y |
| 05130104 | DL2-88 | USTVA | 600050 | TRIB. TO CLEAR FK. R. AT ALLARDT | 362328 | 0845444 | 047 | 049 | SW | 1976 | 1979 | | | |
| 05130104 | DL2-89 | USGS | 03408810 | CROOKED CREEK TRIBUTARY NEAR ALLARDT, TENN | 362330 | 0845443 | 047 | 049 | SW | 1976 | | N | .25 | |
| 05130104 | DL2-90 | USTVA | 600052 | TRIB. TO CROOKED CR. 16.5 | 362330 | 0845443 | 047 | 049 | SW | 1975 | | | | |
| 05130105 | DL2-91 | TN001 | GF66321 | EF OBEY R TENN | 362400 | 0850200 | 047 | 049 | SW | 1968 | 1969 | | | |
| 05130104 | DL2-92 | USTVA | 600053 | TRIB. TO MILL CR. NR ALLARDT | 362422 | 0845148 | 047 | 049 | SW | 1976 | 1979 | | | |
| 05130104 | DL2-93 | USTVA | 600051 | NEAR JAMESTOWN | 362442 | 0845441 | 047 | 049 | SW | 1976 | | | | |
| 05130105 | DL2-94 | USGS | 03414500 | EAST FORK OBEY RIVER NEAR JAMESTOWN, TENN. | 362458 | 0850135 | 047 | 049 | SW | 1965 | | N | 202.00 | Y |
| 05130105 | DL2-95 | USCE | 3DAL10014 | | 362500 | 0850108 | 047 | 049 | SW | 1972 | 1976 | N | | |
| 05130105 | DL2-96 | USGS | 03415960 | WOLF RIVER AT WOLF RIVER, TN | 363214 | 0845709 | 047 | 049 | SW | 1979 | | N | 41.00 | Y |
| 05130105 | DL2-97 | USGS | 03415975 | ROTTEN FORK WOLF RIVER NEAR PALL MALL, TN. | 363220 | 0845656 | 047 | 049 | SW | 1979 | | N | 21.61 | Y |
| 05130105 | DL2-98 | USGS | 03414340 | EAST FORK OBEY RIVER AT OBEY CITY, TN | 361102 | 0850953 | 047 | 133 | SW | 1979 | | | 34.60 | Y |
| 05130105 | DL2-99 | USGS | 03414680 | WEST FORK OBEY RIVER NEAR ALLRED, TN | 361852 | 0851053 | 047 | 133 | SW | 1979 | | | 70.80 | Y |
| 05130106 | DL2-100 | USGS | 03418000 | ROARING RIVER NEAR HILHAM, TENN. | 362027 | 0852535 | 047 | 133 | SW | 1964 | 1965 | | 78.70 | Y |
| 05130106 | DL2-101 | TN001 | GF34176 | TOWN B NR LIVINGSTON TENN | 362148 | 0852026 | 047 | 133 | SW | 1964 | 1967 | | | |
| 05130105 | DL2-102 | TN001 | GF66221 | WF OBEY R TENN | 362300 | 0851200 | 047 | 133 | SW | 1968 | 1969 | | | |
| 05130105 | DL2-103 | USGS | 03415000 | WEST FORK OBEY RIVER NEAR ALPINE, TENN. | 362349 | 0851028 | 047 | 133 | SW | 1965 | | | 115.00 | Y |
| 05130105 | DL2-104 | USCE | 3DAL10015 | | 362406 | 0851010 | 047 | 133 | SW | 1972 | 1976 | N | | |
| 05130105 | DL2-105 | USCE | 3DAL20010 | | 362650 | 0850855 | 047 | 133 | LK | 1971 | 1977 | Y | | |
| 05130105 | DL2-106 | USCE | 3DAL20010 | WEST FORK OBEY RIVER MI 1.8 00001190 | 362653 | 0850857 | 047 | 133 | SW | 1971 | | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

PHYSICAL / CHEMICAL

| CODE NUMBER | Physical: Temperature | Specific conductance | Turbidity | Color | Odor | pH | Suspended solids | Storage media | Chemical: Dissolved solids | Major ions | Hardness | Silica | Phosphorus | Phosphorus species | Nitrogen | Nitrogen species | Detergents | Other minor elements | Radioactivity | Radiochemical species | Carbon | Organic groups | Pesticides species | Other organic species | Biochemical oxygen demand | Chemical oxygen demand | Dissolved oxygen | Other dissolved gases | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-79 | A | A | | | | A | | D | Q | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DL2-81 | Q | Q | | | | Q | | D | Q | | | | | | | | | | | | | | | | | | | | D |
| DL2-82 | N | R | A | | | N | N | D | M | N | E | A | A | E | Q | A | | N | | | Q | A | | | | | A | | D |
| DL2-83 | A | A | | | | A | | D | Q | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-84 | A | A | | | | A | | D | Q | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-85 | Q | Q | | | | Q | | D | Q | | | | | | | | | | | | | | | | | | | | D |
| DL2-86 | M | M | Q | | | M | M | D | M | M | E | Q | Q | E | Q | Q | | M | | | Q | | | | | | R | | D |
| DL2-87 | A | A | | | | A | | D | Q | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-88 | M | M | Q | | | M | M | D | H | M | R | Q | Q | R | Q | Q | | M | | | Q | | | | | | R | | D |
| DL2-89 | Q | Q | | | | Q | | D | Q | | | | | | | | | | | | | | | | | | | | D |
| DL2-90 | M | M | Q | | | M | M | D | M | M | E | Q | Q | E | Q | Q | | M | | | Q | | | | | | R | | D |
| DL2-91 | B | | | | | B | | C | | | | | | | | | | | | | | | | | | | B | | C |
| DL2-92 | M | Q | Q | | | M | M | D | M | M | E | Q | Q | E | Q | Q | | M | | | Q | | | | | | R | | D |
| DL2-93 | M | M | Q | | | M | M | D | M | M | E | Q | Q | E | Q | Q | | M | | | R | | | | | | R | | D |
| DL2-94 | S | S | | E | | E | | D | E | E | E | E | | E | | E | | R | | | | | | | | | | | D |
| DL2-95 | A | A | A | | | A | A | D | A | A | A | | A | | A | A | | A | | | | | | | | | | | D |
| DL2-96 | A | A | | | | A | | D | Q | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-97 | A | A | | | | A | | D | Q | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-98 | A | A | | | | A | | D | | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-99 | A | A | | | | A | | D | | A | | | | | | | | A | | | | | | | | | | | D |
| DL2-100 | 2 | M | | E | | E | | D | E | E | E | E | E | E | E | E | | E | | | | | | | | | | | D |
| DL2-101 | C | | | | | C | | | | | | | | | | | | | | | | | | | | | C | | |
| DL2-102 | B | | | | | B | | C | | | | | | | | | | | | | | | | | | | B | | C |
| DL2-103 | M | M | | | | | | | Q | | | | | | | | | R | | | | | | | | | | | D |
| DL2-104 | A | A | A | | | A | A | D | A | A | A | | A | | A | A | | A | | | | | | | | | | | D |
| DL2-105 | A | A | A | | | A | A | D | A | A | K | | K | | A | K | | K | | | | | | | | | A | | D |
| DL2-106 | M | M | M | | | M | | C | M | B | M | | M | | M | | | | | | | | | | | | M | | C |

BIOLOGIC

| CODE NUMBER | Enteric bacteria | Native bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro invertebrates | Macro invertebrates | Vertebrates | Fungi | Viruses | Primary productivity | Secondary productivity | Chemosynthetic activity | Biostimulatory activity | Toxicity test | Other bioassay test | Chemical tissue test | Histopathological analysis | Other tissue analysis | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-79 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-80 | | | | | | | | | | | | | | | | | | | | | |
| DL2-81 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-82 | | | | | | | | | | | | | | | | | | | | | |
| DL2-83 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-84 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-85 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-86 | | | | | | | | | | | | | | | | | | | | | |
| DL2-87 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-88 | | | | | | | | | | | | | | | | | | | | | |
| DL2-89 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-90 | | | | | | | | | | | | | | | | | | | | | |
| DL2-91 | | | | | | | | | | | | | | | | | | | | | |
| DL2-92 | | | | | | | | | | | | | | | | | | | | | |
| DL2-93 | | | | | | | | | | | | | | | | | | | | | |
| DL2-94 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-95 | | | | | | | | | | | | | | | | | | | | | |
| DL2-96 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-97 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-98 | | | | | | | | | | | | | | | | | | | | | |
| DL2-99 | | | | | | | | | | | | | | | | | | | | | |
| DL2-100 | | | | | | | | | | | | | | | | | | | | | |
| DL2-101 | | | | | | | | | | | | | | | | | | | | | |
| DL2-102 | | | | | | | | | | | | | | | | | | | | | |
| DL2-103 | | | | | | | | Q | | | | | | | | | | | | | D |
| DL2-104 | | | | | | | | | | | | | | | | | | | | | |
| DL2-105 | | | A | | | | | | | | | | | | | | | | | | D |
| DL2-106 | | | | | | | | | | | | | | | | | | | | | |

SEDIMENT / OTHER

| CODE NUMBER | Bed load | Concentration (suspended) | Sediment discharge (suspended) | Concentration (total) | Sediment discharge (total) | Particle size (suspended) | Particle size (bed material) | Storage media | Telemetry | S.W. station years nmo | G.W. station years nmo | Data bank source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL2-79 | | A | A | | | A | | D | | Y | | S |
| DL2-80 | | | | | | | | | | | | S |
| DL2-81 | | Q | | | | | | D | | Y | | W |
| DL2-82 | | | | | | A | | D | | | | S |
| DL2-83 | | A | A | | | A | | D | | Y | | S |
| DL2-84 | | A | A | | | A | | D | | Y | | S |
| DL2-85 | | Q | | | | | | D | | Y | | W |
| DL2-86 | | | | | | | | | | | | S |
| DL2-87 | | A | A | | | A | | D | | | | S |
| DL2-88 | | | | | | | | | | | | S |
| DL2-89 | | Q | | | | | | D | | Y | | W |
| DL2-90 | | | | | | | | | | | | S |
| DL2-91 | | | | | | | | | | | | |
| DL2-92 | | | | | | | | | | | | S |
| DL2-93 | | | | | | | | | | | | S |
| DL2-94 | | Q | | | | | | D | | Y | | SW |
| DL2-95 | | | | | | | | | | | | S |
| DL2-96 | | A | A | | | A | | D | | Y | | S |
| DL2-97 | | A | A | | | A | | D | | Y | | S |
| DL2-98 | | A | A | | | A | | D | | Y | | S |
| DL2-99 | | A | A | | | A | | D | | Y | | S |
| DL2-100 | | | | | | | | | | Y | | SW |
| DL2-101 | | | | | | | | | | | | |
| DL2-102 | | | | | | | | | | | | |
| DL2-103 | | Q | | | | | | D | | Y | | SW |
| DL2-104 | | | | | | | | | | | | S |
| DL2-105 | | | | | | | | | | | | S |
| DL2-106 | | | | | | | | | | | | |

## PARAMETER FREQUENCY CODES

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | B | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA A: LISTING 3

Sources of ground-water-quality data in the Daniel Boone National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05130101 | DL3-1 | USGS | 365129083325501 | HARRIS FAMILY | 365129 | 0833255 | 021 | 013 | GW | 1954 | 1954 | N | | |
| 05100203 | DL3-2 | USGS | 370032083355001 | C.R. SMITH | 370032 | 0833550 | 021 | 051 | GW | 1954 | 1954 | N | | |
| 05100203 | DL3-3 | USGS | 370357083480401 | L. HACKER | 370357 | 0834804 | 021 | 051 | GW | 1954 | 1954 | N | | |
| 05100203 | DL3-4 | USGS | 370430083333401 | FRONTIER NURSING SERVICE | 370430 | 0833334 | 021 | 051 | GW | 1955 | 1955 | N | | |
| 05100202 | DL3-5 | USGS | 370655083335201 | G.W. REVIS | 370655 | 0833352 | 021 | 051 | GW | 1955 | 1955 | N | | |
| 05100203 | DL3-6 | USGS | 370702083383401 | C. LEBFORD | 370702 | 0833834 | 021 | 051 | GW | 1955 | 1955 | N | | |
| 05100202 | DL3-7 | USGS | 371245083380201 | S. HENSLEY | 371245 | 0833802 | 021 | 051 | GW | 1954 | 1954 | N | | |
| 05100203 | DL3-8 | USGS | 371304083421501 | C. WEBB | 371304 | 0834215 | 021 | 051 | GW | 1954 | 1954 | N | | |
| 05100203 | DL3-9 | USGS | 371622083385501 | P. DAVIDSON | 371622 | 0833855 | 021 | 051 | GW | 1954 | 1954 | N | | |
| 05100203 | DL3-10 | USGS | 371712083474901 | P. WOOD | 371712 | 0834749 | 021 | 051 | GW | 1955 | 1955 | N | | |
| 05100203 | DL3-11 | USGS | 371738083400401 | N.C. ABNER | 371738 | 0834004 | 021 | 051 | GW | 1955 | 1955 | N | | |
| 05100204 | DL3-12 | USGS | 374350083453801 | MILLER PREWITT& GOFF FARM | 374350 | 0834538 | 021 | 065 | GW | 1968 | 1968 | | | |
| 05100204 | DL3-13 | USGS | 374353083550101 | WILLIAMS FARM | 374353 | 0835501 | 021 | 065 | GW | 1968 | 1968 | | | |
| 05100204 | DL3-14 | USGS | 374400083560801 | DELLY SHULER | 374400 | 0835608 | 021 | 065 | GW | 1953 | 1953 | N | | |
| 05100204 | DL3-15 | USGS | 374420083460301 | B.F. CREECH HEIRS FARM | 374420 | 0834603 | 021 | 065 | GW | 1968 | 1968 | | | |
| 05130102 | DL3-16 | USGS | 372546083595801 | JIM B. FOX | 372546 | 0835958 | 021 | 109 | GW | 1954 | 1954 | N | | |
| 05100204 | DL3-17 | USGS | 372817083534501 | E. BRYANT | 372817 | 0835345 | 021 | 109 | GW | 1954 | 1954 | N | | |
| 05100204 | DL3-18 | USGS | 373007083562101 | A.J. LAKES | 373007 | 0835621 | 021 | 109 | GW | 1954 | 1954 | N | | |
| 05130101 | DL3-19 | USGS | 365609084194301 | CUMBERLAND MIN. #1-SOBER | 365609 | 0841943 | 021 | 125 | GW | 1966 | 1966 | | | |
| 05130101 | DL3-20 | USGS | 365857084104301 | B.P. SIZEMORE | 365857 | 0841043 | 021 | 125 | GW | 1955 | 1955 | N | | |
| 05130101 | DL3-21 | USGS | 365913084173601 | ROSCOE TURNER | 365913 | 0841736 | 021 | 125 | GW | 1955 | 1955 | N | | |
| 05130102 | DL3-22 | USGS | 370107084193501 | CUMBERLAND NAT'L FOREST | 370107 | 0841935 | 021 | 125 | SP | 1955 | 1955 | N | | |
| 05130101 | DL3-23 | USGS | 370131084141601 | LOUIS MORGAN | 370131 | 0841416 | 021 | 125 | GW | 1954 | 1954 | N | | |
| 05130102 | DL3-24 | USGS | 370648084124401 | JOHN BONAIR | 370648 | 0841244 | 021 | 125 | GW | 1955 | 1955 | N | | |
| 05100204 | DL3-25 | USGS | 373101083525901 | J. C. MAYS | 373101 | 0835259 | 021 | 129 | GW | 1954 | 1954 | N | | |
| 05100204 | DL3-26 | USGS | 373608083455001 | MELCHER ATKINS OIL CO. | 373608 | 0834550 | 021 | 129 | GW | 1967 | 1967 | | | |
| 05100204 | DL3-27 | USGS | 373622083454401 | MELCHER ATKINS OIL CO. | 373622 | 0834544 | 021 | 129 | GW | 1967 | 1967 | | | |
| 05100201 | DL3-28 | USGS | 370727083314301 | UNITED FUEL GAS CO. | 370727 | 0833143 | 021 | 131 | GW | 1954 | 1954 | N | | |
| 05100203 | DL3-29 | USGS | 370913083285701 | A. CAUDILL | 370913 | 0832857 | 021 | 131 | GW | 1954 | 1954 | N | | |
| 05100202 | DL3-30 | USGS | 371106083254101 | E. LAGERVELD | 371106 | 0832541 | 021 | 131 | GW | 1954 | 1954 | N | | |
| 05100202 | DL3-31 | USGS | 371152083221301 | R. DEATON | 371152 | 0832213 | 021 | 131 | GW | 1954 | 1954 | N | | |
| 05100202 | DL3-32 | USGS | 371443083230001 | P. HUFF | 371443 | 0832300 | 021 | 131 | GW | 1954 | 1954 | N | | |
| 05100202 | DL3-33 | USGS | 371612083230201 | R. SIZMORE | 371612 | 0832302 | 021 | 131 | GW | 1954 | 1954 | N | | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL | | | | | | | | CHEMICAL | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | pH | SUSPENDED SOLIDS | STORAGE MEDIA | DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
| DL3-1 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-2 | E | E | | | | E | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-3 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-4 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-5 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-6 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-7 | E | E | | | | E | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-8 | E | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | | D |
| DL3-9 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-10 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-11 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-12 | | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL3-13 | | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL3-14 | E | E | | | | | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-15 | | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL3-16 | E | E | | | | E | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-17 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-18 | E | E | | | | E | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-19 | | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL3-20 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-21 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-22 | E | E | | | | E | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-23 | E | E | | | | | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-24 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-25 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-26 | | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL3-27 | | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL3-28 | | E | | | | E | | D | E | E | | | | | | | | E | | | | | | | | | | | D |
| DL3-29 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-30 | | | | | | | | | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-31 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-32 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-33 | E | E | | | | E | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |

| CODE NUMBER | BIOLOGIC | | | | | | | | | | | | | | | | | | | | | SEDIMENT | | | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA | BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA | TELEMETRY | S W STATION YYES NNO | G W STATION YYES NNO | DATA BANK SOURCE |
| DL3-1 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-2 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-3 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-4 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-5 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-6 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-7 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-8 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-9 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-10 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-11 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-12 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-13 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-14 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-15 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-16 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-17 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-18 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-19 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-20 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-21 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-22 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-23 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-24 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-25 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-26 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-27 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-28 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-29 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-30 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-31 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-32 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |
| DL3-33 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | | | | | | | | | | | | | S |

### PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

### DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DL3-34 | USGS | 370927082383201 | LEVISA STORE CO. | 370927 | 0823832 | 021 | 133 | GW | 1962 | 1962 | N | | |
| 05130101 | DL3-35 | USGS | 363717084213901 | F.A.CREEKMORE | 363717 | 0842139 | 021 | 147 | GW | 1955 | 1955 | N | | |
| 05130104 | DL3-36 | USGS | 363939084395001 | LEWIS HILL | 363939 | 0843950 | 021 | 147 | SP | 1954 | 1954 | N | | |
| 05130101 | DL3-37 | USGS | 363946084194701 | JAMES M.BAIRD | 363946 | 0841947 | 021 | 147 | GW | 1955 | 1955 | N | | |
| 05130104 | DL3-38 | USGS | 364139084422801 | CEPHUS RICE | 364139 | 0844228 | 021 | 147 | GW | 1968 | 1968 | | | |
| 05130101 | DL3-39 | USGS | 364810084260701 | BEAULAH HEIGHTS ORPHANAGE | 364810 | 0842607 | 021 | 147 | GW | 1955 | 1955 | N | | |
| 05130101 | DL3-40 | USGS | 364848084222401 | WILLIAM C.BRYANT | 364848 | 0842224 | 021 | 147 | GW | 1954 | 1954 | N | | |
| 05130101 | DL3-41 | USGS | 365031084272401 | EDWARD B. FARLEY | 365031 | 0842724 | 021 | 147 | GW | 1955 | 1955 | N | | |
| 05130101 | DL3-42 | USGS | 365127084232401 | J.E.PATRICK | 365127 | 0842324 | 021 | 147 | GW | 1954 | 1954 | N | | |
| 05130103 | DL3-43 | USGS | 365133084264001 | POOL 18 | 365133 | 0842640 | 021 | 147 | GW | 1973 | 1973 | | | |
| 05130103 | DL3-44 | USGS | 365137084271301 | E. TAYLOR #20 | 365137 | 0842713 | 021 | 147 | GW | 1958 | 1966 | Y | | |
| 05130103 | DL3-45 | USGS | 365137084271401 | E. TAYLOR #21 | 365137 | 0842714 | 021 | 147 | GW | 1958 | 1966 | Y | | |
| 05130103 | DL3-46 | USGS | 365138084264101 | E. TAYLOR #12 | 365138 | 0842641 | 021 | 147 | GW | 1958 | | Y | | |
| 05130103 | DL3-47 | USGS | 365139084271001 | E. TAYLOR#19 | 365139 | 0842710 | 021 | 147 | GW | 1958 | 1966 | Y | | |
| 05130103 | DL3-48 | USGS | 365143084264801 | E. TAYLOR #16 | 365143 | 0842648 | 021 | 147 | GW | 1958 | 1966 | Y | | |
| 05130103 | DL3-49 | USGS | 365144084270201 | E. TAYLOR #17 | 365144 | 0842702 | 021 | 147 | GW | 1958 | 1966 | Y | | |
| 05130103 | DL3-50 | USGS | 365144084271701 | ELMER TAYLOR | 365144 | 0842717 | 021 | 147 | GW | 1958 | 1958 | N | | |
| 05130103 | DL3-51 | USGS | 365223084293501 | L. CORDER | 365223 | 0842935 | 021 | 147 | GW | 1958 | 1958 | N | | |
| 05130103 | DL3-52 | USGS | 365226084293001 | L. CORDER | 365226 | 0842930 | 021 | 147 | SP | 1958 | 1958 | N | | |
| 05100204 | DL3-53 | USGS | 374929083351301 | U.S. GOVERNMENT | 374929 | 0833513 | 021 | 165 | SP | 1954 | 1959 | N | | |
| 05100204 | DL3-54 | USGS | 375137083383301 | LESLIE BROWN | 375137 | 0833833 | 021 | 165 | GW | 1955 | 1955 | N | | |
| 05100204 | DL3-55 | USGS | 375149083382801 | FRENCHBURG JOB CORPS | 375149 | 0833828 | 021 | 165 | GW | 1966 | 1966 | | | |
| 05100204 | DL3-56 | USGS | 375150083383901 | U.S. FOREST SERVICE | 375150 | 0833839 | 021 | 165 | GW | 1965 | 1965 | | | |
| 05100204 | DL3-57 | USGS | 375159083384001 | FRENCHBURG JOB CORPS | 375159 | 0833840 | 021 | 165 | GW | 1966 | 1966 | | | |
| 05100204 | DL3-58 | USGS | 375449083351801 | C.J. SMALLWOOD | 375449 | 0833518 | 021 | 165 | GW | 1954 | 1954 | N | | |
| 05100101 | DL3-59 | USGS | 375704083375401 | F.D. JACKSON | 375704 | 0833754 | 021 | 165 | GW | 1955 | 1955 | N | | |
| 05100101 | DL3-60 | USGS | 375914083311901 | CORDELL MANN | 375914 | 0833119 | 021 | 165 | GW | 1955 | 1955 | N | | |
| 05100101 | DL3-61 | USGS | 375941083292301 | T.A. SILVERMAN | 375941 | 0832923 | 021 | 165 | GW | 1967 | 1967 | | | |
| 05100101 | DL3-62 | USGS | 380209083201201 | TINY LEWIS | 380209 | 0832012 | 021 | 175 | GW | 1954 | 1954 | N | | |
| 05100101 | DL3-63 | USGS | 380321083174501 | CLARENCE EASTERLING | 380321 | 0831745 | 021 | 175 | GW | 1954 | 1954 | N | | |
| 05100203 | DL3-64 | USGS | 372036083424001 | MS. OPAL PETERS | 372036 | 0834240 | 021 | 189 | GW | 1954 | 1954 | N | | |
| 05100202 | DL3-65 | USGS | 371910083273501 | PETE BOWLING | 371910 | 0832735 | 021 | 193 | GW | 1955 | 1955 | N | | |
| 05100202 | DL3-66 | USGS | 372053083283201 | E.O. ROBINSON | 372053 | 0832832 | 021 | 193 | GW | 1954 | 1954 | N | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

PHYSICAL / CHEMICAL

| CODE NUMBER | PHYSICAL: TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA | CHEMICAL: DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL3-34 | E | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | | D |
| DL3-35 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-36 | E | E | | | | | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-37 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-38 | | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL3-39 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-40 | E | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | | D |
| DL3-41 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-42 | E | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | | D |
| DL3-43 | A | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| DL3-44 | A | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | E | D |
| DL3-45 | A | E | | A | | E | | D | A | E | E | E | | | | A | | E | | | | | | | | | | E | D |
| DL3-46 | A | A | | A | | A | | D | A | A | A | A | A | | | A | | A | | | | | | | | | | A | D |
| DL3-47 | A | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | E | D |
| DL3-48 | E | E | | A | | E | | D | A | E | E | E | | | | A | | E | | | | | | | | | | E | D |
| DL3-49 | A | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | E | D |
| DL3-50 | | E | | | | E | | D | E | E | E | E | | | | | | E | | | | | | | | | | E | D |
| DL3-51 | | E | | | | E | | D | | E | E | E | | | | | | E | | | | | | | | | | E | D |
| DL3-52 | | E | | | | E | | D | | E | E | E | | | | | | E | | | | | | | | | | E | D |
| DL3-53 | E | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | E | D |
| DL3-54 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-55 | | A | | | | A | | D | A | A | A | A | | | | | | | | | | | | | | | | | D |
| DL3-56 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DL3-57 | | A | | | | A | | D | A | A | A | A | | | | | | | | | | | | | | | | | D |
| DL3-58 | E | E | | | | | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-59 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-60 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-61 | | A | | | | A | | D | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL3-62 | E | E | | E | | E | | D | E | E | E | E | | | | E | | E | | | | | | | | | | | D |
| DL3-63 | E | E | | | | | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-64 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-65 | E | | | | | | | D | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-66 | E | E | | | | E | | D | | E | E | | | | | E | | E | | | | | | | | | | | D |

BIOLOGIC / SEDIMENT / OTHER

| CODE NUMBER | BIOLOGIC: ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA | SEDIMENT: BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE BED MATERIAL | STORAGE MEDIA | OTHER: TELEMETRY | S W STATION | G W STATION | DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL3-34 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| DL3-35 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-36 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-37 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-38 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-39 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-40 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-41 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-42 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-43 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-44 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-45 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-46 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | D | | | | | | | | D | | | Y | SWW |
| DL3-47 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-48 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-49 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-50 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-51 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-52 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-53 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-54 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-55 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-56 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-57 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-58 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-59 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-60 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-61 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-62 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-63 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-64 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-65 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |
| DL3-66 | | | | | | | | | | | | | | | | | 4 | 7 | 0 | 4 | | | | | | | | | | | | | S |

PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05100204 | DL3-67 | USGS | 374503083454901 | H. JAMES MULLINS FARM | 374503 | 0834549 | 021 | 197 | GW | 1968 | 1968 | | | |
| 05100204 | DL3-68 | USGS | 374557083454601 | M.D. WARMAN FARM | 374557 | 0834546 | 021 | 197 | GW | 1968 | 1968 | | | |
| 05100204 | DL3-69 | USGS | 374631083405101 | NATURAL BRIDGE,KY STATE PK | 374631 | 0834051 | 021 | 197 | GW | 1951 | 1957 | Y | | |
| 05100204 | DL3-70 | USGS | 374839083483801 | U.S. FOREST SERVICE | 374839 | 0834838 | 021 | 197 | GW | 1953 | 1953 | N | | |
| 05100204 | DL3-71 | USGS | 375056083430601 | H.B. FARMER | 375056 | 0834306 | 021 | 197 | GW | 1953 | 1953 | N | | |
| 05130102 | DL3-72 | USGS | 370156084230701 | VICTOR L. BLEVINS | 370156 | 0842307 | 021 | 199 | GW | 1955 | 1955 | N | | |
| 05130102 | DL3-73 | KY003 | | SPRING LIVINGSTON WATER PLANT KY | 371806 | 0841312 | 021 | 203 | SP | 1958 | | Y | | |
| 05130102 | DL3-74 | USGS | 372028084114101 | J.W. RUPPE | 372028 | 0841141 | 021 | 203 | GW | 1954 | 1954 | N | | |
| 05130102 | DL3-75 | USGS | 372040084134401 | L&N R.R. | 372040 | 0841344 | 021 | 203 | SP | 1954 | 1954 | N | | |
| 05130102 | DL3-76 | USGS | 372218084160401 | GEORGE W. BAKER | 372218 | 0841604 | 021 | 203 | GW | 1954 | 1954 | N | | |
| 05130102 | DL3-77 | USGS | 372454084113101 | W.M. STEWARD | 372454 | 0841131 | 021 | 203 | GW | 1954 | 1954 | N | | |
| 05130102 | DL3-78 | USGS | 372543084142701 | WM GREEN | 372543 | 0841427 | 021 | 203 | GW | 1954 | 1954 | N | | |
| 05130102 | DL3-79 | USGS | 372756084113501 | J.L. PHILLIPS | 372756 | 0841135 | 021 | 203 | GW | 1954 | 1954 | N | | |
| 05100101 | DL3-80 | USGS | 380733083233401 | CHARLIE BOWMAN | 380733 | 0832334 | 021 | 205 | SP | 1953 | 1953 | N | | |
| 05100101 | DL3-81 | USGS | 381901083264001 | BILL ANDERSON | 381901 | 0832640 | 021 | 205 | GW | 1953 | 1953 | N | | |
| 05100101 | DL3-82 | USGS | 381906083233701 | GEORGE ARTHUR | 381906 | 0832337 | 021 | 205 | GW | 1953 | 1953 | N | | |
| 05130101 | DL3-83 | USGS | 363940084104801 | M.S. DAVENPORT | 363940 | 0841048 | 021 | 235 | GW | 1955 | 1955 | N | | |
| 05130101 | DL3-84 | USGS | 365525084132001 | L.S. HENSLEY | 365525 | 0841320 | 021 | 235 | GW | 1952 | 1954 | Y | | |
| 05100201 | DL3-85 | USGS | 374217083405601 | SUDIE SPANGLER | 374217 | 0834056 | 021 | 237 | GW | 1954 | 1954 | N | | |
| 05100201 | DL3-86 | USGS | 374310083393801 | J.G. LEGG | 374310 | 0833938 | 021 | 237 | GW | 1954 | 1954 | N | | |
| 05100204 | DL3-87 | KY003 | | WELLS CAMPTON WATER PLANT KY | 374412 | 0833252 | 021 | 237 | GW | 1961 | | Y | | |
| 05100204 | DL3-88 | USGS | 374532083363801 | ORPHA CHENAULT | 374532 | 0833638 | 021 | 237 | GW | 1955 | 1955 | N | | |
| 05100204 | DL3-89 | USGS | 374600083313301 | HAROLD ROSE | 374600 | 0833133 | 021 | 237 | GW | 1954 | 1954 | N | | |
| 05100204 | DL3-90 | USGS | 374633083380001 | KY DRILLING&OPERATING CO. | 374633 | 0833800 | 021 | 237 | GW | 1962 | 1962 | N | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

**PHYSICAL**

| CODE NUMBER | TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|
| DL3-67 | | A | | | | A | | D |
| DL3-68 | | A | | | | A | | D |
| DL3-69 | E | E | | E | | E | | D |
| DL3-70 | E | E | | | | | | D |
| DL3-71 | E | E | | | | | | D |
| DL3-72 | E | E | | | | E | | D |
| DL3-73 | | | B | B | B | B | | |
| DL3-74 | E | E | | | | E | | D |
| DL3-75 | E | E | | | | E | | D |
| DL3-76 | E | E | | | | E | | D |
| DL3-77 | E | E | | | | E | | D |
| DL3-78 | E | | | | | | | D |
| DL3-79 | E | E | | | | E | | D |
| DL3-80 | E | E | | | | | | D |
| DL3-81 | E | E | | | | | | D |
| DL3-82 | | E | | | | | | D |
| DL3-83 | E | E | | | | E | | D |
| DL3-84 | E | E | | E | | E | | D |
| DL3-85 | E | E | | | | | | D |
| DL3-86 | E | E | | | | | | D |
| DL3-87 | | | B | B | B | B | | |
| DL3-88 | E | | | | | | | D |
| DL3-89 | E | E | | | | | | D |
| DL3-90 | | E | | | | E | | D |

**CHEMICAL**

| CODE NUMBER | DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL3-67 | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL3-68 | A | A | A | A | | | | | | A | | | | | | | | | | | D |
| DL3-69 | E | E | E | E | | | | E | | E | | | | | | | | | | E | D |
| DL3-70 | E | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-71 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-72 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-73 | B | B | | | B | | | | | | | | | | | | | | | | |
| DL3-74 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-75 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-76 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-77 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-78 | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-79 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-80 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-81 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-82 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-83 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-84 | E | E | E | E | | | | E | | E | | | | | | | | | | | D |
| DL3-85 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-86 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-87 | B | B | | | B | | | | | | | | | | | | | | | | |
| DL3-88 | | E | | | | | | | | | | | | | | | | | | | D |
| DL3-89 | | E | E | | | | | E | | E | | | | | | | | | | | D |
| DL3-90 | E | E | E | | | | | | | E | | | | | | | | | | | D |

**BIOLOGIC**

| CODE NUMBER | ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL3-67 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-68 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-69 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-70 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-71 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-72 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-73 | B | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-74 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-75 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-76 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-77 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-78 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-79 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-80 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-81 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-82 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-83 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-84 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-85 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-86 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-87 | B | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-88 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-89 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |
| DL3-90 | | | | | | | | | | | | | | | | | 4 | 7 | O | 4 | |

**SEDIMENT / OTHER**

| CODE NUMBER | BED LOAD | CONCENTRATION SUSPENDED | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA | TELEMETRY | S W STATION VIVES NINO | G W STATION VIVES NINO | DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL3-67 | | | | | | | | | | | | S |
| DL3-68 | | | | | | | | | | | | S |
| DL3-69 | | | | | | | | | | | | S |
| DL3-70 | | | | | | | | | | | | S |
| DL3-71 | | | | | | | | | | | | S |
| DL3-72 | | | | | | | | | | | | S |
| DL3-73 | | | | | | | | | | | | |
| DL3-74 | | | | | | | | | | | | S |
| DL3-75 | | | | | | | | | | | | S |
| DL3-76 | | | | | | | | | | | | S |
| DL3-77 | | | | | | | | | | | | S |
| DL3-78 | | | | | | | | | | | | S |
| DL3-79 | | | | | | | | | | | | S |
| DL3-80 | | | | | | | | | | | | S |
| DL3-81 | | | | | | | | | | | | S |
| DL3-82 | | | | | | | | | | | | S |
| DL3-83 | | | | | | | | | | | | S |
| DL3-84 | | | | | | | | | | | | S |
| DL3-85 | | | | | | | | | | | | S |
| DL3-86 | | | | | | | | | | | | S |
| DL3-87 | | | | | | | | | | | | |
| DL3-88 | | | | | | | | | | | | S |
| DL3-89 | | | | | | | | | | | | S |
| DL3-90 | | | | | | | | | | | | S |

**PARAMETER FREQUENCY CODES**

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H· | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

**STORAGE MEDIA CODES**

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

**TELEMETRY CODES**

| Code | Meaning |
|---|---|
| 1 | Telemotor-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

**DATA SOURCE CODES**

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05130106 | DL3-91 | USGS | 03417797 | LIVINGSTON SPRING NEAR LIVINGSTON, TENN | 362159 | 0851958 | 047 | 133 | SP | 1962 | 1964 | | | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

### PHYSICAL

| CODE NUMBER | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media |
|---|---|---|---|---|---|---|---|---|
| DL3-91 | M | | | | | | | P |

### CHEMICAL

| CODE NUMBER | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL3-91 | | | E | | | | | | | | | | | | | | | | | | P |

### BIOLOGIC

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL3-91 | | | | | | | | | | | | | | | | | | | | | |

### SEDIMENT

| CODE NUMBER | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media |
|---|---|---|---|---|---|---|---|---|
| DL3-91 | | | | | | | | |

### OTHER

| CODE NUMBER | Telemetry | S W Station Y=YES N=NO | G W Station Y=YES N=NO | Data Bank Source |
|---|---|---|---|---|
| DL3-91 | | N | | |

## PARAMETER FREQUENCY CODES

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

## SUPPLEMENTAL DATA B

Annotated bibliography of investigations pertinent to coal mining and water resources in the Daniel Boone National Forest study area.

SUPPLEMENTAL DATA B: SUMMARY 1

Annotated bibliography of hydrologic studies performed in small areas of the Daniel Boone National Forest area.

REFERENCE CODE: DB/S1-1

TITLE: Influences of Strip Mining on the Hydrologic Environment of Parts of Beaver Creek Basin, Kentucky

GEOGRAPHICAL AREA: Beaver Creek Basin, Kentucky
Wayne County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The series of reports, that is being published by the U.S. Geological Survey as Professional Paper 427, is the product of a cooperative study by several Federal and State agencies. The physical environment of the study areas and the history of mining in the basin are described in the first report, Professional Paper 427-A (Musser, 1963). Results obtained during the study period 1955-59 and definitions of terms are given in the second report, Professional Paper 427-B (Collier and others, 1964). The third report, Professional Paper 427-C (Collier, Pickering, and Musser, 1970), described the results of the investigation since 1955 with emphasis on the period 1959-66. With the end of the 1966 water year, the project became dormant until the 1974 water year when the project was reactivated for 1 year. The purpose of the reactivation was to determine the changes in the hydrologic characteristics of Cane Branch after the intervening 7 years.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)

McCabe, J. A., Influences of strip mining on the hydrologic environment of parts of Beaver Creek basin, Kentucky, 1973-74: U.S. Geological Survey Professional Paper 427-D.

Collier, C. R., Pickering, R. J., Musser, J. J., 1970, Influences of strip mining on the hydrologic environment of parts of Beaver Creek basin, Kentucky 1955-66: U.S. Geological Survey Professional Paper 427-C, 80 p.

McCabe, J. A., 1970, Precipitation and runoff: U.S. Geological Survey Professional Paper 427-C, p. C5-C9.

Hopkins, H. T., and Mull, D. S., 1970, Groundwater: U.S. Geological Survey Professional Paper 427-C, p. C9-C14.

Musser, J. J., and Pickering, R. J., 1970, Geochemistry of water: U.S. Geological Survey Professional Paper 427-C, p. C14-C30.

Collier, C. R., 1970, Erosion and sedimentation: U.S. Geological Survey Professional Paper 427-C, p. C31-C46.

Henly, J. P., 1970, Stream bottom fauna: U.S. Geological Survey Professional Paper 427-C, p. C46-C49.

Sheridan, J. R., 1970, Fish population: U.S. Geological Survey Professional Paper 427-C, p. C50-C53.

REFERENCE CODE: DB/S1-1--Continued.

Weaver, R. H., and Nash, H. D., 1970, Microbiology of streams: U.S. Geological Survey Professional Paper 427-C, p. C53-C57.

Sigafoos, R. S., 1970, Tree growth: U.S. Geological Survey Professional Paper 427-C, p. C57-C59.

Collier, C. R., and others, 1964, Influences of strip mining on the hydrologic environment of parts of Beaver Creek basin, Kentucky, 1955-59: U.S. Geological Survey Professional Paper 427-B, 85 p.

Musser, J. J., 1963, Description of physical environment and of strip-mining operations in parts of Beaver Creek basin, Kentucky: U.S. Geological Survey Professional Paper 427-A, 25 p.

REFERENCE CODE: DB/S1-2

TITLE: Effectiveness of Surface Mine Sedimentation Ponds

GEOGRAPHICAL AREA: Breathitt and Perry Counties, Kentucky

PURPOSE, OBJECTIVE, AND(OR) RESULTS:
Nine sedimentation ponds at surface coal mining operation in Pennsylvania, West Virginia, and Kentucky were evaluated for reducing suspended solids in storm runoff. The ponds were sampled during baseline and rainfall events. Theoretical and actual suspended solids removal efficiencies were compared. Major problems resulted from poor construction and inadequate maintenance. Suspended solid removal efficiencies were generally much lower essentially correct under baseline conditions. Generally, theoretical removal efficiencies were much higher than actual efficiencies during rainfall.

PUBLISHED REPORTS AND(OR) ARTICLES:
Kathuria, D. V., Nawrocki, M. A., and Becker, B. C., 1976, Effectiveness of surface mine sedimentation ponds: Hittman Associates, Inc., Columbia, Maryland, EPA-600/2-76-117, 100 p.

AVAILABLE FROM:
The National Technical Information Service
Springfield, Virginia 22161
as PB-258 917

REFERENCE CODE: DB/S1-3

TITLE: Study of Water Quality of Laurel Lake

STARTING DATE: May 1975

GEOGRAPHICAL AREA: Laurel River basin, Kentucky

AREAL EXTENT: 300 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Current sampling activities are designed to define existing water-quality conditions in and downstream of the reservoir and its tributaries. Once sufficient physical, chemical and biological data are collected, means to alleviate existing and anticipated water-quality problems will be studied.

DATA AVAILABLE FROM:
Corps of Engineers
Nashville District
P.O. Box 1070
Nashville, Tennessee 37202

REFERENCE CODE: DB/S1-4

TITLE: Floods on Triplett Creek in Vicinity of Morehead, Kentucky

COMPLETION DATE: 1969

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This report was prepared by the U.S. Geological Survey to further the objectives of the Appalachian Regional Commission. It presents hydrologic data that can be used to evaluate the extent depth and frequency of floods that affect the economic development of flood plains of Triplett Creek and its tributaries in a selected area at Morehead, Kentucky. The data provide a technical basis for solving existing flood-plain problems and formulating regulations for land use and development that will reduce future flood damage. The report will be useful for preparing building and zoning regulations, locating waste disposal and water treatment facilities, and developing recreational areas.

The approximate areas that would be inundated by floods with 5-, 25-, and 50-year recurrence intervals on Triplett Creek and its tributaries in the vicinity of Morehead are shown on the topographic map.

PUBLISHED REPORTS AND(OR) ARTICLES:
Hannum, C. H., 1969, Floods in Triplett Creek in vicinity of Morehead, Kentucky: U.S. Geological Survey Hydrologic Investigations Atlas HA-342.

REFERENCE CODE: DB/S1-5

TITLE: The Effects of Strip Mining on the Microbiology of a Stream Free from Domestic Pollution

GEOGRAPHICAL AREA: McCreary County, Kentucky

PURPOSE, OBJECTIVES AND(OR) RESULTS:
The microflora of Cane Branch, McCreary County, Kentucky, which drains a strip-mined area, and Helton Branch, which drains a similar but non-mined area, were studied to determine the biological effects of acid mine drainage. Numbers and types of bacteria, fungi, yeasts, and algae from both surface and bottom samples, as well as temperature and pH were studied to learn the changes of ecology with dilution and recovery. These data are tabulated by season and stream. Iron oxidizing bacteria appear to be indigenous in acid mine water and directly associated with acid formation. Ferrobacillus ferroxidans was found in Cane Branch in all seasons, but only in summer in Helton Branch. The lowering of pH to 3.0-4.1 from 6.3-6.7, with an increase in sulfates and almost total elimination of bicarbonate alkalinity, resulted in the alteration of microflora in Cane Branch, primarily the establishment of F. ferroxidans. The role of fungi in stream chemistry is as yet unknown. Cane Branch algae growth and diversity of types increased with distance from the surface of pollution where bumilleria, which is found only in streams with acid mine waste, was the only genus present.

PUBLISHED REPORTS AND(OR) ARTICLES:
Weaver, R. H., and Nash, H. D., 1968, The effects of strip mining on the microbiology of a stream free from domestic pollution: Symposium on Coal Mine Drainage Research, Mellon Institute, Pittsburg, Pennsylvania.

AVAILABLE FROM:
Author
Kentucky University
Department of Microbiology
Lexington, Kentucky

REFERENCE CODE: DB/S1-6

TITLE: The Effects of Acid Mine Pollution on the Fish Population of Goose Creek, Clay County, Kentucky

GEOGRAPHICAL AREA: Clay County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
To appraise the effect of acid mine water discharged into a creek from a coal mine, the density of fish population was recorded by utilizing an electric shocker. The yield in the unpolluted part of the creek averaged 61.3 lbs/acre, whereas that in the polluted part only 5.38 lbs/acre. About 70 percent of shocked fish were recovered. The minimum economic loss caused by the pollution of the creek was estimated to be $13,325.

REFERENCE CODE: DB/S1-6--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:
Turner, W. R., 1967, The effects of acid mine pollution on the fish population of Goose Creek, Clay County, Kentucky: Biology of Water Pollution, p. 192-193.

AVAILABLE FROM:
Kentucky State Department of Fish and Wildlife Resources
Frankfort, Kentucky

REFERENCE CODE: DB/S1-7

TITLE: Fish and Benthic Populations of the New River, Tennessee

GEOGRAPHICAL AREA: New River, Big South Fork, and Clear Fork River basins, northeastern Tennessee

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The objective of this study is to provide information on the benthic and fish populations that occur in the system under study. Twenty-two sampling stations on the New River and Big South Fork, and six stations on the Clear Fork River were established for collection of benthic macroinvertebrate and fish populations. Benthic organisms were collected with a Surber sampler from riffle areas at each station. Fish population estimates were made using the catch per unit effort technique by electrofishing a confined area at each station except those too large for efficient sampling. High discharge areas were sampled with gill nets and electrofished for two hours. Alkalinity, pH, conductivity and temperature were also measured at each station.

Chemical analysis indicates that acid mine drainage as well as sedimentation are serious problems in the New River Watershed. Benthic populations were seriously degraded in tributary streams stressed by acid mine drainage and in the main stem of the New River below these tributaries; however, there was a gradual improvement of benthic populations in the lower reaches of the New River and upper Big South Fork.

Fish populations were reduced at the seriously stressed stations; however, fairly high concentration of fish were found in the moderately stressed areas. Species of Cyprinidae, Catostomidae, Centrarchidae and Percidae were commonly collected at nearly all stations, and Ictaluridae was collected at only a few stations. Game fish (Centrarchidae) represented a significant proportion of the fish populations at many of the stations and indicates that the potential for a productive fishery exists if environmental conditions are improved.

REFERENCE CODE: DB/S1-7--Continued.

The Clear Fork River is a typically soft water system with low pH and alkalinity, indicating that this system is very fragile and cannot tolerate any inputs of acid mine drainage. Most of the tributaries and nearly all of the main stem of the New River show some degree of stress resulting from acid mine drainage and sedimentation originating from the coal-mined areas. Further biological analysis is needed to provide added insight into the existing biological conditions and establish a more workable set of baseline data needed for future monitoring. Identification of all tributary streams contributing degraded water quality to the New River that require reclamation should be ascertained by chemical and biological sampling. (From author's abstract.)

PUBLISHED REPORTS AND(OR) ARTICLES:

Brazinski, M. J., 1979, Fish populations of the New River, Tennessee, a system receiving acid coal mine drainage: M.S. Thesis, Tennessee Technological University, Cookeville, Tennessee.

Winger, P. V., Bettoli, P., Brazinski, M. J., and Lakey, C., 1977, Fish and benthic populations of the New River, Tennessee: Tennessee Technological University, Cookeville, final report to U.S. Fish and Wildlife Service.

AVAILABLE FROM:

Tennessee Technological University
Cookeville, Tennessee 38501

REFERENCE CODE: DB/S1-8

TITLE: Strip Mine Drainage Water Quality with Emphasis on Toxic Substances

STARTING DATE: June 1976

GEOGRAPHICAL AREA: Cumberland River basin, Fentress County, Tennessee

AREAL EXTENT: 6 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

The purpose of this study is to develop an easily used planning level model that can predict the potential impact of proposed mining scenarios on water quality and the downstream aquatic biota based on readily measurable physical site characteristics. Hydrologic data are being collected by the U.S. Geological Survey at three small watersheds in Fentress County, Tennessee, two of which have area mines in them, and the other is a background watershed. Over 20 water-quality constituents are measured, and aquatic biota samples are also taken. In addition, the Geological Survey cooperates (through partial funding) with the University of Tennessee to collect hydrologic and water-quality data at six small watersheds in the New River basin (Scott and Anderson Counties, Tennessee). The U.S. Geological Survey collects the hydrologic data at these six watersheds, one of which is background; the other five contain contour mines.

REFERENCE CODE: DB/S1-8--Continued.

REPORTS (if any) AVAILABLE FROM:
Division of Water Management
Tennessee Valley Authority
448 Evans Building
Knoxville, Tennessee

REFERENCE CODE: DB/S1-9

TITLE: Effects of Acid Mine Drainage on the Stream Ecosystem of the East Fork of the Obey River, Tennessee

COMPLETION DATE: 1973

GEOGRAPHICAL AREA: Fentress County, Tennessee

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The stream ecosystem of the East Fork Obey River, Tennessee, was studied from January 1970 through December 1970. Emphasis centered on four phases of study; water qualtiy, macroinvertebrates, fish, and aquatic flora affected by acid mine drainage. Two control stations were established on the study area, one located above the pollution zone and the other located below the zone of pollution. A reservoir station was also established to detect any neutralization occurring within the reservoir below the confluence of the East Fork and West Fork.

Various water-quality parameters for Dale Hollow Reservoir, a 30,000-acre Corps of Engineers' impoundment of the Obey River, were studied from February 1971 through January 1972. Emphasis was focused upon the effects of acid mine drainage which enters the impoundment from one of the tributaries. The investigation involved two major objectives: completion of a comprehensive survey of parameters related to water quality, and determination of changes caused by acid mine drainage.

PUBLISHED REPORTS AND(OR) ARTICLES:
Nicholas, L. E., Jr., and Bulow, F. J., 1973, Effects of acid mine drainage on the stream ecosystem of the East Fork of the Obey River, Tennessee: Journal of the Tennessee Academy of Science, 48(1), p. 30-39.

Nicholas, L. E., 1973, A study of the effects of acid mine drainage on the stream ecosystem of the East Fork Obey River, Tennessee: M.S. Thesis, Tennessee Technological University, Cookeville, Tennessee.

Ragsdale, E. L., 1975, Some aspects of water quality in Dale Hollow Reservoir, Tennessee, with emphasis on the effects of acid mine drainage: M.S. Thesis, Tennessee Technological University, Cookeville, Tennessee.

Ragsdale, E. L., and Bulow, F. J., 1975, Possible effects of acid mine drainage on the water qualtiy and fish populations of Dale Hollow Reservoir, Tennessee and Kentucky: Journal of the Tennessee Academy of Science, 50(3), p. 91-95.

REFERENCE CODE: DB/S1-9--Continued.

AVAILABLE FROM:
Authors
Tennessee Technological University
Cookeville, Tennessee

REFERENCE CODE: DB/S1-10

TITLE: An Ecological Survey of the West Fork of the Obey River, Tennessee

GEOGRAPHICAL AREA: West Fork and Obey River basins, Tennessee

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A 1-year study of the West Fork of the Obey River in Overton County, Tennessee, was undertaken to survey the water quality, benthic macroinvertebrate population, and fish population. A secondary objective was to determine the effects of acid mine drainage from a small intermittent tributary stream, Cub Creek.

Water quality immediately below the zone of pollution was only slightly affected. A precipitate resulting from the reaction of sulfuric acid and iron salts with carbonates covered the bottom below the sources of pollution, thereby reducing the total numbers and taxonomic diversity of the benthic macroinvertebrate and fish populations. Cub Creek had a localized, detrimental effect on the water quality, benthos, and fish populations in the West Fork.

Thirteen water-quality parameters were monitored. Twenty-five invertebrate families and 29 species of fishes were identified. (Author's abstract.)

PUBLISHED REPORTS AND(OR) ARTICLES:
Carrithers, R. B., and Butow, F. J., 1973, An ecological survey of the West Fork on the Obey River, Tennessee, with emphasis on the effects of acid mine drainage: Journal of the Tennessee Academy of Science, v. 48, no. 2, p. 65-72.

Carrithers, R. B., 1971, An ecological survey of the West Fork of the Obey River, Tennessee, with special emphasis on the effects of acid mine drainage: M.S. Thesis, Tennessee Technological University, Cookeville, Tennessee

AVAILABLE FROM:
Authors
Tennessee Technological University
Cookeville, Tennessee 38501

REFERENCE CODE: DB/S1-11

TITLE: A Survey of the Benthic Macroinvertebrates of Dale Hollow Reservoir, Tennessee, with Emphasis on the Effects of Coal Mine Drainage

GEOGRAPHICAL AREA: Overton County, Tennessee

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A 1-year study of the benthos of Dale Hollow Reservoir, Tennessee, was conducted to compare the benthos of that portion of the reservoir affected by acid mine drainage to that portion of the reservoir unaffected by acid mine drainage. A second objective was to determine if benthos productivity corresponded to the greater numbers and more pounds of fish caught per hour within the three areas of the reservoir where the Tennessee Game and Fish Commission was collecting creel census data.

Benthos in the East Fork embayment, occasionally affected by acid mine drainage, did not appear to be appreciably different in qualitatively from the benthos in the West Fork embayment. Benthos tolerant to acid mine drainage were present in both embayments. The East Fork transect had an average of 70.5 organisms per square foot. The West Fork had an average of 149.4 organisms per square foot.

There were greater numbers of macrobenthic organisms at the Wolf River transect than at the Obey River transect or the reservoir proper. Creel census data indicated greater numbers, and more pounds of fish per hour were caught by fishermen in the Wolf River embayment than in the Obey River embayment or the reservoir proper.

PUBLISHED REPORTS AND(OR) ARTICLES:
Scott, M. S., 1972, A survey of the benthic macroinvertebrates of Dale Hollow Reservoir, Tennessee, with emphasis on the effects of coal mine drainage: M.S. Thesis, Tennessee Technological University, Cookeville, Tennessee

AVAILABLE FROM:
Author
Tennessee Technological University
Cookeville, Tennessee

SUPPLEMENTAL DATA B: SUMMARY 2

Annotated bibliography of studies concerning the influence of coal mining on the water resources of any small areas in Kentucky or Tennessee.

REFERENCE CODE: DB/S2-1

TITLE: Stream Water Quality in the Coal Region of Kentucky

GEOGRAPHICAL AREA: Selected counties in the Appalachian coal region

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This study was undertaken with the primary objective of establishing a water-quality data base for small, first-order unmined and surface-mined watersheds throughout Appalachia. There is a need for data which explicity show changes in water quality attributable to both old and recent surface mining. Most previous water-quality data in the study area were from watersheds so large that it was impossible to isolate the effects of surface mning from the confounding effects of other activities of man.

Small streams were sampled in selected counties in the State where coal is surface mined. Sampling was at approximate monthly intervals. The water-quality data from these streams are presented in this report and should help fill the need for data from small watersheds in Appalachia.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Dyer, K. L., Stream water quality in the coal regions of Kentucky, Part 2 of Water quality of Appalachia: U.S. Department of Agriculture, Forest Service, Berea, Kentucky.

AVAILABLE FROM:
U.S. Department of Agriculture
Forest Service
Northeastern Forest Experiment Station
Route 2, Kentucky Highway 21 East
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-2

TITLE: Effects of Coal Mining on the Hydrologic Environment, Pike County, Kentucky

STARTING DATE: July 1975

GEOGRAPHICAL AREA: East-central Kentucky

AREAL EXTENT: 6 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Surface mining for coal upstream from Fishtrap Reservoir, Pike County, Kentucky, has altered the natural environment considerably. Ongoing investigations have shown a marked increase in sediment loads in streams, an extremely high rate of sedimentation of the reservoir, and deterioration in chemical quality of water in the streams and reservoir. A unique opportunity for studying the hydrologic environment before, during, and

REFERENCE CODE: DB/S2-2--Continued.

after surface mining exists in the watershed of Grapevine Creek. Data on sediment and acid production by strip-mine operations would be useful to action agencies in controlling and managing mining activities and practices, and in planning and designing future reservoirs. The objectives of this study are: (1) To establish a data base for the unmined Grapevine Creek basin including streamflow, chemical quality, sediment, land use, and physiographic characteristics; (2) to record the effects of surface mining on sediment loads and pollution of streams and to relate these effects to changes in the use of land surface by comparison with data predating mining; (3) to record the effects of required reclamation on the above parameters for a period of several years, using the study in the Beaver Creek basin, McCreary County, Kentucky, as a model. Streamflow, water quality, and physiographic data are to be collected before and during the period of mining and reclamation. A stream-gaging and automatic sediment-sampling station will be installed and operated at the mouth of Dicks Fork, one of the tributaries to be mined. A similar station on Grapevine Creek is in operation and will be maintained. Chemical-quality data will be collected monthly at these two stations and periodically at about 10 other tributaries to Grapevine Creek. The physiographic parameters will be compiled from aerial photographs, maps, and field observations to cover the mined and non-mined tributaries.

PUBLISHED REPORTS AND(OR) ARTICLES:

(Soon to be published)
Dysart, J. E., Hydrology and surface-water quality of the Grapvine Creek basin, Pike County, Kentucky: U.S. Geological Water-Resources Investigation.

(Soon to be published)
Dysart, J. E., Effects of coal mining on small streams of the Levisa Fork basin, Kentucky: U.S. Geological Survey Water-Resources Investigation.

(Soon to be published)
Dysart, J. E., Downstream effects of coal mining on the surface-water quality of the Levisa Fork basin, Kentucky-Virginia: U.S. Geological Survey Water-Resources Investigation.

NAME AND ADDRESS OF INVESTIGATOR:

Author
U.S. Geological Survey, WRD
600 Federal Place
Louisville, Kentucky 40204

REFERENCE CODE: DB/S2-3

TITLE: Water from Coal Mines in Johnson and Martin Counties, Kentucky

STARTING DATE: July 1975

GEOGRAPHICAL AREA: Eastern Kentucky

AREAL EXTENT: 495 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Small communities in eastern Kentucky historically have had problems of water supply. The recent increase in coal-mining activity and the resulting increase in population has in some communities placed critical demands on the existing water supplies. In addition, many communities can expect limited economic growth and development due to the lack of a dependable source of water. A possible source of water is abandoned coal mines. This investigation is the first attempt to evaluate abandoned coal mines as potential sources of water. Definition of the factors that control the utilization of abandoned mines for this purpose could have significant impact on the economic growth and development of small communities in eastern Kentucky. The purpose of this study is to provide industries, communities, and individuals with geologic and hydrologic information on potential water supplies from coal mines. The objectives of this study are to: (1) Inventory mines which are supplying water and determine what construction techniques were used to develop the water supply from each mine; (2) measure the yield from each mine. Estimates of yield may be obtained from former mine employees. Modified pumping tests may be used where mines are tapped by drilled wells. Water flowing from mines may be measured with current meter or stopwatch and bucket; (3) conduct field tests for pH, specific conductance, total acidity/alkalinity, collect samples for laboratory analysis for chemical constituents and fecal and total coliform; (4) draw maps showing the regional correlation of water-producing coal mines.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Mull, D. S., Cordiviola, S., Risser, D. W., Water from underground coal mines in Johnson and Martin Counties, Kentucky: U.S. Geological Survey Water-Resources Investigation.

NAME AND ADDRESS OF INVESTIGATOR:
Authors
U.S. Geological Survey
600 Federal Place
Louisville, Kentucky 40202

REFERENCE CODE: DB/S2-4

TITLE: Effect of Surface Mining on Storm Flow and Peak Flow from Six Small Basins in Eastern Kentucky

GEOGRAPHICAL AREA: Eastern Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Hydrologic records from six small eastern Kentucky watersheds were analyzed to determine the effect of surface mining on storm flows and peak flows. Average storm-flow volumes were not changed by surface mining, whereas average peak flows were increased 36 percent. Peak flow increases were only in the summer. Smaller peak flows are doubled; moderate ones are increased by about a third; peak flows around 100 csm seem to be largely unaffected; and the larger peak flows may have been reduced by surface mining. The maximum annual storm flows, usually in winter or spring, appeared slightly reduced. No time trend in either storm flows or peak flows could be detected in 5 years of postmining record. Surface mining is not a serious floodwater discharge problem. (Author's abstract.)

PUBLISHED REPORTS AND(OR) ARTICLES:
Bryan, B. A., and Hewlett, J. D., 1981, Effect of surface mining on storm flow and peak flow from six small basins in eastern Kentucky: American Water Resources Association, Water Resources Bulletin, v. 17, no. 2, p. 290-299.

Bryan, B. A., and Hewlett, J. D., 1979, The effect of strip mining on the headwater hydrograph of eastern Kentucky: Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, Lexington, Kentucky, 1979, p. 51-55.

AVAILABLE FROM:
Authors
School of Forest Resources
Athens, Georgia 30602

REFERENCE CODE: DB/S2-5

TITLE: Surface Mining and the Hydrologic Balance

GEOGRAPHICAL AREA: Breathitt County, Kentucky, and Raleigh County, West Virginia

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Research by the U.S. Forest Service at Berea, Kentucky, has shown that surface mining results in increases in storm peak flows during and immediately after mining, but that peaks may be significantly lower after reclamation is completed. Data from experimental sites in Breathitt County, Kentucky, and Raleigh County, West Virginia, during major rainstorms on April 4, 1977, and December 8, 9, and 10, 1978, showed that

REFERENCE CODE: DB/S2-5--Continued.

streamflow from surface-mined watersheds peaked lower than that from adjacent or nearby unmined watersheds. Impoundments on surface-mined lands can be effective in controlling runoff and erosion provided the ponds are properly constructed. Erosion and subsequent sedimentation are greatest during early stages of mining, but diminish rapidly as the land is reclaimed and vegetation growth progresses. (From U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980).

PUBLISHED REPORTS AND(OR) ARTICLES:

Curtis, W. R., 1979, Surface mining and the hydrologic balance: Mining Congress Journal, p. 35-40.

Curtis, W. R., 1978, Effects of surface mining on hydrology, erosion, and sedimentation in eastern Kentucky: Fourth Kentucky Coal Refuse and Utilization Seminar, Pineville, Kentucky, Proceedings.

Curtis, W. R., 1977, Hydrological aspects of surface mining: Annual Meeting of the Society of American Foresters, Albuquerque, New Mexico, Proceedings.

Curtis, W. R., 1977, Surface mining and the flood of April 1977: U.S. Department of Agriculture Forest Service Research Note, NE 248, 4 p.

Curtis, W. R., 1974, Sediment yield from strip mined watersheds in eastern Kentucky: Second Research and Applied Technology Symposium on Mined Land Reclamation, Louisville, Kentucky, Proceedings, p. 88-100.

Curtis, W. R., 1972, Strip mining increases flood potential of mountain watersheds: National Symposium on Watersheds in Transition, Fort Collins, Colorado, Proceedings, p. 357-360.

NAME AND ADDRESS OF INVESTIGATOR:

Author
U.S. Department of Agriculture
Northeastern Forest Experiment Station
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-6

TITLE: Fluvial Sediment Study of Fishtrap and Dewey Lake Drainage Basins, Kentucky-Virginia

GEOGRAPHICAL AREA: Pike and Johnson Counties, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

Fourteen drainage basins above Fishtrap and Dewey Lakes, and ranging in size from 1.68 to 297 $mi^2$ in eastern Kentucky and southeastern Virginia were studied to determine origin and magnitudes of sediment. Sediment

REFERENCE CODE: DB/S2-6--Continued.

yields from surface-mined area ranged from 2,890 to 21,000 tons/sq mi/yr, and from 732 to 3,470 tons/sq mi/yr from non-strip-mined areas. Water and sediment discharge from storms on surface-mined areas are similar to data from an earlier study in the Beaver Creek basin of Kentucky. Aerial photos are used to compare areas disturbed by surface and deep mining. Deposition rates and trap-efficiency figures are given. Chemical-quality studies indicate that man's activities have altered chemical quality of the water in Levisa Fork, but not greatly affected the chemical quality of the water in Johns Creek basin. (Author's abstract.)

PUBLISHED REPORTS AND(OR) ARTICLES:

Curtis, W. F., Flint, R. F., Russell, F., George, F. H., and Santos, J. F., 1978, Fluvial sediment study of Fishtrap and Dewey Lakes drainage basins, Kentucky-Virginia: U.S. Geological Survey Water-Resources Investigations 78-037.

AVAILABLE FROM:

National Technical Information Service
Springfield, Virginia 22161
as AD-A 056-573

REFERENCE CODE: DB/S2-7

TITLE: Evaluation of the Volumes and Characteristics of Mine Waste Effluents of three Strip Mine Localities in Eastern Kentucky and Their Potential Environmental Impacts

GEOGRAPHICAL AREA: Breathitt, Perry, and Letcher Counties, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

The three study sites in the Hazard Coal-Reserve District are all either on the North Fork of the Kentucky River, or on a tributary to the North Fork. One site is in Breathitt County, one in Perry County, and the third, where the study was of the shortest duration, in Letcher County. The report describes the stratigraphy of the coal beds, the soils, and site characteristics, and gives results of analyses of overburden, coals, and water samples from mine effluents and receiving streams. Only at the site in Perry County, where the relatively high sulfur Hazard #9 coal was being mined, was acid drainage a potential problem. Increases in chemical parameters in mine effluents were reduced as mining ended and the sites were reclaimed. Sediment was judged to be much more of a problem than degradation of the chemical quality of the water. It was also concluded that using settling ponds to remove sediment was not a satisfactory control method in the hilly terrain of eastern Kentucky.

PUBLISHED REPORTS AND(OR) ARTICLES:

Leung, S. S., and Hester, N. C., 1978, Evaluation of the volumes and characteristics of mine waste effluents of three strip mine localities in eastern Kentucky and their potential environmental impacts: Eastern Kentucky University, Richmond, Kentucky, 297 p.

REFERENCE CODE: DB/S2-8

TITLE: The Effects of Mine Acid on the Pond River Watershed in Western Kentucky

GEOGRAPHICAL AREA: Pond River Basin
Muhlenberg and Mclean Counties, Kentucky

AREAL EXTENT: 799 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The effects of $H_2SO_4$ formed in unreclaimed coal mines were discussed. The acid was found to flow into lower swamp areas where it caused considerable damage to the ecosystem. The major effect was the mass destruction of thousands of trees and various other phreatophtic plants, resulting in wildlife migrating out of the affected areas. New methods of mine acid abatment were considered to make mass reclamation of the area more realistic now than in the past.

PUBLISHED REPORTS AND(OR) ARTICLES:
Dyer, R., 1977, The effects of mine acid on the Pond River watershed in western Kentucky: U.S. Geological Survey Water-Resources Bulletin, v. 13, no. 5, p. 1069-1074.

NAME AND ADDRESS IN INVESTIGATOR:
Author
Western Kentucky University
Bowling Green, Kentucky

REFERENCE CODE: DB/S2-9

TITLE: Effect of Strip Mining on Water Quality in Small Streams in Eastern Kentucky

GEOGRAPHICAL AREA: Breathitt County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Streamflow data are analyzed to show the effects of strip mining on chemical quality of water in six first-order streams in Breathitt County, Kentucky. All these watersheds were unmined in August 1967, but five have since been strip mined. The accumulated data from this case history study indicate that strip mining causes large increases in the concentration of most major dissolved constituents in the runoff waters, the concentration of most of these reaching a maximum sometime after mining has ceased, then holding steady for several years. The maximum concentration of dissolved salts occurred during the low flow of the dormant season, whereas maximum salt loads occurred during the high flow of the early part of the growing season. (From U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980).

REFERENCE CODE: DB/S2-9--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:

Dyer, K. L., and Curtis, W. R., 1977, Effect of strip mining on water quality in small streams in eastern Kentucky, 1967-75: U.S. Department of Agriculture Forest Service Research Paper NE 372, 13 p.

Curtis, W. R., 1973, Effects of strip mining on hydrology of small mountain watersheds in Appalachia: Ecology and Reclamation of Devastated Land, (R. J. Hutnik and Grant Davis, editors), v. 1, Gordon and Breach, New York, p. 145-157.

Curtis, W. R., 1972, Chemical changes in streamflow following surface mining in eastern Kentucky: Symposium on Coal Mine Drainage Research, 4th, Mellon Institute, Pittsburg, Pennsylvania, Proceedings, p. 19-31.

NAME AND ADDRESS OF INVESTIGATOR:

Authors
U.S. Department of Agriculture
Northeastern Forest Experiment Station
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-10

TITLE: Onsite Control of Sedimentation Utilizing the Modified Block-Cut Method of Surface Mining

GEOGRAPHICAL AREA: Perry and Letcher Counties, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

A detailed survey, including a geologic investigation, was conducted at the project site on Lower Lick Fork, Perry and Letcher Counties, Kentucky. The preliminary plans presented in this report include a description of the method, construction design and schedule, projected mine water quality and quantity, and estimates of capital and operating costs. (Author's abstract.)

PUBLISHED REPORTS AND(OR) ARTICLES:

Haan, C. T., 1977, Onsite control of sedimentation utilizing the modified block-cut method of surface mining: University of Kentucky, Kentucky Department of Natural Resources and Environmental Protection, and Watkins and Associates, Inc., Report to Laboratory, Cincinnati, Ohio, Interagency Energy-Environmental Research and Development Program Report, EPA-600/7-77-068, 101 p.

AVAILABLE FROM:

The National Technical Informtion Service
Springfield, Virginia 22161
as PB-272 244.

REFERENCE CODE: DB/S2-11

TITLE: Acid Lake Renovation

GEOGRAPHICAL AREA: Muhlenberg County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Five acid lakes created in 1967 during surface coal mining at the Peabody Coal Company's River Queen Mine in Muhlenberg County, Kentucky, were successfully restored through treatment with limestone. The treatment applied was 44.8 metric tons of agricultural limestone/HA on problem areas within each lake's watershed, and certain extremely toxic areas caused by extensive waste coal and gob were covered by grading. The limestone was blown over the lake surface using a truck with blower attachment, except at lake 5 where only the watershed was treated. The lakes, all extremely acidic prior to treatment (pH 3.0-4.3), attained the state water-quality standard of pH 6.0 within 6 months, again with the exception of lake 5, which took 18 months. Renovation costs never exceeded estimated costs of draining and filling, and ranged from 10-100 percent of those costs. Before treatment, all lakes were devoid of fish, and fauna consisted primarily of chironomid and ceratopogonid larvae and a few aquatic beetle species. The only aquatic vascular plants were the Cattail Typhaslatiofolia (all lakes) and narrow-leafed Cattail T. Angustifolia (lake 2 only). After treatment, diverse communities of vertebrates and invertebrates appeared, mostly through natural invasion, but supplemented by fish stocking. Macroinvertebrate orders increased from four to nine; frogs, toads, turtles, and snakes appeared; and wetland birds and mammals appeared or increased.

PUBLISHED REPORTS AND(OR) ARTICLES:
Rosso, W. A., 1977, Acid Lake renovation: Symposium on Coal Mine Drainage Research, 7th, Louisville, Kentucky, 1979, p. 61-70.

AVAILABLE FROM:
Peabody Coal Company
Regional Lab
Central City, Kentucky

REFERENCE CODE: DB/S2-12

TITLE: Sampling of Water Quality

GEOGRAPHICAL AREA: Breathitt County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
To determine what frequency of sampling would provide the best estimate of water quality from the fewest samples; samples were analyzed weekly from six first-order streams in eastern Kentucky over 7 water years. Results indicate that baseline water quality can be adequately defined by sampling every 2 weeks for 1 year. Biweekly sampling was also adequate during and immediatly after surface mining. Monthly sampling was found to be generally adequate a year or more after mining was completed. Regression analyses indicated that specific conductance can be used to estimate the concentrations of dissolved solids and of dissociated ions such as calcium, magnesium, and sulfate. (From U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980.)

REFERENCE CODE: DB/S2-12--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:

Curtis, W. R., 1976, Sampling for water quality: National Bureau of Standards Special Publication 464, Methods and Standards for Environmental Measurements, IMR Symposium, 8H, Gaithersburg, Maryland, 1975, p. 237-244.

NAME AND ADDRESS OF INVESTIGATOR:

Author
U.S. Department of Agriculture
Northeastern Forest Experiment Station
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-13

TITLE: Debris Basins for Control of Surface Mine Sedimentation

COMPLETION DATE: June 1976

GEOGRAPHICAL AREA: Dicks Fork and Rhoades Branch watersheds, Pike County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

Dicks Fork and Rhoades Branch watersheds in hilly eastern Kentucky were shown to be acceptable sites for demonstration of the feasibility of debris basins in controlling water pollution. The sites are in areas where very little erosion-causing activity has occurred and where surface mining is to be initiated. Adjacent "virgin" watersheds were also selected for each study site to provide background data on water quality where man's activities have been very limited. Pertinent site information including flow and water-quality data were gathered. Cooperation agreements were signed by the various mining companies assuring access and data availability. (Adapted from author's abstract.)

PUBLISHED REPORTS AND(OR) ARTICLES:

Kimball, R. L., 1976, Debris basins for control of surface mine sedimentation: Report of Kentucky Department for Natural Resources and Conservation and U.S. Environmental Protection Agency, Industrial Environmental Research Laboratory, Cincinnati, Ohio, Environmental Protection Technology Series, EPA-600/2-76-108, 48 p.

REFERENCE CODE: DB/S2-14

TITLE: Reclamation of Orphan Strip-Mined Land in Southern Illinois and Western Kentucky

GEOGRAPHICAL AREA: Clear Creek Swamp, Western Kentucky

AREAL EXTENT: 0.3 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The Palzo Project is a 192-acre, surface-mined area which discharges acid drainage. It is being reclaimed by using sewage sludge as a spoil amendment and then revegetating. Water quality in the creek that drains the area was monitored at seven sampling stations by both chemical and biological analyses. Various biological diversity indexes used as indications of pollution are discussed and evaluated and found to be misleading. In Kentucky, the Clear Creek Swamp area has been caused by the filling of stream channels by erosion from farmlands. Some parts of the swamp are affected by acid drainage from mining in the watershed. Both water quality and biota of the swamp were studied. (Gleason and Russell, 1977).

PUBLISHED REPORTS AND(OR) ARTICLES:
Leuthart, C. A., 1975, Reclamation of orphan strip mined land in southern Illinois and western Kentucky--a field study of the Palzo Project of Williamson County, Illinois, and the Clear Creek Swamp of Webster and Hopkins Counties, Kentucky: Ph.D. Thesis, University of Louisville, University microfilms 75-25, 471, 225 p.

REFERENCE CODE: DB/S2-15

TITLE: Surface Mine Pollution Abatement and Land Use Impact Investigation

GEOGRAPHICAL AREA: Breathitt County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Volume I of a five-volume series presents a general introduction to the physical, socioeconomic, and data characteristics of eastern Kentucky. Topics covered relating to the physical characteristics of eastern Kentucky include geology, topography, climate, water resources, pedology, vegetation, and minerals. A discussion of the population, education, employment, income, housing, and social and economic literature is included in the section relating to the social and economic characteristics of the area. Water quality, coal geology, revegetation-reclamation, satellite and aerial imagery, and land use data are discussed, and apparent data deficiencies are presented. Emphasis in the examination of each topic is on its relationship to the mining industry, or to land use and environmental problems. A discussion of the Inventory Map of Surface Mined Lands in Eastern Kentucky is included; the map is found in Volume V. Volumes II-

REFERENCE CODE: DB/S2-15--Continued.

V present: (II) Watershed Ranking Selection of the Study Area: Analysis of the Study Area (Quicksand Watershed, Breathitt County, KY); (III) Considerations of Post Mining Land Use, Mine Inventory and Abatement Plan for the Quicksand Watershed; (IV) An Investigation of Alternative Data Systems with a Recommendation for a Statewide Environmental Storage and Retrieval System; and (V) Maps.

PUBLISHED REPORTS AND(OR) ARTICLES:

Adams, W. G., 1975, Surface mine pollution abatement and land use impact investigation: Volume I--An introduction to the eastern Kentucky area and its data characteristics: Eastern Kentucky University, Richmond, Kentucky, 142 p.

Adams, W. G., 1975, Surface mine pollution abatement and land use impact investigation: Volume III--Considerations of post mining land use, mine inventory and abatement plan for the quicksand watershed: Eastern Kentucky University, Richmond, Kentucky, 25 p.

Adams, W. G., 1975, Surface mine pollution abatement and land use impact investigation: Volume V: Eastern Kentucky University, Richmond, Kentucky, 279 p.

AVAILABLE FROM:

National Technical Information Service
Springfield, Virginia 22161
as PB-272 959, PB-272 961, and PB-272 960, respectively.

REFERENCE CODE: DB/S2-16

TITLE: Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky

GEOGRAPHICAL AREA: Breathitt County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

A study was conducted on small mountain watersheds in eastern Kentucky to determine the effects of strip mining and subsequent sedimentation on fishes and bottom fauna. Following surface mining, fishes were found to be progressively eliminated from headwaters downstream. Benthic food organisms were reduced in numbers and kinds by at least 90 percent. Reproduction in darters and minnows was curtailed by siltation, either by the prevention of mating or by kill-off of fry and eggs. One species of fish was found to be able to tolerate increased silt and turbidity.

REFERENCE CODE: DB/S2-16--Continued.

Continued siltation from strip mine operations in two streams tributary to the North Fork of the Kentucky River has prevented the recovery of fish populations in those streams. All species reported from Leatherwood Creek in 1972 have been forced downsteam, and six of those species are now absent from that stream. Two other species are now missing from both streams. Populations of Semotilus atromaculatus apparently are on the increase, perhaps because of the removal of competing species. (From U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980).

PUBLISHED REPORTS AND(OR) ARTICLES:

Branson, B. A., and Batch, D. L., 1974, Additional observations on the effects of strip mining on small-stream fishes in east-central Kentucky: Transactions of Kentucky Academy of Science, 35 (3-4): 81-83.

Branson, B. A., and Batch, D. L., 1972, Effects of strip mining on small-stream fishes in east-central Kentucky: Proceedings of Biological Society, Washington, D.C., 84 (59): p. 507-518.

AVAILABLE FROM:

Authors
U.S. Department of Agriculture
Northeastern Forest Experiment Station
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-17

TITLE: Regression Techniques for Estimation of Sulfate in Streams Draining an Area Affected by Coal Mining

GEOGRAPHICAL AREA: Olney, Kentucky

AREAL EXTENT: 255 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

This paper describes the development of a regression equation which gives the relationship between specific electrical conductance and sulfate concentration. Coefficients for the formula ($Y = a + bX$) were determined using data from 465 chemical analyses made over a 17-year period at the stream-gaging station at Olney, Kentucky. This formula makes it possible to monitor long-term effects of coal mining on stream-water chemistry with specific conductance measurements and a limited number of chemical analyses.

PUBLISHED REPORTS AND(OR) ARTICLES:

Grubb, H. F., and Ryder, P. D., 1973, Regression techniques for estimation of sulfate in streams draining an area affected by coal mining: Environmental Engineering and Science Conference, 3rd, Louisville, Kentucky, Proceedings, p. 129-137.

REFERENCE CODE: DB/S2-18

TITLE: Effects of Coal Mining on the Water Resources of the Tradewater River Basin, Kentucky

GEOGRAPHICAL AREA: Hopkins and Webster Counties, Kentucky

AREAL EXTENT: 943 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The effects of coal-mine drainage on the water resources of the Tradewater River basin in the Western Coal Field region of Kentucky were evaluated (1) by synthesis and interpretation of 16 years of daily conductance data, 465 chemical analyses covering an 18-year period, 28 years of daily discharge data, and 14 years of daily suspended-sediment data from the Tradewater River at Olney; and (2) by collection synthesis, and interpretation of chemical and physical water-quality data, and water-quality data collected over a 2-year period from mined and nonmined sites in the basin. (From author's abstract.)

PUBLISHED REPORTS AND(OR) ARTICLES:
Grubb, H. F., and Ryder, P. D., 1972, Effects of coal mining on the water resources of the Tradewater River basin, Kentucky: U.S. Geological Survey Water-Supply Paper 1940, 83 p.

REFERENCE CODE: DB/S2-19

TITLE: Terraces Reduce Runoff and Erosion on Surface Mine Benches

GEOGRAPHICAL AREA: Breathitt County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Erosion with subsequent stream siltation and turbidity is probably the most important off-site effect of surface mining operations. For the industry to survive, it is imperative that erosion and sedimentation be minimized. Storm-peak runoff rates were cut in half by the terracing treatment. Suspended-sediment yield was likewise reduced. A better vegetative cover was established on the terraced plots. Terraces on strip-mine benches were installed for about 10 dollars per acre. Seedbed preparation alone is worth the cost of terracing since it means a better vegetative cover on the disturbed land. (From U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980.)

PUBLISHED REPORTS AND(OR) ARTICLES:
Curtis, W. R., 1971, Terraces reduce runoff and erosion on the surface mine benches: Journal of Soil and Water Conservation, 26 (5): p. 198-199.

NAME AND ADDRESS OF INVESTIGATOR:
Author
U.S. Department of Agriculture
Northeastern Forest Experiment Station
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-20

TITLE: Strip Mining, Erosion, and Sedimentation

GEOGRAPHICAL AREA: Breathitt County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
In Appalachia, land is being disturbed by strip mining at an alarming rate. The spoils left by strip mining represent a heterogeneous mixture of sandstone, shale, and soil. This freshly exposed unprotected material, is subject to rapid weathering and erosion. Maximum sediment yields occur during active mining operations and also during large storms thereafter. Suspended-sediment yields of over 46,000 ppm were observed from one watershed. Bedload amounted to 66,500 cubic feet per square mile of drainage area over a 2-year period from another mined watershed. (From U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980.)

PUBLISHED REPORTS AND(OR) ARTICLES:
Curtis, W. R., 1971, Strip mining, erosion, and sedimentation: Transactions of American Society of Agriculture Engineers, 14 (3): p. 434-436.

NAME AND ADDRESS OF INVESTIGATOR:
Author
U.S. Department of Agriculture
Northeastern Forest Experiment Station
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-21

TITLE: The Effect of Acid Mine Water on Flood-Plain Soils in the Western Kentucky Coalfields

GEOGRAPHICAL AREA: Hopkins County, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Laboratory and greenhouse tests were carried out to assess the extent of contamination by acid drainage from surface mines in the Clear Creek flood plain, Hopkins County, Kentucky. Analysis of water samples from a stream channel, ground water, and ponding shows a low pH which tended to increase with distance from the source of acid drainage. The soils had not only a low pH, but also a concentration of exchangeable aluminum well above the amount known to restrict plant growth. In greenhouse tests, liming and fertilizer additions overcame the toxic effects of acid soils.

PUBLISHED REPORTS AND(OR) ARTICLES:
Blevins, R. L., Bailey, H. H., and Ballard, G. E., 1970, The effect of acid mine water on flood-plain soils in the western Kentucky coalfields: Soil Science, 110 (3), p. 191-196.

NAME AND ADDRESS OF INVESTIGATOR:
Authors
University of Kentucky
Lexington, Kentucky

REFERENCE CODE: DB/S2-22

TITLE: Erosion from Abandoned Coal-Haul Roads

GEOGRAPHICAL AREA: Bell, Harlan, and Perry Counties, Kentucky

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Abandoned coal-haul roads contribute substantially to stream sedimentation, thus affecting the water quality of streams flowing from mined watersheds. Such roads represent 10 percent of total area disturbed by strip mining in eastern Kentucky. A study of abandoned coal-haul roads in eastern Kentucky showed that erosion from the road surface amounted to 2.6 and 5 inches of soil respectively for roads built on sandy silt and silt soils. This study indicates that all coal-haul roads which are to be abandoned should receive immediate treatment to insure proper drainage and surface stabilization during the period of non-use. Construction of cross channels or drainage dips, and establishment of a grass cover should be immediately accomplished upon abandonment, with tree planting to follow as the season permits. If properly bedded down and their drainage facilities and surface maintained as subsequent use might dictate, these roads could serve as access for fire control or recreational purposes. (From U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980.)

PUBLISHED REPORTS AND(OR) ARTICLES:
Weigle, W. K., 1966, Erosion from abandoned coal-haul roads: Journal of Soil and Water Conservation, 21 (3): 1 p.

NAME AND ADDRESS OF INVESTIGATOR:
Author
U.S. Department of Agriculture
Northeastern Forest Experiment Station
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-23

TITLE: Stream-Water Quality in the Coal Region of Tennessee

GEOGRAPHICAL AREA: Selected counties in the Appalachian coal region

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This study was undertaken with the primary objective of establishing a water-quality data base for small first-order unmined and surface-mined watersheds throughout Appalachia. There is a need for data which explicity shows changes in water quality attributable to both old and recent surface mining. Most previous water-quality data in the study area were from watersheds so large that it was impossible to isolate the effects of surface mining from the confounding effects of other activities of man.

REFERENCE CODE: DB/S2-23--Continued.

Small streams were sampled in selected counties in the State where coal is surface mined. Sampling was at approximate monthly intervals. The water-quality data from these streams are presented in this report and should help fill the need for data from small watersheds in Appalachia.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Dyer, K. L., Stream-water quality in the coal region of Tennessee; Part 5 of water quality of Appalachia: U.S. Department of Agriculture, Forest Service, Berea, Kentucky

AVAILABLE FROM:
U.S. Department of Agriculture
Forest Service
Northeastern Forest Experiment Station
Route 2, Kentucky Highway 21 East
Berea, Kentucky 40403

REFERENCE CODE: DB/S2-24

TITLE: Hydrologic Effects of Coal Mining in the New River Basin, Tennessee

STARTING DATE: July 1975

COMPLETION DATE: September 1980

GEOGRAPHICAL AREA: New River Basin, northeastern Tennessee

AREAL EXTENT: 384 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The general objective is to determine the effect of coal mining on water quality, sediment production, and streamflow in the New River Basin in Tennessee. Specific objectives are to derive land cover and physical parameters of the basin, characterize subbasins and monitor selected subbasins to assess integrated effects on hydrology, and characterize spatial differences in water quality and sediment transport.

The approach is to derive land cover data to characterize the basin and segment it into relatively homogeneous regions. Gaging stations will be established at the outlet of each region and at the mouth of the total basin. Six small basins with different mining activity will be monitored for surface water, water quality, and suspended sediment; three of these will have continuous sediment samplers and measurements of bedload. These will be used to establish the range of quality and runoff parameters and to calibrate digital models of the runoff, water quality, and sediment-load characteristics.

REFERENCE CODE: DB/S2-24--Continued.

Results of efforts to characterize bedload material on the main stem of New River have shown that large quantities of coarse material, dominated by coal, are mobilized during runoff events. Preliminary analysis shows that the bedload material ranges in size from fine sand to very coarse gravel and that coal accounts for well over 50 percent of the material by weight.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)

Parker, R. S., and Carey, W. P., The quality of water discharging from the New River and Clear Fork Basins, Tennessee: U.S. Geological Survey Water-Resources Investigations 80-37, 56 p.

Carey, W. P., 1979, Sediment characteristics of the New River basin, Tennessee: Symposium on surface mining hydrology, sedimentology, and reclamation, University of Kentucky, Lexington, 1979, 25 p.

Jennings, M. E., Carey, W. P., and Blevins, D. W., 1980, Field studies for verification of surface mining hydrologic models: Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, University of Kentucky, Lexington, 1980, Proceedings, p. 47-55.

AVAILABLE FROM:
Authors
U.S. Geological Survey
A-413 Federal Building
Nashville, Tennessee 37203

REFERENCE CODE: DB/S2-25

TITLE: Simulation of Effects of Contour Coal Strip Mining on Storm-Water Runoff and Pollutant Yields

GEOGRAPHICAL AREA: Six small watersheds in the New River Basin, Tennessee

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A set of mathematical models was derived and evaluated on 5 years of runoff and pollutant data in the New River, Tennessee. The six watersheds used in the study ranged in size from 429 to 2,765 acres. All but one watershed had been or was undergoing contour coal strip mining. The remaining watershed was in 100-percent forest.

The models consisted of a storm hydrograph simulator, a watershed pollutant load simulator and a site erosion simulator. The storm hydrograph simulator, TENN-I, has been optimized on numerous agricultural and urban watersheds in the Tennessee Valley. The watershed pollutant load simulator, LOAD-I, was based upon development of a mass balance that was derived from storm hydrographs and pollutographs. The soil erosion model,

REFERENCE CODE: DB/S2-25--Continued.

ERODE-I, was based upon soil erosion mechanics and overland flow. Erosion, runoff, and pollutant loads were simulated for storm events on both a real time basis and on a design storm basis. A regionalization scheme associated with the model permitted simulation of the effects of contour coal strip mining on storm water and pollutant load. (Authors' abstract.)

PUBLISHED REPORTS AND(OR) ARTICLES:

Overton, D. E., and Crosby, E. C., 1980, Simulation of effects on contour coal strip mining on storm-water runoff and pollutant yields: Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, Lexington, Kentucky, Proceedings, p. 475-480.

REFERENCE CODE: DB/S2/26

TITLE: Water Quality of Big South Fork National River and Recreation Area

STARTING DATE: January 1979

GEOGRAPHICAL AREA: New River and Clear Fork River, Cumberland River tributaries, Tennessee

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

The objective of this project is to define the water quality, sediment load, and turbidity characteristics of the Big South Fork Cumberland River and major tributaries in the Big South Fork National River and Recreation Area and relate to mining activity in the basin. Collect sufficient information to develop predictive models for forecasting flow, chemical quality, and sediment loading for use in park management.

The approach of this study is to initiate a program to monitor flow, chemical quality, and sediment transport of the New River and Clear Fork Cumberland River tributaries. Collect, at several points on the Big South Fork Cumberland River, sufficient data to characterize streams, relate water quality and sediment transport to flow, and to develop models for forecasting flow, chemical quality, and sediment transport for use in park management.

AVAILABLE FROM:

U.S. Geological Survey, WRD
Nashville, Tennessee

REFERENCE CODE: DB/S2-27

TITLE: Orphan Strip Mine Reclamation Program

STARTING DATE: May 1977

GEOGRAPHICAL AREA: Campbell, Dickenson, Scott Counties, Tennessee

AREAL EXTENT: 15 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Data are acquired to assess the effects of strip mine reclamation efforts. The data will be used for a report on strip mine reclamation and suggestions on future efforts. In addition to aquatic biota, chemical data are collected and analyzed for iron, manganese, sulfate, solids, hardness, acidity, alkalinity, dissolved oxygen, temperature, nickel, copper, zinc, chromium, and lead. Study watersheds are established at three locations within the two-state area. Stations that had comparable habitats and were ecologically similar were selectd so comparisons could be more between stations. Watersheds are located as follows: Kent Hollow and Ollis Creek, Campbell County, Tennessee; Trace Fork, Levisa Fork Drainage, Dickenson County, Virginia; Jones Branch, South Fork Drainage, Scott County, Tennessee.

REPORTS (if any) AVAILABLE FROM:
Water Quality and Ecology Branch Tennessee Valley Authority
A251 401 Building
Chattanooga, Tennessee 37401

REFERENCE CODE: DB/S2-28

TITLE: The Effect of Coal Surface Mining on the Water Quality of Mountain Drainage Basin Streams

STARTING DATE: January 1975

COMPLETION DATE: December 1975

GEOGRAPHICAL AREA: New River basin, Scott County, Tennessee

AREAL EXTENT: 0.7-4.2 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Six small watersheds, ranging from 1.7 to 11 $km^2$, within the New River Basin of Cumberland Mountains of Northern Tennessee were monitored weekly and simultaneously for water quality between January and December 1975. Three watersheds were undisturbed by mining activity and served to establish bench-mark data. The other three watersheds represented varying

REFERENCE CODE: DB/S2-28--Continued.

stages of coal mining activity, ranging from initiation of surface mining in one watershed to essentially complete stripping 3 years ago, and current deep mining activity in another. Distinct differences were observed for the variables pH, alkalinity, sulfate, calcium, magnesium, iron manganese, total solids, and suspended solids among the disturbed watersheds. The undisturbed watershed stream-constituent concentrations were quite uniform from stream to stream and from sample to sample.

PUBLISHED REPORTS AND(OR) ARTICLES:

Minear, R. A., and Tschantz, B. A., 1976, The effect of coal surface mining on the water quality of mountain drainage basin streams: Journal of the Water Pollution Control Federation, v. 48, no. 11, p. 2549-2569.

Tschantz, B. A., and Minear, R. A., 1976, Impact of coal strip mining on water quality and hydrology of east Tennessee: Research Report No. 47, University of Tennessee, Water Resources Center, 46 p.

Rose, R. R., and Minear, R. A., 1975, Some aspects of water quality and their relationship to hydrology in small coal mined drainage basins in the Cumberland Mountains: University of Tennessee, Department of Civil Engineering, American Chemical Society, Division of Environmental Chemistry Reprints 15 (1), 168-169.

AVAILABLE FROM:

(Second publication)
National Technical Information Service
Sprinfield, Virginia 22161
as PB 251-391

SUPPLEMENTAL DATA B: SUMMARY 3

Annotated bibliography of large area studies pertinent to the hydrology of the Daniel Boone National Forest area.

REFERENCE CODE: DB/S3-1

(Soon to be published)
Kiesler, J., Quinones, F., Mull, D. S., and York, K. L., Hydrology of area 13, Eastern Coal Province, Kentucky, Virginia, West Virginia: U.S. Geological Survey.

(Soon to be published)
Leist, D. W., Quinones, F., Mull, D. S., and Young, M., Hydrology of area 15, Eastern Coal Province, Kentucky, Tennessee: U.S. Geological Survey.

(Soon to be published)
Quinones, F., York, K. L., and Plebuch, R., Hydrology of area 34, Interior Coal Province, Eastern Region, Kentucky: U.S. Geological Survey.

Quinones, F., Mull, D. S., York, K. L., and Kendall, V., 1981, Hydrology of area 14, Eastern Coal Province, Kentucky: Water-Resources Investigation 81-137.

SUMMARY:
The coal provinces of the country are divided into hydrologic reporting areas. Hydrologic information and sources are presented as text, tables, maps, and other illustrations designed to be useful to mine owners, operators, and consulting engineers in planning and implementing surface-mine operations that comply with the environmental requirements of the "Surface Mining Control and Reclamation Act of 1977."

REFERENCE CODE: DB/S3-2

Scott, A. G., 1980, An interim report on the investigation of flooding in the Tug Fork basin of Kentucky, Virginia, and West Virginia: U.S. Geological Survey, Water-Resources Investigation, Open-File Report 80-1188, p. 116.

ABSTRACT:
An analytical plan is presented for a study of the effects of land-use changes on the magnitude and frequency of flood-peak flows and on sediment characteristics of the Tug Fork in Kentucky, Virginia, and West Virginia. The plan includes compilation and analysis of available data, collection of new data on small, single land-use drainage areas for deterministic computer modeling, and creation of a computer model of the Tug Fork basin for definition of cumulative land-use impacts.

Also presented is a compilation of the available hydrologic data and a description of related studies expected to provide information and data useful to the ongoing work. The data compilation includes: Hourly precipitation for selected days and annual maximum daily precipitation for nine sites, annual maximum streamflow rates and stages for three stream-gaging sites, hourly gage-height and discharge rates for selected storms at four stream-gaging sites, flood profiles, flood-frequency relations, and other streamflow information.

REFERENCE CODE: DB/S3-3

Runner, G. S., and Chin, E. H., 1980, Flood of April 1977 in the Appalachian region of Kentucky, Tennessee, Virginia, and West Virginia: U.S. Geological Survey Professional Paper 1028.

ABSTRACT:
Heavy rains fell over the Appalachian region of Kentucky, Tennessee, Virginia, and West Virginia April 2-5, 1977, causing record flooding. Rainfall amounts of 4 to 15.5 inches were observed. The maximum amount of 15.5 inches occurred at Jolo, West Virginia, in about 30 hours. This was more than twice the amount which would be expected for a 100-year recurrence-interval storm. Flood discharges along the upper Guyandotte River, Tub River, Clinch River, and Dowell River in the Tennessee River basin exceeded those previously known. Severe flooding also occurred along the Holston River and along the North Fork Kentucky River. Recurrence intervals of observed flood discharges were greater than 100 years at 29 streamflow measurement sites. Substantial reductions in peak stages and discharges on Levisa Fork, North Pound River, and Guyandotte River attained as a result of reservoir storage were reported. Suspended-sediment discharges on Guyandotte River near Baileysville, West Virginia, and Tug Fork at Glenhayes, West Virginia, were 54,800 tons/day and 290,000 tons/day, respectively, April 5, 1977. Twenty-two lives were lost and total property damage reportedly exceeded $400 million in the four-state area.

REFERENCE CODE: DB/S3-4

Kimball, R. L., 1974, Surface mine water quality control in the Eastern Kentucky Coalfields: Report to Kentucky Department of Natural Resources Environmental Protection and Appalachian Regional Commission, 92 p.

ABSTRACT:
This report is concerned with acid mine drainage and other forms of chemical water pollution attributed to surface mining in the Eastern Kentucky Coalfield and gives primary emphasis to identifying coal seams with the highest acid-producing potential. The parameters, criteria, and methodology developed and used to achieve this end are described. The research effort included a general evaluation of existing water-quality data for all the major drainage basins in the Eastern Kentucky Coalfield, followed by a concentrated study in Kentucky, Big Sandy, and Cumberland River basins. (Adapted from Summary.)

REFERENCE CODE: DB/S3-5

Striffler, W. D., 1973, Ecology and reclamation of devastated land: Vol. 1, R. J. Hutnik and G. Davis, Eds., New York, Gordon and Breach, Paper II-4, p. 175-191.

ABSTRACT:
A survey of water quality was conducted in eastern Kentucky during the summer of 1966. A total of 180 sampling points, including all fourth-order and larger watersheds, were measured. Field measurements included stream discharge, water temperature, dissolved oxygen, pH, oxidation-reduction potential and specific conductance. Laboratory determinations included aluminum, calcium, magnesium, total iron, manganese, and sulfates. In summary, although acid pollution is a very serious problem on small, severely disturbed watersheds, it is not important on the larger watersheds or major rivers during low-flow conditions in eastern Kentucky. (From author's abstract.)

REFERENCE CODE: DB/S3-6

Biesecker, J. E., and George, J. R., 1966, Stream quality in Appalachia as related to coal-mine drainage, 1965: U.S. Geological Survey Circular 526, 27 p.

ABSTRACT:
A stream-quality reconnaissance at 318 locations in May 1965 offered the first opportunity for a contemporaneous regional collection and appraisal of water-quality data in Appalachia. The results provide a means of regional comparison of the influence of coal-mine drainage on stream quality at approximately median steamflow. The results disclose that the chemical quality of the water at nearly 200 sites did not meet recommended drinking-water standards. At many of these sites, inferior quality was caused by excessive concentrations of solutes commonly associated with coal mine waters.

Water-quality damage from mine drainage is particularly severe in the more heavily mined northern third of the region where high sulfate content, free mineral acidity, and low pH are typical of most affected streams. A deficiency in natural stream alkalinity in this part of the coal region contributes greatly to the massive effect of mine drainage upon stream quality. However, data collected from streams affected by mine drainage along the west edge of this part of the coalfield suggest extensive neutralization of mine water. In southern Appalachia, coal-mine drainage had less influence on stream quality than in northern Appalachia. Fewer streams in this area were influenced by mine drainage, and the magnitude of stream damage for affected streams was less than in northern Appalachia. (Authors' abstract.)

REFERENCE CODE: DB/S3-7

Musser, J. J., 1965, Water resources of the Appalachian region: Pennsylvania to Alabama: U.S. Geological Survey Hydrologic Investigations Atlas HA-198, Sheet 9.

SUMMARY:
Acid streams in the Appalachian region are identified and discussed, and the amount of acidity as $H_2SO_4$ discharged annually into several streams is tabulated.

REFERENCE CODE: DB/S3-8

U.S. Geological Survey, 1964, Floods of January-February 1957 in southeastern Kentucky and adjacent areas: Water-Supply Paper 1652-A.

ABSTRACT:
Heavy rains over an extensive area on January 27 - February 2, 1957, caused extreme flooding in southeastern Kentucky and adjacent areas in West Virginia, Virginia, and Tennessee. Total rainfall for the storm period ranged from 6 to 9 inches over most of the report area and was 12½ inches at the eastern end of the Virginia-Kentucky State line.

The principal basins affected by the storm were those of the Big Sandy, Kentucky, Cumberland, and Tennessee Rivers.

Maximum discharge of record occurred in many streams. On Levisa Fork near Grundy, Virginia, the peak discharge of 33,200 cfs was 50 percent greater than the previous maximum in 17 years of record and was 3.3 times the mean annual flood. The peak discharges on tributaries of the Kentucky River and on the Holston and Clinch Rivers were also the greatest on record, and those on the upper Cumberland River were nearly as great as those during the historic floods of 1918 and 1946.

Total flood damage was estimated at $61 million, of which $39 million was in the Big Sandy River basin (mostly in Kentucky) and $15 million was in the Kentucky River basin--$52 million of the total damage was in Kentucky. (Author's abstract.)

REFERENCE CODE: DB/S3-9

Brown, R. F., and Lambert, T. W., 1963, Reconnaissance of ground-water resources in the Mississippian Plateau region, Kentucky: U.S. Geological Survey Water-Supply Paper 1603.

Supplemented by U.S. Geological Survey Hydrological Atlas 35.

REFERENCE CODE: DB/S3-9--Continued.

ABSTRACT:
The U.S. Geological Survey, in cooperation with the Kentucky Geological Survey, and previous to 1958 with the Department of Economic Development of Kentucky, presents in this report a reconnaissance study of ground-water occurrence in the Missisippian Plateau region of central Kentucky. Included in the region is the westernmost portion of the Daniel Boone National Forest. The region is drained by the Cumberland, Tennessee, and Green Rivers, all of which are tributary to the Ohio River.

The region is underlain chiefly by limestone, shale, and sandstone ranging in age from Ordovician to Pennsylvanian. Alluvial deposits of sand and gravel of Quaternary age occur along the Ohio River and its tributaries.

More than half of the wells in the region yield supplies adequate for modern domestic use, and a few wells yield more than 1,000 gal/min (gallons per minute). Hydrographs in the report show the effects of recharge and discharge of shallow and deep aquifers. Diagrammatic sketches of observation wells and a spring show the conditions such as lithology of the aquifer, topographic situation, distance from streams and sinkholes, and height of water level above stream level controlling the occurrence of ground water in the Mississippian Plateau region. The factors controlling occurrence of ground water are correlated with the yield of wells by means of tables and charts.

The water from most limestone aquifers in the region is hard, and during periods of heavy rainfall, the water becomes turbid. Charts and tables show the quality of water from aquifers in the region and the relationship of discharge of a few springs to the dissolved constituents and specific conductance. (From authors' abstract.)

REFERENCE CODE: DB/S3-10

Price, W. E., Mull, D. S., and Kilburn, C., 1962, Reconnaissance of ground-water resources in the Eastern Coalfield Region, Kentucky: U.S. Geological Survey Water-Supply Paper 1607, 56 p.

Supplemented by U.S. Geological Survey Hydrological Atlases 36, 37, and 38.

ABSTRACT:
The availability of ground water in different parts of this region was determined chiefly by analyzing ground-water data collected during the reconnaissance. The resulting water-availability maps, published as Hydrologic Investigations Atlases, were designed to be used in conjunction with this report.

REFERENCE CODE: DB/S3-10--Continued.

Water from wells and springs in the Eastern Coalfield Region varies widely in chemical character, but most of the water is of the calcium magnesium bicarbonate or sodium bicarbonate type. Chloride and iron are the most objectionable constituents in the ground water of the region. Salty water is known to occur at depths of less than 300 feet in all the physiographic sections of the region, except the Cumberland Mountain section. In general, the chloride content of the ground water becomes higher with increasing depth below drainage, and water that is salty enough to be called a brine eventually will be met in wells drilled deep enough in any part of the region.

Iron is present in noticeable quantities in the water from wells and springs in all formations in the region. Areas in which vadose water drains through beds of black shale or coal, or areas in which acidic mine drainage recharges the ground water probably will have a high iron content. Under these circumstances, the iron-bearing water probably will occur only at shallow depths. (From authors' abstract.)

REFERENCE CODE: DB/S3-11

Baker, J. A., Price, W. E., Jr., 1956, Public and industrial water supplies of the Eastern Coalfield Region, Kentucky: U.S. Geological Survey Circular 369.

ABSTRACT:
About 115,100,000 gal/d (gallons per day) of water is pumped for 119 large public and industrial water supplies in the 29 counties of the Eastern Coalfield Region of Kentucky. About 12 percent of water is used for public supply and about 88 percent for industrial supply. Public supplies provide 191,000 people with water, and per capita consumption ranges from 12 to possibly 460 gal/d. The quantity of water pumped in a public supply for industrial use is sometimes more than half the total water provided. Industries in the region use water primarily for cooling. The largest amounts are used for coal washing, gas transmission, petroleum processing, railroad supply, and coal- and steel-products manufacture.

About 6 percent of the water pumped for public and industrial supplies is ground water and about 94 percent is surface water. However, of the total number of cities, industries, and institutions supplied, ground water provide 37 percent of the supply, surface water, 52 percent, and ground and surface water combined, 11 percent.

Large ground-water supplies in the region are obtained principally from wells and abandoned coal mines, but a few are obtained from springs. Wells yield from 2 to 330 gal/min (gallons per minute) and get most of their

REFERENCE CODE: DB/S3-11--Continued.

water from sandstone in rocks of Pennsylvanian age and from sand and gravel in alluvium of Quaternary age. Most water is of the calcium or magnesium bicarbonate or sodium bicarbonate type; however, some water is high in iron content and some has a large proportion of sulfate.

Most of the surface water pumped in the Eastern Coalfield is from the big Sandy River and its tributaries, and from the Ohio River. In the future, surface water will be the principal source for towns and industries needing large quantities of water. (Authors' abstract.)

REFERENCE CODE: DB/S3-12

Maxwell, B. W., 1954, Public and industrial water supplies of the Western Coal Region, Kentucky: U.S. Geological Survey Circular 339.

ABSTRACT:
Data on the source, pumpage, treatment, and storage of water for 88 public and industrial water supplies in the 10 counties of the Western Coalfield Region of Kentucky are presented.

The total daily pumpage of water in the region is about 50,000,000 gallons. Seventy-two percent of this is obtained from wells and 28 percent is obtained from surface supplies. The Quaternary alluvium provides about 91 percent of the ground water used in the region. Of the total pumpage, 24 percent is used for all purposes from public supplies. The daily consumption of water per person from public supplies ranges from 21 to 197 gallons and averages 110 gallons. The chief industrial consumption of water is for coal washing, production of chemicals, distilling, and secondary recovery of petroleum.

The region is the southern part of a large basin of shales and sandstones of Pennsylvanian age which is overlain in places by alluvial sands and gravels and silts of Quaternary and Recent age. The chief aquifers are the Pennsylvanian sandstones and the sands and gravels of the alluvium. The water in the Pennsylvanian sandstones is fresh in the outcrop areas and becomes progressively more mineralized towards the center of the basin. Yields from the Pennsylvanian sandstones range from a few gallons per minute up to 500 gal/min. Water in the alluvium ranges from hard to very hard and may be pumped from vertical wells at rates up to at least 1,000 gal/min. (Author's abstract.)

REFERENCE CODE: DB/S3-13

(Soon to be published)
Hollyday, E. F., and Hansen, C. R., Improving estimates of streamflow characteristics in the Cumberland Plateau of Tennessee by using digital land-cover data from the Landsat satellite: U.S. Geological Survey Water-Resources Investigations.

ABSTRACT:
The primary objective is to improve upon the regression equations used to estimate streamflow in areas affected by coal mining in the Cumberland Plateau by using land-cover information derived from digitally processed Landsat data as well as maps. The digital data will update the land-cover data base for the New River basin project "Hydrologic Effects of Coal Mining."

The usefulness of the digital land-cover data base developed from Landsat tapes and available map data will be tested by an experiment designed to compare two sets of regression equations--one containing the most up-to-date but routinely-derived basin characteristics derived from Landsat tapes.

REFERENCE CODE: DB/S3-14

May, V. J., and others, 1981, Hydrology of area 18, Eastern Coal Province, Tennessee: U.S. Geological Survey Water-Resources Investigations 81-492.

ABSTRACT:
The Eastern Coal Province is divided into 24 hydrologic reporting areas. This report describes the general hydrology of Area 18 which is located in the Cumberland River basin in central Tennessee near the southern end of the province.

Hydrologic information and sources are presented as text, tables, maps, and other illustrations designed to be useful to mine owners, operators, and consulting engineers in planning and implementing surface-mine operations that comply with the environmental requirements of the "Surface Mining Control and Reclamation Act of 1977."

Area 18 encompasses parts of three physiographic regions: From east to west--the Cumberland Plateau, Highland Rim, and Central Basin. The Plateau is underlain by sandstones and shales, with thin interbedded coal beds of Pennsylvanian age. The Highland Rim and Central Basin are underlain by limestone and dolomite of Mississippian age.

Field and laboratory analyses of chemical and physical water-quality parameters of streamflow samples show no widespread water-quality problems. Some streams, however, in the heavily mined areas have concentrations of sulfate, iron, manganese, and sediment above natural levels and pH values below natural levels. Mine seepage and direct mine drainage were not sampled.

REFERENCE CODE: DB/S3-14--Continued.

Ground water occurs in and moves through fractures in the sandstones and shales and solution openings in the limestones and dolomites. Depth to water is variable, ranging from about 5 to 70 feet below land-surface datum in the limestones and dolomites, and 15 to 40 feet in the coal-bearing rocks.

The quality of ground water is generally good. Locally, in coal-bearing rocks, acidic water and high concentrations of manganese, chloride, and iron have been detected.

REFERENCE CODE: DB/S3-15

Pennington, W., 1980, Benthic populations of thirty-three stream locations draining coal reserves of Tennessee: Tennessee Technological University, Cookeville: Final report to U.S. Geological Survey, Nashville.

ABSTRACT:
Water pollution occurs from the mining of coal when dissolved, suspended, or other solid mineral waste enters the receiving streams. This can occur from water flowing from surface or underground mines. The pollution that occurs may be physical or chemical and is usually harmful to aquatic life. Because of the increase in mining activity, the U.S. Geological Survey has initiated a monitoring program to determine the benthic macroinvertebrate populations of selected areas draining coal reserves to coincide with their current water-quality monitoring programs. This information will be used to make projections of changes that may occur and to provide baseline information for many of the areas that may be affected by future mining. This report summarizes some of that benthic macroinvertebrate information. (From author's introduction.)

REFERENCE CODE: DB/S3-16

Tennessee Valley Authority, Stream pollution by coal mining in the Tennessee Valley Region: Tennessee Valley Authority, Norris, Tennessee.

TVA will provide upon request. Contact:
TVA Forestry Building
Publications
Norris, Tennessee 37828

REFERENCE CODE: DB/S3-16

ABSTRACT:
A total of 60 counties in the Tennessee River watershed and adjacent areas in Alabama, Kentucky, Tennessee, and Virginia have streams impacted by coal mining. In 1978, a total of 1,870 miles of streams were estimated to be polluted intermittently or continuously by mining activities in Tennessee alone. All of these stream miles are affected by sedimentation problems and a number of these streams are affected by acid mine drainage.

Water quality, sedimentation, and flooding problems are generally confined to smaller streams in the region with little substantial effect on the Cumberland, Kentucky, and Tennessee Rivers. During the first 2 years of surface mining, the annual sediment load to streams may reach 360 tons per acre. Drainage from deep mines accounts for 75 percent of the acid water problems in the coalfields of the region.

Although many small streams are affected by mining in the region, the problem is much less severe in comparison to that of northern Appalachia.

State legislation and enforcement in recent years has resulted in better reclamation and therefore lessened the impact on streams.

REFERENCE CODE: DB/S3-17

Minear, R. A., Tschantz, B. A., Rule, J. H., Vaughan, G. L., Overton, D. E., and Briggs, G., 1977, Environmental aspects of coal production in the Appalachian region, U.S. Energy Research and Development Administration Report, ORO-4946-2, 185 p.

Minear, R. A., Tschantz, B. A., Rule, J. H., Vaughan, G. L., Overton, D. E., and Briggs, 1976, Environmentl aspects of coal production in the Appalachian region; Progress report, June 1, 1975 - May 31, 1976: Knoxville Appalachian Resources Project, Tennessee University, 96 p.

PURPOSE, OBJECTIVE, AND(OR) ABSTRACT:
This study covers progress on the work being carried out in the New River watershed, Tennessee. Activity is divided into four projects: Task 1. Hydrologic Impact of Strip Mining on Small East Tennessee Watersheds; Task 2. Mobilization of Heavy Metals and Other Contaminants from Contour Strip Mine Spoil; Task 3. Distribution of Heavy Metals in Sediment of Strip Mine Watersheds; and Task 4. Biological Impact of Contour Strip Mining in Small Watersheds.

## SUPPLEMENTAL DATA C

NAWDEX listings of sources of monitoring-site data found in the Hoosier National Forest study area.

## SUPPLEMENTAL DATA C: LISTING 1

Sources of streamflow and stage data in the Hoosier National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD YYYES NNNO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA YYYES NNNO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05120208 | HL1-1 | USGS | 03371550 | MF SALT C AT STORY IN | 390537 | 0861229 | 018 | 013 | SW | 1954 | 1968 | | 38.20 | |
| 05140104 | HL1-2 | USGS | 03303040 | BIRD HOLLOW C TR NR ENGLISH IN | 382149 | 0862800 | 018 | 025 | SW | 1975 | 1980 | | .20 | |
| 05120202 | HL1-3 | USGS | 03371600 | S. FK. SALT CREEK AT KURTZ, IND. | 385746 | 0861212 | 018 | 071 | SW | 1958 | 1971 | Y | 38.20 | |
| 05120208 | HL1-4 | USNWS | 12-9605-8 | WILLIAMS IND ON E F WHITE R | 384809 | 0863945 | 018 | 093 | SW | 1921 | | | | |
| 05120209 | HL1-5 | USGS | 03374460 | PATOKA R. NR. VALEENE, IND. | 382559 | 0862709 | 018 | 117 | SW | 1963 | 1963 | | 29.00 | |
| 05120209 | HL1-6 | USGS | 03374470 | PATOKA RIVER NEAR ENGLISH, IND. | 382626 | 0862721 | 018 | 117 | SW | 1969 | | | 30.80 | |
| 05120209 | HL1-7 | USGS | 03374455 | PATOKA RIVER NEAR HARDINSBURG, IND | 382641 | 0862314 | 018 | 117 | SW | 1967 | | N | 12.80 | |
| 05120209 | HL1-8 | USGS | 03374450 | PATOKA R. NR. VALEENE, IND. | 382908 | 0862230 | 018 | 117 | SW | 1963 | 1963 | | 3.00 | |
| 05120202 | HL1-9 | USGS | 03373680 | FRENCH LICK CREEK TRIB NR FRENCH LICK, INDIA | 383008 | 0863620 | 018 | 117 | ME | 1972 | | | .30 | |
| 05120208 | HL1-10 | USGS | 03373600 | LICK C NR PAOLI IN | 383242 | 0862656 | 018 | 117 | SW | 1954 | 1968 | | 18.90 | |
| 05120208 | HL1-11 | USGS | 03373700 | LOST RIVER NR. WEST BADEN SPRINGS, IND. | 383510 | 0863803 | 018 | 117 | SW | 1963 | | N | 287.00 | Y |
| 05140201 | HL1-12 | USGS | 03303240 | DEER C RR CANNELTON IN | 375816 | 0863839 | 018 | 123 | SW | 1974 | | | 8.70 | |
| 05140104 | HL1-13 | USGS | 03303170 | OIL C NR LEOPOLD IND | 380702 | 0863322 | 018 | 123 | SW | 1969 | 1969 | | 34.00 | |

| CODE NUMBER | TYPES OF DATA* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STAGE | | | | FLOW | | | | | VOLUME | | | (F) | (G) | (H) | (I) |
| | (A) COMPLETE | (B) PEAK | (B) LOW | (C) STORAGE MEDIA | (D) COMPLETE | (B) PEAK | (B) LOW | (A) MISCELLANEOUS | (C) STORAGE MEDIA | (E) TOTAL | (E) CHANGE | (C) STORAGE MEDIA | TELEMETRY | OTHER HYDROLOGIC DATA | OTHER RELATED DATA | DATA BANK SOURCE |
| HL1-1 | E | | | P | | 9 | 9 | | P | | | | | | | T |
| HL1-2 | Z | | | P | | 9 | | | P | | | | | | | T |
| HL1-3 | I | E | | C | 2 | E | | | C | | | | | 5678 | 6 | T |
| HL1-4 | O | | | D | | 9 | | | D | | | | | 9 | 6 | T |
| HL1-5 | | | | | | | | | | | | | | | | T |
| HL1-6 | M | | | P | | 9 | 9 | Z | P | | | | | 1 | | T |
| HL1-7 | 2 | 1 | | C | 1 | 1 | | | D | | | | | | 6 | T |
| HL1-8 | | | | | | | | | | | | | | | | T |
| HL1-9 | I | | | P | | 9 | 9 | | P | | | | | | 1 | T |
| HL1-10 | E | | | P | | 9 | 9 | | P | | | | | | | T |
| HL1-11 | 2 | 1 | | C | E | 1 | | | D | | | | | 67 | 6 | T |
| HL1-12 | | | 1 | P | | | 9 | | P | | | | | | | T |
| HL1-13 | I | | | D | 1 | | | | D | | | | | | 6 | T |

* USE CODE TABLES (See right margin) indicated by letter in () in column heading

# CODE TABLES

### TABLE (A)-COMPLETE STAGE and MISCELLANEOUS FLOW

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual (twice per year) |
| A | | 9 | Annual (once per year) |
| B | | | Other periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### TABLE (B)-STAGE and FLOW, PEAK or LOW

| Code | Meaning |
|---|---|
| 1 | Year-round |
| 2 | Seasonal |
| 8 | Annual maximum or minimum |
| 9 | Irregular |
| E | Eliminated activity |

### TABLE (C)-STORAGE MEDIA

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TABLE (D)-COMPLETE FLOW

| Code: Year-Round | Code: Seasonal | Meaning |
|---|---|---|
| 1 | 2 | Daily flow |
| 3 | 4 | Monthly flow determined |
| E | E | Eliminated activity |

### TABLE (E)-VOLUME

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Daily values | 9 | Irregular |
| 3 | Monthly values | E | Eliminated activity |

### TABLE (F)-TELEMETRY

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Telemeter-land lines | 5 | DARC |
| 2 | Telemeter-radio network | 6,8 | Other or type unspecified |
| 3 | Landsat | 7 | Two or more types |
| 4 | GOES | | |

### TABLE (G)-OTHER HYDROLOGIC DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | QW recurring | 7 | Flood frequency |
| 2 | QW nonrecurring | 8 | Coef. of roughness |
| 3 | Flood hydrograph | 9 | Time of travel |
| 4 | Sediment studies | A | Flood plain maps |
| 5 | Cross section | B | Tides |
| 6 | Flow duration | C | Surface inflow-outflow |

### TABLE (H)-OTHER RELATED DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Precipitation | 4 | Radiation (solar) |
| 2 | Wind | 5 | Soil moisture |
| 3 | Evaporation | 8 | Datum (mean sea level) |

### TABLE (I)-DATA BANK SOURCE

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA C: LISTING 2

Sources of surface-water-quality data in the Hoosier National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y-YES N-NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y-YES N-NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05120208 | HL2-1 | USEPA | 182806 | MONROE RESERVOIR | 390318 | 0862115 | 018 | 013 | LK | 1973 | 1973 | | | |
| 05120208 | HL2-2 | USCE | 2MNR14001 | | 390348 | 0861627 | 018 | 013 | SW | 1971 | 1978 | N | | |
| 05120208 | HL2-3 | USEPA | 182805 | MONROE RESERVOIR | 390438 | 0861934 | 018 | 013 | LK | 1973 | 1973 | | | |
| 05140104 | HL2-4 | USFS | 110017 | L. BLUE R. 2.7M SE BEECHWOOD,IN | 381001 | 0862458 | 018 | 025 | SW | 1979 | | | | |
| 05140104 | HL2-5 | USFS | 110014 | STINKING FORK CK. 1.5M SW SULFUR | 381226 | 0862907 | 018 | 025 | SW | 1979 | | | | |
| 05140104 | HL2-6 | USFS | 110018 | LITTLE BLUE R 1.3MI SE SULFUR,IN | 381253 | 0862716 | 018 | 025 | SW | 1979 | | | | |
| 05140104 | HL2-7 | USFS | 110013 | BOGARD CR .5MI SE GRANTSBURG, IN | 381653 | 0862840 | 018 | 025 | SW | 1979 | | | | |
| 05140104 | HL2-8 | USFS | 110012 | L. BLUE R. .5M SE GRANTSBURG, IN | 381654 | 0862844 | 018 | 025 | SW | 1979 | | | | |
| 05140104 | HL2-9 | USFS | 110011 | OTTER CK. 1.1M SW GRANTSBURG | 381713 | 0862939 | 018 | 025 | SW | 1979 | | | | |
| 05140104 | HL2-10 | USFS | 110010 | L. BLUE R. 1M NW GRANTSBURG, IN | 381727 | 0862935 | 018 | 025 | SW | 1979 | | | | |
| 05140201 | HL2-11 | USGS | 381756086404200 | ANDERSON RIVER NR BIRDSEYE, IND. | 381756 | 0864042 | 018 | 025 | SW | 1974 | 1974 | | | |
| 05140201 | HL2-12 | USGS | 381811086404200 | TR TO ANDERSON RIVER SE OF BIRDSEYE, IND. | 381811 | 0864042 | 018 | 025 | SW | 1974 | 1974 | | | |
| 05140201 | HL2-13 | USGS | 381745086412500 | TR TO WADDLE B AT HWY 145 NR BIRDSEYE, IND. | 381745 | 0864125 | 018 | 037 | SW | 1974 | 1974 | | | |
| 05120208 | HL2-14 | USCE | 2MNR15001 | | 390119 | 0861539 | 018 | 071 | SW | 1971 | 1978 | N | | |
| 05120208 | HL2-15 | IN001 | 174297 | WHITE RIVER AT WILLIAMS | 384747 | 0863953 | 018 | 093 | SW | 1973 | | | | |
| 05120208 | HL2-16 | IN001 | EW 77 | E F WHITE R AT WILLIAMS IN | 384748 | 0864000 | 018 | 093 | SW | 1971 | | | | |
| 05120208 | HL2-17 | USEPA | HEL-01 | HARDIN RIDGE SEWAGE TREATMENT PL | 390055 | 0862705 | 018 | 105 | ES | 1975 | 1975 | | | |
| 05120208 | HL2-18 | USEPA | 182802 | MONROE RESERVOIR | 390126 | 0862754 | 018 | 105 | LK | 1973 | 1973 | | | |
| 05120208 | HL2-19 | USCE | 2MNR20002 | MONROE RE 32.7 SALT CR | 390127 | 0862756 | 018 | 105 | LK | 1971 | 1978 | N | | |
| 05120202 | HL2-20 | USEPA | 182803 | MONROE RESERVOIR | 390402 | 0862622 | 018 | 105 | LK | 1973 | 1973 | | | |
| 05120208 | HL2-21 | USCE | 2MNR20003 | MONROE RE 40.7 SALT CR | 390424 | 0862503 | 018 | 105 | LK | 1971 | 1978 | N | | |
| 05120208 | HL2-22 | USEPA | 182804 | MONROE RESERVOIR | 390602 | 0862428 | 018 | 105 | LK | 1973 | 1973 | | | |
| 05120209 | HL2-23 | USCE | 2PRR10002 | MILE 132.0 PATOKA R | 382421 | 0863601 | 018 | 117 | SW | 1971 | 1978 | N | | |
| 05120209 | HL2-24 | USGS | 03374460 | PATOKA R. NR. VALEENE, IND. | 382559 | 0862709 | 018 | 117 | SW | 1963 | 1963 | | 29.00 | |
| 05120209 | HL2-25 | USGS | 03374470 | PATOKA RIVER NEAR ENGLISH, IND. | 382626 | 0862721 | 018 | 117 | SW | 1969 | | | 30.80 | |
| 05120209 | HL2-26 | USGS | 03374450 | PATOKA R. NR. VALEENE, IND. | 382908 | 0862230 | 018 | 117 | SW | 1963 | 1963 | | 3.00 | |
| 05120202 | HL2-27 | USGS | 03373680 | FRENCH LICK CREEK TRIB NR FRENCH LICK, INDIA | 383008 | 0863620 | 018 | 117 | ME | 1973 | 1978 | | .30 | |
| 05120208 | HL2-28 | USGS | 03373700 | LOST RIVER NR. WEST BADEN SPRINGS, IND. | 383510 | 0863803 | 018 | 117 | SW | 1974 | 1979 | | 287.00 | Y |
| 05140201 | HL2-29 | USGS | 380353086400501 | THEIS CR BELOW STRUCT 1 NR BRISTOW IND | 380353 | 0864005 | 018 | 123 | SW | 1975 | 1975 | | | |
| 05140201 | HL2-30 | USGS | 380549086400001 | LITTLE SULFUR CR BELOW STRUC 2 NR BRISTOW IN | 380549 | 0864000 | 018 | 123 | SW | 1975 | | | | |
| 05140201 | HL2-31 | USGS | 380634086403201 | SULFUR FK CR BELOW STRUCT 4 NR BRISTOW IND | 380634 | 0864032 | 018 | 123 | SW | 1975 | 1975 | | | |
| 05140201 | HL2-32 | USFS | 110003 | SNAKE BR 2.3 MI SW BANDON, IND. | 380716 | 0863824 | 018 | 123 | SW | 1974 | | | | |
| 05140201 | HL2-33 | USFS | 110005 | TIPSAW LAKE AT DAM | 380732 | 0863857 | 018 | 123 | SW | 1974 | | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL | | | | | | | | CHEMICAL | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
| HL2-1 | A | A | A | | | A | | D | | A | | | A | A | A | A | | | | | | | | | | | A | | D |
| HL2-2 | R | R | R | | | R | R | D | E | R | R | | R | | R | R | | R | | | | | | | R | | R | | D |
| HL2-3 | A | A | R | | | A | | D | | A | | | A | A | A | A | | | | | | | | | | | A | | D |
| HL2-4 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | A | | D |
| HL2-5 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | A | | D |
| HL2-6 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | A | | D |
| HL2-7 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | A | | D |
| HL2-8 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | A | | D |
| HL2-9 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | A | | D |
| HL2-10 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | A | | D |
| HL2-11 | A | A | | | | A | | D | A | A | A | A | A | A | A | A | | A | | | | | | | | | | A | D |
| HL2-12 | | A | | | | A | | D | | A | A | | A | A | A | A | | | | | | | | | | | | A | D |
| HL2-13 | A | A | | | | A | | D | | A | A | | A | A | A | A | | | | | | | | | | | | A | D |
| HL2-14' | Q | R | R | | | Q | R | D | E | N | R | | A | | A | A | | R | | | | | | | R | | Q | | D |
| HL2-15 | N | N | | | | N | N | D | | N | | | | | | N | | N | | N | | N | | | N | N | N | | D |
| HL2-16 | M | M | | | | M | M | D | | M | | | M | | M | | | M | | | | | | | M | | M | | D |
| HL2-17 | | | | | | A | A | D | | | | | | | | | | | | | | | | | A | | | | D |
| HL2-18 | R | R | R | | | R | | D | | R | | | R | R | R | R | | | | | | | | | | | R | | D |
| HL2-19 | N | R | R | | | K | R | D | 5 | R | R | | E | | E | E | | E | | | | | | | | | N | | D |
| HL2-20 | R | R | R | | | R | | D | | R | | | R | R | R | R | | | | | | | | | | | R | | D |
| HL2-21 | N | R | R | | | N | R | D | 5 | R | R | | E | | E | E | | | | | | | | | E | | N | | D |
| HL2-22 | R | R | R | | | R | | D | | R | | | R | R | R | R | | | | | | | | | | | R | | D |
| HL2-23 | M | M | M | | | M | M | C | 5 | M | M | | M | | M | | | | | | | | | | M | | M | | D |
| HL2-24 | | A | | | | A | | D | A | A | A | | | | | | | | | | | | | | | | | | D |
| HL2-25 | O | N | | N | | N | | D | N | N | N | N | M | Q | | N | | N | | | | | | | | | E | M | D |
| HL2-26 | | A | | | | A | | D | A | A | A | | | | | | | | | | | | | | | | | | D |
| HL2-27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HL2-28 | A | A | | | | A | | D | A | A | A | A | A | A | A | A | | A | | | A | | A | A | | | A | A | D |
| HL2-29 | A | A | | | | A | | D | A | A | A | A | A | A | A | A | | A | | | | | | | | | A | A | D |
| HL2-30 | R | R | | | | R | | D | R | R | R | R | R | R | R | R | | R | | | R | | | | | | R | R | D |
| HL2-31 | A | A | | | | A | | D | A | A | A | A | A | A | A | A | | A | | | A | | | | | | A | A | D |
| HL2-32 | A | A | A | | | A | | D | | A | | | | A | A | A | | | | | | | | | | | A | | D |
| HL2-33 | A | A | A | | | A | | D | | A | | | | A | A | A | | | | | | | | | | | A | | D |

| CODE NUMBER | BIOLOGIC | | | | | | | | | | | | | | | | | | | | | SEDIMENT | | | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | Telemetry | S W Station | G W Station | Data Bank Source |
| HL2-1 | | | A | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-2 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-3 | | | R | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| HL2-14' | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-15 | N | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-16 | M | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| HL2-17 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-18 | | | R | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-19 | E | | A | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-20 | | | R | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-21 | R | | A | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-22 | | | R | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-23 | M | | | | | | | | | | | | | | | | | | | | C | | | | | | | | | | | | S |
| HL2-24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HL2-25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SW |
| HL2-26 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HL2-27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | W |
| HL2-28 | | | | | | | | | | | | | | | | | | | | | | | A | A | | | | | D | | | | SW |
| HL2-29 | | | A | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-30 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-31 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-32 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| HL2-33 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |

PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05140201 | HL2-34 | USFS | 110004 | TIPSAW LAKE AT BEACH | 380748 | 0863822 | 018 | 123 | SW | 1974 | | | | |
| 05140201 | HL2-35 | USGS | 38075508638OOO1 | MIDDLE FK ANDERSON RESERVOIR 4 NR BRISTOW, I | 380755 | 0863800 | 018 | 123 | LK | 1975 | 1975 | | | |
| 05140201 | HL2-36 | USFS | 110002 | NORTH FORK 2.5 MI. W BANDON, IND | 380801 | 0863850 | 018 | 123 | SW | 1974 | | | | |
| | HL2-37 | USFS | 110001 | SULFUR C 1.4 MI. W BANDON, IND. | 380810 | 0863732 | 018 | 123 | SW | 1979 | | | | |
| 05140104 | HL2-38 | USFS | 110015 | MILL CREEK 2.2 MI. SE ORIOLE, IN | 380940 | 0862847 | 018 | 123 | SW | 1979 | | | | |
| | HL2-39 | USFS | 110034 | SADDLE LAKE 8.9M NE TELL CITY | 380944 | 0863332 | 018 | 123 | LK | 1977 | | | | |
| 05140201 | HL2-40 | USGS | 381016086381101 | WINDING BR BELOW STRUCT 5 NR BRISTOW IND | 381016 | 0863811 | 018 | 123 | SW | 1975 | | | | |
| 05140201 | HL2-41 | USFS | 110006 | UNAMED CREEK 4 MI SW ST.CROIX IN | 381035 | 0863759 | 018 | 123 | SW | 1974 | | | | |
| | HL2-42 | USFS | 110033 | CELINA LAKE 2M SW ST. CROIX | 381115 | 0863646 | 018 | 123 | LK | 1977 | | | | |
| 05140201 | HL2-43 | USGS | 381123086392401 | MIDDLE FK ANDERSON R AT STRUC 6 NR BRISTOW, | 381123 | 0863924 | 018 | 123 | SW | 1975 | | | | |
| | HL2-44 | USFS | 110032 | INDIAN LAKE 4M SW ST. CROIX | 381148 | 0863900 | 018 | 123 | LK | 1977 | | | | |
| 05140201 | HL2-45 | USGS | 381331086381501 | M FK ANDERSON RIVER AT SR 62 NR ST CROIX IND | 381331 | 0863815 | 018 | 123 | SW | 1975 | | | | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

### PHYSICAL

| CODE NUMBER | TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|
| HL2-34 | A | A | A | | | A | | D |
| HL2-35 | A | A | | | | A | | D |
| HL2-36 | A | A | A | | | A | | D |
| HL2-37 | A | A | A | | | A | | D |
| HL2-38 | A | A | A | | | A | | D |
| HL2-39 | A | A | A | | | A | | D |
| HL2-40 | R | R | | | | R | | D |
| HL2-41 | A | A | A | | | A | | D |
| HL2-42 | A | A | A | | | A | | D |
| HL2-43 | R | R | | | | R | | D |
| HL2-44 | A | A | A | | | A | | D |
| HL2-45 | R | R | | | | R | | D |

### CHEMICAL

| CODE NUMBER | DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HL2-34 | | A | | | | A | A | A | | | | | | | | | | | A | | D |
| HL2-35 | | | | | | | | | | | | | | | | | | | A | | D |
| HL2-36 | | A | | | | A | A | A | | | | | | | | | | | A | | D |
| HL2-37 | | A | | | | A | A | A | | | | | | | | | | | A | | D |
| HL2-38 | | A | | | | | | | | | | | | | | | | | A | | D |
| HL2-39 | | A | | | | A | A | A | | | | | | | | | | | A | | D |
| HL2-40 | R | R | R | R | R | R | R | R | | R | | | R | | | | | | R | R | D |
| HL2-41 | | A | | | | A | A | A | | | | | | | | | | | A | | D |
| HL2-42 | | A | | | | A | A | A | | | | | | | | | | | A | | D |
| HL2-43 | R | R | R | R | R | R | R | R | | R | | | R | | E | E | | | R | R | D |
| HL2-44 | | A | | | | A | A | A | | | | | | | | | | | A | | D |
| HL2-45 | R | R | R | R | R | R | R | R | | R | | | R | | | | | | R | R | D |

### BIOLOGIC

| CODE NUMBER | ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HL2-34 | A | | | | | | | | | | | | | | | | | | | | D |
| HL2-35 | | | A | | | | | | | | | | | | | | | | | | D |
| HL2-36 | A | | | | | | | | | | | | | | | | | | | | D |
| HL2-37 | | | | | | | | | | | | | | | | | | | | | |
| HL2-38 | | | | | | | | | | | | | | | | | | | | | |
| HL2-39 | A | | | | | | | | | | | | | | | | | | | | D |
| HL2-40 | E | | | | | | | | | | | | | | | | | | | | D |
| HL2-41 | | | | | | | | | | | | | | | | | | | | | |
| HL2-42 | A | | | | | | | | | | | | | | | | | | | | D |
| HL2-43 | A | | R | | | | | | | | | | | | | | | | | | D |
| HL2-44 | A | | | | | | | | | | | | | | | | | | | | D |
| HL2-45 | A | | R | | | | | | | | | | | | | | | | | | D |

### SEDIMENT

| CODE NUMBER | BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|
| HL2-34 | | | | | | | | |
| HL2-35 | | | | | | | | |
| HL2-36 | | | | | | | | |
| HL2-37 | | | | | | | | |
| HL2-38 | | | | | | | | |
| HL2-39 | | | | | | | | |
| HL2-40 | | | | | | | | |
| HL2-41 | | | | | | | | |
| HL2-42 | | | | | | | | |
| HL2-43 | | | | | | | | |
| HL2-44 | | | | | | | | |
| HL2-45 | | | | | | | | |

### OTHER

| CODE NUMBER | TELEMETRY | S W STATION VAYES NINO | G W STATION VAYES NINO | DATA BANK SOURCE |
|---|---|---|---|---|
| HL2-34 | | | | S |
| HL2-35 | | | | S |
| HL2-36 | | | | S |
| HL2-37 | | | | S |
| HL2-38 | | | | S |
| HL2-39 | | | | S |
| HL2-40 | | | | S |
| HL2-41 | | | | S |
| HL2-42 | | | | S |
| HL2-43 | | | | S |
| HL2-44 | | | | S |
| HL2-45 | | | | S |

### PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

### DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA C: LISTING 3

Sources of ground-water-quality data in the Hoosier National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05140104 | HL3-1 | USGS | 381727086303901 | KING NO 2 ENGLISH, IND. | 381727 | 0863039 | 018 | 025 | GW | 1958 | 1958 | N | | |
| 05140104 | HL3-2 | USGS | 380333086291301 | ROY TAYLOR | 380333 | 0862913 | 018 | 123 | GW | 1967 | 1967 | | | |
| 05140104 | HL3-3 | USGS | 380347086263301 | FOSTER PARKS | 380347 | 0862633 | 018 | 123 | GW | 1967 | 1967 | | | |
| 05140104 | HL3-4 | USGS | 380439086292501 | CASSIDY | 380439 | 0862925 | 018 | 123 | GW | 1967 | 1967 | | | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

### PHYSICAL

| CODE NUMBER | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media |
|---|---|---|---|---|---|---|---|---|
| HL3-1 | E | E | | E | | E | | D |
| HL3-2 | | A | | A | | A | | D |
| HL3-3 | | A | | A | | A | | D |
| HL3-4 | | A | | A | | A | | D |

### CHEMICAL

| CODE NUMBER | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HL3-1 | E | E | E | E | | E | | E | | E | | | | | | | | | | E | D |
| HL3-2 | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| HL3-3 | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| HL3-4 | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |

### BIOLOGIC

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HL3-1 | | | | | | | | | | | | | | | | | | | | | |
| HL3-2 | | | | | | | | | | | | | | | | | | | | | |
| HL3-3 | | | | | | | | | | | | | | | | | | | | | |
| HL3-4 | | | | | | | | | | | | | | | | | | | | | |

### SEDIMENT

| CODE NUMBER | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media |
|---|---|---|---|---|---|---|---|---|
| HL3-1 | | | | | | | | |
| HL3-2 | | | | | | | | |
| HL3-3 | | | | | | | | |
| HL3-4 | | | | | | | | |

### OTHER

| CODE NUMBER | Telemetry | S W Station [illegible] | G W Station [illegible] | Data Bank Source |
|---|---|---|---|---|
| HL3-1 | | | | S |
| HL3-2 | | | | S |
| HL3-3 | | | | S |
| HL3-4 | | | | S |

### PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 8 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,6 | Other or type unspecified |
| 7 | Two or more types |

### DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA D

Annotated bibliography of investigations pertinent to coal mining and water resources in the Hoosier National Forest study area.

SUPPLEMENTAL DATA D: SUMMARY 1

Annotated bibliography of hydrologic studies performed in small areas of the Hoosier National Forest area.

REFERENCE CODE: H/S1-1

TITLE: The Dieback Role of Myriophyllium Spicatum in Monroe Reservoir, Indiana.

GEOGRAPHICAL AREA: Monroe Lake, southcentral Indiana.

AREAL EXTENT: 16.8 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Enclosures (2-m diameter) were placed in the littoral zone of Monroe Reservoir, Monroe Co., Indiana, to evaluate the chemical and biological effects of late summer dieback of Myriophyllum spicatum. Aerial photography, combined with quadrat sampling, was used to measure standing crop at peak summer biomass. Plant tissue analysis was applied to total biomass estimates to determine potential N and P release from senescing macrophytes. At the time of dieback, considerable pulses of SRP, $NH_3$-N and $NO_3$-N were detected in the enclosures with plants and adjacent open water sites. These nutrient inputs were associated with episodes of normal macrophyte senescence and decay. Chlorophyll a increased greatly in response to these nutrient inputs, indicating important increases in phytoplankton production as a direct consequence of macrophyte dieback. Crashing autumn phytoplankton populations were responsible for additional pulsed inputs of SRP, $NH_3$-N and $NO_3$-N in enclosed and open water locations. Realized nutrient inputs from senescent M. spicatum are estimated to represent as much as 20 percent of the annual P budget, and not more than 2.2 percent of the annual N budget for the reservoir. (Technical report abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Landers, D. H., and Frey, D. G., 1980, The dieback role of Myriophyllum spicatum in Monroe Reservoir, Indiana: Purdue University Water Resources Research Center Technical Report No. 134.

Landers, D. H., 1979, The chemical and biological effects of annual dieback of Myriophyllum spicatum L. and the importance relative to nutrient cycling in Monroe Reservoir, Monroe County, Indiana: Ph.D. thesis, Department of Biology, Indiana University, Bloomington, Indiana.

AVAILABLE FROM:
Water Resources Research Center
Indiana University
1005 E. 10th St. (Geology 417)
Bloomington, IN 47401

REFERENCE CODE: H/S1-2

TITLE: A One-Dimensional, Steady-State, Dissolved-Oxygen Model and Waste-Load Assimilation Study for Clear Creek, Monroe County, Indiana.

STARTING DATE: October, 1977.

REFERENCE CODE: H/S1-2--Continued.

COMPLETION DATE: October, 1979.

GEOGRAPHICAL AREA: South central Monroe County, Southwest Indiana.

AREAL EXTENT: 47.8 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The Indiana State Board of Health is developing a State water-quality management plan that includes establishing limits for wastewater effluents discharged into Indiana streams. A digital model calibrated to conditions in Clear Creek was used to develop alternatives for future waste loadings that would be compatible with Indiana stream water-quality standards defined for two critical hydrologic conditions, summer and winter low flows.

The Winston-Thomas wastewater-treatment facility is the only point-source waste load affecting the modeled segment of Clear Creek. A new wastewater-treatment facility under construciton at Dillman Road (river mile 13.78) will replace the Winston Thomas wastewater-treatment facility (river mile 16.96) in 1980.

Natural streamflow during the summer and annual 7-day, 10-year flows are zero, so no benefit from dilution is provided.

The model indicated that ammonia-nitrogen toxicity is the most significant factor affecting the stream water quality during summer and winter low flows. The ammonia-nitrogen concentrations of the wastewater effluent exceeds the maximum total ammonia-nitrogen concentations of 2.5 milligrams per liter for summer months (June through August) and 4.0 milligrams per liter for winter months (November through March) required for Indiana streams.

Nitrification, benthic-oxygen demand, and algal respiration were the most significant factors affecting the dissolved-oxygen concentration in Clear Creek during the model calibration. Nitrification should not significantly affect the dissolved-oxygen concentration in Clear Creek during summer low flows when the ammonia-nitrogen toxicity standards are met.

Carbonacious biochemical-oxygen demand is probably not a significant factor in the dissolved-oxygen dynamics of Clear Creek because most of the carbonaceous biochemical-oxygen demand was estimated to be removed through settling or some other process.

The 5-day biochemical-oxygen demand of the effluent from the new waste water-treatment facility at Dillman Road will be limited to 5 milligrams per liter after the implementation of advanced-waste treatment in 1980.

PUBLISHED REPORTS AND(OR) ARTICLES:
Wilber, W. G., Crawford, C. G., Peters, J. G., and Girardi, F. P., 1979, A one-dimensional, steady state, dissolved-oxygen model and waste-load assimilation study for Clear Creek, Monroe County, Indiana: U.S. Geological Survey Open-File Report 79-1533, 63 p.

REFERENCE CODE: H/S1-2--Continued.

AVAILABLE FROM:
Library Copy
U.S.G.S.
Indianapolis, IN 46202

REFERENCE CODE: H/S1-3

TITLE: Water-Quality Assessment of the Middle Fork Anderson-River Watershed, Crawford and Perry Counties, Indiana.

STARTING DATE: September, 1975.

COMPLETION DATE: January, 1978.

GEOGRAPHICAL AREA: Perry and Crawford Counties, Southwestern Indiana.

AREAL EXTENT: 106 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Surface-water quality in the watershed is generally good except for problem-causing concentrations of bacteria, dissolved oxygen, and phosphorous at some sites along the main stem during low flow and manganese at most sites year-round.

Dissolved solids concentrations ranged from 76 to 248 milligrams per liter. Concentrations at sites upstream from reservoirs were greater than those at sites downstream during medium and low flows, but concentrations at sites upstream and downstream were similar during high flows.

Calcium and bicarbonate ions were dominant at most sites during low flows, whereas these ions were codominant with magnesium and sulfate at most sites during high flows.

Dissolved oxygen concentration ranged from 2.1 to 11.6 milligrams per liter or from 21 to 124 percent of saturation. Low concentrations were associated with the main stem of the river during low flows when sluggish pooled conditions prevailed.

Concentrations of certain inorganic constituents (including nutrients) were as follows: Dissolved manganese concentrations ranged from 0.02 to 7.3 milligrams per liter. The concentrations were generally higher at sites downstream from reservoirs than at sites upstream and was greater than the problem-causing level 0.05 milligrams per liter at most sites. The high manganese concentrations are probably associated with organic acids in the streams. Dissolved-nitrate concentration (as nitrogen) ranged from 0.03 to 3.3 milligrams per liter, the highest concentrations occurring during winter and spring in drainage from areas of the most intense cultivation. Dissolved-phosphorous concentrations were typically 0.03 milligrams per liter or less, except at one site in September 1975, when the concentration was 0.12 milligrams per liter, and at three sited in July 1976, when concentrations were 0.12, 0.41, and 0.58 milligrams per liter.

REFERENCE CODE: H/S1-3--Continued.

Chlorinated hydrocarbons were detected in bed material from two of the three sites sampled. Two micrograms or less per kilogram aldrin, DDT, DDD, DDE, dieldrin, and (or) chlordane and as much as 15 micrograms per kilogram PCB compounds were detected.

Suspended-sediment concentration ranged from 1 to 148 milligrams per liter. Concentrations in two sites downstream from reservoirs were higher for medium and low flows and, despite large changes in flow, were considerably more consistent than the concentrations at two sites unaffected by reservoirs.

Concentrations of fecal-coliform and fecal-streptococcal bacteria ranged from 5 to 9,900 and from 10 to 15,000 colonies per 100 milliliters, respectively. Source of high counts (more than 2,000 colonies per 100 milliliters) is probably livestock upstream from sampling sites.

Diversity indices (genera level) 2.7 and 2.5 at the two sites sampled from benthic invertebrates indicate healthy biologic communities at both sites.

Diversity indices (genera level) of the phytoplankton populations at seven sites ranged from 1.4 to 3.3. The phytoplankton populations were generally well balanced except for stressed communities at two mainstem sites during the September sampling.

PUBLISHED REPORTS AND(OR) ARTICLES:
Ayers, M. A., 1978, Water-quality assessment of the Middle Fork Anderson River watershed, Crawford and Perry Counties, Indiana: U.S. Geological Survey Open-File Report 78-71, 31 p.

AVAILABLE FROM:
Library Copy
U.S.G.S.
Indianapolis, IN 46202

REFERENCE CODE: H/S1-4

TITLE: Monroe Reservoir, Indiana--Hydrologic Circulation, Sedimentation, Water Chemistry and Nutrient Relations.

STARTING DATE: January 1975.

COMPLETION DATE: December 1976.

GEOGRAPHICAL AREA: Monroe Lake, Southcentral Indiana.

AREAL EXTENT: 16.8 $mi^2$

REFERENCE CODE: H/S1-4--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This project began on January 1, 1975 with a scheduled duration of 2 years to December 31, 1976. This study relates the hydrologic circulation pattern of the lake with biological, chemical, and sedimentation characteristics. Results and conclusions are reported herein within the qualification of one unusually dry year during the 2-year study.

Studies were undertaken to determine the annual production rates and the trophic level of the lake to serve as a basis for interpreting the subsequent nutrient enrichment experiments. The study attempts to resolve the question of which nutrients are limiting algal production and under which conditions.

PUBLISHED REPORTS AND(OR) ARTICLES:
Bradbury, K. R., 1977, Sedimentation and soil alteration, Monroe Reservoir, Indiana: Master of Arts thesis, Department of Geology, Indiana University, Bloomington, Indiana.

Bradbury, K. R., Grahm, M. S., and Ruhe, R. V., 1977, Monroe Reservoir, Indiana, Part I, hydrologic circulation, sedimentation, and water chemistry: Indiana University Water Resources Research Center, Technical Report No. 87.

Chang, W. Y. B. and Frey, D. C., 1977, Monroe Reservoir, Indiana, Part II, nutrient relations: Indiana University Water Resources Research Center, Technical Report No. 87.

Graham, M. J., 1977, Chemical systems, Monroe Reservoir, Indiana: Master of Arts thesis, Department of Geology, Indiana University, Bloomington, Indiana.

REFERENCE CODE: H/S1-5

TITLE: A Water-Quality Assessment of the Hall-Flat Creek Watershed, Dubois County, Indiana.

STARTING DATE: 1975.

COMPLETION DATE: 1976.

GEOGRAPHICAL AREA: Southeastern Dubois County, Southwestern Indiana.

AREAL EXTENT: 68 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
An investigation of water quality in the Hall-Flat Creek watershed on April 15 and 16, 1975, showed that dissolved-solids concentrations were low (76 to 130 milligrams per liter). Concentration of nitrate (as nitrogen) in streams ranged from 0.05 and 1.3 milligrams per liter; concentration of phosphate (as phosphorous) was 0.03 milligrams per liter or less. Concentrations of fecal coliform (20 to 260 colonies per 100 millileters) and fecal streptococci (5 to

REFERENCE CODE: H/S1-5--Continued.

8,800 colonies per 100 milliliters) were significant only in the lower Flat Creek site, where animal waste contamination was suspected. Small concentrations (1.7 micrograms per kilogram or less) of aldrin, dieldrin, DDD, DDE, and heptachlor epoxide were found in two or more of the three streambed samples. Well-balanced benthic communities were found at the Hall and Flat Creek sampling sites; however, physical environmental constraints are limiting the abundance of organisms in the Straight River benthic community.

PUBLISHED REPORTS AND(OR) ARTICLES:

Ayers, M. A., 1976, A water-quality assessment of the Hall-Flat Creek watershed, Dubois County Indiana: U.S. Geological Survey Open-File Report 76-94, 18 p.

REFERENCE CODE: H/S1-6

TITLE: A Water-Quality Assessment of the Lost River Watershed, Dubois, Lawrence, Martin, Orange, and Washington Counties, Indiana.

STARTING DATE: 1974.

COMPLETION DATE: December, 1975.

GEOGRAPHICAL AREA: Orange, Dubois, Lawrence, Martin, and Washington Counties, Southwestern Indiana.

AREAL EXTENT: 365 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

A water-quality assessment of the Lost River watershed was made from data collected on November 11-14, 1974, and March 5, 1975. Surface waters in the watershed were calcium bicarbonate types of various levels of mineralization. Crawford-upland streamwaters were considerable less mineralized than water from the Mitchell plain part of the watershed. Streamwaters contained between 0.06 and 5.9 milligrams per liter nitrate (as nitrogen), 0.25 milligram per liter or less phosphate (as phosphorus), and from 2.3 to 26 milligrams per liter organic carbon. Concentrations of fecal coliform bacteria ranged from 35 to 75,000 colonies per 100 milliliters and fecal streptococci bacteria from 15 to 49,000 colonies per 100 milliliters. Human waste contamination of streamwater is suspected downstream of Paoli and West Baden. Aldrin, dieldrin, chlordane, DDT, DDD, DDE and PCB's were detected in one or more of the four samples of streambed material. A very productive benthic community was found in upper Lost River. Midge larvae and aquatic sowbugs were the dominant invertebrates and Cladophora sp was the predominant periphyton at the site sampled.

REFERENCE CODE: H/S1-6--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:
Ayers, M. A., 1975, A water-quality assessment of the Lost River watershed, Dubois, Lawrence, Martin, Orange, and Washington Counties, Indiana: U.S. Geological Survey Open-File Report 75-646, 24 p.

AVAILABLE FROM:
Library copy
U.S. Geological Survey
Indianapolis, IN 46202

REFERENCE CODE: H/S1-7

TITLE: A Water-Quality Assessment of the Anderson River Watershed, Crawford, Dubois, Perry, and Spencer Counties, Indiana.

STARTING DATE: 1974.

COMPLETION DATE: October 1975.

GEOGRAPHICAL AREA: Perry, Crawford, Dubois, and Spencer Counties, Southwestern Indiana.

AREAL EXTENT: 152 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A water-quality assessment of the Anderson River watershed was made January 14-17, 1974. Most of the streamwaters in the basin were found to be of good quality. Coal mine drainage into Lanman Run, Meinrad Hollow, and Swingting Creek appears to be causing significant changes in the chemical, physical, and biological characteristics of these streams. Upland streamwaters in the watershed generally contained less than 0.5 milligram per liter nitrate (as N), whereas waters flowing from the more intensely cultivated bottom lands generally contained about 5.0 milligrams per liter nitrate (as N). Concentrations of fecal coliform bacteria ranged from 0 to 550 colonies per 100 milliliters and fecal streptococci concentrations ranged from 8 to 10,000 colonies per 100 milliliters. Chlordane, dieldrin, DDT, and DDD were found only in the bottom materials of one of the two sites sampled for insecticides. Suspended sediment data indicate a 100-percent or more increase in sediment concentrations downstream from highway construction for Interstate 64.

PUBLISHED REPORTS AND(OR) ARTICLES:
Ayers, M. A. and Shampine, W. J., 1975, A water-quality assessment of the Anderson River watershed, Crawford, Dubois, Perry, and Spencer Counties, Indiana: U.S. Geological Survey Open-File Report 75-325, 23 p.

AVAILABLE FROM:
Library copy
U.S. Geological Survey
Indianapolis, IN 46202

REFERENCE CODE: H/S1-8

TITLE: A Land Capability Model for the Lower Lake Monroe Watershed.

GEOGRAPHICAL AREA: Lake Monroe watershed.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The purpose of this study is to develop a prelininary land-use capability model for a 100 square mile area surrounding Lake Monroe, a 10,750-acre reservoir in south central Indiana. This study can be reviewed as an extention of the Lake Monroe Land Suitability Study (1975) which provides land-use, geological, and ecological inventories for the Lake Monroe area. A second goal of the present study is to develop a user-oriented interactive computer program which will make both the inventory and the model output available to planners, prospective developers, and other interested citizens.

Capability analysis is the synthetic, quantitative evaluation of the limitations which physical land variables may impose on the potential of a parcel of land for a variety of human uses. Capability analysis is most useful early in the planning process, e.g., examining potential sites for a proposed project. The physical variables considered in a capability analysis can be combined with social variables to produce a suitability analysis which can be used as a basis for regional planning. The present model is not a suitability model and thus does not consider social variables.

The Lake Monroe study describes the area's geology, terrestrial and aquatic ecology, current land use, and the institutional framework determining political and legal jurisdication over the area. In the Lake Monroe study, the significance of the various types of data with reference to land-use considerations is discussed. A geologic description of the area is given, and the soil-material characteristics of each of the area's geologic subdivisions are outlined; these are then related to such land use factors as on-site septic disposal, foundation and excavation conditions, slope stability, and ground water. The Lake Monroe area forests and wildlife and their management are considered; the influence of forests in regulating runoff and erosion are discussed. The study describes the physical and chemical properties of the lake itself and the potential damage which might result from increased phsophate input. Current land uses of the surrounding area are mapped and questions of land development, zoning, and land-use change are considered. Finally, Federal, State, and local agencies having powers bearing on the planning and development of the Lake Monroe region are listed and their roles described. (Report Introduction)

PUBLISHED REPORTS AND(OR) ARTICLES:
Chiesa, J. R., Roberts, M. C., Randolph, J. C., and Howe, R. S., 1975, A land capability model for the lower Lake Monroe watershed: Indiana University Water Resources Research Center, Technical Report No. 66.

AVAILABLE FROM:
Water Resources Research Center
Indiana University
1005 E. 10th St. (Geology 417)
Bloomington, IN 47401

REFERENCE CODE: H/S1-9

TITLE: Geohydrology of Karst Terrain, Lost River Watershed, Southern Indiana.

GEOGRAPHICAL AREA: Southern Indiana.

PUBLISHED REPORTS AND(OR) ARTICLES:
Indiana University, Water Resources Research Center, 1975, Geohydrology of Karst terrain, Lost River watershed, southern Indiana, Report of Investigation No. 7, Bloomington, Indiana.

AVAILABLE FROM:
Water Resources Research Center
Indiana University
1005 E. 10th St. (Geology 417)
Bloomington, IN 47401

REFERENCE CODE: H/S1-10

TITLE: Acid Mine Drainage Problem of the Potoka River Watershed, Southwestern Indiana.

GEOGRAPHICAL AREA: Southwestern Indiana.

PUBLISHED REPORTS AND(OR) ARTICLES:
Indiana University, Water Resources Research Center, 1969, Acid mine-drainage problem of the Potoka River watershed, southwestern Indiana: Report of Investigation No. 4, Bloomington, Indiana.

AVAILABLE FROM:
Water Resources Research Center
Indiana University
1005 E. 10th St. (Geology 417)
Bloomington, Indiana 47401

SUPPLEMENTAL DATA D: SUMMARY 2

Annotated bibliography of studies concerned with the influence of coal mining on the water resources of any small areas in Indiana.

REFERENCE CODE: H/S2-1

TITLE: Analysis of Hydrologic Impacts of Surface Mining in West-Central Indiana Using an Interactive Modeling Approach.

STARTING DATE: October 1979.

COMPLETION DATE: September 1984.

GEOGRAPHICAL AREA: West-central Indiana.

AREAL EXTENT: 800 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Assessment of the probable hydrologic impacts of proposed surface coal mining is required by the 1977 Surface Mining Act. Digital watershed and ground-water flow models can be used as tools to evaluate these hydrologic impacts. However, a complete modeling procedure, adaptable to surface mining in States of the Interior Coal Province, has not been widely applied in the field.

The U.S. Geological Survey has developed a distributed-parameter watershed model in which hydrologic processes are simulated in separate modules that can be modified or replaced to fit the problem. The Survey is also testing this model and 11 other models for reliability and applicability to 10 small watersheds (from 0.1 to 8 square miles) in surface-mined areas of southwestern Indiana.

In 1980, the 10 watersheds, representing agricultural, unreclaimed mining, reclaimed mining, and mixed land uses, were instrumented to collect rainfall and streamflow data. Two of these watersheds were equipped to collect sediment, pH, specific conductance, and temperature data. Using these data and the analyses of 12 models, the authors will select, develop, and assemble model components that best simulate the hydrologic processes producing streamflow.

The effects of mining on local aquifer systems and surface- and ground-water interactions will also be simulated. These simulations will be verified by measuring (1) soil-moisture profiles with a neutron-probe, (2) base streamflow, and (3) water-table fluctuations. Evapotranspiration will be estimated from climatic data. Surface- and ground-water simulations will interact to the extent needed to obtain a consistent model of both systems.

REPORTS IN PREPARATION:
Eikenberry, S. E., Shedlock, R. J., Duwelius, R. F., Hydrologic setting of surface-coal mines in west-central Indiana.

Shedlock, R. J. and Eikenberry, S. E., Impacts of surface-coal mining on ground- and surface-water flow and interactions in west-central Indiana.

Hydrograph simulation for small watersheds in the surface-coal mined area of west-central Indiana.

AVAILABLE FROM
U.S. Geological Survey
Indianapolis, IN 46202

REFERENCE CODE: H/S2-2

TITLE: Effects of Surface Mining on Water Quality in a Small Watershed, Sullivan County, Indiana.

STARTING DATE: 1975.

COMPLETION DATE: 1981.

GEOGRAPHICAL AREA: Southeastern Sullivan County, Southwestern Indiana.

AREAL EXTENT: 3 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Effects of surface mining on water quality in Spencer Creek tributary upstream and downstream from a surface mine and on South Lake adjacent to the mine were monitored during a 5-year study (1975-79) in the 1,210-acre watershed of the tributary.

Compared with the background values, pH and concentrations of all major dissolved ions and dissolved, suspended, and streambed metals generally increased in Spencer Creek tributary downstream from the mine. Median dissolved sodium and sulfate concentrations increased to as much as eighteenfold and fourteenfold, respectively, and median dissolved manganese and suspended aluminum concentrations increased as much as sevenfold and more than twofold. Concentrations of suspended metals decreased more than 50 percent after installation of sediment ponds by the mine operator. During high streamflow, concentrations of major ions at background and mined sites on Spencer Creek tributary decreased, but dissolved- and suspended-metal concentrations increased downstream from the mine.

South Lake exhibited seasonal stratification and mixing characteristics of other lakes at a similar latitude. However, the bottom three feet of the water column demonstrated persistent chemical stratification. Phytoplankton populations of the lake varied seasonally, and the population density pattersn resembled those in other lakes at latitudes similar to that of South Lake.

PUBLISHED REPORTS AND(OR) ARTICLES:
Peters, J. G., 1981, Effects of surface mining on water quality in a small watershed, Sullivan County, Indiana: U.S. Geological Survey Open-File Report 81-543, (in press).

AVAILABLE FROM:
U.S. Geological Survey
Indianapolis, IN 46202

REFERENCE CODE: H/S2-3

TITLE: Hydrologic Evaluation of a Hypothetical Coal-Mining Site near Chrisney, Spencer County, Indiana.

REFERENCE CODE: H/S2-3--Continued.

STARTING DATE: 1979.

COMPLETION DATE: 1981.

GEOGRAPHICAL AREA: West-central Spencer County, Southwestern Indiana.

AREAL EXTENT: 24 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Protecting the water resources of the nation is a major emphasis of the Surface Mining Control and Reclamation Act, PL 95-87. Permanent regulations established for this Act by the Office of Surface Mining (OSM) require the issuance of a permit before mining begins. An application for a mining permit must include an assessment of the hydrologic characteristics of the mining site and adjacent area, and a projection of the potential impacts of mining activities on surface water and ground water.

OSM's permanent regulations and guidelines provide little insight on the "how to" aspect of making the required hydrologic assessment. This investigation was completed to improve the understanding of the kinds of information needed to make such assessments by: (a) reviewing the regulations to determine what hydrologic information is required; (b) preparing an example hydrologic assessment based on the regulations; and (c) using the experience gained in (a) and (b) to identify areas lacking or needing additional data to make the required assessment.

Hydrologic data for the study area were obtained from published and unpublished reports, maps, aerial photographs, personal interviews with residents in the area of the hypothetical mine site, and discussions with experts in the field. Where data were unavailable, "synthetic" data were generated by extrapolation from proximate or similar watersheds and (or) by assumptions based on experience or theory. A limited amount of field data was collected to corroborate and augment information originating from all these sources.

PUBLISHED REPORTS AND(OR) ARTICLES:
Zogorski, J. S., Ramey, D. S., Lambert, P. W., Martin, J. D., and Warner, R. E., 1981, Hydrologic evaluation of a hypothetical coal-mining site near Chrisney, Spencer County, Indiana: U.S. Geological Survey Open-File Report 80-1107.

REPORT AVAILABLE FROM:
U.S. Geological Survey
Indianapolis, IN 46202

REFERENCE CODE: H/S2-4

TITLE: Field Study for Verification of Surface Mining Hydrologic Models.

REFERENCE CODE: H/S2-4--Continued.

GEOGRAPHICAL AREA: Selected small watersheds in Tennessee and Indiana.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Hydrologic field studies on 13 mined and unmined watersheds in Tennessee and Indiana will provide a data base for a comparative study of 12 surface-mining hydrologic models. Data being collected includes flow, sediment, and water-quality information. The watershed models to be compared are summarized as to hydrologic capability. (Author's abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Jennings, M. E., Carey, W. P., and Blevins, D. W., 1980, Field study for verification of surface mining hydrologic models: Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, Lexington, Kentucky, Proceedings, p. 47-53.

REFERENCE CODE: H/S2-5

TITLE: Hydrology of a Watershed Containing Flood-Control Reservoirs and Coal Surface-Mining Activity, Southwestern Indiana.

GEOGRAPHICAL AREA: Sullivan, Vigo, Clay, and Greene Counties, Southwestern Indiana.

AREAL EXTENT: 237 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The effect of man's activities that have disturbed land areas can be both beneficial and deleterious. One of the important areas for study concerns the quality and quantity of water produced during the process of surface mining, which results in (1) groundwater contained in the piles of cast overburden, (2) water in last-cut lakes and ponds in the disturbed area, and (3) affected water in the streams.

Our hydrologic studies in Indiana show that surface mining for coal can (1) provide additional supplies of ground water, (2) aid in flood control, and (3) alter the water quality in some areas. Current mining practices in conformance with Indiana law are controlling the latter problem-acid mine-drainage which is caused mainly by old mine-waste piles, compacted areas such as haul roads, and underground mines.

The Busseron Creek watershed, a Public Law 566 Project of the U.S. Soil Conservation Service, contains sites for 26 reservoirs, of which 23 are flood control only. In this watershed of 237 sq. miles, surface mining for coal has already disturbed one site and at least two others are scheduled for mining.

During flushout-periods of high runoff caused by sudden and intense storms--acid mine-drainage is a problem in this watershed; normally runoff from unmined areas and non-acid mined areas provides sufficient dilution. Proper management of releases of water impounded by the mining process can materially remedy this problem.

REFERENCE CODE: H/S2-5--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:
Agnew, A. F. and Corbett, D. M., 1973, Hydrology of a watershed containing flood-control reservoirs and coal surface mining activity, southwestern Indiana: New York, Gordon and Breach, Ecology and Reclamation of Devastaged Land, vol. 1, R. J. Hutnik and G. Davis (eds.), p. 159-173.

AVAILABLE FROM:
Library copy
U.S. Geological Survey
Indianapolis, IN 46202

REFERENCE CODE: H/S2-6

TITLE: A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana.

COMPLETION DATE: 1972.

GEOGRAPHICAL AREA: Spencer County, Southwestern Indiana.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Three Spencer County surface mine lakes in the same immediate area, each about 30 years old were studied. Differences between the characteristics of the lakes are a function of the area/volume ratios, slopes of basins, and watersheds. These lakes are in the alkaline stage of recovery. The study results prove that each lake is modified, chemically, physically, and biologically at its own rate.

PUBLISHED REPORTS AND(OR) ARTICLES:
Coe, M. W. and Schmelz, D. V., 1972, A preliminary description of the physico-chemical characteristics and biota of three strip mine lakes, Spencer County, Indiana: Proceedings of the Indiana Academy of Science, vol. 82, p. 184-188.

REFERENCE CODE: H/S2-7

TITLE: Acid Mine Pollution Effects on Lake Biology.

COMPLETION DATE: 1971.

GEOGRAPHICAL AREA: Southwestern Indiana.

REFERENCE CODE: H/S2-7--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
For greater recreationsl potential of stripmine lakes, certain fundamental limnological information and the unique water chemistry resulting from leaching of substances contained in the cast overburden of the lakes were investigated. The six coal stripmine lakes studied during July 1969 to December 1970 in southern Indiana had a pH range of 2.5 to 8.2. Successional trends with increasing pH indicated lake differences. Increasing levels of dissolved oxygen and decreasing concentrations of dissolved substances showed environmental trends in surface waters. These tendencies were somewhat obscured by differences in the annual cycles of stratification, four of the lakes proving to be unexpectedly meromictic. Biological changes associated with increasing pH included increasing diversity and increasing homeostasis. Both pH and circulation patterns (meromixis vs. holomixis) influenced biomass, and bottom fauna was further limited by the steep-sided basin form. All stripmine lakes had much higher solute concentrations and lower biological diversity than a small local ono-stripmine reservoir studied as control. A fertilization program in one lake has apparently eliminated all rooted aquatic plants, producted violent plankton oscillations, and low fish populations. Sport fishing in stripmine lakes could be improved by management techniques.

PUBLISHED REPORTS AND(OR) ARTICLES:
Smith, R. W. and Frey, D. G., 1971, Acid mine pollution effects on lake biology: Bloomington, Indiana, Water Resources Research Center, Water Pollution Control Research Series, 131 p.

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22161
as PB-210 709

or

Water Resources Research Center
Indiana University
1005 E. 10th Street (Geology 417)
Bloomington, Indiana 47401

REFERENCE CODE: H/S2-8

TITLE: The Incidence of Sulfur and Iron Oxidizing Bacteria in the Acid Mine Drainage of the Busseron and Patoka Watersheds.

COMPLETION DATE: June 1970.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
There was a general correlation between the acidity of stream samples and the number of sulfur and iron oxidizing bacteria found in the samples.

REFERENCE CODE: H/S2-8--Continued.

Stream samples taken following a rainstorm in the Mud Creek area (Busseron watershed) showed that the acidity and the sulfur and iron oxidizing bacteria were washed out into streams in the "flushout" following the rainstorms.

Analysis of individual watersheds established that the source of the acid production was at the surface of exposed mine-waste material and that these active acid producing mine wastes contained very high numbers of sulfur and iron oxidizing bacteria.

Although the exact percentage of acidity due to the action of these bacteria on mine waste material was not established by field studies, it was possible to demonstrate by laboratory studies that sterilized mine waste material produced no appreciable acid unless unsterilized mine waste material or sulfur and iron oxidizing bacteria isolated from mine waste material were readded. It may thus be presumed that the major portion of the acid is the result of microbial action either directly or indirectly. Core samples taken from reclaimed areas in the Busseron watershed showed that this treatment was effective in reducing the number of sulfur and iron oxidizing bacteria and thus acid pollution was drastically curtailed.

PUBLISHED REPORTS AND(OR) ARTICLES:
Kindig, R. and Ramaley, R., 1970, The incidence of sulfur and iron oxidizing bacteria in the acid mine drainage of the Busseron and Patoka watersheds: Bloomington, Indiana, Indiana University Water Resources Research Center Supplementary Report to Reports No.s 2 and 4, 41 p.

AVAILABLE FROM:
Water Resources Research Center
Indiana University
1005 E. 10th Street (Geology 417)
Bloomington, Indiana 47401

REFERENCE CODE: H/S2-9

TITLE: Hydrology and Chemistry of Coal-Mine Drainage in Indiana.

COMPLETION DATE: 1969.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The flush out effect in the Busseron Creek Watershed is described by using analyses of samples taken during one particular heavy rainfall. . Problems in methods of analysis of mine waters and in correlating results are pointed out.

PUBLISHED REPORTS AND(OR) ARTICLES:
Agnew, A. F., and Corbett, D. M., 1969, Hydrology and chemistry of coal-mining drainage in Indiana: ACS Division of Fuel Chemistry, vol. 13, no. 2, p. 137-149.

REFERENCE CODE: H/S2-10

TITLE: Acid Mine-Drainage Problem of the Patoka River Watershed, Southwestern Indiana.

COMPLETION DATE: August 1969.

GEOGRAPHICAL AREA: Pike County, Patoka River watershed, southwestern Indiana.

AREAL EXTENT: 862 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Report of Investigations No. 4 has a dual objective: (1) to locate and identify the sources of acid in the Patoka River Watershed, and (2) to determine the effect this acid had on the water quality of the Patoka River.

More than 1,500 water samples collected by the Evansville, Indiana, Federal Water Pollution Control Administration, and the Indiana State Board of Health were reviewed by the author, and the resulting studies were presented.

PUBLISHED REPORTS AND(OR) ARTICLES:
Corbett, D. M., 1969, Acid mine-drainage problem of the Patoka River watershed, southwestern Indiana: Bloomington, Indiana, Indiana University Water Resources Research Center Report of Investigation No. 4, 173 p.

AVAILABLE FROM:
Water Resources Research Center
Indiana University
1005 E. 10th Street (Geology 417)
Bloomington, Indiana 47401

REFERENCE CODE: H/S2-11

TITLE: Coal Mining Effect on Busseron Creek Watershed, Sullivan County, Indiana.

COMPLETION DATE: July 1968.

GEOGRAPHICAL AREA: Vigo, Clay, and Greene Counties, Southwestern Indiana.

AREAL EXTENT: 237 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The present study was instrumented to obtain accurate and representative sampling of the water quality and quantity at different times of the year and in response to normal and abnormal physical events, both natural and manmade. Two years of streamflow data have been acquired together with chemical analyses of approximately 450 water samples (13 parameters were analyzed for each sample), taken at different stages of stream level and volume of discharge at different times during the year. The areas known to carry acid water in the streams were the Big Branch - Mud Creek, the Buttermilk Creek, and the Sulphur Creek tributary watersheds. Surface mining had disturbed 26 percent, 7 percent, and 12 percent, respectively, of these areas.

REFERENCE CODE: H/S2-11--Continued.

The present study showed that Big Branch above Station No. 17 has no acid mine-drainage problem, although sulfate occasionally is high. Mud Creek above Station No. 15 did show acid mine-drainage, but this was due to old mine-waste piles and underground mines rather than to recent or current surface mining. The acid content of Mud Creek had dropped considerably after joining the better quality water in Big Branch. Sulphur Creek acid drainage is apparently contributed by both old underground mines and surface mines. It is not known what effect the S.C.S. flood-control reservoir in this Watershed will have on the acid waters that it will impound.

The relatively unmined tributary watersheds upstream from the Big Branch - Mud Creek and the Sulphur Creek tributaries provide good-quality water that dilutes the acid waters created therein, so that the water quality on the Busseron Creek at Sullivan (Station No. 9) is moderate to good except during those rises when flushouts occur.

Buttermilk Creek Tributary, which enters Busseron Creek downstream from Station No. 9, contributes acid water that is derived from old mine-waste piles and an old underground mine. However, it is diluted in the mainstem Busseron Creek so that at Station No. 1 the quality is always acceptable or better, except during flushouts such as that on November 10, 1966.

A summary of the flushout investigation shows that the effect is dependent upon:

1)-- the magnitude and intensity of the storm,
2)-- the length of time since the last flushout,
3)-- the ratio of compacted area to the total area disturbed by surface mining,
4)-- the storage potential of last-cut lakes and adjacent cast overburden at the time of the storm, and
5)-- the ease of storm runoff from the compacted areas.

Thus it is concluded (1) that the magnitude and frequency of storm runoff has an appreciable effect on acid concentrations in a stream, and (2) that present surface-mining operations, except for coal-processing plants, are not the cause of acid water in the streams; rather, it is due mainly to old waste piles and compacted areas within the disturbed area, and underground mines.

PUBLISHED REPORTS AND(OR) ARTICLES:

Corbett, D. M. and Agnew, A. F., 1968, Coal mining effect on Busseron Cr-ek watershed, Sullivan County, Indiana: Bloomington, Indiana, Indiana Universtiy Water Resources Research Center, Report of Investigations no. 2, 234 p.

AVAILABLE FROM:

Water Resources Research Center
Indiana University
1005 E. 10th Street (Geology 417)
Bloomington, Indiana 47401

REFERENCE CODE: H/S2-12

TITLE: Mine Drainage Control at the Chinook Mine.

COMPLETION DATE: 1968.

GEOGRAPHICAL AREA: Near Stauton, Indiana.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The two types of drainage waters of the Chinook Mine near Staunton, Indiana, are from the pit areas and from the coal preparation plant. The water from 15 water sample stations on the receiving streams is collected monthly and analyzed for pH, total iron, and sulfate. The control of drainage is carried out according to the 1967 reclamation laws; grading is specifically described.

PUBLISHED REPORTS AND(OR) ARTICLES:
Lawson, A. E., 1968, Mine drainage control at the Chinook Mine: Purdue University, Proceedings of the Twenty-Third Indiana Waste Conference, Engineering Extension Service No. 132, p. 1018-1020.

REFERENCE CODE: H/S2-13

TITLE: Water Supplied by Coal Surface Mines, Pike County, Indiana.

COMPLETION DATE: December 1965.

GEOGRAPHICAL AREA: South-central Pike County, Indiana.

AREAL EXTENT: 270 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
An area of 270 square miles in Pike County was investigated during the fall of 1964, to determine the effect on stream flow of cast overburden from surface mining operations for coal. Two continuous-recording stream-gaging stations were constructed, and observations were made at more than 150 sites on four occasions during the period September 16-November 6. As shown by the studies herein reported, 26.1 square miles of cast overburden in the 270 square miles constituting the area studied in the central part of the Patoka River basin, contributed a flow of water to the Patoka River of 7 cfs (cubic feet per second) of 4 1/2 mgd (million gallons daily) during October 1964, whereas other nearby areas of like size or larger were dry throughout the period or for most of it.

Cast overburden resulting from surface mining of coal produces significant amounts of flow during severe drought periods as compared with little or no yield from undisturbed areas in southwestern Indiana. Although some rather wide departures were observed in the water yields from cast overburden at individual sites, an average production for the total 26.1 square miles of cast overburden was 0.27 cfs, or 174,500 gpd per square mile.

REFERENCE CODE: H/S2-13--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:

Corbett, D. M., 1965, Water supplied by coal surface mines, Pike County, Indiana: Bloomington, Indiana, Indiana University Water Resources Research Center Report of Investigations, no. 1, 67 p.

AVAILABLE FROM:

Water Resources Research Center
Indiana University
1005 E. 10th Street (Geology 417)
Bloomington, Indiana 47401

REFERENCE CODE: H/S2-14

TITLE: Effect of Sealing on Acidity of Mine Drainage.

COMPLETION DATE: 1930.

GEOGRAPHICAL AREA: Southwestern Indiana.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

Samples of water were taken from both open and closed sections of eight mines in southern Indiana. The evidence seems conclusive that sealing of worked-out or abandoned sections of mines results in inhibiting acid formation. "Sealing" must be made air-tight.

PUBLISHED REPORTS AND(OR) ARTICLES:

Leitch, R. D., Yant, W. P., and Sayers, R. R., 1930, Effect of sealing on acidity of mine drainage: U.S. Bureau of Mines, RI 2994, 11 p.

Leitch, R. D., Yant, W. P., and Sayers, R. R., 1930, Effect of sealing on acidity of mine drainage: U.S. Bureau of Mines Report of Investigations/ 2994.

Leitch, R. D., and Yant, W. P., 1930, Sealing old workings prevents acid formation and saves pipes and streams: Coal Age, vol. 35, p. 78-80.

SUPPLEMENTAL DATA D: SUMMARY 3

Annotated bibliography of large area studies pertinent to the hydrology of the Hoosier National Forest area.

REFERENCE CODE: H/S3-1

(Soon to be published)
Bobo, L. L., and Martin, J. D., Evaluation of ground-water quality, coal mining region, southwestern Indiana.

(Soon to be published)
Crawford, C. G., Analysis of historical surface-water-quality data in the coal mining region of southwestern Indiana.

(Soon to be published)
Renn, D. E., Analysis of stormwater quality for different land uses in the coal-mining region of southwestern Indiana.

Renn, D. E., Ragone, S. E., and Wilber, W. G., 1980, Quality of surface water in the coal-mining region, southwestern Indiana, March and May 1979: U.S. Geological Survey Open-File Report 80-970, 65 p.

(Soon to be published)
Renn, D. E., Wilber, W. G., and Crawford, C. G., Quality of surface water in the coal-mining region, southwestern Indiana, October 1979 to September 1980.

(Soon to be published)
Wangsness, D. J., A preliminary biological assessment of streams in the coal-mining region of southwestern Indiana.

(Soon to be published)
Wilber, W. G., Crawford, C. G., Renn, D. E., Ragone, S. E., and Wangness, D. J., Preliminary assessment of the factors affecting water quality in the coal-mining region, southwestern Indiana, March to October 1979.

AVAILABLE FROM:
Authors
U.S. Geological Survey
Indianapolis, IN 46202

ABSTRACT:
Under Section 507 (b)(11) of Public Law 95-87 (the Surface Mine Control and Reclamation Act) an appropriate Federal or State Agency must provide applicants for coal-mining permits water-quality and hydrologic information on the "general area" so that the applicant can assess the probable effects of the proposed mining. This information will also enable the regulatory authority to make an assessment of the probable cumulative impacts of all anticipated mining in the general area and its effects on water quality and hydrology.

To help meet the goals of Public Law 95-87 the U.S. Geological Survey is establishing a data-collection network in the coal-mining region of southwestern Indiana. The purpose of this network is to provide water-quality and hydrologic data on the "general area" for coal-mining permits.

REFERENCE CODE: H/S3-1--Continued.

Water-quality and hydrologic data were collected at 85 sites in October 1979 and at 21 sites monthly from January through September 1980. These samples were collected during steady-state flow conditions. Samples were also collected 10 times during nonsteady-state flow conditions at 8 sites from March to June 1980. At each site water samples were collected for determining concentrations of selected heavy metals, cations and anions, nutrients, and trace elements. Specific conductance, pH, water temperature, dissolved oxygen, and instantaneous discharge were also measured at each site. During October 1979 streambed samples were collected at 85 sites for determining concentrations of absorbed constituents on sediment smaller than 63 microns in diameter. Also, during March 1980 streambed samples were collected at 14 sites for coal separation analysis.

REFERENCE CODE: H/S3-2

(Soon to be published)
Bobo, L. L., and Eikenberry, S. E., Ground and surface-water quality and hydrologic data from in and around an active surface coal-mine, Clay and Vigo Counties, Indiana; U.S. Geological Survey.

AVAILABLE FROM:
U.S. Geological Survey, WRD
Indianapolis, IN 46202

ABSTRACT:
Few data exist from reclaimed surface coal mines to evaluate water quality and hydrology, particularly in areas where high acid-production potential material is selectively buried. Because so few data exist from these regions, a study was done to determine the effects of modern mining and reclamation on both ground and surface water in and around an active reclaimed surface coal mine, Clay and Vigo Counties, Indiana.

From September 1977 through February 1980, water quality and hydrologic data were collected from 41 wells and 24 stream sites. Land use in the study area was: agricultural and forested, affected and unaffected by mining operations, and reclaimed and unreclaimed surface coal mine.

Field measurements included water temperature, specific conductance, pH, Eh, dissolved oxygen, ground-water elevations and streamflow. Water samples from wells and streams were analyzed for concentration of major cations and anions, alkalinity, hardness, aluminum, iron, manganese, trace elements, organic carbon, phosphorous and dissolved-solids residue at 180 degrees Celsius.

Ferrous iron concentrations were determined in water samples from selected wells, and percent sulfur by weight and potential acidity were determined in split-drive reclaimed-cast-overburden samples. Additional analyses of stream samples done to determine (1) concentrations of elements absorbed onto streambed materials, (2) concentrations and particle size of suspended-sediment water, and (3) populations and Shannon diversity indices of phytoplankton in water.

REFERENCE CODE: H/S3-2--Continued.

This report includes a compilation and summary statistics by site for most of these data and methods of sampling and analysis.

REFERENCE CODE: H/S3-3

(Soon to be published)
Crawford, C. G. and Wilber, W. G., Distribution of metals in dissolved and particulate phases in streams draining surface mined and non-surface mined watersheds in southwestern Indiana.

(Soon to be published)
Crawford, C. G. and Wilber, W. G., Mineralogy and transport phases of metal in streams draining the coal mining region of southwest Indiana.

AVAILABLE FROM:
Authors
U.S. Geological Survey, WRD
Indianapolis, IN 46202

ABSTRACT:
A continuous-flow-through supercentrifuge has successfully been used to distinguish between dissolved, colloidal and particulate phases of metals transport in streams located in the coal-mining region of southwest Indiana. The technique was used to compare streams draining forested, agricultural, and both reclaimed and unreclaimed surface-mined watersheds.

Most of the metals were found to be transported in the dissolved phase regardless of land use. Metals associated with the suspended particulate and colloidal fractions usually amounted to only a small percentage of the total concentration in the stream. Concentrations of metals were generally highest in streams draining unreclaimed surface-mined watersheds. Concentrations of metals in streams draining reclaimed surface-mined watersheds were generally higher than those draining forested or agricultural watersheds although substantially less than found in streams draining unreclaimed surface-mined watersheds.

Metals concentrations on the particles were found to be higher in the least disturbed watersheds. The highest concentrations were found on particles in streams draining forested watersheds and the lowest on particles in streams draining unreclaimed surface-mined watersheds.

REFERENCE CODE: H/S3-4

(Soon to be published)
Martin, J. D., Design of groundwater-quality monitoring network--methodology for planners and managers.

REFERENCE CODE: H/S3-4--Continued.

AVAILABLE FROM:
Author
U.S. Geological Survey, WRD
Indianapolis, Indiana 46202

ABSTRACT
The report describes the process of designing a groundwater quality monitoring network for a representative portion of southwestern Indiana. Major emphasis will be placed on determining groundwater quality data needs. Laws and programs requiring groundwater quality data will be identified. Agency/user data needs will be reported (where determined by agency or specified by law) or determined (by author in view of objectives of programs or law). Common groundwater quality data needs will be determined.

Available groundwater quality data will be analyzed to: (1) determine factors affecting groundwater quality and (2) determine adequacy of data to meet needs. A monitoring network will be proposed to meet common data needs.

A non-technical report format will be used to facilitate the communication of the process, analyses, and results to water resource managers and planners.

REFERENCE CODE: H/S3-5

(Soon to be published)
Wangness, D. J., and others, 1981, Hydrology of Area 33, Eastern Region, Interior Coal Province, southwestern Indiana and northern Kentucky: U.S. Geological Survey Open-File Report 81-423.

(Soon to be published)
Wangsness, D. J., Miller, R. L., Bailey, Z. Chapman, and Crawford, C. G., 1981, Hydrology of Area 32, Eastern Region, Interior Coal Province, southwestern Indiana: U.S. Geological Survey Open-File Report 81-498.

(Soon to be published)
Wangsness, D. J., Mackenzie, A. L., Miller, R. L., Bailey, Z. Chapman, and Arihood, L. D., Hydrology of Area 30, Eastern Region, Interior Coal Province, southwestern Indiana.

SUMMARY:
The coal provinces of the country are divided into hydrologic reporting areas. Hydrologic information and sources are presented as text, tables, maps, and other illustrations designed to be useful to mine owners, operators, and consulting engineers in planning and implementing surface-mine operations that comply with the environmental requirements of the "Surface Mining Control and Reclamation Act of 1977."

REFERENCE CODE: H/S3-6

Banaszak, K. J., 1980, Coals as Aquifers in the Eastern United States: Symposium on Surface Mine Hydrology, Sedimentation, and Reclamation, Lexington, Kentucky, Proceedings, p. 235-248.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Coals have long been known as aquifers in the western United States. In the more humid east, coal generally have not been considered as aquifers because of other abundant ground water resources. The presence of an underclay, the development of cleats (joints) within the coal, and the absence of highly permeable beds within the coal measures all can result in the coal being a major water-producing zone in the stratigraphic section. This situation is exemplified in southwestern Indiana. These examples indicate 1) that the quality of water in the coal can be at least as good as or better than any in the coal section and 2) that the amount of water produced ranges from 5 to 40 liters per minute (1 to 10 gallons per minute), sufficient only for domestic use.

Area coal mining should not cause irreparable harm to these aquifers and probably will enhance recharge of this type of aquifer, because the replaced spoil could act as an infiltration gallery. The major concern is quality. If the water table fluctuates, or if acid- or toxic-producing materials are in the vadose zone within the spoil, degradation of water quality is likely. Knowledge of the geologic section and selective handling, if necessary, of those materials will make it possible for area coal mining to enhance, rather than to degrade, eastern coal aquifers. (Author's abstract)

REFERENCE CODE: H/S3-7

Bob, L. L., 1979, Gazetteer of coal-min lakes in southwestern Indiana: U.S. Geological Survey Water-Resources Investigations 79-67, 107 p.

ABSTRACT:
This gazetter is a catalog of lakes formed by surface coal mining in southwestern Indiana that are 0.5 acre or larger and in nonactive mine areas. Approximately 1,000 of the lakes are listed by 7.5-minute quadrangle topographic map name, lake-identification number, latitude and longitude, and county. Other data given are shape of lake, maximum length, mean width, length and development of shoreline, surface area, orientation, presence of a stream inlet or outlet, and geologic data (geologic formation of area surrounding the lake and the mined coal-bed member). Field data (sampling date, pH, specific conductance, apparent color of lake, and general vegetation along the shoreline) were collected for 287 of the lakes.

Two-hundred eighty-seven lakes were sampled once for pH and specific conductance. Vegetation along the shoreline and apparent color of each lake were identified at the same time. Although these data are not sufficient to quantify the water quality of the lakes, they do illustrate the variability of these characteristics. The pH of the 287 lakes ranged from 2.5 to 10.0; however, the pH of 80 percent

REFERENCE CODE: H/S3-7--Continued.

of them ranged from 6 to 9. Specific conductance ranged from 99 to 3,800 microhoms per centimeter at 25° Celsius. Specific conductance for approximately 70 percent of the lakes in the Staunton and Brazil Formations was less than 500 micromhos per centimeter at 25° Celsius, but for approximately 65 percent in the Dugger and Petersburg Formations it was greater than 1,000 micromhos per centimeter at 25° Celsius. The apparent colors of the lakes observed were varying shades of aqua, blue, brown, lime green, red, and green. Eighty percent of the lakes sampled were green.

Lakes sizes ranged from a chosen minimum of 0.5 acre to a maximum of 334 acres. Maximum length ranged from 0.1 to 2 miles, and the mean width was generally less than 0.8 miles.

REFERENCE CODE: H/S3-8

Wiram, V. P., 1976, Pyrite in the Coxville Sandstone Member, Linton Formation, and its effects on acid mine conditions near Latta, Greene County, Indiana: Indiana Department of Natural Resources, Geological Survey Occasional Paper 20, 10 p.

ABSTRACT:
Petrographic, X-ray diffraction, and chemical studies have shown that the basal 5 to 10 feet of the Coxville Sandstone Member of the Linton Formation, especially where the sandstone rests directly on the underlying Seelyville (III) Coal Member, causes acid mine drainage and acid spoil problems in normal strip mine operations at the Latta mine in Greene County. Framboidal (6 to 50 u) and secondary pyrite comprise as much as 5 to 10 percent of this friable porous fine-grained basal sandstone. Oxidation of the pyritic sandstone and subsequent leaching yield effluents with pH values of 2.5 to 3. Preferential stripping and burial of the pyrite-rich sandstone below the ground water table at the foot of the advancing cast overburden bank are recommended to prevent acid mine drainage problems, to avoid reexposure of acid-producing sandstone during regrading, and to prevent further oxidation of pyrite. Maps outlining sandstone bodies and pointing out areas with high acid-producing potential can be developed from sandstone-shale ratios.

REFERENCE CODE: H/S3-9

Corbett, D. M., 1968, Ground-water hydrology pertaining to surface mining for coal--southwestern Indiana: Pittsburgh, Pennsylvania, Second Symposium of Coal-Mine Drainage Research, p. 164-189.

ABSTRACT:
The theme of this report is that cast overburden from surface mining for coal in southwestern Indiana has formed massive man-made groundwater aquifers capable of storing large volumes of water resulting directly from precipitation.

REFERENCE CODE: H/S3-9--Continued.

During the three-year study period reported, it was found that these aquifers materially reduce major flood flows and crests during wet periods; on the other hand, these aquifers increase flows during extended dry periods and during summer and fall seasons when the stream flow is below lowland flooding. Although southwestern Indiana has yet to experience a major flood since the beginning of the study in September 1964, it can now be demonstrated that the low water yield from cast overburden during near-normal and abnormally wet summers is two to four times greater than during the extreme drought period of October 1964. From the documented facts contained in the report, it has also been concluded that much of the water produced by these cast overburdens was not only captured by the last or final cuts to form sizable lakes, but also a large amount was retained in the adjacent cast overburdens, replenishing annual losses by evaporation, seepage, and outflow from these lakes. Data have been analyzed for two tributaries of the Patoka River and three tributaries of Busseron Creek.

REFERENCE CODE: H/S3-10

Sternberg, Y. M. and Agnew, A. F., 1968, Hydrology of surface mining--a case study: Water Resources Research, vol. 4, no. 2, p. 363-368.

ABSTRACT:
A mathmetical model representing a strip mined area is formulated and analyzed. Solutions are obtained for the changes in ground water elevation and ground water flow that would occur in response to a uniform rate of deep percolation over the spoil bank. The solutions developed are for a bounded one dimensional aquifer (spoil bank) where the water level in the last cut (ditch) is a function of time described by an error function. The solution for the ground water flow can be used to forecast maximum and minimum flows from the spoil bank to the last cut.

REFERENCE CODE: H/S3-11

Gluskoter, H. J., 1965, Composition of ground water associated with coal in Illinois and Indiana: Economic Geology, v. 60, no. 3, p. 614-620.

ABSTRACT:
Mineral constituents of uncontaminated ground water from coal seams are predominantly alkalies and chloride, with chloride accounting for about 60 percent of total dissolved solids. Total dissolved solids and total chloride increase with depth. Median pH is 7.7. (Author's abstract)

REFERENCE CODE: H/S3-12

Truax, C. N., Jr., 1965, Water Storage potential of surface-mined coal lands: Mineral Congress Journal.

ABSTRACT:
Research scientists at Indiana University have verified that cast overburdens resulting from coal mining operations act as reservoirs for ground water. During a drought last year streams and lakes in a mined area in southwestern Indiana maintained good levels while nearby streams were dry.

SUPPLEMENTAL DATA E

NAWDEX listings of sources of monitoring-site data found in the Jefferson National Forest study area.

SUPPLEMENTAL DATA E: LISTING 1

Sources of streamflow and stage data in the Jefferson National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02080201 | JL1-1 | USGS | 02018500 | CATAWBA CREEK NEAR CATAWBA, VA. | 372805 | 0800020 | 051 | 023 | SW | 1939 | | Y | 34.30 | |
| 02080201 | JL1-2 | USNWS | 44-1126-N | BUCHANAN VA ON JAMES R | 373150 | 0794045 | 051 | 023 | SW | 1892 | | | 2075.00 | |
| 02080201 | JL1-3 | USGS | 02018700 | CAMBELL BRANCH NEAR FINCASTLE, VA. | 373237 | 0795728 | 051 | 023 | SW | 1968 | | | 1.51 | |
| 02080201 | JL1-4 | USGS | 02018000 | CRAIG CREEK AT PARR, VA. | 373957 | 0795442 | 051 | 023 | SW | 1925 | | N | 329.00 | |
| 02080201 | JL1-5 | VA001 | 02018000 | CRAIG CREEK AT PARR VA | 373957 | 0795442 | 051 | 023 | SW | 1925 | | | 329.00 | |
| 02080201 | JL1-6 | USGS | 02017000 | MEADOW CREEK AT NEWCASTLE, VA. | 372935 | 0800635 | 051 | 045 | SW | 1928 | 1957 | Y | | |
| 02080201 | JL1-7 | USGS | 02017300 | CRAIG CREEK AT NEW CASTLE VA | 373006 | 0800618 | 051 | 045 | SW | 1966 | | | 112.00 | |
| 02080201 | JL1-8 | USGS | 02017500 | JOHNS CREEK AT NEW CASTLE, VA. | 373022 | 0800625 | 051 | 045 | SW | 1925 | | N | 104.00 | |
| 02080201 | JL1-9 | VA001 | 02017500 | JOHNS C AT NEW CASTLE VA | 373022 | 0800625 | 051 | 045 | SW | 1926 | | | 104.00 | |
| 02080201 | JL1-10 | USGS | 02017400 | JOHNS CREEK TRIB. NEAR NEW CASTLE, VA. | 373321 | 0795952 | 051 | 045 | SW | 1966 | | | 2.05 | |
| 02080201 | JL1-11 | USGS | 02017700 | CRAIG CREEK TRIB NEAR NEW CASTLE, VA. | 373321 | 0795952 | 051 | 045 | SW | 1967 | | | 2.05 | |
| 05070202 | JL1-12 | USGS | 03208990 | JOHN W. FLANNAGAN RESERVOIR NEAR HAYSI, VA. | 371400 | 0822056 | 051 | 051 | LK | 1964 | | | 221.00 | |
| 05070202 | JL1-13 | USGS | 03209000 | POUND RIVER BELOW FLANNAGAN DAM NEAR HAYSI, | 371413 | 0822036 | 051 | 051 | SW | 1925 | | N | 221.00 | Y |
| 05070202 | JL1-14 | USGS | 03209200 | RUSSELL FORK AT BARTLICK, VA. | 371445 | 0821925 | 051 | 051 | SW | 1956 | | Y | 526.00 | Y |
| 05050002 | JL1-15 | USGS | 03175500 | WOLF CREEK NEAR NARROWS, VA. | 371820 | 0805100 | 051 | 071 | SW | 1907 | | Y | 223.00 | |
| 02080201 | JL1-16 | USNWS | 44-0411-N | BALCONY FALLS VA ON JAMES R | 373700 | 0792700 | 051 | 163 | SW | 1937 | | | 2975.00 | |
| 02080202 | JL1-17 | USGS | 02024500 | MAURY RIVER NR GLASGOW VA | 373752 | 0792638 | 051 | 163 | SW | 1894 | 1905 | Y | 831.00 | |
| 06010102 | JL1-18 | USGS | 03471100 | DICKEY CREEK AT SUGAR GROVE, VA. | 364622 | 0812510 | 051 | 173 | SW | 1966 | | | 7.28 | |
| 06010102 | JL1-19 | USGS | 03471200 | S.F. HOLSTON RIVER AT TEAS, VA. | 364622 | 0812705 | 051 | 173 | SW | 1967 | | | 31.10 | |
| 06010102 | JL1-20 | USGS | 03470900 | SLEMP CREEK TRIB. NEAR SUGAR GROVE, VA. | 364830 | 0812415 | 051 | 173 | SW | 1966 | 1975 | | .36 | |
| 06010102 | JL1-21 | USGS | 03473800 | STALEY CREEK NEAR MARION, VA. | 364925 | 0812825 | 051 | 173 | SW | 1950 | | | 8.33 | |
| 05050002 | JL1-22 | USGS | 03174500 | WOLF CREEK NEAR BURKES GARDEN, VA. | 370810 | 0812030 | 051 | 185 | SW | 1927 | 1928 | | 36.00 | |
| 06010102 | JL1-23 | USGS | 03472500 | BEAVERDAM CREEK AT DAMASCUS, VA. | 363740 | 0814728 | 051 | 191 | SW | 1900 | | Y | 56.00 | |
| 05070202 | JL1-24 | USGS | 03208800 | POUND RIVER ABOVE INDIAN CREEK, AT POUND, VA | 370726 | 0823629 | 051 | 195 | SW | 1956 | | Y | 36.70 | Y |
| 05070202 | JL1-25 | USGS | 03208680 | NORTH FORK POUND RIVER LAKE AT POUND, VA. | 370727 | 0823752 | 051 | 195 | LK | 1966 | | | 17.20 | |
| 05070202 | JL1-26 | USGS | 03208700 | N. F. POUND RIVER AT POUND, VA. | 370732 | 0823736 | 051 | 195 | SW | 1956 | | Y | 18.50 | Y |
| 05050001 | JL1-27 | USGS | 03165700 | CRIPPLE CREEK AT CEDAR SPRINGS, VA. | 364931 | 0811645 | 051 | 197 | SW | 1967 | | | 11.30 | |

| CODE NUMBER | TYPES OF DATA* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STAGE | | | | FLOW | | | | | VOLUME | | | | (G) | (H) | (I) |
| | (A) COMPLETE | (B) PEAK | (B) LOW | (C) STORAGE MEDIA | (D) COMPLETE | (B) PEAK | (B) LOW | (A) MISCELLANEOUS | (C) STORAGE MEDIA | (E) TOTAL | (E) CHANGE | (C) STORAGE MEDIA | (F) TELEMETRY | OTHER HYDROLOGIC DATA | OTHER RELATED DATA | DATA BANK SOURCE |
| JL1-1 | 2 | 1 | | C | 1 | 1 | | | D | | | | | 1567 | 6 | T |
| JL1-2 | O | | | P | 1 | | | | P | | | | 8 | | 6 | |
| JL1-3 | Z | | | | | 9 | 9 | | | | | | | 3 | 1 | T |
| JL1-4 | I | 1 | | C | 1 | 1 | | | D | | | | | 1 | 6 | T |
| JL1-5 | I | | | D | 1 | | | | D | | | | | A267 | 6 | T |
| JL1-6 | | E | | C | 2 | E | | | C | | | | | | 6 | T |
| JL1-7 | | 1 | | C | | 1 | 9 | | C | | | | | | 6 | T |
| JL1-8 | | 1 | | C | 1 | 1 | | | D | | | | | | 6 | T |
| JL1-9 | I | | | D | 1 | | | | D | | | | | A25678 | 6 | T |
| JL1-10 | Z | 1 | | C | | 1 | 9 | | C | | | | | 358 | 6 | T |
| JL1-11 | Z | 1 | | C | | 1 | 9 | | C | | | | | 3 | 6 | T |
| JL1-12 | I | | | P | | 9 | | | P | 3 | 9 | P | | | 6 | |
| JL1-13 | I | 1 | | C | E | 1 | | | D | | | | 8 | 1567 | 6 | |
| JL1-14 | I | 1 | | C | 1 | 1 | | | D | | | | 8 | 5678 | 6 | |
| JL1-15 | W | 1 | | C | 1 | 1 | | | D | | | | | 15678 | 6 | T |
| JL1-16 | Z | | | | 1 | | | | | | | | | | 6 | |
| JL1-17 | E | E | | C | 2 | E | | | C | | | | | | 6 | |
| JL1-18 | | 1 | | C | | 1 | 9 | | C | | | | | | 6 | T |
| JL1-19 | | 1 | | P | | 9 | 9 | | P | | | | | | | T |
| JL1-20 | Z | | | P | | 9 | | | P | | | | | 58 | | T |
| JL1-21 | | 1 | | C | | 1 | 9 | | C | | | | | 58 | 6 | T |
| JL1-22 | E | | | | E | | | | P | | | | | | 6 | T |
| JL1-23 | | 1 | | C | 2 | 1 | 9 | | C | | | | | 578 | 6 | T |
| JL1-24 | 2 | 1 | | C | 1 | 1 | | | D | | | | 8 | 158 | 6 | |
| JL1-25 | I | | | P | | 9 | | | P | 3 | 9 | P | | | 6 | |
| JL1-26 | I | 1 | | C | E | 1 | | | D | | | | 8 | 1568 | 6 | |
| JL1-27 | | 1 | | P | | 9 | 9 | | P | | | | | | | T |

* USE CODE TABLES (See right margin) indicated by letter in () in column heading

# CODE TABLES

### TABLE (A)-COMPLETE STAGE and MISCELLANEOUS FLOW

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual (twice per year) |
| A | | 9 | Annual (once per year) |
| B | | | Other periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### TABLE (B)-STAGE and FLOW, PEAK or LOW

| Code | Meaning |
|---|---|
| 1 | Year-round |
| 2 | Seasonal |
| 8 | Annual maximum or minimum |
| 9 | Irregular |
| E | Eliminated activity |

### TABLE (C)-STORAGE MEDIA

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TABLE (D)-COMPLETE FLOW

| Code Year-Round | Code Seasonal | Meaning |
|---|---|---|
| 1 | 2 | Daily flow |
| 3 | 4 | Monthly flow determined |
| E | E | Eliminated activity |

### TABLE (E)-VOLUME

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Daily values | 9 | Irregular |
| 3 | Monthly values | E | Eliminated activity |

### TABLE (F)-TELEMETRY

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Telemeter-land lines | 5 | DARC |
| 2 | Telemeter-radio network | 6,8 | Other or type unspecified |
| 3 | Landsat | 7 | Two or more types |
| 4 | GOES | | |

### TABLE (G)-OTHER HYDROLOGIC DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | QW recurring | 7 | Flood frequency |
| 2 | QW nonrecurring | 8 | Coef. of roughness |
| 3 | Flood hydrograph | 9 | Time of travel |
| 4 | Sediment studies | A | Flood plain maps |
| 5 | Cross section | B | Tides |
| 6 | Flow duration | C | Surface inflow-outflow |

### TABLE (H)-OTHER RELATED DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Precipitation | 4 | Radiation (solar) |
| 2 | Wind | 5 | Soil moisture |
| 3 | Evaporation | 6 | Datum (mean sea level) |

### TABLE (I)-DATA BANK SOURCE

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA E: LISTING 2

Sources of surface-water-quality data in the Jefferson National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIBUTING AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02080203 | JL2-1 | USEPA | JAMESRIVER12 | CONFLU SKIMMER CR NR BIG ISLAND | 373120 | 0791956 | 051 | 019 | SW | 1973 | 1973 | | | |
| 02080201 | JL2-2 | USEPA | JAMESRIVER11 | CONFLU W REED CREEK BIG ISLAND | 373128 | 0792052 | 051 | 019 | SW | 1973 | 1973 | | | |
| 02080203 | JL2-3 | VA001 | 2-JMS277.30 | JAMES RIVER | 373142 | 0792107 | 051 | 019 | SW | 1974 | | | | |
| 02080203 | JL2-4 | USEPA | JAMESRIVER9 | OWEN-ILL IND WW PLT BIG ISLAND | 373210 | 0792208 | 051 | 019 | SW | 1973 | 1973 | | | |
| 02080203 | JL2-5 | VA001 | 2-JMS282.28 | JAMES RIVER | 373528 | 0792251 | 051 | 019 | SW | 1969 | | | | |
| 05050002 | JL2-6 | USFS | 140604 | HUNTING CAMP CREEK 76-1 | 370644 | 0811327 | 051 | 021 | SW | 1972 | | N | | |
| 05050002 | JL2-7 | USFS | 140606 | HUNTING CAMP CREEK 76-06 | 370732 | 0811414 | 051 | 021 | SW | 1977 | | | | |
| 05050002 | JL2-8 | USFS | 140607 | HUNTING CAMP CREEK 76-07 | 370734 | 0811329 | 051 | 021 | SW | 1977 | | | | |
| 02080201 | JL2-9 | USGS | 02018500 | CATAWBA CREEK NEAR CATAWBA, VA. | 372805 | 0800020 | 051 | 023 | SW | 1945 | 1969 | N | 34.30 | |
| 02080201 | JL2-10 | USGS | 02018000 | CRAIG CREEK AT PARR, VA. | 373957 | 0795442 | 051 | 023 | SW | 1945 | 1956 | | 329.00 | |
| 02080201 | JL2-11 | USGS | 02017000 | MEADOW CREEK AT NEWCASTLE, VA. | 372935 | 0800635 | 051 | 045 | SW | 1945 | 1968 | N | | |
| 02080201 | JL2-12 | USGS | 02017500 | JOHNS CREEK AT NEW CASTLE, VA. | 373022 | 0800625 | 051 | 045 | SW | 1930 | 1968 | | 104.00 | |
| 02080201 | JL2-13 | VA001 | 02017500 | JOHNS C AT NEW CASTLE VA | 373022 | 0800625 | 051 | 045 | SW | 1930 | 1968 | | 104.00 | |
| 02080201 | JL2-14 | USFS | 140501 | BELOW REGENERATION ON FS60416710 | 373101 | 0801225 | 051 | 045 | SW | 1976 | | | | |
| 02080201 | JL2-15 | USEPA | PBC-1.5 | ABOVE INTAKE-PAINT BANK HATCHERY | 373300 | 0801430 | 051 | 045 | SW | 1971 | 1971 | | | |
| 02080201 | JL2-16 | USEPA | PBC-1.9 | BELOW OUTLET PAINT BANK HATCHERY | 373300 | 0801430 | 051 | 045 | SW | 1971 | 1971 | | | |
| 02080201 | JL2-17 | USFWS | 431731 | PAINT BANK NFH PAINT BANK CREEK | 373304 | 0801430 | 051 | 045 | SW | 1971 | 1972 | | | |
| 02080201 | JL2-18 | USFWS | 431733 | PAINT BANK NFH PAINT BANK CREEK | 373315 | 0801448 | 051 | 045 | SW | 1971 | 1972 | | | |
| 02080201 | JL2-19 | USFS | 140502 | COLD SPRING BRANCH AT 6042 50-2 | 373319 | 0800954 | 051 | 045 | SW | 1976 | | | | |
| 02080201 | JL2-20 | VA001 | 2-POT034.88 | POTTS CREEK | 373410 | 0801545 | 051 | 045 | SW | 1970 | | | | |
| 02080201 | JL2-21 | USFWS | 431735 | PAINT BANK NFH PAINT BANK CREEK | 373419 | 0801536 | 051 | 045 | SW | 1971 | 1972 | | | |
| 05070202 | JL2-22 | USEPA | 510505 | JOHN W. FLANNAGAN DAM | 370808 | 0822536 | 051 | 051 | LK | 1973 | 1973 | | | |
| 05070202 | JL2-23 | VA001 | 6ACNR011.66 | CRANESNEST RIVER | 370810 | 0822533 | 051 | 051 | SW | 1970 | | | | |
| 05070202 | JL2-24 | USEPA | 510504 | JOHN W. FLANNAGAN | 371155 | 0822325 | 051 | 051 | LK | 1973 | 1973 | | | |
| 05070202 | JL2-25 | USEPA | 510503 | JOHN W. FLANNAGAN DAM | 371206 | 0822518 | 051 | 051 | LK | 1973 | 1973 | | | |
| 05070202 | JL2-26 | VA001 | 6ACNR002.00 | CRANESNEST RIVER | 371212 | 0822246 | 051 | 051 | SW | 1974 | | | | |
| 05070202 | JL2-27 | VA001 | 6ACNR000.00 | CRANESNEST RIVER | 371247 | 0822235 | 051 | 051 | SW | 1974 | | | | |
| 05070202 | JL2-28 | USEPA | 510502 | JOHN W. FLANNAGAN DAM | 371248 | 0822236 | 051 | 051 | LK | 1973 | 1973 | | | |
| 05070202 | JL2-29 | VA001 | 6APNR008.15 | POUND RIVER | 371309 | 0822339 | 051 | 051 | SW | 1973 | | | | |
| 05070202 | JL2-30 | VA001 | 6ALTW000.00 | LOWER TWIN BRANCH | 371310 | 0822216 | 051 | 051 | SW | 1973 | | | | |
| 05070202 | JL2-31 | VA001 | 6AUPP000.00 | UPPER TWIN BRANCH | 371311 | 0822219 | 051 | 051 | SW | 1973 | | | | |
| 05070202 | JL2-32 | USEPA | 510501 | JOHN W. FLANNAGAN DAM | 371356 | 0822038 | 051 | 051 | LK | 1973 | 1973 | | | |
| 05070202 | JL2-33 | VA001 | 6APNR001.82 | POUND RIVER | 371358 | 0822038 | 051 | 051 | SW | 1973 | | | | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

### PHYSICAL

| CODE NUMBER | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media |
|---|---|---|---|---|---|---|---|---|
| JL2-1 | S | A | S | S | | S | A | D |
| JL2-2 | S | A | S | S | | S | A | D |
| JL2-3 | K | | | | | K | K | D |
| JL2-4 | S | A | S | S | | S | A | D |
| JL2-5 | K | K | E | | | K | K | D |
| JL2-6 | R | K | K | | | R | | D |
| JL2-7 | | A | A | | | | | D |
| JL2-8 | | K | K | | | | | D |
| JL2-9 | R | R | | R | | R | | D |
| JL2-10 | | A | | E | | E | | P |
| JL2-11 | A | A | | A | | A | | D |
| JL2-12 | A | A | | A | | A | | D |
| JL2-13 | M | M | | E | | E | | P |
| JL2-14 | A | A | A | | | A | A | D |
| JL2-15 | A | | | | | S | A | D |
| JL2-16 | A | | | | | S | A | D |
| JL2-17 | | | | | | | | |
| JL2-18 | | | | | | | | |
| JL2-19 | A | A | A | | | A | A | D |
| JL2-20 | K | | E | | | K | E | D |
| JL2-21 | | | | | | | | |
| JL2-22 | A | A | A | | | A | | D |
| JL2-23 | N | | | | | N | N | D |
| JL2-24 | S | S | S | | | S | | D |
| JL2-25 | R | R | S | | | R | | D |
| JL2-26 | N | | | | | N | N | D |
| JL2-27 | R | R | | | | R | R | D |
| JL2-28 | A | A | A | | | A | | D |
| JL2-29 | A | A | | | | A | A | D |
| JL2-30 | N | | | | | N | R | D |
| JL2-31 | N | | | | | N | R | D |
| JL2-32 | R | R | R | | | R | | D |
| JL2-33 | N | | | | | N | N | D |

### CHEMICAL

| CODE NUMBER | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL2-1 | A | S | S | | A | A | A | A | | A | | | S | A | | | S | | S | | D |
| JL2-2 | A | S | S | | A | A | A | A | | A | | | S | A | | | S | | S | | D |
| JL2-3 | R | A | | | K | K | K | K | | S | | | K | | | | K | | K | | D |
| JL2-4 | A | S | S | | A | A | A | A | | A | | | S | A | | | S | | S | | D |
| JL2-5 | K | E | | | K | K | K | K | | A | | | K | | E | | K | K | K | | D |
| JL2-6 | | E | R | | | E | | E | | | | | | | | | | | E | | D |
| JL2-7 | | | | | | | | | | | | | | | | | | | | | |
| JL2-8 | | | | | | | | | | | | | | | | | | | | | |
| JL2-9 | R | R | R | R | | R | | R | | R | | | | | | | | | | | D |
| JL2-10 | E | E | E | E | | | | E | | E | | | | | | | | | | | P |
| JL2-11 | A | A | A | A | | A | | A | | A | | | | | | | | | | | D |
| JL2-12 | A | A | A | A | | A | | A | | A | | | | | | | | | | | D |
| JL2-13 | E | E | E | E | | E | | E | | E | | | | | | | | | | | P |
| JL2-14 | | | | | | | | | | | | | | | | | | | | | |
| JL2-15 | S | A | A | | A | A | A | S | | A | | | A | | | | A | | A | | D |
| JL2-16 | S | A | A | | A | A | A | S | | A | | | A | | | | A | | A | | D |
| JL2-17 | | R | R | | | R | R | R | | | | | | | | | R | | R | | D |
| JL2-18 | | R | R | | | R | R | R | | | | | | | | | R | | R | | D |
| JL2-19 | | | | | | | | | | | | | | | | | | | A | | D |
| JL2-20 | E | E | | | K | K | K | K | | S | | | | | | | E | | K | | D |
| JL2-21 | | R | R | | | R | R | R | | | | | | | | | R | | R | | D |
| JL2-22 | | A | | | A | A | A | A | | | | | | | | | | | A | | D |
| JL2-23 | N | A | | | R | R | R | R | | A | | | | | | | E | | N | | D |
| JL2-24 | | S | | | S | S | S | S | | | | | | | | | | | S | | D |
| JL2-25 | | R | | | R | R | R | R | | | | | | | | | | | R | | D |
| JL2-26 | N | A | | | N | N | N | N | | E | | | | | | | | | N | | D |
| JL2-27 | R | A | | | A | A | R | R | | A | | | A | | | | R | A | R | | D |
| JL2-28 | | A | | | A | A | A | A | | | | | | | | | | | A | | D |
| JL2-29 | A | A | | | A | A | A | A | | E | | | A | | | | A | A | A | | D |
| JL2-30 | R | A | | | R | R | R | R | | E | | | | | | | | | N | | D |
| JL2-31 | R | A | | | R | R | R | R | | E | | | | | | | | | N | | D |
| JL2-32 | | R | | | R | R | R | R | | | | | | | | | | | R | | D |
| JL2-33 | N | A | | | R | R | R | R | | E | | | | | | | | | N | | D |

### BIOLOGIC

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL2-1 | S | | A | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-2 | S | | A | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-3 | R | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-4 | S | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-5 | K | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-6 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-7 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-8 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-9 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-10 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-11 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-12 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-13 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-14 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-15 | A | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-16 | A | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-17 | R | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-18 | R | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-19 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-20 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-21 | R | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-22 | | | A | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-23 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-24 | | | S | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-25 | | | R | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-26 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-27 | R | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-28 | | | A | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-29 | A | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-30 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-31 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-32 | | | R | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-33 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |

### SEDIMENT / OTHER

| CODE NUMBER | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | Telemetry | S W Station Wves Nino | G W Station Wves Nino | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL2-1 | | | | | | | | | | | | S |
| JL2-2 | | | | | | | | | | | | S |
| JL2-3 | | | | | | | | | | | | S |
| JL2-4 | | | | | | | | | | | | S |
| JL2-5 | | | | | | | | | | | | S |
| JL2-6 | | | | | | | | | | | | S |
| JL2-7 | | A | | | | | | D | | | | S |
| JL2-8 | | K | | | | | | D | | | | S |
| JL2-9 | | | | | | | | | | | | SW |
| JL2-10 | | | | | | | | | | | | W |
| JL2-11 | | | | | | | | | | | | SW |
| JL2-12 | | | | | | | | | | | | SW |
| JL2-13 | | | | | | | | | | | | |
| JL2-14 | | R | | | | | | D | | | | S |
| JL2-15 | | | | | | | | | | | | S |
| JL2-16 | | | | | | | | | | | | S |
| JL2-17 | | | | | | | | | | | | S |
| JL2-18 | | | | | | | | | | | | S |
| JL2-19 | | R | | | | | | D | | | | S |
| JL2-20 | | | | | | | | | | | | S |
| JL2-21 | | | | | | | | | | | | S |
| JL2-22 | | | | | | | | | | | | S |
| JL2-23 | | | | | | | | | | | | S |
| JL2-24 | | | | | | | | | | | | S |
| JL2-25 | | | | | | | | | | | | S |
| JL2-26 | | | | | | | | | | | | S |
| JL2-27 | | | | | | | | | | | | S |
| JL2-28 | | | | | | | | | | | | S |
| JL2-29 | | | | | | | | | | | | S |
| JL2-30 | | | | | | | | | | | | S |
| JL2-31 | | | | | | | | | | | | S |
| JL2-32 | | | | | | | | | | | | S |
| JL2-33 | | | | | | | | | | | | S |

### PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

### DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JL2-34 | USCE | 1JWFW0004 | JOHN W FLANNAGAN RESERVOIR | 371359 | 0822059 | 051 | 051 | LK | 1977 | | | | |
| 05070202 | JL2-35 | USGS | 03208990 | JOHN W. FLANNAGAN RESERVOIR NEAR HAYSI. VA. | 371400 | 0822056 | 051 | 051 | LK | 1978 | 1980 | | 221.00 | |
| | JL2-36 | USCE | 1JWFW0001 | POUND RIVER | 371413 | 0822036 | 051 | 051 | SW | 1900 | | | | |
| 05070202 | JL2-37 | USGS | 03209000 | POUND RIVER BELOW FLANNAGAN DAM NEAR HAYSI, | 371413 | 0822036 | 051 | 051 | SW | 1930 | | | 221.00 | Y |
| 05070202 | JL2-38 | VA001 | 6ARSS021.39 | RUSSELL FORK | 371442 | 0821926 | 051 | 051 | SW | 1970 | | | | |
| 05070202 | JL2-39 | USGS | 03209200 | RUSSELL FORK AT BARTLICK, VA. | 371445 | 0821925 | 051 | 051 | SW | 1979 | | | 526.00 | Y |
| 05050002 | JL2-40 | USFS | 140104 | DISMAL CREEK 41-1 | 371158 | 0805255 | 051 | 071 | SW | 1974 | 1975 | | | |
| 05050002 | JL2-41 | USGS | 03175500 | WOLF CREEK NEAR NARROWS, VA. | 371820 | 0805100 | 051 | 071 | SW | 1930 | 1969 | | 223.00 | |
| 05050002 | JL2-42 | VA001 | 9-WFC003.69 | WOLF CREEK | 371821 | 0805059 | 051 | 071 | SW | 1970 | | | | |
| 05050002 | JL2-43 | VA001 | 9-NEW040.13 | NEW RIVER | 372000 | 0804500 | 051 | 071 | SW | 1967 | | | | |
| 05050002 | JL2-44 | VA001 | 9-NEW036.48 | NEW RIVER | 372003 | 0804834 | 051 | 071 | SW | 1967 | | N | | |
| 05050002 | JL2-45 | WV001 | KN-63 | NEW R AT NARROWS VA | 372025 | 0804530 | 051 | 071 | SW | 1967 | 1967 | | | |
| 05050002 | JL2-46 | USEPA | 510081 | NEW RIVER ABOVE CELANESE FIBER | 372027 | 0804529 | 051 | 071 | SW | 1972 | 1972 | | | |
| 05050002 | JL2-47 | USEPA | VA0000299001 | NEW RIVER-CELANESE OUTFALL #001 | 372035 | 0804602 | 051 | 071 | SW | 1972 | 1972 | | | |
| 02080201 | JL2-48 | USFS | 140101 | CABIN BRANCH 51-1 | 372245 | 0801500 | 051 | 121 | SW | 1973 | 1975 | | | |
| 02080201 | JL2-49 | VA001 | 2-JMS290.85 | JAMES RIVER | 373656 | 0792956 | 051 | 163 | SW | 1970 | 1978 | N | | |
| 02080202 | JL2-50 | USGS | 02024500 | MAURY RIVER NR GLASGOW VA | 373752 | 0792638 | 051 | 163 | SW | 1967 | 1968 | | 831.00 | |
| 02080202 | JL2-51 | USEPA | JAMESRIVER7 | BRIDGE ON US RT 501 NEAR SNOWDEN | 373758 | 0792628 | 051 | 163 | SW | 1973 | 1973 | | | |
| 02080202 | JL2-52 | VA001 | 2-MRY009.80 | MAURY RIVER | 373854 | 0792634 | 051 | 163 | SW | 1967 | 1978 | Y | | |
| 02080202 | JL2-53 | VA001 | 2-MRY000.46 | MAURY RIVER | 374324 | 0792232 | 051 | 163 | SW | 1970 | | | | |
| 02080201 | JL2-54 | USFS | 219917 | PRECIP STA BUENA VISTA, VA. | 374418 | 0792110 | 051 | 163 | SW | 1975 | | | | |
| 06010102 | JL2-55 | USFS | 140605 | STALEY CREEK 19-1 | 364738 | 0812815 | 051 | 173 | SW | 1972 | 1975 | N | | |
| 05050001 | JL2-56 | USFS | 140602 | KILLINGER CREEK 31-2 | 364957 | 0812004 | 051 | 173 | SW | 1972 | | | | |
| 05050001 | JL2-57 | USFS | 140601 | KILLINGER CREEK 31-1 | 365000 | 0811930 | 051 | 173 | SW | 1971 | | | | |
| 06010102 | JL2-58 | VA001 | 6CHUN004.76 | HUNGRY MOTHER CRK | 365216 | 0813122 | 051 | 173 | SW | 1972 | 1976 | N | | |
| 06010102 | JL2-59 | VA001 | 6CHUN005.76 | HUNGRY MOTHER CRK | 365303 | 0813126 | 051 | 173 | SW | 1972 | 1976 | N | | |
| 06010101 | JL2-60 | VA001 | 6CHUN006.15 | HUNGRY MOTHER CRK | 365321 | 0813114 | 051 | 173 | SW | 1972 | 1976 | N | | |
| 06010102 | JL2-61 | VA001 | 6CLAL001.28 | LAUREL CREEK | 363647 | 0814518 | 051 | 191 | SW | 1967 | 1976 | N | | |
| 06010102 | JL2-62 | VA001 | 6CBVD002.00 | BEAVERDAM CREEK | 363652 | 0814815 | 051 | 191 | SW | 1967 | | | | |
| 06010102 | JL2-63 | VA001 | 6CBVD000.07 | BEAVERDAM CREEK | 363908 | 0814732 | 051 | 191 | SW | 1969 | | | | |
| 06010102 | JL2-64 | USFS | 140408 | STRAIGHT LAUREL 22-8 | 363917 | 0814130 | 051 | 191 | SW | 1974 | 1975 | | | |
| 05070202 | JL2-65 | VA001 | 6APNK006.24 | N FORK POUND RI. | 370600 | 0824033 | 051 | 195 | SW | 1973 | | | | |
| 05070202 | JL2-66 | VA001 | 6APNK006.42 | N FORK POUND | 370602 | 0824044 | 051 | 195 | SW | 1976 | | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL: Temperature | Specific conductance | Turbidity | Color | Odor | pH | Suspended solids | Storage media | CHEMICAL: Dissolved solids | Major ions | Hardness | Silica | Phosphorus | Phosphorus species | Nitrogen | Nitrogen species | Detergents | Other minor elements | Radioactivity | Radiochemical species | Carbon | Organic groups | Pesticides species | Other organic species | Biochemical oxygen demand | Chemical oxygen demand | Dissolved oxygen | Other dissolved gases | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL2-34 | A | A | N | | | A | A | D | N | A | A | | A | | A | A | | A | | | | | | | | | A | | D |
| JL2-35 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JL2-36 | A | A | N | | | A | A | D | N | A | A | | A | | A | A | | N | | | | | | | | | A | | D |
| JL2-37 | A | A | | A | | A | | D | A | A | A | A | | A | A | A | | A | | | | | | | | | | | D |
| JL2-38 | N | | | | | N | N | D | N | A | | | K | K | K | K | | A | | | | | | | E | | N | E | D |
| JL2-39 | N | N | | | | N | | D | N | N | A | A | A | | | A | | N | | | | A | | | | | | A | D |
| JL2-40 | H | M | M | | | M | | D | | | | | | | | | | | | | | | | | | | | | |
| JL2-41 | A | A | | A | | A | | D | A | A | A | A | | A | | A | | A | | | | | | | | | | | D |
| JL2-42 | H | N | E | | | H | N | D | N | | | | N | N | H | H | | S | | | N | | E | | K | N | H | | D |
| JL2-43 | K | | | | | K | E | D | E | E | E | | K | K | K | K | | S | | | | | | | E | | K | | D |
| JL2-44 | K | | | | | K | K | D | E | E | E | | K | K | K | K | | S | | | K | | | | K | | K | | D |
| JL2-45 | M | | M | M | M | M | M | | M | M | | | | | | | | | | | | | | | M | | M | | |
| JL2-46 | A | A | | A | | A | A | D | A | A | | | | | | A | | | | | | A | | | | | A | | D |
| JL2-47 | A | A | | A | | A | A | D | A | A | | | | | | A | | | | | | A | | A | | | | | D |
| JL2-48 | K | K | K | | | K | | D | | | | | | | | | | | | | | | | | | | | | |
| JL2-49 | H | | | | | H | 9 | D | 9 | E | | | Q | Q | Q | R | | R | | | E | | E | | E | | H | | D |
| JL2-50 | N | N | | N | | N | | D | N | N | N | N | | N | | N | | N | | | | | | | | | | | D |
| JL2-51 | A | | A | A | | A | A | D | A | A | A | | A | A | A | A | | A | | | A | A | | | A | | A | | D |
| JL2-52 | R | | | | | R | R | D | R | E | E | | R | R | R | R | | S | | | A | | | | E | | R | | D |
| JL2-53 | K | K | E | | | K | K | D | K | E | | | K | R | K | K | | A | | | K | | A | A | K | K | K | | D |
| JL2-54 | | N | | | | N | | D | | | | | | | | | | | | | | | | | | | | | |
| JL2-55 | R | R | R | | | R | | D | | R | R | | | N | | N | | | | | | | | | | | E | | D |
| JL2-56 | A | A | A | | | A | | D | | | | | | | | | | | | | | | | | | | | | |
| JL2-57 | A | R | R | | | A | | D | | | | | | | | | | | | | | | | | | | | | |
| JL2-58 | K | | | | | K | | D | | | | | K | K | K | K | | A | | | | | | | | | K | | D |
| JL2-59 | A | | | | | A | | D | | | | | K | K | K | K | | A | | | | | | | | | A | | D |
| JL2-60 | K | | | | | K | | D | | | | | K | K | K | K | | A | | | | | | | | | K | | D |
| JL2-61 | R | | E | | | R | E | D | E | E | E | | K | K | K | K | | R | | | | | E | E | E | | R | | D |
| JL2-62 | R | | | | | R | R | D | R | A | E | | K | K | K | K | | A | | | | A | | | E | | R | | D |
| JL2-63 | R | | | | | R | R | D | R | A | | | K | K | H | H | | A | | | | | | | E | | R | | D |
| JL2-64 | R | R | R | | | R | | D | | | | | | | | | | | | | | | | | | | | | |
| JL2-65 | N | | | | | N | N | D | N | | | | N | N | N | N | | E | | | | | | | | | N | | D |
| JL2-66 | K | | | | | K | K | D | K | K | | | K | K | K | K | | K | | | | | | | | | K | | D |

| CODE NUMBER | BIOLOGIC: Enteric bacteria | Native bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro invertebrates | Macro invertebrates | Vertebrates | Fungi | Viruses | Primary productivity | Secondary productivity | Chemosynthetic activity | Biostimulatory activity | Toxicity test | Other bioassay test | Chemical tissue test | Histopathological analysis | Other tissue analysis | Storage media | SEDIMENT: Bed load | Concentration (suspended) | Sediment discharge (suspended) | Concentration (total) | Sediment discharge (total) | Particle size (suspended) | Particle size (bed material) | Storage media | OTHER: Telemetry | S W station | G W station | Data bank source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL2-34 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-35 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | W |
| JL2-36 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-37 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | SW |
| JL2-38 | N | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-39 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | WSS |
| JL2-40 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-41 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | SW |
| JL2-42 | H | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-43 | K | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-44 | K | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-45 | M | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | |
| JL2-46 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-47 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-48 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-49 | H | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-50 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | SW |
| JL2-51 | A | | A | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-52 | Q | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-53 | K | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-54 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-55 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-56 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-57 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-58 | K | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-59 | A | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-60 | K | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-61 | K | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-62 | R | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-63 | R | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-64 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | | | | | | | | | | | | | S |
| JL2-65 | N | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |
| JL2-66 | K | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | D | | | | | | | | | | | | S |

PARAMETER FREQUENCY CODES

| Code: Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 8,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB. AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05070202 | JL2-67 | VA001 | 6APNK006.00 | N FORK POUND RI. | 370610 | 0824025 | 051 | 195 | SW | 1972 | 1976 | N | | |
| 05070202 | JL2-68 | VA001 | 6APNK005.58 | N FORK POUND RI. | 370611 | 0824002 | 051 | 195 | SW | 1972 | 1976 | N | | |
| 05070202 | JL2-69 | VA001 | 6APLL000.09 | PHILLIPS CREEK | 370622 | 0824014 | 051 | 195 | SW | 1972 | 1976 | N | | |
| 05070202 | JL2-70 | VA001 | 6APNK001.29 | N FORK POUND RI. | 370725 | 0823752 | 051 | 195 | SW | 1973 | | | | |
| 05070202 | JL2-71 | USGS | 03208800 | POUND RIVER ABOVE INDIAN CREEK, AT POUND, VA | 370726 | 0823629 | 051 | 195 | SW | 1969 | 1979 | | 36.70 | Y |
| 05070202 | JL2-72 | USGS | 03208680 | NORTH FORK POUND RIVER LAKE AT POUND, VA. | 370727 | 0823752 | 051 | 195 | LK | 1978 | 1980 | | 17.20 | |
| 05070202 | JL2-73 | USGS | 03208700 | N. F. POUND RIVER AT POUND, VA. | 370732 | 0823736 | 051 | 195 | SW | 1969 | | | 18.50 | Y |
| 05070202 | JL2-74 | VA001 | 6APNK001.01 | N FORK POUND RI. | 370735 | 0823742 | 051 | 195 | SW | 1973 | | | | |
| 05070202 | JL2-75 | VA001 | 6APNR028.01 | POUND RIVER | 370923 | 0823410 | 051 | 195 | SW | 1979 | | | | |
| 05050002 | JL2-76 | USEPA | 510085 | ATKINS MILL BR-DS WYTHEVILLE STP | 370358 | 0805616 | 051 | 197 | SW | 1972 | 1972 | | | |
| 05050002 | JL2-77 | USEPA | VA002081 | WYTHEVILLE, VA. STP | 370402 | 0805618 | 051 | 197 | SW | 1972 | 1972 | | | |
| 05050002 | JL2-78 | USEPA | 510084 | ATKINS MILL BR-US WYTHEVILLE STP | 370406 | 0805619 | 051 | 197 | SW | 1972 | 1972 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

PHYSICAL

| CODE NUMBER | TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|
| JL2-67 | N | | | | | N | K | D |
| JL2-68 | N | | | | | N | A | D |
| JL2-69 | N | | | | | N | K | D |
| JL2-70 | N | | | | | N | N | D |
| JL2-71 | A | A | | A | | A | | D |
| JL2-72 | | | | | | | | |
| JL2-73 | A | A | | A | | A | | D |
| JL2-74 | N | | | | | N | N | D |
| JL2-75 | K | | | | | K | K | D |
| JL2-76 | A | A | | A | | A | A | D |
| JL2-77 | A | A | | A | | A | A | D |
| JL2-78 | A | A | | A | | A | A | D |

CHEMICAL

| CODE NUMBER | DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL2-67 | K | | | | K | K | K | K | | E | | | | | | | | | N | | D |
| JL2-68 | K | | | | A | A | A | A | | E | | | | | | | | | N | | D |
| JL2-69 | K | | | | R | R | K | K | | E | | | | | | | | | N | | D |
| JL2-70 | N | | | | N | N | N | N | | E | | | | | | | | | N | | D |
| JL2-71 | A | A | S | A | | A | | A | | S | | | | | | | | | | | D |
| JL2-72 | | | | | | | | | | | | | | | | | | | | | |
| JL2-73 | A | A | A | A | | A | | A | | R | | | | | | | | | | | D |
| JL2-74 | N | E | | | N | N | N | N | | E | | | | | | | | | N | | D |
| JL2-75 | K | | | | K | K | K | K | | A | | | K | | | | K | | K | | D |
| JL2-76 | A | | | | | | | A | | | | | | A | | | A | | A | | D |
| JL2-77 | A | | | | | | | A | | | | | | A | | A | A | | A | | D |
| JL2-78 | A | | | | | | | A | | | | | | A | | | A | | A | | D |

BIOLOGIC

| CODE NUMBER | ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL2-67 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-68 | A | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-69 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-70 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-71 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-72 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-73 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL2-74 | N | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-75 | K | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-76 | A | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-77 | A | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |
| JL2-78 | A | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | D |

SEDIMENT / OTHER

| CODE NUMBER | BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA | TELEMETRY | S W STATION VAVES NINO | G W STATION VAVES NINO | DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL2-67 | | | | | | | | | | | | S |
| JL2-68 | | | | | | | | | | | | S |
| JL2-69 | | | | | | | | | | | | S |
| JL2-70 | | | | | | | | | | | | S |
| JL2-71 | | | | | | | | | | | | SW |
| JL2-72 | | | | | | | | | | | | W |
| JL2-73 | | | | | | | | | | | | SW |
| JL2-74 | | | | | | | | | | | | S |
| JL2-75 | | | | | | | | | | | | S |
| JL2-76 | | | | | | | | | | | | S |
| JL2-77 | | | | | | | | | | | | S |
| JL2-78 | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA E: LISTING 3

Sources of ground-water-quality data in the Jefferson National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 03010101 | JL3-1 | USGS | 372651079370402 | 33HS2 EDWARDS HOUSE NPS | 372651 | 0793704 | 051 | 019 | SP | 1974 | 1974 | | | |
| 02080201 | JL3-2 | USGS | 373351079285603 | 33HS3 NPS HEADFOREMOST MT | 373351 | 0792856 | 051 | 019 | SP | 1974 | 1974 | | | |
| 06010102 | JL3-3 | USGS | 03471000 | STEVE KEESLING SPRING AT SUGAR GROVE, VA. | 364627 | 0812505 | 051 | 173 | SP | 1954 | 1954 | N | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

**PHYSICAL**

| CODE NUMBER | TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|
| JL3-1 | A | A | | A | | A | | D |
| JL3-2 | A | A | | A | | A | | D |
| JL3-3 | | E | | E | | E | | D |

**CHEMICAL**

| CODE NUMBER | DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL3-1 | A | A | A | A | | A | | A | | A | | | | | | | | | | A | D |
| JL3-2 | A | A | A | A | | A | | A | | A | | | | | | | | | | A | D |
| JL3-3 | E | E | E | E | | | | E | | E | | | | | | | | | | | D |

**BIOLOGIC**

| CODE NUMBER | ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JL3-1 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL3-2 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |
| JL3-3 | | | | | | | | | | | | | | | | | 5 | 4 | O | 6 | |

**SEDIMENT**

| CODE NUMBER | BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|
| JL3-1 | | | | | | | | |
| JL3-2 | | | | | | | | |
| JL3-3 | | | | | | | | |

**OTHER**

| CODE NUMBER | TELEMETRY | S W STATION VAYES NINO | G W STATION VAYES NINO | DATA BANK SOURCE |
|---|---|---|---|---|
| JL3-1 | | | | S |
| JL3-2 | | | | S |
| JL3-3 | | | | S |

## PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA F

Annotated bibliography of investigations pertinent to coal mining and water resources in the Jefferson National Forest study area.

SUPPLEMENTAL DATA F: SUMMARY 1

Annotated bibliography of hydrologic studies performed in small areas of the Jefferson National Forest area.

REFERENCE CODE: J/S1-1

TITLE: Carroll County Groundwater.

COMPLETION DATE: Scheduled for late 1981.

GEOGRAPHICAL AREA: Southwest Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
These reports identify and define the conditions governing the availablity and the quality of the groundwater in a specific area. Information that covers both general and technical characteristics has been incorporated within in order to make this report of maximum service to the citizens of Virginia. (R. V. Davis, Executive Secretary, Virginia State Water Control Board).

PUBLISHED REPORTS AND(OR) ARTICLES:
Planning Bulletin (number unassigned as of June 1981).

AVAILABLE FROM:
Virginia State Water Control Board
408 E. Main Street
Abingdon, Virginia 24210

REFERENCE CODE: J/S1-2

TITLE: Dickenson County Groundwater.

COMPLETION DATE: 1981.

GEOGRAPHICAL AREA: Southwest Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
These reports identify and define the conditions governing the availability and the quality of the groundwater in a specific area. Information that covers both general and technical characteristics has been incorporated within in order to make this report of maximum service to the citizens of Virginia. (R. V. Davis, Executive Secretary, Virginia State Water Control Board).

PUBLISHED REPORTS AND(OR) ARTICLES:
Planning Bulletin (number unassigned as of June 1981).

AVAILABLE FROM:
Virginia State Water Control Board
408 E. Main Street
Abingdon, Virginia 24210

REFERENCE CODE: J/S1-3

TITLE: Hydrologic Investigation of a Portion of the Georges Branch Drainage near Teas, Virginia.

STARTING DATE: 1981.

GEOGRAPHICAL AREA: Southwest Virginia.

AREAL EXTENT: Approximately 100 acres.

PURPOSE, OBJECTIVES, AND(OR) ABSTRACT:
The quantity and quality of water in Georges Branch is being investigated to determine the affects of mining. Of primary concern is the possible problems associated with sediment derived from inactive manganese mine spoil piles. Silt laden waters can seriously affect fish hatchery operations downstream. Data will be collected for two years in an effort to document streamflow characteristics and to determine the need and feasibility of restoration. (Oral communication, Bill Morrison, U.S. Forest Service, Roanoke, Virginia, June 9, 1981).

PUBLISHED REPORTS AND(OR) ARTICLES:
In-unit report to be completed at end of study.

AVAILABLE FROM:
U.S. Forest Service
210 Franklin Road SW
Caller Service 2900
Roanoke, Virginia 24001

REFERENCE CODE: J/S1-4

TITLE: Quality of Surface Water in the Coal Mining Area of Southwest Virginia.

GEOGRAPHICAL AREA: Lee, Scott, Buchanan, Dickenson, Wise, and Russell Counties, southwestern Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
In 1978, the U.S. Geological Survey made a reconnaissance of the surface-water quality in the coal mining area of southwest Virginia. The survey was directed toward providing baseline water-quality data against which any future changes could be compared. Available data were examined as a guide for selecting parameters to be measured during the 1978 survey. The purpose of this report is to summarize the findings of this reconnaissance and to characterize the water quality of streams in the southwest Virginia coal mining area.

Water samples were collected from six major streams at 6-week intervals during 1978 to define the temporal variation in surface-water quality. The spatial variation in water quality was determined by synoptic sampling of 63 stations during a 3-day low-flow period between September 26 and 28, 1978.

REFERENCE CODE: J/S1-4--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:
Rogers, S. M. and Hufschmidt, P. W., 1980, Quality of surface water in the coal mining area of southwest Virginia, U.S. Geological Survey Water-Resources Investigations Open-File Report 80-769, 2 p.

AVAILABLE FROM:
U.S. Geological Survey, WRD
200 West Grace Street, Room 304
Richmond, Virginia 23220

REFERENCE CODE: J/S1-5

TITLE: John W. Flannagan Reservoir, Dickenson County, Virginia.

STARTING DATE: 1975.

GEOGRAPHICAL AREA: Southwest Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S. EPA National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

PUBLISHED REPORTS AND(OR) ARTICLES:
Working Paper-463.

AVAILABLE FROM:
Virginia State Water Control Board
2111 N. Hamilton Street
P.O. Box 11143
Richmond, Virginia 23219

REFERENCE CODE: J/S1-6

TITLE: The Recovery of Damaged Streams.

STARTING DATE: 1971.

GEOGRAPHICAL AREA: Southwest Virginia.

REFERENCE CODE: J/S1-6--Continued.

PURPOSE, OBJECTIVES, AND(OR) ABSTRACT:
Four cases are described in which streams in the northeastern U.S. recovered from various stresses: (1) simulated shock acidification of Mill Creek, near Blacksburg, Virginia; (2) long-term acid mine drainage from Appalachian coal fields into Indian Creek in southern Pennsylvania and Little Scrubgrass Creek in northwestern Pennsylvania; (3) an ethyl benzene-creosote spill on October 10, 1970 in the Roanoke River at Salem, Virginia; and (4) two industrial spills on the Clinch River in southwestern Virginia and northeastern Tennessee. The ability of a stream to assimilate wastes depends on its capacity to transform them before they reach deleterious levels. Recovery from overload depends on (1) the severity and duration of the stress; (2) associated stresses; (3) recolonization by beneficial organisms; and (4) residual effects upon nonbiological units, such as the substrate. Short-term acute stress from release of acidic or caustic materials results in immediate reduction in the macroinvertebrate and fish communities. A rapid recovery may be expected when no residual toxicity is found and recolonizing organisms are available from undamaged areas. Long-term acute stress, and stresses from materials with residual toxicities, also produce an immediate reduction in both diversity and density of organisms, but with residual toxicities the surviving macroinvertebrates tend to form an interm atypical community which persists for the duration of the toxicity.

PUBLISHED REPORTS AND(OR) ARTICLES:
Cairns, J., Jr. and others, 1971, The recovery of damaged streams: ASB Bulletin Vol. 18, No. 3, p. 79-106.

AVAILABLE FROM:
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24060

REFERENCE CODE: J/S1-7

TITLE: A Biological and Chemical Water Quality Investigation of the Pound River Watershed.

STARTING DATE: 1970.

GEOGRAPHICAL AREA: Southwest Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This detailed study of the Pound River, located in Virginia near the Kentucky border, was made after a preliminary investigation of a reported fish kill revealed acid mine drainage pollution. Results of biological and chemical sampling carried out a designated stations during 1970 are given. In many sections benthic life was found to be depressed or non-existent. High manganese and zinc as well as acid and high iron content were found in the most polluted sections of the river. In a live box study of the ability of the stream to support fish life, fish did not survive beyond 24 hours. Sources of mine drainage are identified.

REFERENCE CODE: J/S1-7--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES: 54 page report.

AVAILABLE FROM:
Virginia State Water Control Board
Technical Services Division
2111 N. Hamilton Street
P.O. Box 11143
Richmond, Virginia 23219.

## SUPPLEMENTAL DATA F: SUMMARY 2

Annotated bibliography of studies concerned with the influence of coal mining on the water resources of any small areas in Virginia.

REFERENCE CODE: J/S2-1

TITLE: Stream Water Quality in the Coal Region of Virginia.

GEOGRAPHICAL AREA: Selected counties in the Appalachian coal region.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This study was undertaken with the primary objective of establishing a water quality data base for small first order unmined and surface-mined watersheds throughout Appalachia. There is a need for data which explicitly show changes in water quality attributable to both old and recent surface mining. Most previous water quality data in the study area was from watersheds so large it was impossible to isolate the effects of surface mining from the confounding effects of other activities of man.

Small streams were sampled in selected counties in the State where coal is surface mined. Sampling was at approximate monthly intervals. The water quality data from these streams are presented in this report and should help fill the need for data from small watersheds in Appalachia.

PUBLISHED REPORTS AND(OR) ARTICLES:
(soon to be published)
Dyer, K. L., Stream water quality in the coal region of Virginia, Part 6 of Water quality of Appalachia, U.S. Department of Agriculture, Forest Service, Berea, Kentucky.

AVAILABLE FROM:
U.S. Department of Agriculture
Forest Service
Northeastern Forest Experiment Station
Route 2, Kentucky Highway 21 East
Berea, Kentucky 40403

REFERENCE CODE: J/S2-2

TITLE: Buchanan County Groundwater.

COMPLETION DATE: 1978.

GEOGRAPHICAL AREA: Southwest Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
These reports identify and define the conditions governing the availability and the quality of the groundwater in a specific area. Information that covers both general and technical characteristics has been incorporated within in order to make this report of maximum service to the citizens of Virginia. (R. V. Davis, Executive Secretary, Virginia State Water Control Board).

PUBLISHED REPORTS AND(OR) ARTICLES:
Epps, S. R., 1978, Buchanan County groundwater present conditions and prospects: Virginia State Control Board, Planning Bulletin No. 311, 75 p.

REFERENCE CODE: J/S2-2--Continued.

AVAILABLE FROM:
Virginia State Water Control Board
408 E. Main Street
Abingdon, Virginia 24210

REFERENCE CODE: J/S2-3

TITLE: Acid Mine Drainage and its Impact on a Small Virginia Stream.

GEOGRAPHICAL AREA: Southwest Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A study was conducted to chemically characterize three streams entering Chestnut Creek in southwestern Virginia and to assess the biological and chemical alterations in the creek. Over a six mile reach, the benthic macroinvertebrate population was reduced to zero, the natural low alkalinity (25 mg/l) of the stream was reduced to less than 5 mg/l, and the pH was reduced from 7.2 to 6.3. Increased concentration of iron from less than 0.01 mg/l to more than 4.0 mg/l was accompanied by the deposition of a coating of iron hydroxide up to 0.25 inches thick in the stream bed, which is probably responsible for the absence of benthic macroinvertebrates. In situ bioassays with bluegill, sunfish, and one snail species showed that the creek water, after confluence with streams, was not toxic in 192 hours to fish, and snails survived 96 hours before they began to die. Undiluted was highly toxic.

PUBLISHED REPORTS AND(OR) ARTICLES:
Hoehn, R. C., and Sizemore, 1977, Acid mine drainage and its impact on small Virginia streams: Virginia Polytechnic Institute Water Resources Bulletin, V. 13, No. 1, p. 153-160.

AVAILABLE FROM:
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24060

SUPPLEMENTAL DATA F: SUMMARY 3

Annotated bibliography of large area studies pertinent to the hydrology of the Jefferson National Forest area.

REFERENCE CODE: J/S3-1

Hufschmidt, P. W. and others, 1981, Hydrology of area 16, eastern coal province, Virginia, Tennessee: U.S. Geological Survey Open-File Report 81-204.

SUMMARY:
The coal provinces of the country are divided into hydrologic reporting area. Hydrologic information and sources are presented as text, tables, maps, and other illustrations designed to be useful to mine owners, operators, and consulting engineers in planning and implementing surface-mine operations that comply with the environmental requirements of the "Surface Mining Control and Reclamation Act of 1977."

REFERENCE CODE: J/S3-2

Higgins, D., 1980, Water resources of the Jefferson National Forest: U.S. Forest Service, unpublished report, 56+ p.

AVAILABLE FROM:
U.S. Forest Service
Caller Service 2900
210 Franklin Road SW
Roanoke, Virginia 24011

ABSTRACT:
This report presents the results of an Order 4 Water Resource Inventory for the Jefferson National Forest. A water resource inventory is an organized characterization of water in all phases of the hydrologic cycle, maximizing the use of available information and data. It is performed in response to public issues and management concerns. An Order 4 is a low intensity survey intended to provide a broad overview of the Forest's water resource. The purpose of this report is to provide information for the Forest land and resource management plan. It is also intended to serve as a hydrologic data base to be used by watershed specialists in future water resource planning and evaluations. (From Introduction)

REFERENCE CODE: J/S3-3

Scott, A. G., 1980, An interim report on the investigation of flooding in the Tug Fork basin of Kentucky, Virginia, and West Virginia: U.S. Geological Survey, Water-Resources Investigation, Open-File Report 80-1188, p. 116.

ABSTRACT:
An analytical plan is presented for a study of the effects of land-use changes on the magnitude and frequency of flood-peak flows and on sediment characteristics of the Tug Fork in Kentucky, Virginia, and West Virginia. The plan includes compilation and analysis of available data, collection of new data on small, single land-use drainage areas for deterministic computer modeling, and creation of a computer model of the Tug Fork basin for definition of cumulative land-use impacts.

REFERENCE CODE: J/S3-3--Continued.

Also presented is a compilation of the available hydrologic data and a description of related studies expected to provide information and data useful to the ongoing work. The data compilation includes: Hourly precipitation for selected days and annual maximum daily precipitation for nine sites, annual maximum streamflow rates and stages for three stream-gaging sites, hourly gageheight and discharge rates for selected storms at four stream-gaging sites, flood profiles, flood-frequency relations, and other streamflow information.

REFERENCE CODE: J/S3-4

Runner, G. S. and Chin, E. H., 1980, Flood of April 1977 in the Appalachian region of Kentucky, Tennessee, Virginia, and West Virginia: U.S. Geological Survey Professional Paper 1028.

ABSTRACT:
Heavy rains fell over the Appalachian region of Kentucky, Tennessee, Virginia, and West Virginia April 2-5, 1977, causing record flooding. Rainfall amounts of 4 to 15.5 inches were observed. The maximum amount of 15.5 inches occurred at Jolo, West Virginia, in about 30 hours. This was more than twice the amount which would be expected for a 100-year recurrence-interval storm. Flood discharges along the upper Guyandotte River; Tub Fork, and Levisa Fork in the Big Sandy River basin; Cumberland River; and Clinch River and Dowell River in the Tennessee River basin exceeded those previously known. Severe flooding also occurred along the Holston River and along the North Fork Kentucky River. Recurrence intervals of observed flood discharges were greater than 100-years at 29 streamflow measurement sites. Substantial reductions in peak stages and discharges on Levisa Fork, North Pound River, and Guyandotte River, attained as a result of reservoir storage, were reported by U.S. Army Corps of Engineers. Maximum daily suspended-sediment discharges on Guyandotte River near Baileysville, West Virginia, and Tug Fork at Glenhayes, West Virginia, were 54,800 tons/day and 290,000 tons/day, respectively, April 5, 1977. Twenty-two lives were lost and total property damage reportedly exceeded $400 million in the four-state area.

REFERENCE CODE: J/S3-5

Ross, B. B. and others, 1976, A model for predicting flood hazards due to specific land-use practices, Virginia Polytechnical Institute Bulletin No. 99, Blacksburg, Virginia.

ABSTRACT:
This investigation developed a finite element model for mathematically routing overland and channel flow when rainfall excess is known. To determine rainfall excess, a procedure was developed to subdivide a drainage area into similarly responding units, defined as hydrologic response units. These units were

REFERENCE CODE: J/S3-5--Continued.

functions of soil texture, soil depth, land use, and hydrology group classification. A computer model, based on the Mein and Larson and Holtan infiltration equations, was developed to generate excess precipitation for each hydrologic response unit. A finite element grid, devised for both the watershed and the main streams, allowed use of the hydrologic response units within an element to obtain weighted rainfall excess values for each element. A one-dimensional finite element scheme, in conjunction with Galerkin's residual method, simulated overland and open channel flow. Hurricane Camille (August, 1969) provided an event by which the model was tested and calibrated on the South River watershed in Augusta County, Virginia. Having the ability to report changes in land use, the finite element procdure allowed several arbitrary land-use changes to be incorporated into the model in order to observe the river's response under flood conditions. The effects of changes in the number and size of the elements in the watershed and in the streams also were observed, along with changes in the size of the time increment.

REFERENCE CODE: J/S3-6

Miller, E. M., 1971, Virginia small streams program, preliminary flood-frequency relations: U.S. Geological Survey Open-File Report, 16 p.

AVAILABLE FROM:
U.S. Geological Survey, WRD
200 West Grace Street, Room 304
Richmond, Virginia 23220

ABSTRACT:
Techniques are presented for estimating the probable magnitude and frequency of floods on small streams in Virginia. Also included is the history and current status of the cooperative program of small stream flood frequency investigations in Virginia. Regression equations are based on records collected on streams that are virtually unaffected by the influences of urbanization. Therefore, the relations should not be used for estimating flood magnitudes and frequencies for streams with appreciable amounts of urbanization in their basins. Graphical techniques were used to define flood-frequency curves for small stream sites with the 5 to 10 years of available record. Also for the 1964-70 period, frequency curves were drawn for 20 long term record gaging stations in the Atlantic slope basins and 14 long term record gaging stations in the Ohio River basins. Frequency curves using annual peaks for the total period of record were available for all the long term stations. The regression equations are applicable for estimating the 2, 5, and 10-year flood magnitudes at small sites in Virginia.

REFERENCE CODE: J/S3-7

Musser, J. J., 1965, Water Resources of the Appalachian Region: Pennsylavnia to Alabama; U.S. Geological Survey Hydrologic Investigation Atlas HA-198, Sheet 9.

SUMMARY:
Acid streams in the Appalachian region are identified and discussed, and the amount of acidity as $H_2SO_4$ discharged annually into several streams is tabulated.

REFERENCE CODE: J/S3-8

Biesecker, J. E. and George, J. R., 1966, Stream quality in Appalachia as related to coal-mine drainage, 1965: U.S. Geological Survey Circular 526, 27 p.

ABSTRACT:
A stream-quality reconnaissance at 318 locations in May 1965 offered the first opportunity for a contemporaneous regional collection and appraisal of water-quality data in Appalachia. The results provide a means of regional comparison of the influence of coal-mine drainage on stream quality at approximately median streamflow. The results disclose that the chemical quality of the water at nearly 200 sites did not meet recommended drinking-water standards. At many of these sites, inferior quality was caused by excessive concentrations of solutes commonly associated with coal-mine waters.

Water-quality damage from mine drainage is particularly severe in the more heavily mined northern one-third of the region where high sulfate content, free mineral acidity, and low pH are typical of most affected streams. A deficiency in natural stream alkalinity in this part of the coal region contributed greatly to the massive effect of mine drainage upon stream quality. However, data collected from streams affected by mine drainage along the west edge of this part of the coal field suggest extensive neutralization of mine water. In southern Appalachian coal-mine drainage had less influence on stream quality than in northern Appalachia. Fewer streams in this area were influenced by mine drainage, and the magnitude of stream damage for affected streams was less than in northern Appalachia. (Author's abstract)

SUPPLEMENTAL DATA G

NAWDEX listings of sources of monitoring-site data found in the Monongahela National Forest study area.

SUPPLEMENTAL DATA G: LISTING 1

Sources of streamflow and stage data in the Monongahela National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02070001 | ML1-1 | USGS | 01606000 | N F SOUTH BR POTOMAC R AT CABINS, W. VA. | 385905 | 0791410 | 054 | 023 | SW | 1935 | | Y | 314.00 | |
| 05050003 | ML1-2 | USGS | 03182000 | KNAPP CREEK AT MARLINTON, W. VA. | 381240 | 0800430 | 054 | 075 | SW | 1944 | 1958 | N | 108.00 | |
| 05050007 | ML1-3 | USGS | 03193830 | GILMER RUN NEAR MARLINTON, W. VA. | 381912 | 0800552 | 054 | 075 | SW | 1968 | 1974 | N | 1.80 | |
| 05050003 | ML1-4 | USGS | 03180680 | COOPER RUN NR GREEN BANK, W V | 382432 | 0794843 | 054 | 075 | SW | 1965 | 1977 | | 1.52 | |
| 05050003 | ML1-5 | USGS | 03180700 | DEER CREEK BELOW GREENBANK, W. VA. | 382500 | 0795142 | 054 | 075 | SW | 1960 | 1974 | | 60.00 | |
| 05020001 | ML1-6 | USGS | 03180530 | BRUSH RUN NR BARTDW, W.VA. | 383030 | 0794703 | 054 | 075 | SW | 1965 | 1978 | | 1.28 | |
| 05050003 | ML1-7 | USGS | 03180500 | GREENBRIER RIVER AT DURBIN, W. VA. | 383235 | 0795000 | 054 | 075 | SW | 1943 | | N | 134.00 | |
| 05050003 | ML1-8 | USGS | 03180350 | W.FK. GREENBRIER RIVER TRIB AT DURBIN,W.VA. | 383330 | 0794952 | 054 | 075 | SW | 1965 | 1977 | | 134.00 | |
| 05050003 | ML1-9 | USGS | 03180350 | W.FK. GREENBRIER RIVER TRIB AT DURBIN,W.VA. | 383330 | 0794952 | 054 | 075 | SW | 1965 | 1977 | | 134.00 | |
| 05050003 | ML1-10 | USGS | 03181900 | MOODY MOORE HOLLOW NR HUNTERSVILLE, W V | 381355 | 0795844 | 054 | 083 | SW | 1965 | 1977 | | .55 | |
| 05020004 | ML1-11 | USGS | 03063500 | GANDY C AT HORTON WV | 384800 | 0793245 | 054 | 083 | SW | 1924 | 1964 | | 36.00 | |
| 05020004 | ML1-12 | USGS | 03068000 | SHAVERS FORK AT BEMIS, W. VA. | 384827 | 0794416 | 054 | 083 | SW | 1917 | | Y | 115.00 | Y |
| 05020004 | ML1-13 | USGS | 03063950 | JOB RUN NEAR WYMER, W.VA. | 385255 | 0793545 | 054 | 083 | SW | 1965 | 1977 | | 1.08 | |
| 05020004 | ML1-14 | USGS | 03064000 | LAUREL F AT WYMER WV | 385255 | 0793605 | 054 | 083 | SW | 1924 | 1964 | | 46.30 | |
| 05020004 | ML1-15 | USGS | 03064500 | GLADY FORK AT EVENWOOD W VA | 385340 | 0793850 | 054 | 083 | SW | 1924 | 1964 | | 41.00 | |
| 05020004 | ML1-16 | USGS | 03068600 | SHAVERS FORK ABOVE BOWDEN, W. VA. | 385410 | 0794141 | 054 | 083 | SW | 1974 | 1978 | N | 138.00 | Y |
| 05020004 | ML1-17 | USGS | 03068610 | TAYLOR RUN AT BOWDEN W VA | 385427 | 0794149 | 054 | 083 | SW | 1973 | | N | 5.06 | Y |
| 05020004 | ML1-18 | USGS | 03068800 | SHAVERS FORK BELOW BOWDEN, W. VA. | 385447 | 0794614 | 054 | 083 | SW | 1973 | | N | 151.00 | Y |
| 05020004 | ML1-19 | USGS | 03063600 | HORSECAMP RUN AT HARMAN, W. VA. | 385451 | 0793032 | 054 | 083 | SW | 1969 | 1974 | N | 6.57 | |
| 05020001 | ML1-20 | USGS | 03068607 | STALNAKER RUN NEAR BOWDEN, WV | 385502 | 0794111 | 054 | 083 | SW | 1978 | | | 1.55 | Y |
| 05020001 | ML1-21 | USGS | 03068604 | TAYLOR RUN NEAR ALPENA, WV | 385524 | 0794012 | 054 | 083 | SW | 1978 | | | 1.06 | Y |
| 05020004 | ML1-22 | USGS | 03065000 | DRY FORK AT HENDRICKS, W. VA. | 390420 | 0793720 | 054 | 093 | SW | 1939 | | N | 345.00 | |
| 05020004 | ML1-23 | USGS | 03067000 | BLACKWATER R AT HENDRICKS WV | 390435 | 0793740 | 054 | 093 | SW | 1911 | 1918 | | 140.00 | |
| 05020004 | ML1-24 | USGS | 03069000 | SHAVERS FDRK AT PARSONS, W. VA. | 390545 | 0794040 | 054 | 093 | SW | 1887 | | Y | 214.00 | |
| 05020004 | ML1-25 | USGS | 03069500 | CHEAT RIVER NEAR PARSONS,W.VA. | 390720 | 0794050 | 054 | 093 | SW | 1887 | | Y | 718.00 | |
| 05020004 | ML1-26 | USGS | 03066500 | NF BLACKWATER R AT DOUGLAS WV | 390730 | 0793105 | 054 | 093 | SW | 1929 | 1931 | | 17.90 | |
| 05020004 | ML1-27 | USGS | 03069650 | RIGHT FK. CLOVER RUN NR PARSONS, W. VA. | 390910 | 0794546 | 054 | 093 | SW | 1967 | 1977 | | 2.21 | |

| CODE NUMBER | STAGE (A) COMPLETE | STAGE (B) PEAK | STAGE (B) LOW | STAGE (C) STORAGE MEDIA | FLOW (D) COMPLETE | FLOW (B) PEAK | FLOW (B) LOW | FLOW (A) MISCELLANEOUS | FLOW (C) STORAGE MEDIA | VOLUME (E) TOTAL | VOLUME (E) CHANGE | VOLUME (C) STORAGE MEDIA | (F) TELEMETRY | (G) OTHER HYDROLOGIC DATA | (H) OTHER RELATED DATA | (I) DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML1-1 | I | E | | C | 4 | E | 9 | | D | | | | | | 6 | |
| ML1-2 | | E | | C | E | E | 9 | | C | | | | | | 6 | |
| ML1-3 | O | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-4 | Z | E | | C | | E | | | C | | | | | | 6 | |
| ML1-5 | | | | | | | 9 | | P | | | | | | | |
| ML1-6 | Z | E | | C | | E | | | C | | | | | | 6 | |
| ML1-7 | 2 | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-8 | Z | E | | C | | E | | | C | | | | | | 6 | |
| ML1-9 | Z | E | | C | | E | | | C | | | | | | 6 | |
| ML1-10 | Z | E | | C | | E | | | C | | | | | | 6 | |
| ML1-11 | E | | | | E | | | | P | | | | | | | |
| ML1-12 | E | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-13 | Z | | | P | | 9 | | | P | | | | | | 1 | |
| ML1-14 | E | | | P | E | 9 | 9 | Z | P | | | | | | | |
| ML1-15 | E | | | P | E | 9 | 9 | Z | P | | | | | | | |
| ML1-16 | | | | | 1 | | | | D | | | | | | | |
| ML1-17 | 2 | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-18 | | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-19 | I | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-20 | | | | | 3 | | | | D | | | | | | 1 | |
| ML1-21 | | | | | 1 | | | | D | | | | | | | |
| ML1-22 | I | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-23 | E | | | | E | | | | P | | | | | | | |
| ML1-24 | I | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-25 | I | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| ML1-26 | E | | | | E | | | | P | | | | | | | |
| ML1-27 | Z | | | P | | 9 | | | P | | | | | | 1 | |

* USE CODE TABLES (See right margin) indicated by letter in ( ) in column heading

# CODE TABLES

## TABLE (A)-COMPLETE STAGE and MISCELLANEOUS FLOW

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual (twice per year) |
| A | | 9 | Annual (once per year) |
| B | | | Other periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## TABLE (B)-STAGE and FLOW, PEAK or LOW

| Code | Meaning |
|---|---|
| 1 | Year-round |
| 2 | Seasonal |
| 8 | Annual maximum or minimum |
| 9 | Irregular |
| E | Eliminated activity |

## TABLE (C)-STORAGE MEDIA

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TABLE (D)-COMPLETE FLOW

| Code Year-Round | Code Seasonal | Meaning |
|---|---|---|
| 1 | 2 | Daily flow |
| 3 | 4 | Monthly flow determined |
| E | E | Eliminated activity |

## TABLE (E)-VOLUME

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Daily values | 9 | Irregular |
| 3 | Monthly values | E | Eliminated activity |

## TABLE (F)-TELEMETRY

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Telemeter-land lines | 5 | DARC |
| 2 | Telemeter-radio network | 6,8 | Other or type unspecified |
| 3 | Landsat | 7 | Two or more types |
| 4 | GOES | | |

## TABLE (G)-OTHER HYDROLOGIC DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | QW recurring | 7 | Flood frequency |
| 2 | QW nonrecurring | 8 | Coef. of roughness |
| 3 | Flood hydrograph | 9 | Time of travel |
| 4 | Sediment studies | A | Flood plain maps |
| 5 | Cross section | B | Tides |
| 6 | Flow duration | C | Surface inflow-outflow |

## TABLE (H)-OTHER RELATED DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Precipitation | 4 | Radiation (solar) |
| 2 | Wind | 5 | Soil moisture |
| 3 | Evaporation | 6 | Datum (mean sea level) |

## TABLE (I)-DATA BANK SOURCE

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

## SUPPLEMENTAL DATA G: LISTING 2

Sources of surface-water-quality data in the Monongahela National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ML2-1 | USFS | 210701 | N NK SO BR POTOMAC N FK GAP 00000870 | 385900 | 0791400 | 054 | 023 | SW | 1969 | | | | |
| 02070001 | ML2-2 | USGS | 01606000 | N F SOUTH BR POTOMAC R AT CABINS, W. VA. | 385905 | 0791410 | 054 | 023 | SW | 1959 | 1975 | Y | 314.00 | |
| 05050003 | ML2-3 | USFS | 211303 | LAUREL RUN OF MEADOW CREEK | 375700 | 0800630 | 054 | 025 | LK | 1974 | | | | |
| 05050003 | ML2-4 | USFS | 211399 | MEADOW CREEK AT MOUTH | 375730 | 0800730 | 054 | 025 | SW | 1971 | | | | |
| 05050003 | ML2-5 | USFS | 211305 | LAKE SHERWOOD OUTLET | 380000 | 0800030 | 054 | 025 | SW | 1971 | | | | |
| 05050003 | ML2-6 | USFS | 211307 | LAKE SHERWOOD INLET | 380030 | 0800000 | 054 | 025 | SW | 1971 | | | | |
| 05050003 | ML2-7 | USFS | 211308 | BEAR BRANCH NEAR MOUTH | 380030 | 0800030 | 054 | 025 | SW | 1974 | 1978 | N | | |
| 05050003 | ML2-8 | USFS | 211306 | LAKE SHERWOOD SWIMMING AREA | 380200 | 0800230 | 054 | 025 | SW | 1974 | | | | |
| 02070001 | ML2-9 | USFS | 210705 | BIG RUN AT MOUTH | 383729 | 0793330 | 054 | 071 | SW | 1971 | | | | |
| 02070001 | ML2-10 | WV001 | 550470 | | 384225 | 0792746 | 054 | 071 | SW | 1967 | 1978 | N | | |
| 02070001 | ML2-11 | WV001 | PSB 28 30 | NF S BR POTOMAC R JUDY GAP W VA | 384231 | 0792833 | 054 | 071 | SW | 1967 | | | | |
| | ML2-12 | USFS | 210057 | JUDY SPRINGS S 0521 00000820 | 384501 | 0793103 | 054 | 071 | SW | 1969 | 1978 | Y | | |
| 02070001 | ML2-13 | USFS | 210804 | REEDS CK 7.5 MI NORTH FRANKLIN | 384534 | 0791954 | 054 | 071 | SW | 1974 | | | | |
| 02070001 | ML2-14 | USFS | 210803 | REEDS CK 7 MI NORTH FRANKLIN | 384606 | 0791914 | 054 | 071 | SW | 1974 | | | | |
| 02070001 | ML2-15 | USFS | 210805 | REEDS CK 7.2 MI NORTH FRANKLIN | 384606 | 0791914 | 054 | 071 | SW | 1974 | | | | |
| 02070001 | ML2-16 | USFS | 210702 | N FK S BR POTOMAC AT M. SENECA | 385000 | 0792200 | 054 | 071 | SW | 1970 | | | | |
| 02070001 | ML2-17 | USFS | 210704 | SENECA CR AT MOUTH | 385000 | 0792230 | 054 | 071 | SW | 1971 | | N | | |
| 02070001 | ML2-18 | USFS | 210703 | BRUSHY RUN AT MOUTH | 385030 | 0792500 | 054 | 071 | SW | 1971 | | | | |
| 02070001 | ML2-19 | USFS | 210802 | SMOKE HOLE 9.5MI SW PETERSBURG | 385114 | 0791648 | 054 | 071 | SW | 1970 | 1970 | | | |
| 02070001 | ML2-20 | USFS | | SENECA C | 385200 | 0792700 | 054 | 071 | SW | 1968 | | | | |
| 05050003 | ML2-21 | USFS | 211309 | LAUREL RUN NEAR MOOTH | 380400 | 0800015 | 054 | 075 | SW | 1974 | | N | | |
| 05050003 | ML2-22 | USFS | 211102 | DOUTHAT CR AT NF BOUNDARY | 380700 | 0800100 | 054 | 075 | SW | 1975 | | N | | |
| 05050003 | ML2-23 | USFS | 211202 | HOLCOMB RUN OF BEAVER CREEK | 380800 | 0800530 | 054 | 075 | SW | 1974 | 1974 | | | |
| 05050003 | ML2-24 | USGS | 380948079585601 | 100.0 KNAPP CREEK AT MINNEHAHA SPRINGS, W. V | 380948 | 0795856 | 054 | 075 | SW | 1972 | 1972 | | | |
| | ML2-25 | USFS | 211704 | CHARLES CK 28 MI.E.RICHWOOD,WVA. | 381100 | 0801615 | 054 | 075 | SW | 1977 | | | | |
| 05050005 | ML2-26 | USFS | 219907 | PRECIP 20 MI SE RICHWOOD | 381105 | 0801515 | 054 | 075 | SW | 1974 | 1979 | | | |
| 05050003 | ML2-27 | USFS | 219908 | PRECIP 12 MI EAST RICHWOOD | 381112 | 0801930 | 054 | 075 | SW | 1974 | 1978 | N | | |
| 05050003 | ML2-28 | USGS | 381121080011601 | 101.0 CUMMINS CREEK AT HUNTERSVILLE, W. VA. | 381121 | 0800116 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-29 | USFS | 211204 | STAMPING CREEK AT SR 39 | 381130 | 0801430 | 054 | 075 | SW | 1974 | | N | | |
| 05050003 | ML2-30 | USFS | 211209 | BLUE LICK 17 MI EAST RICHWOOD | 381130 | 0801300 | 054 | 075 | SW | 1975 | | | | |
| 05050003 | ML2-31 | USGS | 381148080001201 | 102.0 BROWNS CREEK NEAR HUNTERSVILLE, W. VA. | 381148 | 0800012 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-32 | USFS | 211210 | BLUE LICK 17 MI EAST RICHWOOD | 381200 | 0801250 | 054 | 075 | SW | 1975 | | | | |
| 05050005 | ML2-33 | USFS | 219938 | DOGWAY PRECIP 12.5 MI E RICHWOOD | 381200 | 0801800 | 054 | 075 | SW | 1974 | | N | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL: TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA | CHEMICAL: DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-1 | R | R | A | | | R | | D | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-2 | 2 | | | | | | | D | | | | | | | | | | | | | | | | | | | | | |
| ML2-3 | R | R | R | | | R | | D | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-4 | R | R | R | | | R | | D | | R | | E | | E | R | R | | R | | | | | | | | | | | D |
| ML2-5 | R | R | R | | | R | | D | | R | | E | | E | R | R | | R | | | | | | | | | | | D |
| ML2-6 | R | R | R | | | R | | D | | R | | E | | E | R | R | | R | | | | | | | | | | | D |
| ML2-7 | R | R | R | | | R | | D | | R | | | | E | S | A | | R | | | | | | | | | | | D |
| ML2-8 | E | E | E | | | E | | D | | E | | | | E | E | E | | E | | | | | | | | | | | D |
| ML2-9 | R | R | A | | | R | | D | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-10 | Q | Q | Q | Q | R | Q | Q | D | Q | Q | Q | | Q | E | Q | Q | Q | Q | A | | R | Q | | | Q | | Q | Q | D |
| ML2-11 | Q | Q | Q | Q | Q | Q | Q | C | Q | Q | Q | | | | Q | | | Q | | | | | | | Q | | Q | | C |
| ML2-12 | | A | A | A | | A | | D | | A | A | | | | | A | | A | | | | | | | | | | | D |
| ML2-13 | A | A | A | | | A | | D | | A | | | | A | A | A | | A | | | | | | | | | | | D |
| ML2-14 | A | A | A | | | A | | D | | A | | | | A | A | A | | A | | | | | | | | | | | D |
| ML2-15 | A | A | A | | | A | | D | | A | | | | A | A | A | | A | | | | | | | | | | | D |
| ML2-16 | R | R | A | | | R | | D | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-17 | R | R | A | | | R | | D | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-18 | R | R | R | | | R | | D | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ML2-20 | Y | Y | Y | | | Y | | | | Y | Y | | Y | | Y | | Y | | | | | | | | | | | | |
| ML2-21 | S | S | S | | | S | | D | | S | | | | E | S | A | | R | | | | | | | | | | | D |
| ML2-22 | A | A | A | | | A | | D | | A | | | | E | S | A | | A | | | | | | | | | | | D |
| ML2-23 | A | A | | | | A | | D | | A | | | | | | A | | A | | | | | | | | | | | D |
| ML2-24 | A | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-25 | R | R | A | | | R | | D | | R | | | | | R | R | | R | | | | | | | | | | | D |
| ML2-26 | N | A | | | | A | | D | | A | | | | | | E | | | | | | | | | | | | | D |
| ML2-27 | A | K | | | | K | | D | | K | | | | | | 6 | | K | | | | | | | | | | | D |
| ML2-28 | A | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-29 | R | R | R | | | R | | D | | R | | | | E | R | A | | R | | | | | | | | | | | D |
| ML2-30 | R | R | R | | | R | | D | | R | | | | E | R | R | | R | | | | | | | | | | | D |
| ML2-31 | A | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-32 | R | R | R | | | R | | D | | R | | | | E | R | R | | R | | | | | | | | | | | D |
| ML2-33 | A | A | | | | A | | D | | A | | | | | | N | | N | | | | | | | | | | | D |

| CODE NUMBER | BIOLOGIC: ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA | SEDIMENT: BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA | OTHER: TELEMETRY | S W STATION YES NINO | G W STATION YES NINO | DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | W |
| ML2-3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-5 | E | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| ML2-6 | E | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| ML2-7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-8 | X | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| ML2-9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-10 | Q | | Q | | | | | | Q | | | | | | | | | | | | D | | | | | | | | | | | | S |
| ML2-11 | Q | | | | | | | | | | | | | | | | | | | | C | | | | | | | | | | | | |
| ML2-12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-13 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| ML2-14 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| ML2-15 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| ML2-16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-19 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| ML2-20 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ML2-21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-26 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-29 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-31 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-32 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| ML2-33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y-YES N-NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y-YES N-NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05050005 | ML2-34 | USFS | 219909 | PRECIP 13 MI E RICHWDDD | 381220 | 0801810 | 054 | 075 | SW | 1970 | 1978 | N | | |
| 05050003 | ML2-35 | USGS | 03182000 | KNAPP CREEK AT MARLINTON, W. VA. | 381240 | 0800430 | 054 | 075 | SW | 1946 | 1974 | N | 108.00 | |
| 05050003 | ML2-36 | USFS | 219905 | PRECIP MARLINTON | 381300 | 0800255 | 054 | 075 | SW | 1974 | | | | |
| 05050005 | ML2-37 | USFS | 219914 | PRECIP SITE 15.5MI ENE RICHWDOD | 381342 | 0801353 | 054 | 075 | SW | 1973 | | Y | | |
| | ML2-38 | USFS | 211620 | BIG LAUREL CK ABOVE FRIEL RUN 00000530 | 381744 | 0801031 | 054 | 075 | SW | 1978 | | | | |
| | ML2-39 | USFS | 211621 | FRIEL RUN AT MOUTH 00000550 | 381748 | 0801032 | 054 | 075 | SW | 1978 | | | | |
| | ML2-40 | USFS | 211622 | FRIEL RUN AT NF BDUNDARY 00000570 | 381835 | 0800926 | 054 | 075 | SW | 1978 | | | | |
| 05050007 | ML2-41 | USFS | 211406 | 6 MILES NNW MARLINTON W.VA. | 381848 | 0800600 | 054 | 075 | SW | 1976 | | | | |
| 05050005 | ML2-42 | USFS | 211616 | WILLIAMS RIVER 19 MI NE RICHWD | 381853 | 0801215 | 054 | 075 | SW | 1977 | | | | |
| | ML2-43 | USFS | 211623 | WILLIAMS RIV ABOVE LITTLE LAUREL 00000590 | 381905 | 0801221 | 054 | 075 | SW | 1978 | | | | |
| | ML2-44 | USFS | 211619 | WILLIAMS RIV BELOW LITTLE LAUREL 00000510 | 381908 | 0801221 | 054 | 075 | SW | 1978 | | | | |
| 05050007 | ML2-45 | USGS | 03193830 | GILMER RUN NEAR MARLINTON, W. VA. | 381912 | 0800552 | 054 | 075 | SW | 1970 | 1974 | | 1.80 | |
| 05050007 | ML2-46 | USFS | 211405 | 7 MILES NNW MARLINTON W.VA. | 381927 | 0800607 | 054 | 075 | SW | 1974 | | N | | |
| 05050007 | ML2-47 | USGS | 03990010 | DLD FIELD FDRK AT CROOKED FDRK | 381929 | 0800556 | 054 | 075 | SW | 1973 | 1973 | | | |
| 05050007 | ML2-48 | USGS | 03990020 | CROOKED FORK AT DLD FIELD FDRK | 381930 | 0800558 | 054 | 075 | SW | 1973 | 1973 | | | |
| 05050007 | ML2-49 | USFS | 211403 | 8 MILES NNW MARLINTON W.VA. | 381949 | 0800739 | 054 | 075 | SW | 1974 | | N | | |
| 05050007 | ML2-50 | USFS | 211402 | 8 MILES NNW MARLINTON W.VA. | 381954 | 0800810 | 054 | 075 | SW | 1974 | | N | | |
| 05050007 | ML2-51 | USFS | 211404 | 7 MILES NNW MARLINTON W.VA. | 381955 | 0800715 | 054 | 075 | SW | 1974 | | N | | |
| 05050003 | ML2-52 | USGS | 382000079581201 | 098.0 CLOVER LICK CREEK AT CLOVER LICK, W. V | 382000 | 0795812 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050005 | ML2-53 | USFS | 211606 | 9 MILES NW MARLINTDN W.VA. | 382015 | 0800943 | 054 | 075 | SW | 1976 | | | | |
| | ML2-54 | USFS | 211615 | TEA CREEK 17.5 MI NE RICHWDOD | 382023 | 0801401 | 054 | 075 | SW | 1977 | | | | |
| 05050005 | ML2-55 | USFS | 211607 | LITTLE LAUREL 10MI NW MARLINTDN | 382109 | 0801221 | 054 | 075 | SW | 1976 | | | | |
| 05050007 | ML2-56 | USGS | 03990030 | UNNAMED TRIB AT N PLEASANT VLY SCH | 382118 | 0800530 | 054 | 075 | SW | 1973 | 1973 | | | |
| 05050003 | ML2-57 | USGS | 382138079541201 | 094.0 THOMAS CREEK NEAR DUNMORE, W. VA. | 382138 | 0795412 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-58 | USGS | 382157079524201 | 093.0 MDORE RUN AT DUNMORE, W. VA. | 382157 | 0795242 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050007 | ML2-59 | USGS | 03990040 | MILL CREEK AT OLD FIELD FK | 382210 | 0800703 | 054 | 075 | SW | 1973 | 1973 | | | |
| 05050003 | ML2-60 | WVQ01 | 550733 | DEER CREEK AT MOUTH | 382325 | 0795008 | 054 | 075 | SW | 1972 | 1975 | | | |
| 05050003 | ML2-61 | WVO01 | KNG-130 | GREENBRIER R IN CASS | 382337 | 0795009 | 054 | 075 | SW | 1975 | | N | | |
| 05050003 | ML2-62 | WVO01 | 550729 | GREENBRIER RIVER IN CASS | 382337 | 0795009 | 054 | 075 | SW | 1972 | | | | |
| 05050007 | ML2-63 | USGS | 03990050 | OLD FIELD FORK AT SLATY FORK W.VA. | 382435 | 0800725 | 054 | 075 | SW | 1973 | 1974 | | | |
| 05050007 | ML2-64 | USGS | 03990060 | SLATY FORK AT SLATY FORK W.VA. | 382436 | 0800725 | 054 | 075 | SW | 1973 | 1974 | | | |
| 05050003 | ML2-65 | USGS | 382504079494801 | 091.0 NORTH FORK NEAR GREENBANK, W. VA. | 382504 | 0794948 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050007 | ML2-66 | USGS | 03990110 | LAUREL RUN AT ELK | 382505 | 0800752 | 054 | 075 | SW | 1973 | 1973 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL: Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media | CHEMICAL: Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-34 | N | M | E | | | M | | D | | M | | | | | | 6 | | N | | | | | | | | | | | D |
| ML2-35 | O | A | | | | A | | D | A | A | A | R | | | | A | | A | | | | | | | | | R | A | D |
| ML2-36 | A | M | | | | M | | D | | M | | | | R | K | K | | K | | | | | | | | | | | D |
| ML2-37 | N | A | | | | A | | D | | A | | | | | | 6 | | | | | | | | | | | | | D |
| ML2-38 | A | A | A | | | A | | D | | A | | | | A | A | A | | A | | | | | | | | | | | D |
| ML2-39 | A | A | A | | | A | | D | | A | | | | A | A | A | | A | | | | | | | | | | | D |
| ML2-40 | A | S | A | | | S | | D | | S | | | | S | S | S | | R | | | | | | | | | | | D |
| ML2-41 | A | A | A | | | A | | D | | A | | | | A | A | A | | A | | | | | | | | | | | D |
| ML2-42 | R | R | R | | | R | | D | | R | | | | A | R | R | | R | | | | | | | | | | | D |
| ML2-43 | K | K | K | | | K | | D | | R | | | | A | R | R | | R | | | | | | | | | | | D |
| ML2-44 | R | R | R | | | R | | D | | R | | | | A | R | R | | R | | | | | | | | | | | D |
| ML2-45 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ML2-46 | A | R | A | | | R | | D | | R | | | | S | S | S | | S | | | | | | | | | | | D |
| ML2-47 | A | A | | | | A | | D | | | | | | | | | | | | | | | | | | | A | | D |
| ML2-48 | A | A | | | | A | | D | | | | | | | | | | | | | | | | | | | A | | D |
| ML2-49 | A | R | A | | | R | | D | | R | | | | S | S | S | | S | | | | | | | | | | | D |
| ML2-50 | A | S | A | | | S | | D | | S | | | | S | S | S | | S | | | | | | | | | | | D |
| ML2-51 | A | S | A | | | S | | D | | S | | | | S | S | S | | S | | | | | | | | | | | D |
| ML2-52 | A | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-53 | S | S | A | | | S | | D | | S | | | | A | A | A | | A | | | | | | | | | | | D |
| ML2-54 | R | R | R | | | R | | D | | R | | | | | R | R | | R | | | | | | | | | | | D |
| ML2-55 | S | R | R | | | R | | D | | R | | | | S | S | S | | R | | | | | | | | | | | D |
| ML2-56 | A | A | | | | A | | D | | | | | | | | | | | | | | | | | | | A | | D |
| ML2-57 | A | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-58 | A | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-59 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ML2-60 | M | E | M | | | M | M | D | M | M | M | | | | | | | E | | | | | | | | | | | D |
| ML2-61 | Q | Q | Q | Q | Q | Q | Q | C | Q | Q | Q | | Q | | Q | | | Q | | | Q | | Q | | Q | | Q | Q | C |
| ML2-62 | S | S | S | S | S | S | S | D | R | S | S | | S | E | A | S | S | S | | | S | S | | | S | | S | R | D |
| ML2-63 | R | R | R | | | R | | D | | R | R | | | | | | | R | | | | | | | | | A | | D |
| ML2-64 | A | A | A | | | A | | D | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-65 | A | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-66 | A | A | | | | A. | | D | | | | | | | | | | | | | | | | | | | A | | D |

| CODE NUMBER | BIOLOGIC: Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-34 | | | | | | | | | | | | | | | | | | | | | |
| ML2-35 | | | | | | | | | | | | | | | | | | | | | |
| ML2-36 | | | | | | | | | | | | | | | | | | | | | |
| ML2-37 | | | | | | | | | | | | | | | | | | | | | |
| ML2-38 | | | | | | | | | | | | | | | | | | | | | |
| ML2-39 | | | | | | | | | | | | | | | | | | | | | |
| ML2-40 | | | | | | | | | | | | | | | | | | | | | |
| ML2-41 | | | | | | | | | | | | | | | | | | | | | |
| ML2-42 | | | | | | | | | | | | | | | | | | | | | |
| ML2-43 | | | | | | | | | | | | | | | | | | | | | |
| ML2-44 | | | | | | | | | | | | | | | | | | | | | |
| ML2-45 | | | | | | | | | | | | | | | | | | | | | |
| ML2-46 | | | | | | | | | | | | | | | | | | | | | |
| ML2-47 | | | | | | | | | | | | | | | | | | | | | |
| ML2-48 | | | | | | | | | | | | | | | | | | | | | |
| ML2-49 | | | | | | | | | | | | | | | | | | | | | |
| ML2-50 | | | | | | | | | | | | | | | | | | | | | |
| ML2-51 | | | | | | | | | | | | | | | | | | | | | |
| ML2-52 | | | | | | | | | | | | | | | | | | | | | |
| ML2-53 | | | | | | | | | | | | | | | | | | | | | |
| ML2-54 | | | | | | | | | | | | | | | | | | | | | |
| ML2-55 | | | | | | | | | | | | | | | | | | | | | |
| ML2-56 | | | | | | | | | | | | | | | | | | | | | |
| ML2-57 | | | | | | | | | | | | | | | | | | | | | |
| ML2-58 | | | | | | | | | | | | | | | | | | | | | |
| ML2-59 | | | | | | | | | | | | | | | | | | | | | |
| ML2-60 | | | | | | | | | | | | | | | | | | | | | |
| ML2-61 | Q | Q | | | | | | | | | | | | | | | | | | | C |
| ML2-62 | S | | S | | | | | | S | | | | | | | | | | | | D |
| ML2-63 | R | | | | | | | | | | | | | | | | | | | | D |
| ML2-64 | A | | | | | | | | | | | | | | | | | | | | D |
| ML2-65 | | | | | | | | | | | | | | | | | | | | | |
| ML2-66 | | | | | | | | | | | | | | | | | | | | | |

| CODE NUMBER | SEDIMENT: Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | OTHER: Telemetry | S W Station VAVES NINO | G W Station VAVES NINO | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-34 | | | | | | | | | | | | S |
| ML2-35 | | | | | | | | | | | | SW |
| ML2-36 | | A | | | | | | D | | | | S |
| ML2-37 | | | | | | | | | | | | S |
| ML2-38 | | | | | | | | | | | | S |
| ML2-39 | | A | | | | | | D | | | | S |
| ML2-40 | | | | | | | | | | | | S |
| ML2-41 | | R | | | | | | D | | | | S |
| ML2-42 | | A | | | | | | D | | | | S |
| ML2-43 | | | | | | | | | | | | S |
| ML2-44 | | | | | | | | | | | | S |
| ML2-45 | | | | | | | | | | | | W |
| ML2-46 | | A | | | | | | D | | | | S |
| ML2-47 | | | | | | | | | | | | S |
| ML2-48 | | | | | | | | | | | | S |
| ML2-49 | | A | | | | | | D | | | | S |
| ML2-50 | | A | | | | | | D | | | | S |
| ML2-51 | | A | | | | | | D | | | | S |
| ML2-52 | | | | | | | | | | | | S |
| ML2-53 | | R | | | | | | D | | | | S |
| ML2-54 | | | | | | | | | | | | S |
| ML2-55 | | S | | | | | | D | | | | S |
| ML2-56 | | | | | | | | | | | | S |
| ML2-57 | | | | | | | | | | | | S |
| ML2-58 | | | | | | | | | | | | S |
| ML2-59 | | | | | | | | | | | | S |
| ML2-60 | | | | | | | | | | | | S |
| ML2-61 | | | | | | | | | | | | |
| ML2-62 | | | | | | | | | | | | S |
| ML2-63 | | | | | | | | | | | | S |
| ML2-64 | | | | | | | | | | | | S |
| ML2-65 | | | | | | | | | | | | S |
| ML2-66 | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB. AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05050003 | ML2-67 | USFS | 219912 | PRECIPITATION SITE, ARBOVALE | 382607 | 0794905 | 054 | 075 | SW | 1975 | | | | |
| 05050003 | ML2-68 | USGS | 382638079494901 | 090.0 DEER CREEK NEAR ARBORVALE, W. VA. | 382638 | 0794949 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-69 | USGS | 382819079513501 | 087ALLEGHENY RUN AT HOSTERMAN W.VA. | 382819 | 0795135 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-70 | WV001 | 550730 | GREENBRIER R. NEAR NOTTINGHAM | 383057 | 0795034 | 054 | 075 | SW | 1974 | 1974 | | | |
| 05050003 | ML2-71 | USGS | 383109079504001 | 084.0 ELK CREEK NEAR DURBIN, W. VA. | 383109 | 0795040 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-72 | USFS | 210907 | LAKE BUFFALO INLET | 383130 | 0794200 | 054 | 075 | SW | 1971 | | N | | |
| 05050003 | ML2-73 | USFS | 210906 | LAKE BUFFALO OUTLET | 383200 | 0794230 | 054 | 075 | SW | 1971 | | | | |
| 05050003 | ML2-74 | WV001 | 550615 | E FK. OF GREENBRIER R. IN BARTOW | 383219 | 0794632 | 054 | 075 | SW | 1972 | | | | |
| 05020001 | ML2-75 | USGS | 383220079463001 | 075.0 EAST FORK GREENBRIER R AT BARTOW, W. V | 383220 | 0794630 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-76 | WV001 | 550732 | GREENBRIER RIVER NEAR DURBIN | 383225 | 0795009 | 054 | 075 | SW | 1974 | 1974 | | | |
| 05050003 | ML2-77 | USFS | 219904 | GREENBRIER RANGER STA, BARTOW | 383229 | 0794641 | 054 | 075 | SW | 1975 | | | | |
| 05050003 | ML2-78 | USFS | 210901 | GREENBRIER RIV AT DURBIN 00000620 | 383230 | 0795000 | 054 | 075 | SW | 1969 | | | | |
| 05050003 | ML2-79 | USFS | 210903 | E. FK. GREENBRIER RV AT FRANK | 383230 | 0794600 | 054 | 075 | SW | 1971 | | | | |
| 05050003 | ML2-80 | USEPA | 550035 | TANNERY AT FRANK, OLD LAGOON | 383235 | 0794720 | 054 | 075 | SW | 1964 | 1971 | | | |
| 05050003 | ML2-81 | USEPA | 550036 | TANNERY AT FRANK, LAGOON,OUTFALL | 383235 | 0794720 | 054 | 075 | SW | 1965 | 1965 | | | |
| 05050003 | ML2-82 | USGS | 03180500 | GREENBRIER RIVER AT DURBIN, W. VA. | 383235 | 0795000 | 054 | 075 | SW | 1971 | 1973 | | 134.00 | |
| 05050003 | ML2-83 | USEPA | 550060 | EAST FORK GREENBRIER AT DURBIN | 383241 | 0794918 | 054 | 075 | SW | 1964 | 1973 | | | |
| 05050003 | ML2-84 | WV001 | 550734 | JOHNS RUN NEAR MOUTH | 383246 | 0794852 | 054 | 075 | SW | 1973 | | | | |
| 05050003 | ML2-85 | WV001 | 550734 | JOHNS RUN NEAR MOUTH | 383246 | 0794852 | 054 | 075 | SW | 1973 | | | | |
| 05050003 | ML2-86 | USGS | 383247079475701 | 076.0 JOHNS RUN AT FRANK, W. VA. | 383247 | 0794757 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-87 | USGS | 383247079475701 | 076.0 JOHNS RUN AT FRANK, W. VA. | 383247 | 0794757 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05020004 | ML2-88 | USFS | 210902 | W FK GREENBRIER RV AT DURBIN | 383300 | 0794930 | 054 | 075 | SW | 1970 | | | | |
| 05020004 | ML2-89 | USFS | 210902 | W FK GREENBRIER RV AT DURBIN | 383300 | 0794930 | 054 | 075 | SW | 1970 | | | | |
| 05050003 | ML2-90 | USFS | 210905 | LITTLE R. E. FK. GREENBRIER RV. | 383300 | 0794300 | 054 | 075 | SW | 1971 | | | | |
| 05020001 | ML2-91 | USGS | 03180400 | W. FORK GREENBRIER R AT DURBIN, W. VA. | 383300 | 0794954 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-92 | WV001 | 550616 | W FK OF GREENBRIER R. AT DURBIN | 383300 | 0794952 | 054 | 075 | SW | 1972 | | | | |
| 05020004 | ML2-93 | USGS | 383323079440501 | 074.0 LITTLE RIVER NEAR THORNWOOD, W. VA. | 383323 | 0794405 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-94 | USEPA | 550029 | JOHN'S RUN, TANNERY AT FRANK | 383347 | 0794819 | 054 | 075 | SW | 1964 | 1965 | | | |
| 05020001 | ML2-95 | USGS | 383357079491701 | 081.0 MOUNTAIN LICK CREEK NEAR OLIVE, W. VA. | 383357 | 0794917 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05020001 | ML2-96 | USGS | 383357079491701 | 081.0 MOUNTAIN LICK CREEK NEAR OLIVE, W. VA. | 383357 | 0794917 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-97 | USGS | 383411079432901 | 073.0 GUM CABIN CREEK NEAR THORNWOOD, W. VA. | 383411 | 0794329 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-98 | USGS | 383438079421301 | 072.0 LONGRUN NEAR THORNWOOD, W. VA. | 383438 | 0794213 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05020004 | ML2-99 | USFS | 210904 | LITTLE R. W. FK. GREENBRIER RV. | 383700 | 0794800 | 054 | 075 | SW | 1971 | | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

PHYSICAL

| CODE NUMBER | Temperature | Specific conductance | Turbidity | Color | Odor | pH | Suspended solids | Storage media |
|---|---|---|---|---|---|---|---|---|
| ML2-67 | | Q | | | | W | | D |
| ML2-68 | A | A | | | | A | | D |
| ML2-69 | A | A | | | | A | | D |
| ML2-70 | A | A | A | | | | | D |
| ML2-71 | A | A | | | | A | | D |
| ML2-72 | R | R | A | | | R | | D |
| ML2-73 | R | R | A | | | R | | D |
| ML2-74 | K | K | H | E | E | M | H | D |
| ML2-75 | A | A | | | | A | | D |
| ML2-76 | A | | A | | | | | D |
| ML2-77 | E | M | | | | M | | D |
| ML2-78 | R | R | A | | | R | | D |
| ML2-79 | S | S | A | | | S | | D |
| ML2-80 | E | A | | E | | E | | D |
| ML2-81 | | | | | | | | |
| ML2-82 | R | R | | | | R | | D |
| ML2-83 | | A | A | A | | A | | D |
| ML2-84 | H | R | R | | | R | R | D |
| ML2-85 | H | R | R | | | R | R | D |
| ML2-86 | A | A | | | | A | | D |
| ML2-87 | A | A | | | | A | | D |
| ML2-88 | R | R | A | | | R | | D |
| ML2-89 | R | R | A | | | R | | D |
| ML2-90 | R | R | A | | | R | | D |
| ML2-91 | R | R | | | | R | | D |
| ML2-92 | K | R | H | E | E | H | H | D |
| ML2-93 | A | A | | | | A | | D |
| ML2-94 | | | | | | | | |
| ML2-95 | A | A | | | | A | | D |
| ML2-96 | A | A | | | | A | | D |
| ML2-97 | A | A | | | | A | | D |
| ML2-98 | A | A | | | | A | | D |
| ML2-99 | R | R | A | | | R | | D |

CHEMICAL

| CODE NUMBER | Dissolved solids | Major ions | Hardness | Silica | Phosphorus | Phosphorus species | Nitrogen | Nitrogen species | Detergents | Other minor elements | Radioactivity | Radiochemical species | Carbon | Organic groups | Pesticides species | Other organic species | Biochemical oxygen demand | Chemical oxygen demand | Dissolved oxygen | Other dissolved gases | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-67 | | Q | | | | | | | | | | | | | | | | | | | D |
| ML2-68 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-69 | | | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-70 | | | | | | | A | A | | | | | | A | | | A | | A | A | D |
| ML2-71 | | | | | | | | | | A | | | | | | | | | A | | D |
| ML2-72 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-73 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-74 | H | M | H | | E | | E | E | | E | | | E | E | | | E | E | E | E | D |
| ML2-75 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-76 | | | | | | | A | A | | | | | | A | | | A | | A | A | D |
| ML2-77 | | Q | | | | Q | Q | Q | | Q | | | | | | | | | | | D |
| ML2-78 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-79 | | S | | E | | S | S | S | | S | | | | | | | | | | | D |
| ML2-80 | | A | | | A | | | | | | | | A | | | | A | | | | D |
| ML2-81 | | | | | | | | | | | | | | | | | | | | | |
| ML2-82 | A | R | R | A | | | | A | | A | | | | | | | | | E | S | D |
| ML2-83 | | A | A | | | | | | | | | | A | | | | | | | | D |
| ML2-84 | R | R | R | | | | | | | E | | | E | | | | | E | | | D |
| ML2-85 | R | R | R | | | | | | | E | | | E | | | | | E | | | D |
| ML2-86 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-87 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-88 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-89 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-90 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-91 | R | R | R | R | | | | R | | R | | | | | | | | | R | R | D |
| ML2-92 | H | H | H | | E | | E | E | | E | | | E | E | | | E | | E | E | D |
| ML2-93 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-94 | | | | | | | | | | | | | | | | | | | | | |
| ML2-95 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-96 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-97 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-98 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-99 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |

BIOLOGIC

| CODE NUMBER | Enteric bacteria | Native bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro invertebrates | Macro invertebrates | Vertebrates | Fungi | Viruses | Primary productivity | Secondary productivity | Chemosynthetic activity | Biostimulatory activity | Toxicity test | Other bioassay test | Chemical tissue test | Histopathological analysis | Other tissue analysis | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-67 | | | | | | | | | | | | | | | | | | | | | |
| ML2-68 | | | | | | | | | | | | | | | | | | | | | |
| ML2-69 | | | | | | | | | | | | | | | | | | | | | |
| ML2-70 | | | A | | | | | | A | | | | | | | | | | | | D |
| ML2-71 | | | | | | | | | | | | | | | | | | | | | |
| ML2-72 | | | | | | | | | | | | | | | | | | | | | |
| ML2-73 | | | | | | | | | | | | | | | | | | | | | |
| ML2-74 | E | | E | | | | | | E | | | | | | | | | | | | D |
| ML2-75 | | | | | | | | | | | | | | | | | | | | | |
| ML2-76 | | | A | | | | | | A | | | | | | | | | | | | D |
| ML2-77 | | | | | | | | | | | | | | | | | | | | | |
| ML2-78 | | | | | | | | | | | | | | | | | | | | | |
| ML2-79 | | | | | | | | | | | | | | | | | | | | | |
| ML2-80 | | | | | | | | | | | | | | | | | | | | | |
| ML2-81 | | | | | | | | | | | | | | | | | | | | | |
| ML2-82 | | | | | | | | | | | | | | | | | | | | | |
| ML2-83 | | | | | | | | | | | | | | | | | | | | | |
| ML2-84 | | | | | | | | | | | | | | | | | | | | | |
| ML2-85 | | | | | | | | | | | | | | | | | | | | | |
| ML2-86 | | | | | | | | | | | | | | | | | | | | | |
| ML2-87 | | | | | | | | | | | | | | | | | | | | | |
| ML2-88 | | | | | | | | | | | | | | | | | | | | | |
| ML2-89 | | | | | | | | | | | | | | | | | | | | | |
| ML2-90 | | | | | | | | | | | | | | | | | | | | | |
| ML2-91 | | | | | | | | | | | | | | | | | | | | | |
| ML2-92 | E | | E | | | | | | E | | | | | | | | | | | | D |
| ML2-93 | | | | | | | | | | | | | | | | | | | | | |
| ML2-94 | | | | | | | | | | | | | | | | | | | | | |
| ML2-95 | | | | | | | | | | | | | | | | | | | | | |
| ML2-96 | | | | | | | | | | | | | | | | | | | | | |
| ML2-97 | | | | | | | | | | | | | | | | | | | | | |
| ML2-98 | | | | | | | | | | | | | | | | | | | | | |
| ML2-99 | | | | | | | | | | | | | | | | | | | | | |

SEDIMENT / OTHER

| CODE NUMBER | Bed load | Concentration (suspended) | Sediment discharge (suspended) | Concentration (total) | Sediment discharge (total) | Particle size (suspended) | Particle size (bed material) | Storage media | Telemetry | S W station | G W station | Data bank source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-67 | | | | | | | | | | | | S |
| ML2-68 | | | | | | | | | | | | S |
| ML2-69 | | | | | | | | | | | | S |
| ML2-70 | | | | | | | | | | | | S |
| ML2-71 | | | | | | | | | | | | S |
| ML2-72 | | | | | | | | | | | | S |
| ML2-73 | | | | | | | | | | | | S |
| ML2-74 | | | | | | | | | | | | S |
| ML2-75 | | | | | | | | | | | | S |
| ML2-76 | | | | | | | | | | | | S |
| ML2-77 | | | | | | | | | | | | S |
| ML2-78 | | | | | | | | | | | | S |
| ML2-79 | | | | | | | | | | | | S |
| ML2-80 | | | | | | | | | | | | S |
| ML2-81 | | | | | | | | | | | | S |
| ML2-82 | | | | | | | | | | | | SW |
| ML2-83 | | | | | | | | | | | | S |
| ML2-84 | | | | | | | | | | | | S |
| ML2-85 | | | | | | | | | | | | S |
| ML2-86 | | | | | | | | | | | | S |
| ML2-87 | | | | | | | | | | | | S |
| ML2-88 | | | | | | | | | | | | S |
| ML2-89 | | | | | | | | | | | | S |
| ML2-90 | | | | | | | | | | | | S |
| ML2-91 | | | | | | | | | | | | S |
| ML2-92 | | | | | | | | | | | | S |
| ML2-93 | | | | | | | | | | | | S |
| ML2-94 | | | | | | | | | | | | S |
| ML2-95 | | | | | | | | | | | | S |
| ML2-96 | | | | | | | | | | | | S |
| ML2-97 | | | | | | | | | | | | S |
| ML2-98 | | | | | | | | | | | | S |
| ML2-99 | | | | | | | | | | | | S |

PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05050003 | ML2-100 | USGS | 383701079483001 | 080.0 LITTLE RIVER NEAR MAY, W. VA. | 383701 | 0794830 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-101 | USGS | 384244079464501 | 078.0 SNORTING LICK RUN AT WILDELL, W. VA. | 384244 | 0794645 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05050003 | ML2-102 | USGS | 384246079464501 | 077.0 WEST FK GREENBRIER R AT WILDELL, W. VA | 384246 | 0794645 | 054 | 075 | SW | 1972 | 1972 | | | |
| 05020001 | ML2-103 | WVOO1 | 550582 | TYGART VALLEY R. AB VALLEY HEAD | 383215 | 0800203 | 054 | 083 | SW | 1974 | 1974 | | | |
| 05020004 | ML2-104 | WVOO1 | 550741 | SHAVERS FORK BLW. STONECOAL RUN | 383906 | 0795134 | 054 | 083 | SW | 1973 | 1975 | | | |
| 05020004 | ML2-105 | USFS | 210539 | GLADE RUN 18 MI SOUTH ELKINS | 383938 | 0795042 | 054 | 083 | LK | 1969 | | | | |
| 05020004 | ML2-106 | USFS | 210534 | WHITMEADOW 17.8 MI SOUTH ELKINS | 383946 | 0795120 | 054 | 083 | LK | 1969 | | | | |
| 05020004 | ML2-107 | WVOO1 | 550779 | GLADE RUN NEAR MOUTH | 383948 | 0795047 | 054 | 083 | SW | 1972 | 1975 | N | | |
| 05020004 | ML2-108 | USFS | 210538 | JOHNS CAMP 17 MI SOUTH ELKINS | 384019 | 0795009 | 054 | 083 | LK | 1970 | | | | |
| 05020004 | ML2-109 | WVOO1 | 550740 | SHAVERS FORK ABOVE COUCH RUN | 384041 | 0795030 | 054 | 083 | SW | 1973 | 1975 | | | |
| 05020004 | ML2-110 | WVOO1 | 550783 | CROUCH RUN NEAR MOUTH | 384043 | 0795034 | 054 | 083 | SW | 1974 | 1975 | | | |
| 05020004 | ML2-111 | USFS | 210304 | GANDY DAM SITE 13MI NE BARTOW | 384050 | 0793723 | 054 | 083 | SW | 1974 | | | | |
| 05020004 | ML2-112 | USFS | 210305 | BIG RUN LAKE 13.5 MI NE BARTOW | 384105 | 0793633 | 054 | 083 | SW | 1974 | | | | |
| 05020004 | ML2-113 | USFS | 210532 | SHAVERS FK 16 MI SOUTH ELKINS | 384117 | 0795001 | 054 | 083 | LK | 1969 | | | | |
| 05020004 | ML2-114 | WVOO1 | 550739 | SHAVERS FK. BLW COUCH RUN | 384120 | 0795020 | 054 | 083 | SW | 1973 | 1975 | | | |
| 05020004 | ML2-115 | USFS | 210531 | YOKUM RUN 16 MI SOUTH ELKINS | 384122 | 0795000 | 054 | 083 | LK | 1969 | | | | |
| 05020004 | ML2-116 | USFS | 210306 | BIG RUN DAM 13.5MI NE BARTOW | 384132 | 0793623 | 054 | 083 | SW | 1974 | | | | |
| 05020004 | ML2-117 | USFS | 210530 | SHAVERS FK 14.5 MI SOUTH ELKINS | 384223 | 0795019 | 054 | 083 | LK | 1969 | | | | |
| 05020004 | ML2-118 | USFS | 210307 | SINKS OF GANDY 14MI NE BARTOW | 384225 | 0793827 | 054 | 083 | SW | 1975 | | | | |
| 05020004 | ML2-119 | USFS | 210529 | MCGEE RUN 14.5 MI SOUTH ELKINS | 384227 | 0795019 | 054 | 083 | LK | 1969 | | | | |
| 05020004 | ML2-120 | USFS | 210308 | BEE RUN AT MOUTH 18MI SE ELKINS | 384557 | 0793421 | 054 | 083 | SW | 1975 | | | | |
| 05020004 | ML2-121 | USFS | 210309 | SWALLOW RUN 18 MILES SE ELKINS | 384603 | 0793321 | 054 | 083 | SW | 1975 | | | | |
| 05020004 | ML2-122 | USFS | 210310 | UPPER TWO SPRING 18MI SE ELKINS | 384715 | 0793318 | 054 | 083 | SW | 1975 | | | | |
| 05020004 | ML2-123 | USFS | 210311 | LOWER TWO SPRING 17MI SE ELKINS | 384752 | 0793238 | 054 | 083 | SW | 1975 | | | | |
| 05020004 | ML2-124 | USGS | 03068000 | SHAVERS FORK AT BEMIS, W. VA. | 384827 | 0794416 | 054 | 083 | SW | 1975 | | | 115.00 | Y |
| 05020004 | ML2-125 | WVOO1 | 550772 | SHAVERS FORK AT BEMIS | 384827 | 0794416 | 054 | 083 | SW | 1972 | 1978 | N | | |
| 05020004 | ML2-126 | USFS | 219923 | SHAVERS FK 9 MI SE ELKINS W.VA. | 384841 | 0794417 | 054 | 083 | SW | 1975 | | | | |
| 05020004 | ML2-127 | USGS | 03068600 | SHAVERS FORK ABOVE BOWDEN, W. VA. | 385410 | 0794141 | 054 | 083 | SW | 1974 | | | 138.00 | Y |
| 05020004 | ML2-128 | USGS | 03068610 | TAYLOR RUN AT BOWOEN W VA | 385427 | 0794149 | 054 | 083 | SW | 1973 | | | 5.06 | Y |
| 05020004 | ML2-129 | WVOO1 | 550780 | TAYLOR RUN NEAR MOUTH | 385427 | 0794150 | 054 | 083 | SW | 1972 | 1975 | N | | |
| 05020004 | ML2-130 | USEPA | 550621 | SHAVERS FK US FISH HATCHERY RUN | 385435 | 0794330 | 054 | 083 | SW | 1974 | 1974 | | | |
| 05020004 | ML2-131 | USEPA | 550622 | UNN TRIB-FISH HATCHERY RUN | 385435 | 0794330 | 054 | 083 | SW | 1974 | 1974 | | | |
| 05020004 | ML2-132 | USEPA | 550623 | UNN TRIB FISH HATCH RUN-POND OVR | 385435 | 0794330 | 054 | 083 | SW | 1974 | 1974 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

PHYSICAL

| CODE NUMBER | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media |
|---|---|---|---|---|---|---|---|---|
| ML2-100 | A | A | | | | A | | D |
| ML2-101 | A | A | | | | A | | D |
| ML2-102 | A | A | | | | A | | D |
| ML2-103 | A | | | | | | | D |
| ML2-104 | M | K | M | | | M | M | D |
| ML2-105 | R | R | R | | | R | | D |
| ML2-106 | R | R | R | | | R | | D |
| ML2-107 | H | H | H | | | H | K | D |
| ML2-108 | R | R | R | | | R | | D |
| ML2-109 | H | K | H | | | H | H | D |
| ML2-110 | K | K | K | | | K | K | D |
| ML2-111 | R | R | R | | | R | | D |
| ML2-112 | R | R | R | | | R | | D |
| ML2-113 | R | R | R | | | R | | D |
| ML2-114 | H | K | H | | | H | H | D |
| ML2-115 | R | R | R | | | R | | D |
| ML2-116 | R | R | R | | | R | | D |
| ML2-117 | R | R | R | | | R | | D |
| ML2-118 | R | R | R | | | R | | D |
| ML2-119 | R | R | R | | | R | | D |
| ML2-120 | R | R | A | | | R | | D |
| ML2-121 | R | R | A | | | R | | D |
| ML2-122 | A | A | A | | | A | | D |
| ML2-123 | R | R | A | | | R | | D |
| ML2-124 | K | K | K | | | | | D |
| ML2-125 | Q | Q | Q | | | Q | Q | D |
| ML2-126 | A | Q | P | | | Q | | D |
| ML2-127 | O | O | E | | | O | | D |
| ML2-128 | O | O | E | | | O | | D |
| ML2-129 | Q | Q | M | | | M | K | D |
| ML2-130 | A | A | | A | | A | A | D |
| ML2-131 | A | A | | A | | A | A | D |
| ML2-132 | A | A | | A | | A | A | D |

CHEMICAL

| CODE NUMBER | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-100 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-101 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-102 | | A | A | | | | | | | A | | | | | | | | | A | | D |
| ML2-103 | | | | | | | | | | | | | | | | | | | A | | D |
| ML2-104 | M | M | A | | | | | | | M | | | | | | | | | | | D |
| ML2-105 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-106 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-107 | H | H | | | | | | | | H | | | | | | | | | | | D |
| ML2-108 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-109 | H | H | A | | | | | | | H | | | | | | | | | | | D |
| ML2-110 | R | K | | | | | | | | K | | | | | | | | | | | D |
| ML2-111 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-112 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-113 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-114 | H | H | A | | | | | | | H | | | | | | | | | | | D |
| ML2-115 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-116 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-117 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-118 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-119 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-120 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-121 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-122 | | A | | | | A | A | A | | A | | | | | | | | | | | D |
| ML2-123 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-124 | | | | | | | | | | | | | | | | | | | A | | D |
| ML2-125 | Q | Q | E | | E | | E | E | | Q | E | | | | | | E | | E | | D |
| ML2-126 | | Q | | | | Q | Q | Q | | Q | | | | | | | | | | | D |
| ML2-127 | A | A | A | A | | | | | | A | | | | | | | | | | A | D |
| ML2-128 | A | A | A | A | | E | | E | | A | | | | | | | | | | A | D |
| ML2-129 | Q | M | E | | | | | | | M | | | | | | | | | | | D |
| ML2-130 | A | A | | | | | | | | A | | | | | | | | | | | D |
| ML2-131 | A | A | | | | | | | | A | | | | | | | | | | | D |
| ML2-132 | A | A | | | | | | | | A | | | | | | | | | | | D |

BIOLOGIC

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-100 | | | | | | | | | | | | | | | | | | | | | |
| ML2-101 | | | | | | | | | | | | | | | | | | | | | |
| ML2-102 | | | | | | | | | | | | | | | | | | | | | |
| ML2-103 | | | | | | | | | | | | | | | | | | | | | |
| ML2-104 | | | | | | | | | | | | | | | | | | | | | |
| ML2-105 | | | | | | | | | | | | | | | | | | | | | |
| ML2-106 | | | | | | | | | | | | | | | | | | | | | |
| ML2-107 | | | | | | | | | | | | | | | | | | | | | |
| ML2-108 | | | | | | | | | | | | | | | | | | | | | |
| ML2-109 | | | | | | | | | | | | | | | | | | | | | |
| ML2-110 | | | | | | | | | | | | | | | | | | | | | |
| ML2-111 | | | | | | | | | | | | | | | | | | | | | |
| ML2-112 | | | | | | | | | | | | | | | | | | | | | |
| ML2-113 | | | | | | | | | | | | | | | | | | | | | |
| ML2-114 | | | | | | | | | | | | | | | | | | | | | |
| ML2-115 | | | | | | | | | | | | | | | | | | | | | |
| ML2-116 | | | | | | | | | | | | | | | | | | | | | |
| ML2-117 | | | | | | | | | | | | | | | | | | | | | |
| ML2-118 | | | | | | | | | | | | | | | | | | | | | |
| ML2-119 | | | | | | | | | | | | | | | | | | | | | |
| ML2-120 | | | | | | | | | | | | | | | | | | | | | |
| ML2-121 | | | | | | | | | | | | | | | | | | | | | |
| ML2-122 | | | | | | | | | | | | | | | | | | | | | |
| ML2-123 | | | | | | | | | | | | | | | | | | | | | |
| ML2-124 | | | | | | | | | | | | | | | | | | | | | |
| ML2-125 | E | | | | | | | | | | | | | | | | | | | | D |
| ML2-126 | | | | | | | | | | | | | | | | | | | | | |
| ML2-127 | | | | | | | | | | | | | | | | | | | | | |
| ML2-128 | | | | | | | | | | | | | | | | | | | | | |
| ML2-129 | | | | | | | | | | | | | | | | | | | | | |
| ML2-130 | | | | | | | | | | | | | | | | | | | | | |
| ML2-131 | | | | | | | | | | | | | | | | | | | | | |
| ML2-132 | | | | | | | | | | | | | | | | | | | | | |

SEDIMENT / OTHER

| CODE NUMBER | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | Telemetry | S W Station | G W Station | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-100 | | | | | | | | | | | | S |
| ML2-101 | | | | | | | | | | | | S |
| ML2-102 | | | | | | | | | | | | S |
| ML2-103 | | | | | | | | | | | | S |
| ML2-104 | | | | | | | | | | | | S |
| ML2-105 | | | | | | | | | | | | S |
| ML2-106 | | A | | | | | | D | | | | S |
| ML2-107 | | | | | | | | | | | | S |
| ML2-108 | | | | | | | | | | | | S |
| ML2-109 | | | | | | | | | | | | S |
| ML2-110 | | | | | | | | | | | | S |
| ML2-111 | | | | | | | | | | | | S |
| ML2-112 | | | | | | | | | | | | S |
| ML2-113 | | A | | | | | | D | | | | S |
| ML2-114 | | | | | | | | | | | | S |
| ML2-115 | | A | | | | | | D | | | | S |
| ML2-116 | | | | | | | | | | | | S |
| ML2-117 | | A | | | | | | D | | | | S |
| ML2-118 | | | | | | | | | | | | S |
| ML2-119 | | | | | | | | | | | | S |
| ML2-120 | | | | | | | | | | | | S |
| ML2-121 | | | | | | | | | | | | S |
| ML2-122 | | | | | | | | | | | | S |
| ML2-123 | | | | | | | | | | | | S |
| ML2-124 | | K | | | | | | D | | | | SW |
| ML2-125 | | | | | | | | | | | | S |
| ML2-126 | | A | | | | | | D | | | | S |
| ML2-127 | | O | O | | | | | D | | | | SW |
| ML2-128 | | O | O | | | | | D | | | | SW |
| ML2-129 | | | | | | | | | | | | S |
| ML2-130 | | | | | | | | | | | | S |
| ML2-131 | | | | | | | | | | | | S |
| ML2-132 | | | | | | | | | | | | S |

PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| O | R | 7 | Quarterly |

| Code: Year-Round | Code: Seasonal | Code: Eliminated | MEANING |
|---|---|---|---|
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05020004 | ML2-133 | USEPA | 550624 | CULVERT TO UNN TRIB FISH HATCH R | 385435 | 0794330 | 054 | 083 | SW | 1974 | 1974 | | | |
| 05020004 | ML2-134 | USEPA | 550625 | CULVERT TO TP TO TRIB FISH HATCH | 385435 | 0794330 | 054 | 083 | SW | 1974 | 1974 | | | |
| 05020004 | ML2-135 | USFWS | 531261 | BOWDEN NFH SHAVERS FORK RIVER | 385445 | 0794305 | 054 | 083 | SW | 1971 | 1972 | | | |
| 05020004 | ML2-136 | USFWS | 531261.1 | BOWDEN NFH SHAVERS FORK RIVER | 385445 | 0794305 | 054 | 083 | SW | 1971 | 1972 | | | |
| 05020004 | ML2-137 | USGS | 03068800 | SHAVERS FORK BELOW BOWDEN, W. VA. | 385447 | 0794614 | 054 | 083 | SW | 1972 | | | 151.00 | Y |
| 05020004 | ML2-138 | WV001 | 550773 | SHAVERS FORK NEAR BOWDEN | 385447 | 0794614 | 054 | 083 | SW | 1974 | 1975 | | | |
| 05020004 | ML2-139 | USFWS | 531261.2 | BOWDEN NFH SHAVERS FORK RIVER | 385449 | 0794315 | 054 | 083 | SW | 1971 | 1972 | | | |
| 05020004 | ML2-140 | USFWS | 531265 | BOWDEN NFH SHAVERS FORK RIVER | 385449 | 0794613 | 054 | 083 | SW | 1971 | 1972 | | | |
| 05020004 | ML2-141 | USFWS | 531263 | BOWDEN NFH SHAVERS FORK RIVER | 385451 | 0794319 | 054 | 083 | SW | 1971 | 1972 | | | |
| 05020004 | ML2-142 | USGS | 03063600 | HORSECAMP RUN AT HARMAN, W. VA. | 385451 | 0793032 | 054 | 083 | SW | 1969 | 1977 | | 6.57 | |
| 05020004 | ML2-143 | USFWS | 531264 | BOWDEN NFH SHAVERS FORK RIVER | 385452 | 0794321 | 054 | 083 | SW | 1971 | 1972 | | | |
| 05020004 | ML2-144 | USFS | 210501 | TAYLOR RUN AT MOUTH 00000780 | 385457 | 0794157 | 054 | 083 | SW | 1966 | | | | |
| 05020001 | ML2-145 | USGS | 03068607 | STALNAKER RUN NEAR BOWDEN, WV | 385502 | 0794111 | 054 | 083 | SW | 1978 | | | 1.55 | Y |
| 05020004 | ML2-146 | USFS | 210543 | BICKLE RUN 8.5 MILES EAST ELKINS | 385503 | 0794244 | 054 | 083 | SW | 1977 | | | | |
| 05020004 | ML2-147 | USFS | 210503 | MILL RUN 4.4 MI EAST ELKIKNS | 385507 | 0794127 | 054 | 083 | SW | 1974 | | | | |
| 05020004 | ML2-148 | USFS | 210502 | MILL RUN 4.3 MI EAST ELKINS | 385512 | 0794130 | 054 | 083 | SW | 1974 | | | | |
| 05020004 | ML2-149 | USFS | 210504 | RICH CHAMP 493 MI EAST ELKINS | 385517 | 0794126 | 054 | 083 | SW | 1974 | | | | |
| 05020004 | ML2-150 | USFS | 210505 | RICH CHAMP RUN 4.4 MI E ELKINS | 385518 | 0794119 | 054 | 083 | SW | 1974 | | | | |
| 05020004 | ML2-151 | USFS | 210506 | STALNAKER RUN 4.4 MI EAST ELKINS | 385522 | 0794124 | 054 | 083 | SW | 1974 | | | | |
| 05020001 | ML2-152 | USGS | 03068604 | TAYLOR RUN NEAR ALPENA, WV | 385524 | 0794012 | 054 | 083 | SW | 1979 | | | 1.06 | Y |
| | ML2-153 | USFS | 210542 | BICKLE RUN 8.4 MI EAST ELKINS | 385541 | 0794255 | 054 | 083 | SW | 1977 | | | | |
| 05020004 | ML2-154 | USFS | 210507 | TAYLOR RUN 9.5 MI EAST ELKINS | 385552 | 0793956 | 054 | 083 | SW | 1974 | | | | |
| | ML2-155 | USFS | 210541 | BICKLE RUN 8.0 MI EAST ELKINS | 385603 | 0794318 | 054 | 083 | SW | 1977 | | | | |
| 05020004 | ML2-156 | USGS | 03068900 | SHAVERS FORK NR ELKINS, W. VA. | 385758 | 0794602 | 054 | 083 | SW | 1975 | | | 161.00 | Y |
| 05020004 | ML2-157 | USGS | 385856079434601 | LITTLE BLACK FORK NEAR ELKINS, W. VA. | 385856 | 0794346 | 054 | 083 | SW | 1976 | 1976 | | | |
| 05020004 | ML2-158 | USFS | 210509 | CLIFTON RUN 10 MI NNE ELKINS | 390008 | 0794536 | 054 | 083 | SW | 1974 | | | | |
| 05020004 | ML2-159 | USFS | 210510 | CLIFTON RUN 10 MI NNE ELKINS | 390008 | 0794536 | 054 | 083 | SW | 1975 | | | | |
| 05020004 | ML2-160 | USFS | 210508 | PRECIPITATION 8 MI NORTH ELKINS | 390017 | 0794518 | 054 | 083 | SW | 1974 | | | | |
| | ML2-161 | USFS | 219922 | PRECIP 9.0 MILES SOUTH PARSONS | 385745 | 0794127 | 054 | 093 | SW | 1977 | | | | |
| 05020004 | ML2-162 | USFS | 210302 | RED CK. AT MOUTH | 385800 | 0793000 | 054 | 093 | SW | 1971 | | | | |
| 05020004 | ML2-163 | USFS | 210402 | LAUREL FORK AT MOUTH | 385900 | 0793230 | 054 | 093 | SW | 1967 | | N | | |
| 05020004 | ML2-164 | USFS | 210401 | GLADY FORK AT MOUTH 00000760 | 390100 | 0793245 | 054 | 093 | SW | 1969 | | | | |
| 05020004 | ML2-165 | USCE | | CHEAT RIVER-12 | 390149 | 0793520 | 054 | 093 | SW | 1970 | | | | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL | | | | | | | | CHEMICAL | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature | Specific conductance | Turbidity | Color | Odor | pH | Suspended solids | Storage media | Dissolved solids | Major ions | Hardness | Silica | Phosphorus | Phosphorus species | Nitrogen | Nitrogen species | Detergents | Other minor elements | Radioactivity | Radiochemical species | Carbon | Organic groups | Pesticides species | Other organic species | Biochemical oxygen demand | Chemical oxygen demand | Dissolved oxygen | Other dissolved gases | Storage media |
| ML2-133 | A | A |  | A |  | A | A | D | A | A |  |  |  |  |  |  |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-134 | A | A |  | A |  | A | A | D | A | A |  |  |  |  |  |  |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-135 |  |  |  |  |  |  |  |  |  | N | N |  |  | N | N | N |  |  |  |  |  |  |  |  | N |  | N |  | D |
| ML2-136 |  |  |  |  |  |  |  |  |  | N | N |  |  | N | N | N |  |  |  |  |  |  |  |  | N |  | E |  | D |
| ML2-137 | O | O | E |  |  | 3 |  | D | E | E | E | E |  | E |  | E |  | E |  |  |  |  |  |  |  |  |  | E | D |
| ML2-138 | H | H | H |  |  | H | R | D | H | H | E |  | E |  | E | E |  | H |  |  |  |  |  |  | E |  | E |  | D |
| ML2-139 |  |  |  |  |  |  |  |  |  | N | N |  |  | N | N | N |  |  |  |  |  |  |  |  | N |  | N |  | D |
| ML2-140 |  |  |  |  |  |  |  |  |  | N | N |  |  | N | N | N |  |  |  |  |  |  |  |  | N |  | E |  | D |
| ML2-141 |  |  |  |  |  |  |  |  |  | N | N |  |  | N | N | N |  |  |  |  |  |  |  |  | N |  | E |  | D |
| ML2-142 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ML2-143 |  |  |  |  |  |  |  |  |  | N | N |  |  | N | N | N |  |  |  |  |  |  |  |  | N |  | E |  | D |
| ML2-144 | R | R | A |  |  | R |  | D |  | R |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-145 | R | K | R |  |  | R |  | D | A | A | A | A |  |  |  |  |  | A |  |  |  |  |  |  |  |  | R | A | D |
| ML2-146 | A | A | A |  |  | A |  | D |  | A |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-147 | R | R | A |  |  | R |  | D |  | R |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-148 | R | R | A |  |  | R |  | D |  | R |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-149 | R | R | A |  |  | R |  | D |  | R |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-150 | R | R | A |  |  | R |  | D |  | R |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-151 | R | R | A |  |  | R |  | D |  | R |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-152 | R | K | R |  |  | R |  | D | A | A | A | A |  |  |  |  |  | A |  |  |  |  |  |  |  |  | R | A | D |
| ML2-153 | A | A | A |  |  | A |  | D |  | A |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-154 | R | R | A |  |  | R |  | D |  | R |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-155 | A | A | A |  |  | A |  | D |  | A |  |  |  | A | A | A |  | A |  |  |  |  |  |  |  |  |  |  | D |
| ML2-156 | N | N | N |  |  | N |  | D | A | A | A | A |  |  |  |  |  | A |  |  |  |  |  |  |  |  |  | A | D |
| ML2-157 | A | A | A |  |  | A |  | D | A | A | A | A |  |  |  |  |  | A |  |  |  |  |  |  |  |  |  | A | D |
| ML2-158 |  | A | A |  |  | A |  | D |  | A |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |
| ML2-159 | E | S | N |  |  | S |  | D |  | N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |
| ML2-160 | E | R |  |  |  | R |  | D |  | R |  |  |  |  |  | K |  | R |  |  |  |  |  |  |  |  |  |  | D |
| ML2-161 |  | R |  |  |  | R |  | D |  | R |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |
| ML2-162 | R | R | R |  |  | R |  | D |  | R |  | E |  | R | R | R |  | R |  |  |  |  |  |  |  |  |  |  | D |
| ML2-163 | R | R | R |  |  | R |  | D |  | R |  | E |  | R | R | R |  | R |  |  |  |  |  |  |  |  |  |  | D |
| ML2-164 | R | R | R |  |  | R |  | D |  | R |  |  |  | R | R | R |  | R |  |  |  |  |  |  |  |  |  |  | D |
| ML2-165 | Y | Y | Y |  |  | Y |  | C |  |  | Y |  | Y |  | Y |  |  |  |  |  |  |  |  |  |  |  | Y |  | C |

| CODE NUMBER | BIOLOGIC | | | | | | | | | | | | | | | | | | | | | SEDIMENT | | | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enteric bacteria | Native bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro invertebrates | Macro invertebrates | Vertebrates | Fungi | Viruses | Primary productivity | Secondary productivity | Chemosynthetic activity | Biostimulatory activity | Toxicity test | Other bioassay test | Chemical tissue test | Histopathological analysis | Other tissue analysis | Storage media | Bed load | Concentration (suspended) | Sediment discharge (suspended) | Concentration (total) | Sediment discharge (total) | Particle size (suspended) | Particle size bed material | Storage media | Telemetry | S W station (USGS) | G W station (USGS) | Data bank source |
| ML2-133 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-134 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-135 | N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-136 | N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-137 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | O | O |  |  | E |  | D |  |  |  | SW |
| ML2-138 | E |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-139 | N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-140 | N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-141 | N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-142 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | W |
| ML2-143 | N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-144 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-145 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | R | A |  |  |  |  | D |  |  |  | WS |
| ML2-146 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | A |  |  |  |  |  | D |  |  |  | S |
| ML2-147 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | E |  |  |  |  |  | D |  |  |  | S |
| ML2-148 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | E |  |  |  |  |  | D |  |  |  | S |
| ML2-149 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | E |  |  |  |  |  | D |  |  |  | S |
| ML2-150 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | E |  |  |  |  |  | D |  |  |  | S |
| ML2-151 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | E |  |  |  |  |  | D |  |  |  | S |
| ML2-152 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | R | A |  |  |  |  | D |  |  |  | WS |
| ML2-153 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-154 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | E |  |  |  |  |  | D |  |  |  | S |
| ML2-155 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-156 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | N | A |  |  |  |  | D |  |  |  | S |
| ML2-157 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-158 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-159 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-160 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-161 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-162 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-163 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-164 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S |
| ML2-165 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

### PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continunus-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| O | R | 7 | Quarterly |
| S |  | 8 | Semiannual |
| A |  | 9 | Annual |
| B |  |  | Other Periodic (less often than once per year) |
|  | Y |  | Seasonal (no time period specified) |
| Z |  | E | Irregular or unspecified frequency |
| U |  |  | Unique (one-time) measurement |

### STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

### DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05020004 | ML2-166 | USFS | 210202 | RED RUN AT MOUTH | 390200 | 0793530 | 054 | 093 | SW | 1970 | | | | |
| 05020004 | ML2-167 | USCE | | CHEAT RIVER--11 | 390220 | 0794314 | 054 | 093 | SW | 1970 | | | | |
| 05020004 | ML2-168 | USFS | 210303 | OTTER CR. AT MOUTH | 390230 | 0793630 | 054 | 093 | SW | 1971 | | | | |
| 05020004 | ML2-169 | USFS | 219919 | PRECIP 3.3 MILES SOUTH PARSONS | 390309 | 0794100 | 054 | 093 | SW | 1974 | | | | |
| 05020004 | ML2-170 | USFS | 219920 | PRECIP 3 MILES SOUTH PARSONS | 390354 | 0794042 | 054 | 093 | SW | 1974 | | | | |
| 05020004 | ML2-171 | USFS | 210201 | BLACKWATER RIVER AT MOUTH 00000720 | 390400 | 0793800 | 054 | 093 | SW | 1969 | | | | |
| | ML2-172 | USFS | 219921 | PRECIP 2.7 MILES SE PARSONS | 390407 | 0793841 | 054 | 093 | SW | 1977 | | | | |
| 05020004 | ML2-173 | USGS | 03065000 | DRY FORK AT HENDRICKS, W. VA. | 390420 | 0793720 | 054 | 093 | SW | 1972 | 1972 | | 345.00 | |
| 05020004 | ML2-174 | USEPA | 551316 | DRY FORK RIVER AT HENDRICKS | 390421 | 0793741 | 054 | 093 | SW | 1965 | 1968 | | | |
| 05020004 | ML2-175 | USEPA | 551315 | BLACKWATER RIVER AT HENDRICKS | 390423 | 0793745 | 054 | 093 | SW | 1965 | 1968 | | | |
| 05020004 | ML2-176 | USCE | | CHEAT RIVER 13 | 390440 | 0793740 | 054 | 093 | SW | 1970 | | | | |
| 05020004 | ML2-177 | USFS | 219918 | PRECIP USFS LAB PARSONS,W.VA. | 390524 | 0793944 | 054 | 093 | SW | 1974 | | | | |
| 05020004 | ML2-178 | USGS | 03069000 | SHAVERS FORK AT PARSONS, W. VA. | 390545 | 0794040 | 054 | 093 | SW | 1954 | 1975 | Y | 214.00 | |
| 05020004 | ML2-179 | WV001 | 550573 | BLACK FORK RIVER NEAR PARSONS | 390545 | 0794107 | 054 | 093 | SW | 1974 | 1974 | | | |
| 05020004 | ML2-180 | WV001 | MCS-0 | SHAVERS FORK AT PARSONS W VA | 390550 | 0794045 | 054 | 093 | SW | 1963 | | | | |
| 05020004 | ML2-181 | USEPA | 551321 | SHAVERS FORK AT PARSONS | 390558 | 0794048 | 054 | 093 | SW | 1965 | 1968 | | | |
| 05020004 | ML2-182 | USFS | 210301 | BLACKFORK RIVER AT PARSONS 00000740 | 390600 | 0794000 | 054 | 093 | SW | 1969 | | | | |
| 05020004 | ML2-183 | WV001 | 550486 | SHAVERS FORK AT PARSONS | 390601 | 0794043 | 054 | 093 | SW | 1965 | | | | |
| 05020004 | ML2-184 | USFS | 210312 | TUB RUN 7.2 MI EAST PARSONS | 390624 | 0793257 | 054 | 093 | LK | 1975 | 1975 | | | |
| 05020004 | ML2-185 | USCE | | CHEAT RIVER-10 | 390645 | 0794010 | 054 | 093 | SW | 1970 | | | | |
| 05020004 | ML2-186 | WV001 | MC-75 | CHEAT R BL PARSONS ON ROUTE 72 W V | 390715 | 0794030 | 054 | 093 | SW | 1967 | | | | |
| 05020004 | ML2-187 | WV001 | 550485 | CHEAT RIVER AT PARSONS | 390720 | 0794030 | 054 | 093 | SW | 1965 | | | | |
| 05020004 | ML2-188 | USFS | 210102 | LEFT FORK CLOVER RUN | 390800 | 0794300 | 054 | 093 | SW | 1971 | | N | | |
| 05020004 | ML2-189 | USFS | 210103 | HORSERUN AT MOUTH | 390900 | 0793900 | 054 | 093 | SW | 1970 | | | | |
| 05020004 | ML2-190 | USCE | | CHEAT RIVER-9 | 390920 | 0793920 | 054 | 093 | SW | 1970 | | | | |
| 05020004 | ML2-191 | USCE | | CHEAT RIVER-8 | 390950 | 0794230 | 054 | 093 | SW | 1970 | | | | |
| 05020004 | ML2-192 | USFS. | 210101 | CHEAT RIVER BELOW JONATHAN RUND 00000700 | 391100 | 0794300 | 054 | 093 | SW | 1969 | | | | |
| 05020004 | ML2-193 | WV002 | | PARSONS W VA | 391100 | 0793600 | 054 | 093 | SW | 1962 | | Y | | |
| 05020004 | ML2-194 | USFS | 210105 | HORSESHOE RUN 7.3 MI NE ELKINS | 391117 | 0793634 | 054 | 093 | SW | 1974 | | N | | |
| 05020004 | ML2-195 | USFS | 210106 | HORSESHOE RUN 7.4 MI NE PARSONS | 391152 | 0793607 | 054 | 093 | SW | 1969 | | | | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

### PHYSICAL

| CODE NUMBER | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media |
|---|---|---|---|---|---|---|---|---|
| ML2-166 | R | R | R | | | R | | D |
| ML2-167 | Y | Y | Y | | | Y | | C |
| ML2-168 | R | R | R | | | R | | D |
| ML2-169 | | A | | | | A | | D |
| ML2-170 | | A | | | | A | | D |
| ML2-171 | R | R | R | | | R | | D |
| ML2-172 | | R | | | | R | | D |
| ML2-173 | Q | Q | | | | Q | | D |
| ML2-174 | K | K | | | | K | | D |
| ML2-175 | K | K | | | | K | | D |
| ML2-176 | Y | Y | Y | | | Y | | C |
| ML2-177 | | A | | | | A | | D |
| ML2-178 | 2 | | | | | | | D |
| ML2-179 | A | | A | | | | | D |
| ML2-180 | M | M | M | M | M | M | M | C |
| ML2-181 | K | K | | | | K | | D |
| ML2-182 | R | R | R | | | R | | D |
| ML2-183 | K | K | K | K | K | K | K | D |
| ML2-184 | A | A | A | | | A | | D |
| ML2-185 | Y | Y | Y | | | Y | | C |
| ML2-186 | M | M | M | M | M | M | M | C |
| ML2-187 | K | K | K | K | K | K | K | D |
| ML2-188 | R | R | R | | | R | | D |
| ML2-189 | R | R | R | | | R | | D |
| ML2-190 | Y | Y | Y | | | Y | | C |
| ML2-191 | Y | Y | Y | | | Y | | C |
| ML2-192 | R | R | R | | | R | | D |
| ML2-193 | | | O | | | | | |
| ML2-194 | A | A | A | | | A | | D |
| ML2-195 | N | N | N | | | N | | D |

### CHEMICAL

| CODE NUMBER | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-166 | | R | E | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-167 | | | Y | | Y | | Y | | | | | | | | | | | | Y | | C |
| ML2-168 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-169 | | A | | | | | G | M | | A | | | | | | | | | | | D |
| ML2-170 | | A | | | | | G | K | | A | | | | | | | | | | | D |
| ML2-171 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-172 | | R | | | | | | | | | | | | | | | | | | | D |
| ML2-173 | S | Q | Q | Q | | | | Q | | Q | | | | | | | | | | S | D |
| ML2-174 | | K | K | | | | | | | K | | | | | | | | | | | D |
| ML2-175 | | K | K | | | | | | | R | | | | | | | | | | | D |
| ML2-176 | | | Y | | Y | | Y | | | | | | | | | | | | Y | | C |
| ML2-177 | | A | | | | | G | M | | A | | | | | | | | | | | D |
| ML2-178 | | | | | | | | | | | | | | | | | | | | | |
| ML2-179 | | | | | | | | | | | | | | A | | | | | A | A | D |
| ML2-180 | M | M | M | | M | | M | | | M | | | | | | | M | | M | | C |
| ML2-181 | | K | K | | | | | | | K | | | | | | | | | | | D |
| ML2-182 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-183 | N | K | K | | K | E | K | K | K | K | | | R | K | | | R | A | K | N | D |
| ML2-184 | | A | | | | | | | | | | | | | | | | | | | D |
| ML2-185 | | | Y | | Y | | Y | | | | | | | | | | | | Y | | C |
| ML2-186 | M | M | M | | M | | M | | | M | | | | | | | M | | M | | C |
| ML2-187 | N | K | K | | K | N | K | K | K | K | | | R | K | | | R | K | K | N | D |
| ML2-188 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-189 | | R | | E | | R | R | R | | R | | | | | | | | | | | D |
| ML2-190 | | | Y | | Y | | Y | | | | | | | | | | | | Y | | C |
| ML2-191 | | | Y | | Y | | Y | | | | | | | | | | | | Y | | C |
| ML2-192 | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML2-193 | | | | | | | | | | | | | | | | | | | | | |
| ML2-194 | | A | | | | A | | A | | A | | | | | | | | | | | D |
| ML2-195 | | N | | | | R | R | R | | R | | | | | | | | | | | D |

### BIOLOGIC

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-166 | | | | | | | | | | | | | | | | | | | | | |
| ML2-167 | | | | | | | | | | | | | | | | | | | | | |
| ML2-168 | | | | | | | | | | | | | | | | | | | | | |
| ML2-169 | | | | | | | | | | | | | | | | | | | | | |
| ML2-170 | | | | | | | | | | | | | | | | | | | | | |
| ML2-171 | | | | | | | | | | | | | | | | | | | | | |
| ML2-172 | | | | | | | | | | | | | | | | | | | | | |
| ML2-173 | | | | | | | | | | | | | | | | | | | | | |
| ML2-174 | | | | | | | | | | | | | | | | | | | | | |
| ML2-175 | | | | | | | | | | | | | | | | | | | | | |
| ML2-176 | | | | | | | | | | | | | | | | | | | | | |
| ML2-177 | | | | | | | | | | | | | | | | | | | | | |
| ML2-178 | | | | | | | | | | | | | | | | | | | | | |
| ML2-179 | | | A | | | | | | A | | | | | | | | | | | | D |
| ML2-180 | M | M | | | | | | | | | | | | | | | | | | | C |
| ML2-181 | | | | | | | | | | | | | | | | | | | | | |
| ML2-182 | | | | | | | | | | | | | | | | | | | | | |
| ML2-183 | K | | K | | | | | | K | | | | | | | | | | | | D |
| ML2-184 | | | | | | | | | | | | | | | | | | | | | |
| ML2-185 | | | | | | | | | | | | | | | | | | | | | |
| ML2-186 | M | M | | | | | | | | | | | | | | | | | | | C |
| ML2-187 | K | | K | | | | | | K | | | | | | | | | | | | D |
| ML2-188 | | | | | | | | | | | | | | | | | | | | | |
| ML2-189 | | | | | | | | | | | | | | | | | | | | | |
| ML2-190 | | | | | | | | | | | | | | | | | | | | | |
| ML2-191 | | | | | | | | | | | | | | | | | | | | | |
| ML2-192 | | | | | | | | | | | | | | | | | | | | | |
| ML2-193 | B | | | | | | | | | | | | | | | | | | | | |
| ML2-194 | A | | | | | | | | | | | | | | | | | | | | D |
| ML2-195 | N | | | | | | | | | | | | | | | | | | | | D |

### SEDIMENT / OTHER

| CODE NUMBER | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | Telemetry | S W Station Waves Wind | C W Station Waves Wind | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML2-166 | | A | | | | | | D | | | | S |
| ML2-167 | | | | | | | | | | | | |
| ML2-168 | | | | | | | | | | | | S |
| ML2-169 | | | | | | | | | | | | S |
| ML2-170 | | | | | | | | | | | | S |
| ML2-171 | | | | | | | | | | | | S |
| ML2-172 | | | | | | | | | | | | S |
| ML2-173 | | | | | | | | | | | | SW |
| ML2-174 | | | | | | | | | | | | S |
| ML2-175 | | | | | | | | | | | | S |
| ML2-176 | | | | | | | | | | | | |
| ML2-177 | | | | | | | | | | | | S |
| ML2-178 | | | | | | | | | | | | W |
| ML2-179 | | | | | | | | | | | | S |
| ML2-180 | | | | | | | | | | | | |
| ML2-181 | | | | | | | | | | | | S |
| ML2-182 | | | | | | | | | | | | S |
| ML2-183 | | | | | | | | | | | | S |
| ML2-184 | | | | | | | | | | | | S |
| ML2-185 | | | | | | | | | | | | |
| ML2-186 | | | | | | | | | | | | |
| ML2-187 | | | | | | | | | | | | S |
| ML2-188 | | | | | | | | | | | | S |
| ML2-189 | | | | | | | | | | | | S |
| ML2-190 | | | | | | | | | | | | |
| ML2-191 | | | | | | | | | | | | |
| ML2-192 | | | | | | | | | | | | S |
| ML2-193 | | | | | | | | | | | | |
| ML2-194 | | | | | | | | | | | | S |
| ML2-195 | | | | | | | | | | | | S |

### PARAMETER FREQUENCY CODES

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

### DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA G: LISTING 3

Sources of ground-water-quality data in the Monongahela National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD YES NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIBTNG AREA YES NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02070001 | ML3-1 | USFS | 210049 | | 385330 | 0791426 | 054 | 023 | GW | 1970 | 1978 | Y | | |
| 05050003 | ML3-2 | USGS | 375745080073601 | ANTHONY CRT CTR | 375745 | 0800736 | 054 | 025 | GW | 1972 | 1972 | | | |
| 05050003 | ML3-3 | USFS | 211311 | MEADOW CREEK AT NEOLA, W. VA. | 375800 | 0800745 | 054 | 025 | GW | 1975 | | | | |
| 02080201 | ML3-4 | USGS | 372905080250501 | J ALLEN HALL | 372905 | 0802505 | 054 | 063 | GW | 1971 | 1971 | | | |
| 02070001 | ML3-5 | USFS | 210050 | | 385118 | 0791655 | 054 | 071 | GW | 1970 | 1978 | Y | | |
| 02070001 | ML3-6 | USFS | 210051 | | 385133 | 0792746 | 054 | 071 | GW | 1970 | 1978 | Y | | |
| 05050003 | ML3-7 | USGS | 380832079593002 | E E WHITE JR | 380832 | 0795930 | 054 | 075 | GW | 1971 | 1971 | | | |
| 05050003 | ML3-8 | USFS | 211207 | HILLS CK 10 MI EAST RICHWOOD | 381055 | 0802000 | 054 | 075 | GW | 1974 | 1978 | N | | |
| 05050003 | ML3-9 | USFS | 211208 | HILLS CK 12 MI EAST RICHWOOD | 381105 | 0801930 | 054 | 075 | GW | 1974 | 1978 | N | | |
| 05050003 | ML3-10 | USFS | 211206 | SUNDAY LICK 2.5 MI. S MARLINTON | 381140 | 0800540 | 054 | 075 | GW | 1974 | 1978 | N | | |
| 05050003 | ML3-11 | USFS | 211205 | STILLWELL CK 1 MI S MARLINTON | 381215 | 0800512 | 054 | 075 | GW | 1974 | 1978 | N | | |
| 05050003 | ML3-12 | USGS | 381220080054001 | BURRUSS LUMBER | 381220 | 0800540 | 054 | 075 | GW | 1971 | 1971 | | | |
| 05050003 | ML3-13 | USFS | 210033 | | 381615 | 0795108 | 054 | 075 | GW | 1970 | 1978 | Y | | |
| 05050003 | ML3-14 | USGS | 381615079510501 | US FOREST SERVC | 381615 | 0795105 | 054 | 075 | GW | 1971 | 1971 | | | |
| 05050003 | ML3-15 | USGS | 381730079554501 | POCAHONTAS HIGH SCHOOL, FROST, W.VA. | 381730 | 0795545 | 054 | 075 | GW | 1972 | 1972 | | | |
| 05050003 | ML3-16 | USGS | 382500079484601 | WILLIAM SHANE | 382500 | 0794846 | 054 | 075 | GW | 1971 | 1971 | | | |
| 05050003 | ML3-17 | USGS | 382945079474503 | G P TRACEY | 382945 | 0794745 | 054 | 075 | GW | 1971 | 1971 | | | |
| 05050003 | ML3-18 | USFS | 210025 | | 383227 | 0794642 | 054 | 075 | GW | 1968 | 1978 | Y | | |
| 05020004 | ML3-19 | USFS | 210524 | GAUDINEER R 20 MI S ELKINS W.VA | 383727 | 0795122 | 054 | 083 | GW | 1974 | 1978 | | | |
| 05020004 | ML3-20 | USFS | 210523 | GAUDINEER R 20 MI S ELKINS W.VA | 383732 | 0795118 | 054 | 083 | GW | 1974 | 1978 | | | |
| 05020004 | ML3-21 | USFS | 210026 | | 384425 | 0794136 | 054 | 083 | GW | 1970 | 1978 | Y | | |
| 05020004 | ML3-22 | USFS | 210517 | SHAVERS FK 9 MI SE ELKINS W.VA | 384841 | 0794417 | 054 | 083 | GW | 1969 | | | | |
| 05020004 | ML3-23 | USFS | 210516 | SHAVERS FK 8.2 MI E ELKINS W.VA | 385423 | 0794159 | 054 | 083 | GW | 1974 | | | | |
| 05020004 | ML3-24 | USGS | 03068710 | SOUTH SPRING AT BOWDEN W VA | 385438 | 0794222 | 054 | 083 | SP | 1974 | | N | | |
| 05020004 | ML3-25 | USFS | 210514 | SHAVERS FORK 8 MI E ELKINS W.VA. | 385442 | 0794222 | 054 | 083 | GW | 1974 | | | | |
| 05020004 | ML3-26 | USFS | 210515 | BICKLE RUN 7.5 MI E ELKINS W.VA | 385442 | 0794233 | 054 | 083 | GW | 1974 | 1975 | | | |
| 05020004 | ML3-27 | USGS | 03068690 | NORTH SPRING AT BOWDEN W VA | 385443 | 0794216 | 054 | 083 | SP | 1974 | | N | | |
| 05020004 | ML3-28 | USFS | 210010 | | 385506 | 0793957 | 054 | 083 | GW | 1970 | 1978 | Y | | |
| 05020004 | ML3-29 | USFS | 210009 | | 385510 | 0794052 | 054 | 083 | GW | 1970 | 1978 | Y | | |
| 05020004 | ML3-30 | USFS | 210512 | STUART PARK 4 MI E ELKINS W.VA | 385520 | 0794421 | 054 | 083 | GW | 1971 | | N | | |
| 05020004 | ML3-31 | USFS | 210008 | | 385554 | 0794052 | 054 | 083 | GW | 1970 | 1978 | Y | | |
| 05020004 | ML3-32 | USFS | 210007 | | 385606 | 0794352 | 054 | 083 | GW | 1970 | 1978 | Y | | |
| 05020004 | ML3-33 | USFS | 210513 | PRECIP SITE 6 MI E ELKINS W.VA | 385618 | 0794318 | 054 | 083 | GW | 1974 | | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL: Temperature | Specific conductance | Turbidity | Color | Odor | pH | Suspended solids | Storage media | CHEMICAL: Dissolved solids | Major ions | Hardness | Silica | Phosphorus | Phosphorus species | Nitrogen | Nitrogen species | Detergents | Other minor elements | Radioactivity | Radiochemical species | Carbon | Organic groups | Pesticides species | Other organic species | Biochemical oxygen demand | Chemical oxygen demand | Dissolved oxygen | Other dissolved gases | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML3-1 | | A | A | A | | A | | D | E | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-2 | | A | | | | A | | D | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| ML3-3 | E | E | E | | | E | | D | | E | | | | | | | | | | | | | | | | | | | D |
| ML3-4 | | A | | | | A | | D | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| ML3-5 | | A | A | A | | A | | D | | A | A | | | | | A | | A | | | | | | | | | | | D |
| ML3-6 | | A | A | A | | A | | D | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-7 | | A | | | | A | | D | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| ML3-8 | K | K | K | | | K | | D | | K | | | | E | R | A | | R | | | | | | | | | | | D |
| ML3-9 | K | K | K | | | K | | D | | K | | | | E | R | A | | R | | | | | | | | | | | D |
| ML3-10 | R | R | R | | | R | | D | | R | | | | E | S | A | | S | | | | | | | | | | | D |
| ML3-11 | S | S | S | | | S | | D | | S | | | | E | S | A | | A | | | | | | | | | | | D |
| ML3-12 | A | A | | | | A | | D | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| ML3-13 | | A | A | A | | A | | D | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-14 | | A | | | | A | | D | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| ML3-15 | | A | | | | A | | D | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| ML3-16 | | A | | | | A | | D | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| ML3-17 | | A | | | | A | | D | A | A | A | A | | | | A | | A | | | | | | | | | | A | D |
| ML3-18 | | A | A | A | | A | | D | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-19 | S | S | S | | | S | | D | | S | | | | A | A | A | | A | | | | | | | | | | | D |
| ML3-20 | R | R | R | | | R | | D | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML3-21 | | A | A | A | | A | | D | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-22 | M | W | X | | | W | | D | | W | | | | R | R | R | | R | | | | | | | | | | | D |
| ML3-23 | R | R | R | | | R | | D | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML3-24 | O | | 2 | | | | | D | | | | | | | | | | | | | | | | | | | | | |
| ML3-25 | K | R | R | | | R | | D | | R | | | | R | R | R | | R | | | | | | | | | | | D |
| ML3-26 | H | H | H | | | Q | | D | | H | | | | | | S | | S | | | | | | | | | | | D |
| ML3-27 | O | | 2 | | | | | D | | | | | | | | | | | | | | | | | | | | | |
| ML3-28 | | A | A | A | | A | | D | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-29 | | A | A | A | | A | | D | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-30 | N | X | N | | | X | | D | | X | | | | A | A | A | | A | | | | | | | | | | | D |
| ML3-31 | | A | A | A | | A | | D | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-32 | | A | A | A | | A | | D | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-33 | E | K | A | | | K | | D | | K | | | | | | E | | E | | | | | | | | | | | D |

| CODE NUMBER | BIOLOGIC: Enteric bacteria | Native bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro invertebrates | Macro invertebrates | Vertebrates | Fungi | Viruses | Primary productivity | Secondary productivity | Chemosynthetic activity | Biostimulatory activity | Toxicity test | Other bioassay test | Chemical tissue test | Histopathological analysis | Other tissue analysis | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML3-1 | | | | | | | | | | | | | | | | | | | | | |
| ML3-2 | | | | | | | | | | | | | | | | | | | | | |
| ML3-3 | A | | | | | | | | | | | | | | | | | | | | D |
| ML3-4 | | | | | | | | | | | | | | | | | 5 | 4 | 0 | 6 | |
| ML3-5 | | | | | | | | | | | | | | | | | | | | | |
| ML3-6 | | | | | | | | | | | | | | | | | | | | | |
| ML3-7 | | | | | | | | | | | | | | | | | | | | | |
| ML3-8 | | | | | | | | | | | | | | | | | | | | | |
| ML3-9 | | | | | | | | | | | | | | | | | | | | | |
| ML3-10 | | | | | | | | | | | | | | | | | | | | | |
| ML3-11 | | | | | | | | | | | | | | | | | | | | | |
| ML3-12 | | | | | | | | | | | | | | | | | | | | | |
| ML3-13 | | | | | | | | | | | | | | | | | | | | | |
| ML3-14 | | | | | | | | | | | | | | | | | | | | | |
| ML3-15 | | | | | | | | | | | | | | | | | | | | | |
| ML3-16 | | | | | | | | | | | | | | | | | | | | | |
| ML3-17 | | | | | | | | | | | | | | | | | | | | | |
| ML3-18 | | | | | | | | | | | | | | | | | | | | | |
| ML3-19 | | | | | | | | | | | | | | | | | | | | | |
| ML3-20 | | | | | | | | | | | | | | | | | | | | | |
| ML3-21 | | | | | | | | | | | | | | | | | | | | | |
| ML3-22 | A | | | | | | | | | | | | | | | | | | | | D |
| ML3-23 | | | | | | | | | | | | | | | | | | | | | |
| ML3-24 | | | | | | | | | | | | | | | | | | | | | |
| ML3-25 | | | | | | | | | | | | | | | | | | | | | |
| ML3-26 | | | | | | | | | | | | | | | | | | | | | |
| ML3-27 | | | | | | | | | | | | | | | | | | | | | |
| ML3-28 | | | | | | | | | | | | | | | | | | | | | |
| ML3-29 | | | | | | | | | | | | | | | | | | | | | |
| ML3-30 | X | | | | | | | | | | | | | | | | | | | | D |
| ML3-31 | | | | | | | | | | | | | | | | | | | | | |
| ML3-32 | | | | | | | | | | | | | | | | | | | | | |
| ML3-33 | | | | | | | | | | | | | | | | | | | | | |

| CODE NUMBER | SEDIMENT: Bed load | Concentration (suspended) | Sediment discharge (suspended) | Concentration (total) | Sediment discharge (total) | Particle size (suspended) | Particle size (bed material) | Storage media | OTHER: Telemetry | S W station vaves nino | G W station vaves nino | Data bank source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML3-1 | | | | | | | | | | | | S |
| ML3-2 | | | | | | | | | | | | S |
| ML3-3 | | | | | | | | | | | | S |
| ML3-4 | | | | | | | | | | | | S |
| ML3-5 | | | | | | | | | | | | S |
| ML3-6 | | | | | | | | | | | | S |
| ML3-7 | | | | | | | | | | | | S |
| ML3-8 | | | | | | | | | | | | S |
| ML3-9 | | | | | | | | | | | | S |
| ML3-10 | | | | | | | | | | | | S |
| ML3-11 | | | | | | | | | | | | S |
| ML3-12 | | | | | | | | | | | | S |
| ML3-13 | | | | | | | | | | | | S |
| ML3-14 | | | | | | | | | | | | S |
| ML3-15 | | | | | | | | | | | | S |
| ML3-16 | | | | | | | | | | | | S |
| ML3-17 | | | | | | | | | | | | S |
| ML3-18 | | | | | | | | | | | | S |
| ML3-19 | | | | | | | | | | | | S |
| ML3-20 | | | | | | | | | | | | S |
| ML3-21 | | | | | | | | | | | | S |
| ML3-22 | | K | | | | | | D | | | | S |
| ML3-23 | | A | | | | | | D | | | | S |
| ML3-24 | | | | | | | | | | | | W |
| ML3-25 | | A | | | | | | D | | | | S |
| ML3-26 | | | | | | | | | | | | S |
| ML3-27 | | | | | | | | | | | | W |
| ML3-28 | | | | | | | | | | | | S |
| ML3-29 | | | | | | | | | | | | S |
| ML3-30 | | | | | | | | | | | | S |
| ML3-31 | | | | | | | | | | | | S |
| ML3-32 | | | | | | | | | | | | S |
| ML3-33 | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Code: Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |

| Code: Year-Round | Seasonal | Eliminated | MEANING |
|---|---|---|---|
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05020004 | ML3-34 | USFS | 210511 | PRECIP SITE 7 MI NE ELKINS W.VA | 385843 | 0794421 | 054 | 083 | GW | 1974 | | | | |
| 02070001 | ML3-35 | USFS | 210053 | | 390157 | 0791857 | 054 | 093 | GW | 1970 | 1978 | Y | | |
| 05020004 | ML3-36 | USFS | 210004 | | 390624 | 0793611 | 054 | 093 | GW | 1970 | 1978 | Y | | |
| 05020004 | ML3-37 | USFS | 210002 | | 391048 | 0793605 | 054 | 093 | GW | 1970 | 1978 | Y | | |
| 05020004 | ML3-38 | USFS | 210104 | HORSESHOE RUN 7.2 MI NE PARSONS | 391104 | 0793643 | 054 | 093 | GW | 1974 | | | | |

**TYPES OF DATA** (USE CODE TABLES AT BOTTOM OF SHEET)

**PHYSICAL**

| CODE NUMBER | Temperature | Specific conductance | Turbidity | Color | Odor | pH | Suspended solids | Storage media |
|---|---|---|---|---|---|---|---|---|
| ML3-34 | E | R | E | | | R | | D |
| ML3-35 | | A | A | A | | A | | D |
| ML3-36 | | A | A | A | | A | | D |
| ML3-37 | | A | A | A | | A | | D |
| ML3-38 | N | X | X | | | X | | D |

**CHEMICAL**

| CODE NUMBER | Dissolved solids | Major ions | Hardness | Silica | Phosphorus | Phosphorus species | Nitrogen | Nitrogen species | Detergents | Other minor elements | Radioactivity | Radiochemical species | Carbon | Organic groups | Pesticides species | Other organic species | Biochemical oxygen demand | Chemical oxygen demand | Dissolved oxygen | Other dissolved gases | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML3-34 | | R | | | | | | Q | | A | | | | | | | | | | | D |
| ML3-35 | | A | A | | | | | A | | A | | | | | | | | | | | D |
| ML3-36 | | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-37 | E | A | A | | | | | A | E | A | | | | | | | | | | | D |
| ML3-38 | | X | | | | R | R | R | | R | | | | | | | | | | | D |

**BIOLOGIC**

| CODE NUMBER | Enteric bacteria | Native bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro invertebrates | Macro invertebrates | Vertebrates | Fungi | Viruses | Primary productivity | Secondary productivity | Chemosynthetic activity | Biostimulatory activity | Toxicity test | Other bioassay test | Chemical tissue test | Histopathological analysis | Other tissue analysis | Storage media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML3-34 | | | | | | | | | | | | | | | | | | | | | |
| ML3-35 | | | | | | | | | | | | | | | | | | | | | |
| ML3-36 | | | | | | | | | | | | | | | | | | | | | |
| ML3-37 | | | | | | | | | | | | | | | | | | | | | |
| ML3-38 | X | | | | | | | | | | | | | | | | | | | | D |

**SEDIMENT**

| CODE NUMBER | Bed load | Concentration (suspended) | Sediment discharge (suspended) | Concentration (total) | Sediment discharge (total) | Particle size (suspended) | Particle size (bed material) | Storage media |
|---|---|---|---|---|---|---|---|---|
| ML3-34 | | | | | | | | |
| ML3-35 | | | | | | | | |
| ML3-36 | | | | | | | | |
| ML3-37 | | | | | | | | |
| ML3-38 | | | | | | | | |

**OTHER**

| CODE NUMBER | Telemetry | S W station vives nino | G W station vives nino | Data bank source |
|---|---|---|---|---|
| ML3-34 | | | | S |
| ML3-35 | | | | S |
| ML3-36 | | | | S |
| ML3-37 | | | | S |
| ML3-38 | | | | S |

**PARAMETER FREQUENCY CODES**

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

**STORAGE MEDIA CODES**

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

**TELEMETRY CODES**

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 8,8 | Other or type unspecified |
| 7 | Two or more types |

**DATA SOURCE CODES**

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

## SUPPLEMENTAL DATA H

Annotated bibliography of investigations pertinent to coal mining and water resources in the Monongahela National Forest study area.

SUPPLEMENTAL DATA H: SUMMARY 1

Annotated bibliography of hydrologic studies performed in small areas of the Monongahela National Forest area.

REFERENCE CODE: M/S1-1

TITLE: Sediment Yield of Taylor Run.

STARTING DATE: July 1978.

GEOGRAPHICAL AREA: Randolph County, West Virginia.

AREAL EXTENT: 5 $mi^2$

PURPOSE, OBJECTIVE, AND(OR) RESULTS:
Problem: Modern highways are needed in mountainous regions to transport an expanding population and natural resources such as timber and coal. These new highways also make formerly isolated areas available for recreation and make aesthetic regions accessible for the growing tourism trend in West Virginia. The local public, environmentalists, and sportsmen, however, believe that highway construction is responsible for sediment loads that endanger the streams and rivers of the area.

Objective: To monitor streams and differentiate between the amounts of sediment derived from highway construction and from logging and mining.

Approach: Study area will include 5 square miles in Taylor Run basin, Randolph County, West Virginia. Suspended sediment data will be collected to monitor mine sedimentation. The effects of logging, and other operations.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Planned)
Ward, S. M., The effects of highway construction on sediment yield of Taylor Run in Randolph County, West Virginia.

AVAILABLE FROM:
U.S. Geological Survey, WRD
Mont Chateau
Mont Chateau Road
Morgantown, West Virginia 26505

REFERENCE CODE: M/S1-2

TITLE: Water in Hampshire, Hardy, and Western Morgan Counties, West Virginia.

STARTING DATE: July 1971.

COMPLETION DATE: June 1973.

GEOGRAPHICAL AREA: Hampshire, Hardy, and Morgan Counties, West Virginia.

AREAL EXTENT: 785 $mi^2$

REFERENCE CODE: M/S1-2--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Emphasis in this report is on the effect of fractured sedimentary consolidated aquifers on ground-water and surface-water hydrology and chemistry. Fracture traces, faults and lineaments were mapped from aerial photographs, satellite imagery, and field observation. Water quantity and quality data were collected at 685 wells, 100 springs, 4 regular stream-gaging stations, and nineteen other small stream sites. Sixty-two selected wells were tested for drawdown and recovery, and the water was sampled for chemical analysis. Transmissivity values determined from single-well recovery tests and channel methods ranged from 0.6 $ft^2$/day for shale and siltstone to 627 $ft^2$/day for limestone.

Statistical analyses showed that wells yielding the most water were drilled on fractures or in valleys. Wells yielding the least were drilled on nonfractured areas or on hillsides or hilltops. Statistically, specific conductance varied from one aquifer to another, and was higher in water from valley wells than in water from hillside or hill wells. Sulfate concentrations were higher in water from wells in fractures or in valleys than in water from wells in non-fractured areas. Chemical analyses showed that specific conductance of ground water ranged from 18 to 7,600 micromhos, hardness from 3 to 6,370 mg/L, chloride from 1 to 1,270 mg/L, sulfate from 0 to 5,980 mg/L, iron from 0 to 18,000 ug/L, and pH from 4 to 9. (Adapted from author's summary)

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Hobba, W. A., Jr., Groundwater description of Hampshire, Hardy, and western Morgan Counties, West Virginia: West Virginia Geological and Economic Survey, Bulletin 17.

AVAILABLE FROM:
West Virginia Geological and Economic Survey
Mont Chateau Research Center
Morgantown, West Virginia 26505

REFERENCE CODE: M/S1-3

TITLE: Effect of Deep Mining and Mine Collapse on Surface-Water and Ground-Water Hydrology.

STARTING DATE: July 1976.

GEOGRAPHICAL AREA: Marion, Monongahela, and Randolph Counties, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The report describes the effect of underground mining and mine collapse on the hydrology of an area where the mined vein of coal lies above major streams, and in another area where the vein of coal lies below major streams. It was

REFERENCE CODE: M/S1-3--Continued.

found that subsidence cracks at land surface generally parallel predominant joint sets in the rocks. The mining and subsidence cracks cause increased infiltration of precipitation and surface water, decreased evapotranspiration, and higher base flows in some small streams. Ground-water levels in observation wells in under-mined areas fluctuate as much as 100 feet annually. Both gaining and losing streams are found in under-mined areas. Mine pumpage and drainage generally cause diversion of water underground from one basin to another. Areal and single-well aquifer tests indicated near surface rocks to have higher transmissivity values in a subsided basin than in unmined basins. Increased infiltration and circulation though near surface rocks increases dissolved mineral loads in streams as do treated and untreated contributions from mine pumpage and drainage. Abandoned and flooded underground mines make good reservoirs because of their increased transmissivity and storage. Subsidence cracks were not successfully detected by thermal imagery, but springs and seeps were detected and mapped. (Adapted from author's summary)

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Hobba, W. A., Jr., Effects of underground mining and mine collapse on the hydrology of selected basins, West Virginia: West Virginia Geological and Economic Survey, Report of Investigation 33, 88 p.

AVAILABLE FROM:
U.S. Geological Survey
Mont Chateau
Mont Chateau Road
Morgantown, West Virginia 26505

REFERENCE CODE: M/S1-4

TITLE: Shavers Fork Petition Evaluation.

GEOGRAPHICAL AREA: Tucker and Randolph Counties, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This report presents the assessments of the Office of Surface Mining in investigation allegations brought forth by the West Virginia Highlands Conservancy. The Conservancy alleged that Federally owned portions of the Monongahela National Forest within the Shavers Fork basin are unsuitable for surface coal mining. Sections of this report deal with the hydrologic cycle, acid precipitation, surface runoff, groundwater quality and quantity, aquatic biology, and other environmental and socio economic factors.

PUBLISHED REPORTS AND(OR) ARTICLES:
U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement, 1981, Draft Shavers Fork petition evaluation document: Prepared under the provisions of section 522(c) of the Surface Mining Control and Reclamation Act of 1977.

REFERENCE CODE: M/S1-4--Continued.

AVAILABLE FROM:
U.S. Department of Interior
Office of Surface Mining Reclamation and Enforcement
603 Morris Street
Charleston, West Virginia 25301

REFERENCE CODE: M/S1-5

TITLE: Locating Ground-Water Supplies by Remote Sensing--Randolph County, West Virginia.

STARTING DATE: June 1978.

COMPLETION DATE: December 1978.

GEOGRAPHICAL AREA: Randolph County, West Virginia.

AREAL EXTENT: 300 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The study area was the Tygart River Valley near Elkins. The study conclusions were that (1) ground water is available from the alluvium and the underlying shale to supply 200 gal./min. for public supplies; (2) good sites for production wells can be selected using lineaments mapped from satellite imagery and aerial photography; (3) surface electrical resistivity studies are valuable to map buried alluvial sand and gravel and lineaments in shale beneath the alluvium; (4) most of the water is stored in the alluvium; (5) low pH, and high concentrations of iron, manganese, and chloride may cause problems; (6) single-well aquifer tests indicate "high yielding" wells are located along lineaments; (7) multiple-well anisotropic aquifer tests indicate maximum permeability parallels lineaments in the shale; (8) because of the fractured nature of the drawdown; (9) drawdown may cause the upward migration of salty water, which lies at 100-300 feet depth, subsequently degrading water quality. (Adapted from Author's Summary)

PUBLISHED REPORTS AND(OR) ARTICLES:
Hobba, W. A., Jr., 1980, Locating ground-water supplies in Randolph County, West Virginia: U.S. Geological Survey Open-File Report 80-973, 67 p.

AVAILABLE FROM:
U.S. Geological Survey, WRD
Mont Chateau
Mont Chateau Road
Morgantown, West Virginia 26505

REFERENCE CODE: M/S1-6

TITLE: Upper Shavers Fork Sub-Unit Plan.

GEOGRAPHICAL AREA: Randolph and Pocohontas Counties, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This Environmental Impact Statement describes the projects planned in the Upper Shavers Fork Sub-unit of the Monongahela National Forest during the next decade. These projects implement the direction contained in the Monongahela National Forest Land Management Plan. The report discusses alternative and estimated effects of implementing each alternative. The Forest Service preferred alternatives are described and the rationale for their selection. Sections of the Environmental Impact Statement discuss the water resources of the basin, but the major hydrologic evaluations are found in this report's appendix B, "Evaluation of the Water Resources on the Shavers Fork River."

PUBLISHED REPORTS AND(OR) ARTICLES:
U.S. Department of Agriculture, Forest Service, 1980, Upper Shavers Fork Sub-unit plan, Monongahela National Forest, Randolph and Pocohontas Counties, West Virginia: Final Environmental Impact Statement, 213 p.

AVAILABLE FROM:
Forest Supervisor
Monongahela National Forest
P.O. Box 1548
Elkins, West Virginia 25241

REFERENCE CODE: M/S1-7

TITLE: The Limnological Response of a West Virginia Multipurpose Impoundment to Acid Inflows.

GEOGRAPHICAL AREA: Tygart River Lake, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Periodic intrusions of acid mine drainage enter Tygart River Lake during the summer and autumn months. In spite of only moderate vertical thermal gradients in the reservoir, these inflows penetrate the impoundment as well-defined temperature-density currents. The depth of penetration and resulting mixing patterns of the acid inflows are influenced by the design and operation of the dam. The internal hydrogynamics of the reservoir, in turn, influence the chemistry and biology of both the impoundment and the outflow. (From USGS WRSIC abstract system)

PUBLISHED REPORTS AND(OR) ARTICLES:
Koryak, M., Stafford, L. J., and Montgomery, W. H., 1979, The limnological response of a West Virginia multipurpose impoundment to acid inflows: Water Resources Research, Vol. 15, No. 4, p. 929-934.

REFERENCE CODE: M/S1-8

TITLE: Elkins Mine Drainage Pollution Control Demonstration Project.

STARTING DATE: 1964.

GEOGRAPHICAL AREA: Elkins, West Virginia.

AREAL EXTENT: 1 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Information gained on the Elkins, West Virginia mine drainage control project includes data showing long term improvements in water quality, and establishment of grasses, legumes, and trees in various areas. Each of the several subwatersheds into which the project is divided is described. Mine sealing did not reduce oxygen concentration in the mines nor decrease pollution load, but did reduce acidity and sulfate somewhat. Surface reclamation has been successful in decreasing pollution from surface drainage. Greater precipitation over the area, resulting in larger flows in some years has contributed to larger loadings of pollutants expressed as tons per year. (From Gleason and Russell, 1977).

PUBLISHED REPORTS AND(OR) ARTICLES:
U.S. Environmental Protection Agency, Industrial Environmental Research Laboratory, 1977, Elkins mine drainage pollution control demonstration project: EPA Report EPA-600/7-77-090, 316 p.

Hill, R. D., 1973, Reclamation and revegetation of 640 acres of surface mines--Elkins, West Virginia: in "Ecology and Reclamation of Devistated Land," Vol. 2, R. J. Hutnik and G. Davis, Eds., New York, Gordon and Breach, p. 417-450.

Hill, R. D., and Martin, J. F., 1972, Elkins mine drainage pollution control demonstration project--an update: Symposium Coal Mine Drainage, 44th, Pittsburgh, Pennsylvania, p. 96-104.

Hill, R. D., 1969, The effectiveness of mine drainage pollution control measures, Elkins, West Virginia: ACS Division of Fuel Chem. Reprints 13(2), p. 103-115.

Hill, R. D., 1969, Reclamation and revegetation of strip-mined lands for pollution and erosion control: American Society of Agricultural Engineers Winter Meeting, Chicago, Illinois, 31 p.

Scott, R. B., Hill, R. D., Wilmoth, R. C., 1970, Cost of reclamation and mine drainage abatement--Elkins demonstrated project: Environmental Protection Agency, Cincinnati, Ohio, 27 p.

AVAILABLE FROM:
(Fifth and Sixth reports)
National Technical Information Service
Springfield, Virginia 22161
as PB-272 896 and PB-207 189 respectively.

REFERENCE CODE: M/S1-9

TITLE: An Aquatic Biology Study of Roaring Creek, Randolph County, West Virginia.

GEOGRAPHICAL AREA: Randolph County, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Collections of benthic macroinvertebrates made in a single sampling of selected segments of Roaring Creek were compared to reports of two different collection periods on the stream. Water-quality data were also recorded for the sampling stations. The report concluded that from the available data, the headwaters have greatly deteriorated down to station R5, while below R5 faunal diversity shows less decline and populations have greatly increased since 1970.

PUBLISHED REPORTS AND(OR) ARTICLES:
Academic Associates, Inc., (released 1977) Aquatic biology study of Roaring Creek, Randolph County, West Virginia: Report to U.S. EPA, Industrial Environmental Research Laboratory, Cincinnati, Ohio, 15 p.

REFERENCE CODE: M/S1-10

TITLE: Sediment Control at Edray State Hatchery.

STARTING DATE: June 1977.

GEOGRAPHICAL AREA: Edray, West Virginia.

AREAL EXTENT: 0.22 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The information will be used to determine the effectiveness of mitigation measures to control erosion and sedimentation from project site.

Most of data collected consisted of iron, pH, and turbidity readings. Samples were collected at least twice a week. During rains samples were collected hourly.

AVAILABLE FROM:
West Virginia Department of Highways
Material Control
Soil and Testing Division
312 Michigan Avenue
Charleston, West Virginia 25311

REFERENCE CODE: M/S1-11

TITLE: Environmental Water-Quality Study of Potomac and Cheat River Basins.

STARTING DATE: June 1976.

GEOGRAPHICAL AREA: Randolph, Tucker, Grant, Hampshire, Mineral, and Hardy Counties, West Virginia.

AREAL EXTENT: 355 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Acquisition of water quality and biological data to be incorporated into the environmental impact statement for corridor H highway alignments.

In addition to chemical and physical data, aquatic microinvertebrates data obtained to assist in assessing water quality in the areas of proposed corridor H alignments. A total of 80 stations were established in the study area. Samples were taken once each season for a total of 4 samples each year.

AVAILABLE FROM:
West Virginia Department of Highways
Materials Control
Soil and Testing Division
312 Michigan Avenue
Charleston, West Virginia 25311

REFERENCE CODE: M/S1-12

TITLE: Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations.

GEOGRAPHICAL AREA: Tygart Lake area, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A limnological, water-quality and quantity and lake fluctuation, transparency, and ice cover study was made of the Tygart Lake, West Virginia, and its tributaries. The watershed of this lake has been extensively mined for coal and acid mine drainage (AMD) is discharged throughout the area. The significant sources of AMD were found to be the Tygart River and Sandy Creek. Net changes in lake depth were 14-16 meters, and the maximum change was 22 meters. Transparency depth ranged from 0.1 m in December to 7.5 m in the summer. The major factors related to the development of acidity gradients in Tygart Lake were found to be (1) hydrological characteristics including inflow, outflow, and the operational interaction between the inflow and outflow resulting in storage or drawdown, (2) thermal relationships including the spring warming cycle, thermal stratification during the summer, the autumnal cooling cycle, and the winter thermal minimum and (3) water chemistry including the existing chemical stratification or its lack at the beginning of a seasonal period and the chemical quality of inflow. (From USGS WRSIC abstract system)

REFERENCE CODE: M/S1-12--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:
Bensen, A., 1976, Investigation of acid mine drainage effects on reservoir fishery population: Environmental Protection Agency Report EPA-600/2-76-107, 135 p.

Bensen, A., 1973, Investigation of acid mine drainage effects on reservoir fishery population: Report to Bureau of Sports, Fisheries, and Wildlife, U.S. Department of Interior, 135 p.

AVAILABLE FROM:
(first report)
National Technical Information Service
Springfield, Virginia 22161
as PB-252 703

REFERENCE CODE: M/S1-13

TITLE: Geochemical and Sedimentological Analysis of Tygart Lake, West Virginia.

GEOGRAPHICAL AREA: Tygart Lake area, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This study was directed toward obtaining a clearer understanding of the sediment environment of Tygart Lake, a U.S. Army Corps of Engineers reservoir. The reservoir water is acid. Turbulence and total solids were found to be low. The sediment contained clay in proportions varying from 4.1 to 18.3 percent of the total. All parameters of the sedimentary clay exhibited clear patterns of lateral change from the dam toward the Tygart Valley River inlet, and with depth from the sediment-water interface to the base of the sampled core. For loss on ignition, cation exchange capacity, clay content, and the cations of nitrogen, phosphorus, calcium, iron, and magnesium, a decrease in percentages or absolute amounts were detected laterally from the dam toward the Tygart Valley River inlet, an increase was observed with depth in the sediment profile. For silicon, aluminum, and potassium cations, the patterns were reversed, so that increases were noted laterally from the dam toward the river inlet, and decreases were marked with depth in the sediment profile. Kaolinite, illite, vermiculite and minot amounts of montmorillonite were present. Further year-round study of the geochemistry of several limnic basinal areas will be required to verify any general occurrence of patterns of pollutant accumulation within clay sediment. (From USGS WRSIC system)

PUBLISHED REPORTS AND(OR) ARTICLES:
Collin, M. L., 1975, Geochemical sedimentological analysis of Tygart Lake, West Virginia: University of West Virginia, Morgantown, West Virginia, 41 p.

REFERENCE CODE: M/S1-13--Continued.

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22161
as PB-246 046

REFERENCE CODE: M/S1-14

TITLE: Geohydrologic Reconnaissance of the Upper Potomac River Basin.

GEOGRAPHICAL AREA: Upper Potomac River basin, Maryland and West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Geologic conditions in the basin and their effect on water quality are described. A short section is included on acid mine drainage and its contribution to the water problems of the North Branch Potomac River. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Trainer, F. W., and Watkins, F. A., Jr., 1975, Geohydrologic reconnaissance of the upper Potomac River basin: U.S. Geological Survey, Water-Supply Paper 2035, 68 p.

REFERENCE CODE: M/S1-15

TITLE: West Virginia Acid Mine Drainage Study in North Branch Potomac River Basin.

GEOGRAPHICAL AREA: North Branch Potomac River basin, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Earlier studies of the North Branch of the Potomac River indicated that mine drainage emanating from West Virginia and Maryland was responsible for acid pollution of the North Branch. This study was undertaken to locate and map all acid mine drainage sources in West Virginia, measure stream flow, analyze water samples, and research historical and geological information. Using results of a Federal Water Pollution Control Administration study made in 1968-69, trends in the acidity of streams from 1968 to 1973 were established. It was concluded that current coal mining, rather than old abandoned mines, was responsible for the generation of acid in the West Virginia streams of the North Branch Potomac basin. From 1968-72 probably over half of the acid in the North Branch Potomac at the Barnum monitoring station came from Island Creek Coal Company's Alpine and North Branch mines. Acid discharge from the Alpine mine was reduced substantially over the period, but discharge from the North Branch mine increased enormously, contributing 38 percent of the acid at Barnum. Acid discharge from Abrams Creek more than doubled between 1968-69 and 1973 as a result of surface mining. In 1973 average daily

REFERENCE CODE: M/S1-15--Continued.

acid load in lbs/day was 72,000 from the North Branch at Barnum, 22,900 for Buffalo Creek, 15,000 for Abrams Creek, 10,500 for Stony River, and 8,000 for Piney Swamp Run. (From USGS WRSIC abstract system)

PUBLISHED REPORTS AND(OR) ARTICLES:

West Virginia Department of Natural Resources, 1974, West Virginia acid mine drainage study in North Branch Potomac River basin: Division of Water Resources, Charleston, West Virginia, 77 p.

REFERENCE CODE: M/S1-16

TITLE: Assessment of Highway Construction Effects on Water-Quality.

STARTING DATE: October 1974.

GEOGRAPHICAL AREA: Bowden, West Virginia.

AREAL EXTENT: 1 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

The information will be used to determine the effectiveness of remedial mitigating measures taken to correct harmful effects from highway construction.

Chemical and physical data were obtained to assist in assessing highway construction effects on water quality. These data consisted of: general inorganic chemical analysis including trace elements, dissolved oxygen, specific conductance, total alkalinity, and pH. A total of three stations were established in the study area.

AVAILABLE FROM:

West Virginia Department of Highways
Materials Control
Soils and Testing Division
312 Michigan Avenue
Charleston, West Virginia 25311

REFERENCE CODE: M/S1-17

TITLE: Hydrology of Limestone Karst in Greenbrier County, West Virginia.

COMPLETION DATE: 1973.

GEOGRAPHICAL AREA: Southeastern West Virginia, Greenbrier County.

AREAL EXTENT: 136 $mi^2$

REFERENCE CODE: M/S1-17--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The primary purposes of this study were the delineation of both the major subsurface flow routes and the geographic extent of the surface and underground drainage basins. Secondary goals included determination of the nature of water flow through the limestone, and estimation of the water chemistry, an estimation of flow rates through the various cave systems, and an assessment of the suitability of karst water for domestic use. As presented, this report contains the results of the recent hydrologic reconnaissance of the karst area plus a compilation of the available cave maps from numerous cave surveyors.

This report is part of a larger study of the hydrology of the Greenbrier-Bluestone-Upper New River basin, sponsored jointly by the U.S. Geological Survey and the West Virginia Geological and Economic Survey. The information in this report should be useful in evaluating alternative solutions to water problems.

The possible contamination of the karst water is a problem of special importance. The ease with which contaminants may enter and be transmitted through the karst aquifer is apparent from the rapid flow-through times established by the dye-tracer studies and from the "open channel flow" characteristics of many of the limestone solution conduits. A thorough knowledge of the water's source, flow paths, and discharge points is necessary for utilization of karst water. This report contains this general information and should provide a base for more detailed future studies. (Adapted from report introduction, summary and conclusion)

PUBLISHED REPORTS AND(OR) ARTICLES:
Jones, W. K., 1973, Hydrology of limestone karst in Greenbrier County, West Virginia: West Virginia Geological and Economic Survey, Bulletin 36.

AVAILABLE FROM:
West Virginia Geological and Economic Survey
Mont Chateau Research Center
Morgantown, Virginia 26505

REFERENCE CODE: M/S1-18

TITLE: Evaluation of Shavers Fork Mine Seals.

GEOGRAPHICAL AREA: Bowden, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Because of a fish kill in the U.S. Bureau of Sport Fisheries and Wildlife hatchery at Bowden, West Virginia, in 1966, a mine sealing program was undertaken on all known abandoned deep mines discharging acid into three tributaries of Shavers Fork. The appendix contains water quality data collected intermittently over four years to check the effectiveness of the seals. Values are recorded for temperature, flow in GPM, pH, acidity, calcium, magnesium, total hardness,

REFERENCE CODE: M/S1-18--Continued.

sulfate, total iron, conductance, aluminum, and alkalinity as $CaCO_3$. Results of the monitoring program indicated that sealing had not significantly reduced the pollution load. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:

Scott, R. B., 1971, Evaluation of Shavers Fork mine seals: EPA, WQO Publication No. 14010-09/71, 14 p.

REFERENCE CODE: M/S1-19

TITLE: Mine Acid Drainage and Associated Flow Fluctuations.

GEOGRAPHICAL AREA: Left fork of Little Sandy Creek basin, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

The left fork of Little Sandy Creek basin, between Fellowsville and Tunnelton, West Virginia, was surveyed for the location of mine drainage sources. At least 30 out of a total of 47 potential sources of drainage were found to produce acid at some time during the year. Thin-crested 90 degree weirs installed along with permanent staffs were found to be sufficiently accurate for measuring flow fluctuation from the mines. A flow meter was used in determining the relationship between acid load and flow from a mine. Tests were also run for pH, alkalinity, hardness, sulfates, iron, and aluminum. The acid load or production was found to be directly proportional to flow. Sulfates, iron, and aluminum were found to vary much the same as acidity. Hardness was not closely associated to acidity concentration but generally was reduced at higher flow due to a dilution effect. The pH remained relatively constant and independent of flow. A summation of conditions from individual mines was found to account closely with conditions observed in the receiving stream. (From USGS WRSIC system)

PUBLISHED REPORTS AND(OR) ARTICLES:

Jenkins, C. R., Carroll, H. C., 1970, Mine acid drainage and associated flow fluctuations: West Virginia Academy of Science, 1969, 44th, Annual session, West Liberty State College, West Virginia, 1968, Proceedings, Vol. 41, p. 286-293.

REFERENCE CODE: M/S1-20

TITLE: Mine Drainage in the North Branch Potomac River Basin.

GEOGRAPHICAL AREA: North Branch Potomac River basin, West Virginia and Maryland.

REFERENCE CODE: M/S1-20--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A stream sampling program was carried out from March 1968 through May 1969. Data were collected for 16 survey areas on flow, pH, conductivity, temperature, total alkalinity, total hot acidity, and sulfate. Elk Run in West Virginia is identified as the most critical stream in the entire basin. A comparison with earlier data indicates that the water quality above Luke, Maryland, has deteriorated since 1965. Detailed cost estimates for abatement measures are based on the maximum acidity loading for the seven watersheds considered. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Clark, L. J., 1969, Mine drainage in the North Branch Potomac River basin: Chesapeake Tech. Support Laboratory, Technical Report No. 13, 80 p.

REFERENCE CODE: M/S1-21

TITLE: Geology, Hydrology, and Water Quality of the Combined Roaring Creek and Grassy Run Watersheds, Randolph County, West Virginia.

GEOGRAPHICAL AREA: North Central West Virginia, Randolph County.

AREAL EXTENT: 32 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Study Problem - Harmful effects of acid mine drainage upon hydrologic systems.
Study Purpose - To determine through demonstration projects the most effective and least costly methods of prevention and control of water pollution caused by acid mine drainage.
Conclusions - More data are needed. (Adopted from the author's summary)

UNPUBLISHED REPORT:
Gallaher, J. T., about 1968, Geology, hydrology, and water quality of the combined Roaring Creek and Grassy Run watersheds, Randolph County, West Virginia: Administrative report by the U.S. Geological Survey to the Federal Water Pollution Control Administration.

AVAILABLE FROM:
U.S. Geological Survey, WRD
Mont Chateau
Mont Chateau Road
Morgantown, West Virginia 26505

## SUPPLEMENTAL DATA H: SUMMARY 2

Annotated bibliography of studies concerned with the influence of coal mining on the water resources of any small areas in West Virginia.

REFERENCE CODE: M/S2-1

TITLE: Effects of Deep Mining in West Virginia.

STARTING DATE: July 1976.

COMPLETION DATE: May 1980.

GEOGRAPHICAL AREA: Southern West Virginia.

AREAL EXTENT: 33 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
OBJECTIVE: (1) To determine the short-term and long-term effects of mining on surface water quantity and quality, groundwater quantity and quality, and sediment discharge. (2) To determine the effects of mining on the local aquatic environment.

APPROACH: Five similar small drainage basins were selected for the study: two underlain by an active deep mine, another by an inactive deep mine, and two by no deep mine. Wells were inventoried and water levels were monitored by observation wells in each of the basins. Selected streams, and wells were measured and sampled periodically and concurrently in each basin. The cooperation of mining companies was solicited to obtain maps and other pertinent geologic and hydrologic data.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Borchers, J. W., The ecologic impact of coal mining on the hydrologic environment of southern West Virginia: U.S. Geological Survey.

AVAILABLE FROM:
U.S. Geological Survey, WRD
Federal Building, Room 3416
500 E. Quarrier St.
Charleston, West Virginia 25301

REFERENCE CODE: M/S2-2

TITLE: Mining Water-Quality Management Plan.

GEOGRAPHICAL AREA: Cheat River and Shaver's River basins.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The study was made to 1) determine mine drainage affected watersheds through field analysis 2) locate, evaluate and document the sources of abandoned mine drainage 3) rank the abandoned mine lands where mine drainage emerges in accordance with objectives set in Section 403 of PL 95-87.

REFERENCE CODE: M/S2-2--Continued.

Only those areas with specific mine drainage problems in the Cheat River Subbasin are addressed in this report. Although some water quality data were collected and presented in this report on the Shaver's Fork Watershed, an inventory of abandoned mine land problem areas was not attempted because of current evaluations being made by the Office of Surface Mining in the Shaver's Fork Petition Evaluation Document (Draft 522 SMCRA Decision Document), February 1981. (From summary of the report)

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
West Virginia Department of Natural Resources, Mining water-quality management plan: Division of Water Resources, Abandoned Mine Lands Section, Charleston, West Virginia.

REFERENCE CODE: M/S2-3

TITLE: Hydrologic Effects of Stress-Relief Fracturing in an Appalachian Valley.

STARTING DATE: 1976.

COMPLETION DATE: 1981.

GEOGRAPHICAL AREA: Wyoming County, West Virginia.

AREAL EXTENT: 3 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A hydrologic study at Twin Falls State Park, Wyoming County, West Virginia was made to determine how fracture systems affect the occurrence and movement of ground water in a typical valley of the Appalachian Plateaus Physiographic Province. Twin Falls was selected because it is generally unaffected by factors that would complicate an analysis of the data. The study area was the Black Fork Valley at Twin Falls. The valley is about 3 miles long and 400 to 600 feet wide and is cut into massive sandstone units interbedded with thin coal and shale beds.

Two sites were selected for test drilling, pumping tests, and geophysical studies. At both sites, ground water occurs mainly in horizontal bedding-plane fractures under the valley floor and in nearly vertical and horizontal slump fractures along the valley wall. The aquifer is under confined conditions under the valley floor and unconfined conditions along the valley wall. Draw-down from pumping near the center of the valley affected water levels at both sites, indicating a hydrologic connection from the upper to the lower end of the valley. Stream gain-and-loss studies show that ground water discharges to the stream form horizontal fractures beneath Black Fork Falls, near the mouth of Black Fork. The fracture systems that constitute most of the transmissive part

REFERENCE CODE: M/S2-3--Continued.

of the aquifer at Twin Falls are like those described as being formed from stress relief. As stress-relief fractures have been described in other valleys of the Appalachian Plateaus, the same aquifer conditions may exist in those valleys. (From author's provisional summary)

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Wyrick, G. G. and Borchers, T. W., Hydrologic effects of stress-relief fracturing in an Appalachian valley: U.S. Geological Survey.

AVAILABLE FROM:
Authors
U.S. Geological Survey, WRD
3416 Federal Building
Charleston, West Virginia 25303

REFERENCE CODE: M/S2-4

TITLE: Simulation of Surface Mine Hydrology with the Finite Element Storm Hydrograph Model.

GEOGRAPHICAL AREA: Near Beckley, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Use of a spatially responsive finite element model is demonstrated for simulating the hydrologic response of a reclaimed mountaintop removal operation near Beckley, West Virginia. The use of the Finite Element Storm Hydrograph Model (FESHM), developed at Virginia Tech, provides a means of incorporating spatially distributed characteristics of the watershed, thus preserving the natural configuration of overland and channel flow.

The research consisted of a series of calibration studies using runoff plot data to estimate values for model parameters and tests of model predictions against data from two watersheds on the reclaimed mine surface. The model verification consisted of a comparison of simulated and observed runoff characteristics using an ungaged concept. The model was found to predict runoff volume with acceptable accuracy. Peak runoff rate was generally under predicted. Poor performance of model was noted for long duration, low intensity storm events. Use of the model to evaluate the effect of cover management for modification of hydrologic response was demonstrated. (Author's abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Smolen, M. D. and Youmos, T. M., 1980, Simulation of surface mine hydrology with the finite element storm hydrograph model: Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, Lexington, Kentucky, Proceedings, p. 41-46.

REFERENCE CODE: M/S2-5

TITLE: Surface Mining and the Hydrologic Balance.

GEOGRAPHICAL AREA: Breathitt County, Kentucky and Raleigh County, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Research by the U.S. Forest Service at Berea, Kentucky, has shown that surface mining results in increases in storm peak flows during and immediately after mining, but that peaks may significantly lower after reclamation is completed. Data from experimental sites in Breathitt County, Kentucky, and Raleigh County, West Virginia, during major rainstorms on 4 April 1977 and 8, 9, and 10 December 1978 showed that streamflow from surface-mined watersheds peaked lower than that from adjacent or nearby unmined watersheds. Impoundments on surface-mined lands can be effective in controlling runoff and erosion provided the ponds are properly constructed. Erosion and subsequent sedimentation are greatest during early stages of mining but diminish rapidly as the land is reclaimed and vegetation growth progresses. (From U.S. Department of Agriculture, Northeastern Forest Experiment Station, 1980)

PUBLISHED REPORTS AND(OR) ARTICLES:
Curtis, W. R., 1979, Surface mining and the hydrologic balance: Mining Congress Journal, p. 35-40.

Curtis, W. R., 1974, Surface mining and the flood of April 1977; U.S. Department of Agriculture, Forest Service Research Note, NE 248, 4 p.

NAME AND ADDRESS OF INVESTIGATOR:
Author
U.S. Department of Agriculture
Northeastern Forest Experiment Station
Berea, Kentucky 40403

REFERENCE CODE: M/S2-6

TITLE: An Aquatic Biology Study of Dents Run, Monongahela County, West Virginia.

GEOGRAPHICAL AREA: Monongahela County, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Sampling was carried out for benthic macroinvertebrate fauna, algal flora, and water quality June and September 1976 at eight stations on Dents Run and on two stations on adjacent Robinson Run which resembled the pretreatment conditions in Dents Run. Biota found in Dents Run showed that the stream was recovering from acid mine drainage pollution.

PUBLISHED REPORTS AND(OR) ARTICLES:
Academic Associates, Inc., 1977, An aquatic biology study of Dents Run, Monongahela County, West Virginia: Report to U.S. EPA, Industrial Environmental Research Laboratory, Cincinnati, Ohio, 16 p.

REFERENCE CODE: M/S2-7

TITLE: Composition of Water Discharged from Bitumiuous Coal Mines in Northern West Virginia.

GEOGRAPHICAL AREA: Northern West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Chemical analyses were made of five samples of Bituminuous coal mine water to determine ferrous iron, total iron, aluminum, manganese, sodium, potassium, calcium, magnesium, chloride, sulfate, silica, and pH. Selected trace elements were sought in two of the five samples chosen because of their extreme values in pH (3.2 and 7.4). Four of the samples may be considered 'acid mine drainage' so characterized by pH of from 3.2 to 5.5, total iron in excess of 500 ppm, and aluminum greater than 100 ppm in the more acid samples. The fifth sample resembles uncontaminated ground water from the Monongahela group and has a pH of 7.4, total iron less than 4 ppm, and aluminum less than 20 ppm. Similar distinctions in composition are reflected in trace elements of the two extreme samples. Marked differences in the neutral sample and the acid samples indicate the efficacy of water of good quality is discharged from a mine designed to minimize residence time of water in the workings, whereas the acid samples come from mines with more extensive drainage systems. (From USGS WRSIC abstract system)

PUBLISHED REPORTS AND(OR) ARTICLES:

Corbett, R. G., 1977, Effects of coal mining on ground and surface water quality, Monongahela County, West Virginia: University of Akron, the Science of the Total Environment, 8 (1), p. 21-38.

Corbett, R. G. and Growitz, D. J., 1967, Composition of water discharged from bituminous coal mines in northern West Virginia: West Virginia University, Econ. Geol., Vol. 62, No. 6, p. 848-851.

Corbett, R. G., Nuhfer, E. B., and Phillips, H. W., 1967, Trace elements in bituminous coal mine drainage and associated sulfate minerals: Proceedings from the West Virginia Academy of Science, 39, p. 311-314.


REFERENCE CODE: M/S2-8

TITLE: Factors Affecting Water-Quality from Strip-Mined Sites.

GEOGRAPHICAL AREA: Near Beckley, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This project analyzed the parameters that influence the quality of water from stripmined sites. An instrumented watershed near Beckley, West Virginia provided data on precipitation, streamflow, and water quality, both before and during mining operations. The data were analyzed to derive linear relationships between a water-quality parameter and such variables as temperature, current and antecedent precipitation, and the extent of the area disturbed by mining. Mathematical formulae representing sulfate and calcium concentration, alkalinity,

REFERENCE CODE: M/S2-8--Continued.

turbidity, conductance, and discharge were used in the study. A correlation analysis also was made among the various water-quality parameters. A formula in each water-quality parameter was derived for each of three conditions: (1) before mining, (2) during mining for the disturbed area alone, and (3) during mining for the entire watershed. The coefficients in the formulae then were refined for minimum error. The coefficients indicate that temperature is not an important water-quality consideration except in the case of alkalinity. The coefficients of the antecedent precipitation terms indicate that, in most cases, surface runoff is the basic mechanism by which the substances affecting water quality are conveyed from the disturbed area into a receiving stream. The findings provide data that can be used in the future for predicting water-quality impacts from strip-mining operations at particular sites in the study area. (From USGS WRSIC abstract system)

PUBLISHED REPORTS AND(OR) ARTICLES:

Connell, J. F., Contractor, D. N., and Shanholtz, V. O., 1976, Factors affecting water quality from strip-mined sites: Virginia Water Resources Research Center Bulletin 87, Blacksburg, Virginia, 75 p.

REFERENCE CODE: M/S2-9

TITLE: Effectiveness of Surface Mine Sedimentation Ponds.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

Nine sedimentation ponds at surface coal mining operations in Pennsylvania, West Virginia, and Kentucky were evaluated for reducing suspended solids in storm runoff. The ponds were sampled during baseline and rainfall events. Theoretical and actual suspended solids removal efficiencies were compared. Major problems resulted from poor construction and inadequate maintenance. Suspended solid removal efficiencies were generally much lower during a storm. Heoretical predictions of efficiency were essentially correct under baseline conditions. Generally, theoretical removal efficiencies were much higher than actual efficiencies during rainfall.

PUBLISHED REPORTS AND(OR) ARTICLES:

Kathuria, D. V., Nawrocki, M. A., and Becker, B. C., 1976, Effectiveness of surface mine sedimentation ponds: Hittman Associates, Inc., Columbia, Maryland, Report EPA-600/2-76-117, 100 p.

AVAILABLE FROM:

The National Technical Information Service
Springfield, Virginia 22161
as PB-258 917

REFERENCE CODE: M/S2-10

TITLE: Changes in Water Chemistry Resulting from Surface-Mining of Coal on Four West Virginia Watersheds.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Water quality in contiguous watersheds was monitored from May 1969 through April 1974 in order to provide much needed information on normal variations in water quality so that valid comparisons of water quality before and after mining can be made. Sampling was done every two weeks and analyses were made for pH, specific conductance, alkalinity, sulfate, calcium, bicarbonate, magnesium, iron, aluminum, manganese, zinc, and potassium. Results of analyses were evaluated for before mining variations between samples taken in growing and dormant seasons and for water years 1970, 1971, and 1972 which cover a wide range of precipitation. Also, each factor for which analyses were made is discussed and the effect on the parameter of mining in the various watersheds is evaluated.

The production of sulfate and other chemicals at a strip mine and their transport to local streams is a complex process that involves the kinetics of the chemical reactions and the hydrology and geology of the area. This study attempts to understand the interactions involved and to relate various water quality parameters to the hydrology of the area. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Plass, W. T., 1975, Changes in water chemistry resulting from surface-mining of coal on four West Virginia watersheds: Symposium on Surface Mining and Reclamation, 3rd, Louisville, Kentucky, Reprints, p. 152-169.

Plass, W. T., Connell, J. F., Contractor, D. N., and Shanholtz, V. O., 1975, Water quality models for a contour mined watershed: Symposiums on Surface Mining and Reclamation, 3rd, Louisville, Kentucky, Reprints, p. 179-199.

REFERENCE CODE: M/S2-11

TITLE: A Comparative Study of Chemical Loadings of Acid and Nonacid Tributaries to Cheat Lake, West Virginia.

GEOGRAPHICAL AREA: Cheat Lake, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Acid stream loading was compared with non-acid stream loading in tributaries of Cheat Lake, West Virginia, using concentrations and discharge measurements taken during June 1973-January 1974. Acid streams had low pH, high conductivity, high silicate, sulfate, total iron, total acidity, orthophosphate, and total phosphate concentrations, and low nitrite-nitrogen concentrations. Non-acid streams had a pH near neutrality, lower conductivity, and lower silicate, sulfate, total iron, total acidity, orthophosphate, and total phosphate concentrations. Acid streams had high loadings of sulfate, total iron, total orthophosphate, and total phosphate, lower nitrate-nitrogen loading, and contributed more ions to Cheat Lake. Acid mine drainage did not increase silicate loading. Streams receiving acid drainage had higher cation concentrations, except

REFERENCE CODE: M/S2-11--Continued.

potassium, and greater ion concentrations and loadings per unit drainage area. Acid tributaries could be distinguished from non-acid tributaries by all parameters studied except nitrate-nitrogen concentration and loading, silicate loading, and potassium concentration. Maple Run and Quarry Run had been disturbed and were distinguished from other non-acid streams by drainage area concentrations and loadings. Loadings and concentrations per unit drainage area detect small differences in streams and may indicate disturbances in drainage basins undetected by concentrations or loadings alone. (From USGS WRSIC abstracts systems)

PUBLISHED REPORTS AND(OR) ARTICLES:
Edens, D., 1974, A comparative study of chemical loadings of acid and non-acid tributaries to Cheat Lake, West Virginia: Proceedings, West Virginia Academy of Science, Vol. 1, p. 45-51.

REFERENCE CODE: M/S2-12

TITLE: West Virginia Acid Mine Drainage Study in North Branch Potomac River Basin.

GEOGRAPHICAL AREA: North Branch Potomac River Basin.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
All acid mine drainage sources in the North Branch Potomac River Basin were mapped and measured and recommendations were made for reclamation of specific areas as well as for more effective mine drainage treatment and control. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
West Virginia Department of Natural Resources, 1974, West Virginia acid mine drainage study in North Branch Potomac River basin: Charleston, West Virginia.

REFERENCE CODE: M/S2-13

TITLE: Sediment Control Using Modified Mining and Regrading Methods and Sediment Control Structures.

GEOGRAPHICAL AREA: West of Beckley, West Virginia.

AREAL EXTENT: 0.6 $mi^2$

REFERENCE CODE: M/S2-13--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This case history describes a mining operation from the construction of sediment control structures through regrading and revegetation. Data on sediment yield and water quality allow assessment of the effectiveness of the sediment control methods.

PUBLISHED REPORTS AND(OR) ARTICLES:
White, J. R., and Plass, W. T., 1974, Sediment control using modified mining and regrading methods and sediment control structures: in Resources and Applications Technical Symposium on Mined Land Reclamation, Louisville, Kentucky, 2nd, p. 117-123.

REFERENCE CODE: M/S2-14

TITLE: Evaluation of Pollution Abatement Techniques Applicable to Lost Creek and Brown's Creek Watershed, West Virginia.

GEOGRAPHICAL AREA: Lost Creek and Brown's Creek basins, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This study is one of a series of reports concerning the development of an overall environmental pollution abatement plan for the Monongahela River basin. Primary objectives are to evaluate applicable pollution reduction methods and provide recommendations as to least cost and best overall solutions to mine drainage problems. Study results are based on water quality data from previous investigations and on supplementary data gathered during this study. Conclusions are: that water quality of the creeks has improved significantly; that the 4 identified drainage sources discharge 4,800 lbs/day acid load and 600 lbs/day iron load to the principal streams; that conventional surface reclamation and treatment are methods best suited for abatement; that a least cost abatement plan has been developed which would provide an 80 percent reduction in acid and iron loads; and that a long term plan of abatement has been developed which considers associated long-range environmental benefits such as 90 percent reduction in acid and iron loads, a reverse osmosis facility, a sewage treatment plant and aesthetic improvements in other areas of the watersheds. Primary recommendations are: that a program be implemented as soon as practical to perform the described surface reclamation work in accordance with established priorities; that a program to secure funds and obtain preliminary design data for treatment plant possibilities be started with emphasis placed on pursuing the long term plan for the watershed. (From USGS WRSIC abstract system)

PUBLISHED REPORTS AND(OR) ARTICLES:
Ackenheil and Associates Geo Systems, Inc., 1973, Evaluation of pollution abatement techniques applicable to Lost Creek and Brown's Creek watershed, West Virginia: Report for Appalachian Regional Commission, Washington, D.C., 146 p.

REFERENCE CODE: M/S2-14--Continued.

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REFERENCE CODE: M/S2-15

TITLE: Phytoplankton Generic Diversity and Biomass Estimates of a Monongahela River Acid Confluence.

GEOGRAPHICAL AREA: Confluence of Robinson Run with the Monongahela River in northern West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Water samples were taken from the confluence of Robinson Run and the Monongahela River in northern West Virginia in order to obtain information on the effect of an acid stream on generic diversity. Samples at each station were examined to determine generic diversity, biomass, density and distribution of phytoplankton in relation to an acid stream. The parameters pH, hot and cold acidity, dissolved oxygen, percent saturation of oxygen, and water temperature were also measured with analyses of variance and correlation performed on the data. The generic diversity and density were found to be significantly decreased in the acid stream with Euglena being the only genus found. Both diversity and density slowly increased down river with increasing distance from the confluence. The highest generic diversities and densities were found upriver from the confluence. Significant differences in the chemical parameters of Robinson Run were also found. High acidity, as measured by hot and cold acidity values, appeared to be a significant factor in determining the diversity and density indices. (Author's abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Raukin, D. and Keller, E. C., Jr., 1973, Phytoplankton generic diversity and biomass estimates of a Monongahela River acid confluence: Proceedings of the West Virginia Academy of Science, 45 (2), p. 169-177.

REFERENCE CODE: M/S2-16

TITLE: Cabin Creek, West Virginia Strip Mine Demonstration Reclamation Project.

GEOGRAPHICAL AREA: Cabin Creek basin, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This Cabin Creek, West Virginia strip mine demonstration reclamation project study area is the watershed of Cabin Creek, a tributary of the Kanawha River, about 20 miles upstream from Charleston. The basin is about 16.3 miles long and 4.5 miles wide. This area was studied for the effects of strip mining on the

REFERENCE CODE: M/S2-16--Continued.

navigable rivers and their tributaries. After one year, recommendations were to be made to mitigate adverse conditions due to strip mining practices. The report contains all the phases of the study such as mineral resources, hydrology, land use, and socio-economic features.

PUBLISHED REPORTS AND(OR) ARTICLES:

U.S. Army Corps of Engineers, 1973, Cabin Creek, West Virginia strip mine demonstration reclamation project: Huntingdon, West Virginia, Draft EIS-WV-1159-D, 46 p.

REFERENCE CODE: M/S2-17

TITLE: An Analysis of the Zooplankton Community in an Acid Polluted Reservoir.

GEOGRAPHICAL AREA: Cheat Lake, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

Measurements at stations in the backwaters and the main reservoir of Cheat Lake, West Virginia were made to determine if the stations differed significantly on the basis of chemical parameters associated with acid mine pollution. The zooplankton community was studied at each station and chemical and biological parameters were compared. Since its construction in 1929, Cheat Lake has been polluted by acid mine drainage. The reservoir's three backwaters are partially isolated from the main reservoir and do not receive acid except occasionally from the main reservoir. Sampling sites in the reservoir were opposite the coal pile, five miles above the dam, and one-quarter mile above the dam; in the backwaters they were in the middle of Rubles Run and in the middle of Morgan Run. The reservoir stations were similar with low pH and alkalinity and high methyl orange acidity, total acidity and conductivity. The backwaters were nonacid with relatively high pH and alkalinity and low methyl orange acidity, total acidity and conductivity. Community coefficients indicate zooplankton communities in the backwaters are similar but differ from zooplankton in the main reservoir. In addition, zooplankton biomass was much greater in the backwaters. (From USGS WRSIC system)

PUBLISHED REPORTS AND(OR) ARTICLES:

Bible, J. L., 1972, An analysis of the zooplankton community in an acid polluted reservoir: Proceedings of West Virginia Academy of Sciences, Vol. 44, No. 1, p. 32-29.

Volkmar, R. D., 1972, Primary productivity in relation to chemical parameters in Cheat Lake, West Virginia: Proceedings of West Virginia Academy of Science, Vol. 44, No. 1, p. 14-22.

REFERENCE CODE: M/S2-18

TITLE: The Life History of the Alderfly, Sailis Aequalis Banks, in an Acid Mine Stream.

GEOGRAPHICAL AREA: Camp Creep, Wayne County, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The life history of the alderfly, Sialis Aequalis Banks, was studied intensively in an acid mine stream, Camp Creek of Twelvepole Creek, Wayne Co., West Virginia, between July 1970 and June 1971. (From author's abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Woodrum, J. E. and Tarter, D. C., 1972, The life history of the Alderfly, Sialis Aequalis Banks, in an acid mine stream: Amer. Midl. Natar., 89, (2), p. 360-368.

REFERENCE CODE: M/S2-19

TITLE: Aquatic Vascular Plant Distribution in Cheat Lake (Lake Lynn), West Virginia.

GEOGRAPHICAL AREA: Cheat Lake, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A compiling of the aquatic vascular plants of Cheat Lake, with notes as to their abundance and distribution, is given. Cheat Lake is fed by Cheat River, which is becoming increasingly mine-acid polluted, and a record of the plants and some present conditions was considered important to future studies. Ten new county records and two new State records are included. (Author's abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Clovis, J. F., 1971, Aquatic vascular plant distribution in Cheat Lake (Lake Lynn), West Virginia: West Virginia University, Castanea 36, p. 153-163.

REFERENCE CODE: M/S2-20

TITLE: Investigative Mine Survey of a Small Watershed.

GEOGRAPHICAL AREA: Brown's Creek basin, a tributary to the West Fork River in the Monongahela River watershed, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The project in the area of Browns Creek, a tributary of the West Fork River in the Monongahela River watershed includes a survey to locate sources of mine drainage and an evaluation of water quality of the creek. Thirty openings in addition to 51 openings previously located were found. A conclusion is that

REFERENCE CODE: M/S2-20--Continued.

there was such a variety of conditions in the mine openings that no one abatement would apply to all. Water-quality data reported for stream locations, mine openings, and wells include well fluid level, stream flow, conductance, pH, acidity, alkalinity, hardness, iron, sulfate, and aluminum. A comparison of water-quality data from mined and unmined areas shows that while mining operations affect water table levels, they affect the quality of water mainly in the streams. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Halliburton Co., 1970, Investigative mine survey of a small watershed: Report to U.S. Department of Interior, FWQA, Water Pollution Control Research Series 14010 DMO 03/70-A, 89 p.

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as PB-196 110.

REFERENCE CODE: M/S2-21

TITLE: Mine Acid Drainage and Associated Flow Fluctuations.

GEOGRAPHICAL AREA: Left Fork of Little Sandy Creek, West Virginia.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This paper reports the amount and flow from the three major sources of mine drainage to the Left Fork of Little Sandy Creek in West Virginia. Acid production varied directly with flow. Sulfate, iron, and aluminum varied in much the same way. The pH was relatively constant and remained independent of flow. The acid load from seven mine effluents was shown to be the major source of acid in the receiving stream. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Jenkins, C. R., and Carroll, H. C., 1969, Mine acid drainage and associated flow fluctuations: Proceedings of the West Virginia Academy of Science, p. 286-293.

REFERENCE CODE: M/S2-22

TITLE: Survey of the Mine Drainage in the West Fork River Basin.

GEOGRAPHICAL AREA: West Fork River basin, West Virginia.

REFERENCE CODE: M/S2-22--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The results of a survey of drainage from 208 mines in the area are tabulated. Conditions of each of the main tributaries and of the West Fork River itself due to the acid drainage are discussed. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Herndon, L. K., 1931, Survey of the mine drainage in the West Fork River basin: West Virginia University, Engineering Experiment Station, Technical Bulletin No. 4, p. 115-142.

REFERENCE CODE: M/S2-23

TITLE: Stream Pollution Investigation in West Virginia.

GEOGRAPHICAL AREA: Cheat River basin.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The condition of the Cheat River basin is reported on briefly. Among the sources of industrial pollution are some 98 coal mines pouring substantial amounts of acid into the basin. The neutralizing effect of some tannery wastes on the acid river is noted. (From Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Herndon, L. K., 1930, Stream pollution investigation in West Virginia: West Virginia University, Engineering Experiment Station, Technical Bulletin No. 3, p. 68-74.

SUPPLEMENTAL DATA H: SUMMARY 3

Annotated bibliography of large area studies pertinent to the hydrology of the Monongahela National Forest area.

REFERENCE CODE: M/S-1

(Soon to be published)

Dyer, K. L., Stream water-quality in the coal region of West Virginia, Part I of Water quality of Appalachia, U.S. Department of Agriculture, Forest Service, Berea, Kentucky.

ABSTRACT:
This study was undertaken with the primary objective of establishing a water quality data base for small first order unmined and surface-mined watersheds throughout Appalachia. There is a need for data which explicitly show changes in water quality attributable to both old and recent surface mining. Most previous water quality data in the study area was from watersheds so large that it was impossible to isolate the effects of surface mining from the confounding effects of other activites of man.

Small streams were sampled in selected counties in the State where coal is surface mined. Sampling was at approximate monthly intervals. The water quality data from these streams are presented in this report and should help fill the need for data from small watersheds in Appalachia.

REFERENCE CODE: M/S3-2

(To be published)

Ehlke, T. A., and others, 1981, Hydrology of area 8, eastern coal province, West Virginia: U.S. Geological Survey, Water-Resources Investigation, Open-File Report.

Reports to be published in 1981-1982 for areas 9, 10, and 12 also.

SUMMARY:
The coal provinces of the country are divided into hydrologic reporting areas. Hydrologic information and sources are presented as text, tables, maps, and other illustrations designed to be useful to mine owners, operators, and consulting engineers in planning and implementing surface-mine operations that comply with the environmental requirements of the "Surface Mining Control and Reclamation Act of 1977."

REFERENCE CODE: M/S3-3

Runner, G. S., 1980, Runoff Studies on Small Drainage Areas (Technique for Estimating Magnitude and Frequency of Floods in West Virginia), U.S. Geological Survey Open-File Report 80-1218.

Runner, G. S., 1980, Hydrologic data for runoff studies on small drainage areas, U.S. Geological Survey Open-File Report 80-560.

REFERENCE CODE: M/S3-3--Continued.

ABSTRACT:

A technique is presented for estimating the magnitude and frequency of floods on unregulated, virtually natural streams in West Virginia. Multiple-regression techniques were used to develop relations between dependent variables, flood peaks, and independent variable, drainage areas. Data collected at 170 stream-gaging sites were used in the analyses.

Analyses of all residuals errors indicated that the best estimate of flood peaks could be made by dividing the state into three regions.

Peak discharges can be estimated for drainage areas from about 0.3 square miles up to 2000 square miles. Graphs are provided to estimate the flood peak having recurrence intervals of 2, 5, 10, 25, 50, 100, and 500 years and drainage areas between 1 and 1000 square miles. For drainage areas less than 1 and greater than 1,000 square miles, peak flows can be estimated using equations listed on each graph. (From author's summary)

REFERENCE CODE: M/S3-4

Runner, G. S., and Chin, E. H., 1980, Flood of April 1977 in the Appalachian region of Kentucky, Tennessee, Virginia, and West Virginia: U.S. Geological Survey Professional Paper 1028.

ABSTRACT:

Heavy rains fell over the Appalachian region of Kentucky, Tennessee, Virginia and West Virginia April 2-5, 1977, causing record flooding. Rainfall amounts of 4 to 15.5 inches were observed. The maximum amount of 15.5 inches occurred at Jolo, West Virginia, in about 30 hours. This was more than twice the amount which would be expected for a 100-year recurrence-interval storm. Flood discharges along the upper Guyandotte River; Tug Fork and Levisa Fork in the Big Sandy River basin; Cumberland River; and Clinch River and Dowell River in the Tennessee River basin exceeded those previously known. Severe flooding also occurred along the Holston River and along the North Fork Kentucky River. Recurrence intervals of observed flood discharges were greater than 100-years at 29 streamflow measurement sites. Substantial reductions in peak stages and discharges on Levisa Fork, North Pound River, and Guyandotte River, attained as a result of reservoir storage, were reported by U.S. Army Corps of Engineers. Maximum daily suspended-sediment discharges on Guyandotte River near Baileysville, West Virginia, and the Tug Fork at Glenhayes, West Virginia, were 54,800 tons/day and 290,000 tons/day, respectively, April 5, 1977. Twenty-two lives were lost and total property damage reportedly exceeded $400 million in the four-state area.

REFERENCE CODE: M/S3-5

Scott, A. G., 1980, An interim report on the investigation of flooding in the Tug Fork basin of Kentucky, Virginia, and West Virginia: U.S. Geological Survey, Water-Resources Investigations, Open-File Report 80-1188, p. 116.

ABSTRACT:
An analytical plan is presented for a study of the effects of land-use changes on the magnitude and frequency of flood-peak flows and on sediment characteristics of the Tug Fork in Kentucky, Virginia, and West Virginia. The plan includes compilation and analysis of available data, collection of new data on small, single land-use drainage areas for deterministic computer modeling, and creation of a computer model of the Tug Fork basin for definition of cumulative land-use impacts.

Also presented is a compilation of the available hydrologic data and a description of related studies expected to provide information and data useful to the ongoing work. The data compilation includes: Hourly precipitation for selected days and annual maximum daily precipitation for nine sites, annual maximum streamflow rates and stages for three stream-gaging sites, hourly gageheight and discharge rates for selected storms at four stream-gaging sites, flood profiles, flood-frequency relations, and other streamflow information.

REFERENCE CODE: M/S3-6

Double, M. L., Savio, J. A., and Bissonnette, G. K., 1978, Recovery of sanitary-indicator bacteria from streams containing acid mine water: West Virginia University Bulletin, Series 78, No. 10-7, Water Research Institute, Information Report 11, WRI-WW-78-02, 30 p.

ABSTRACT:
Quantitative and qualitative bacteriological studies were conducted on samples from several points on the Monongahela River and its tributaries in areas where the streams are simultaneously affected by acid mine water and organic waste pollution. Multiple-tube fermentation techniques were found to be preferable to conventional direct membrane filtration in recovering sublethally injured coliforms. The recovery was substantially enhanced by the inclusion of an enrichment step in the procedure. Qualitatively, several members of the Enterobacteriaceae were identified, and the differences in the distribution of members of the species at various sampling points suggested that respective members of the species were affected differently by acid mine water. The relative ease of quantitatively detecting fecal streptococci from streams affected by acid mine drainage indicated that this group should be considered for use in assessing bacteriological quality of acid streams. Qualitatively, all members of the fecal streptococcal group were isolated from the streams affected by acid mine water; with the exception of *Streptococcus bovis* and *Streptococcus equinis*. "Total" plate counts, performed on several water samples during the summer months, showed that at incubation temperatures of 10°, 20°, and 35°C there was little difference in quantative detection of bacteria. Prolonged incubation of the "total" bacteria plates gave rise to chromagenic colonies, the numbers of which were found to be correlated with the relative presence of acid mine water in the stream. (Author's abstract adapted)

REFERENCE CODE: M/S3-7

Alderman, J. K. and Smith, W. M., 1977, Acid mine drainage: the problem and the solution: West Virginia University, Coal Research Bureau, Coal Mining and Processing 14 (8), p. 66-68, 87-88.

ABSTRACT:
The authors review the extent of acid mine drainage in West Virginia and some of the abatement projects carried out over the years. They emphasize the great amount of money required to reclaim watersheds affected by mine drainage, especially from abandoned mines. One recommendation is further research to develop more effective and efficient abatement techniques. A second recommendation is to recover and use minerals and metals in the drainage and in the sludge from treatment plants. (From Gleason, 1980)

REFERENCE CODE: M/S3-8

Sack, W. A., Jenkins, C. R., Chambers, B. R., and Lange, R. W., II, 1976, Modeling of acid mine drainage and other pollutants in the Monongahela River basin under low flow conditions: West Virginia, Department of Natural Resources, Charleston, West Virginia, 159 p.

ABSTRACT:
The QUAL 2 model was used to estimate conservative and nonconservative pollutant concentration in the Monongahela River basin under low flow conditions. The work was restricted to the West Virginia portion of the basin which as four major sub-basins: Tygart, West Fort, Cheat, and Monongahela. Net acidity, total dissolved solids, dissolved oxygen and ultimate oxygen demand were the parameters modeled. Point sources included over 100 municipalities and almost 2,000 active and abandoned deep mine-related discharges. (From author's Introduction and Summary)

REFERENCE CODE: M/S3-9

Smith, R. M., Sobek, A. A., Arkle, T. Jr., Sencindiver, J. C., and Freeman, J. R., 1975, Extensive overburden potentials for soil and water quality: U.S. Environmental Protection Agency Report EPA/600-2-76/184, 329 p.

ABSTRACT:
Chemical, physical and mineralogical measurements and interpretations developed during previous studies in West Virginia have been improved and applied to coal overburden columns in 12 widely spaced neighborhoods and 2 adjunct locations in 10 states, from Pennsylvania on the northeast to Alabama on the southeast and Oklahoma on the west. Field studies in each neighborhood and adjunct location involved logging and sampling soil and rock horizons from surface to coal, testing and improving field clues, determining properties of mine soils and water resulting from mining operations, and checking reclamation. Consistent

REFERENCE CODE: M/S-9--Continued.

overburden property relationships within basins and over particular named coals provide opportunities for generalizations and extra-polation between sampled sites. It appears feasible to use detailed information from overburden sampling and analysis as an aid to pre-mining planning of surface mining operations including reclamation and project land use.

REFERENCE CODE: M/S3-10

Environmental Quality Systems, Inc., 1973, Determination of estimated mean mine water quantity and quality from imperfect data and historical records: Rockville, Maryland, 166 p.

AVAILABLE FROM:
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Springfield, Virginia 22161
as PB-242 721

ABSTRACT:
This report is one of a series dealing with different aspects of environmental pollution in the Monongahela River basin. The purpose of the study was to develop a methodology determining the increase or decrease and the sources of pollution when complete data is not available. Special attention was given to acid mine drainage. (From USGS WRSIC abstract system)

REFERENCE CODE: M/S3-11

U.S. Environmental Protection Agency, 1973, The status of active deep mines in the Monongahela River basin: Surveillance Analysis Division, Work Document No. 46, Wheeling Field Office, 129 p.

ABSTRACT:
As a result of the Monongahela Enforcement Conference in 1971, the survey of mines in the area, carried out after the first conference in 1963, was updated. Each of the active underground mine sites previously listed was revisited to determine current operational status and to sample any mine drainage discharges. Although new mine sites were not actively sought, any that were encountered in the course of the survey were added to the inventory. The detailed results of the inventory are presented including results from water analyses for pH, acidity, iron, sulfate, and amount of flow. (From Gleason and Russell, 1977)

REFERENCE CODE: M/S3-12

Clarkson, R. B. and Moore, J. A., 1971, Vascular aquatic plants in acid mine water of the Monongahela River, West Virginia: West Virginia University, Water Resources Institute, Bulletin 2, 8 p.

ABSTRACT:
Six areas on the Monongahela, Tygart Valley, and West Fork Rivers were studied intensively. Measurements were made of nitrogen, phosphate, calcium, total acidity, iron, and pH of the water; substrate grain size; water velocity; and water level. The authors conclude that "substrate, phosphate, and water-level fluctuation are the factors most important to growth of vascular aquatic plants in streams containing acid mine water." (From Gleason and Russell, 1977)

REFERENCE CODE: M/S3-13

U.S. Environmental Protection Agency, Division of Field Investigations, 1971, Monongahela River mine drainage remedial project: Summary Report to Enforcement Conference, Monongahela River and It's Tributaries, Cincinnati, 235 p.

ABSTRACT:
Presented are detailed sections on the geology and hydrology of the Monongahela River basin; mining methods; effects of mine drainage on stream quality; the stream sampling program carried out by the Technical Committee; cost estimates for pollution abatement; and the regulations and abatement programs of Maryland, Pennsylvania, and West Virginia. Attachment A gives summaries of inventories of pollution sources by sub-basin. In Attachment B are recommendations of individual Technical Committee members. Attachment C gives the status of active mines including effluent quality data. (From Gleason and Russell, 1977)

REFERENCES CODE: M/S3-14

Cook, H. A., 1969, Influence of acid mine water on the microflora of sewage: Ph.D. Thesis, West Virginia University, 82 p.

ABSTRACT:
The three-fold purpose of this work was to study the microflora of a mine acid polluted river, the Monongahela; to study the effects of acid mine water on the microorganisms in domestic sewage; and to determine if raw sewage contains amino acids which could serve as nutrients for the microflora in the receiving waters. Microbial population in samples from specified sites along the Monongahela River are reported as total number and percentages of bacteria, yeasts, and filamentous fungi. Temperature and pH influence the number and types of organisms present in incubated samples. Raw sewage alone and mixed with acid mine water were

REFERENCE CODE: M/S3-14--Continued.

analyzed for amino acids. Several of the 17 amino acids detected in the sewage could not be detected in the mine water-sewage mixture and others were present in the mixture only in trace amounts. In the mixture, ammonia concentration increases greatly. (From Gleason and Russell, 1977)

REFERENCE CODE: M/S3-15

Ward, P. E. and Wilmoth, B. M., 1968, Records of wells, springs and test borings, chemical analyses of ground water, and selected driller's logs from the Monongahela River basin in West Virginia: West Virginia Geological and Economical Survey Basin Data Report 1, 73 p.

Ward, P. E. and Wilmoth, 1968, Ground-water hydrology of the Monongahela River basin in West Virginia: West Virginia Geological and Economical Survey River basin Bulletin 1, 54 p.

Friel, E. A., Wilmoth, B. M., Ward, P. E., and Wark, J. W., 1967, Water Resources of the Monongahela River basin, West Virginia: West Virginia Department of Natural Resources, Division of Water Resources Report, 118 p.

ABSTRACT:
The quantity of water available in the Monongahela River basin in north-central West Virginia is adequate to meet the water-use needs of today and for many years to come. Only about 10 percent of the 7,500 cubic feet per second (4,800 million gallons per day) that flows from the basin into Pennsylvania is being used. Much of this is not consumed and is, therefore, available for reuse. This is especially true of the water used for cooling in connection with power generation, which accounts for nearly 90 percent of the total water used in the basin.

A problem of prime concern is the chemical quality of surface water. In streams draining sparsely settled mountainous areas this is not much of a problem but in other areas the streams are highly mineralized--primarily a result of the discharge of acid water from coal-mining areas. Though not widespread, industrial and municipal wastes reaching local drainageways add to the quality problem.

The natural chemical character of the groundwater in the basin is, with some exceptions, satisfactory for most uses. The iron content is high enough in many places to make its removal desirable. Groundwater is objectionally hard in some areas and in a few localities hydrogen sulfied occurs in objectionable quantities. Salty groundwater is found in some aquifers at depths of 100 to 300 feet below the level of the major stream channels in the western part of the basin.

Mining activities affect the local occurrence of groundwater, but the basinwide effect is negligible. The mines act as drainageways for the discharge of groundwater and in a few places have caused a considerable drop in water levels. The effect of mining on the chemical quality of the groundwater apparently does not extend beyond the immediate vicinity of the mines. (From summary)

REFERENCE CODE: M/S3-16

Biesecker, J. E. and George, J. R., 1966, Stream quality in Appalachia as related to coal-mine drainage, 1965: U.S. Geological Survey Circular 526, 27 p.

ABSTRACT:
A stream-quality reconnaissance at 318 locations in May 1965 offered the first opportunity for a contemporaneous regional collection and appraisal of water-quality data in Appalachia. The results provide a means of regional comparison of the influence of coal-mine drainage on stream quality at approximately median streamflow. The results disclose that the chemical quality of the water at nearly 200 sites did not meet recommended drinking water standards. At many of these sites, inferior quality was caused by excessive concentrations of solutes commonly associated with coal mine waters.

Water-quality damage from mine drainage is particularly severe in the more heavily mined northern one-third of the region where high sulfate content, free mineral acidity, and low pH are typical of most affected streams. A deficiency in natural stream alkalinity in this part of the coal region contributes greatly to the massive effect of mine drainage upon stream quality. However, data collected from streams affected by mine drainage along the west edge of this part of the coal field suggest extensive neutralization of mine water. In southern Appalachia coal mine drainage had less influence on stream quality than in northern Appalachia. Fewer streams in this area were influenced by mine drainage, and the magnitude of stream damage for affected streams was less than in northern Appalachia. (Author's abstract)

REFERENCE CODE: M/S3-17

Musser, J. J., 1965, Water Resources of the Appalachian Region: Pennsylvania to Alabama; U.S. Geological Survey Hydrol. Investigation Atalas HA-198, Sheet 9.

SUMMARY:
Acid streams in the Appalachian region are identified and discussed, and the amount of acidity as $H_2SO_4$ discharged annually into several streams is tabulated.

SUPPLEMENTAL DATA I

NAWDEX listings of sources of monitoring-site data found in the Shawnee National Forest study area.

SUPPLEMENTAL DATA I: LISTING 1

Sources of streamflow and stage data in the Shawnee National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07140105 | SL1-1 | USGS | 05599800 | ORCHARD CREEK NEAR FAYVILLE, IL | 371135 | 0892435 | 017 | 003 | SW | 1960 | 1972 | | .09 | |
| 07140108 | SL1-2 | USGS | 05600250 | SANDY CREEK NEAR TAMMS, IL | 371502 | 0892004 | 017 | 003 | SW | 1973 | 1973 | N | 4.39 | |
| 05140204 | SL1-3 | USGS | 03382525 | SALINE R (AUX) NR JUNCTION IL | 373908 | 0881515 | 017 | 059 | SW | 1939 | 1974 | | | |
| 05140204 | SL1-4 | USGS | 03382520 | BLACK BRANCH TRIB NEAR JUNCTION, IL | 374113 | 0881655 | 017 | 059 | SW | 1959 | 1972 | | 1.10 | |
| 07140106 | SL1-5 | USGS | 05599560 | CLAY LICK CREEK NEAR MAKANDA, IL | 373600 | 0891425 | 017 | 077 | SW | 1959 | | | 1.94 | |
| 07140106 | SL1-6 | USGS | 05599580 | BIG MUDDY RIVER TRIB NEAR GORHAM, IL | 374021 | 0892849 | 017 | 077 | SW | 1960 | | | .17 | |
| 05140203 | SL1-7 | USGS | 03385420 | BAY CREEK AT REEVESVILLE, IL | 372105 | 0884238 | 017 | 087 | SW | 1925 | 1925 | N | | |
| 05140203 | SL1-8 | USGS | 03385400 | BAY CREEK AT GRANTSBURG, IL | 372327 | 0884444 | 017 | 087 | SW | 1970 | 1973 | | 118.00 | |
| 05140203 | SL1-9 | USGS | 03386000 | LAKE GLENDALE OUTLET NEAR DIXON SPRINGS, IL | 372450 | 0883950 | 017 | 151 | SW | 1953 | 1963 | N | 1.98 | |
| 05140203 | SL1-10 | USGS | 03385500 | LAKE GLENDALE INLET NEAR DIXON SPRINGS, IL | 372455 | 0883900 | 017 | 151 | SW | 1953 | | N | 1.05 | |
| 05140203 | SL1-11 | USGS | 03386500 | SUGAR CREEK NEAR DIXON SPRINGS, IL | 372456 | 0884025 | 017 | 151 | SW | 1949 | | N | 9.93 | |
| 05140203 | SL1-12 | USGS | 03384490 | LUSK CREEK ABOVE MANSON FORD NEAR EDDYVILLE, | 372707 | 0883402 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-13 | USGS | 03384485 | LUSK CREEK BL COPPEROUS BR NEAR EDDYVILLE, I | 372722 | 0883334 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-14 | USGS | 03385000 | HAYES CREEK AT GLENDALE, IL | 372725 | 0884005 | 017 | 151 | SW | 1948 | 1975 | N | 19.10 | |
| 05140203 | SL1-15 | USGS | 03384480 | COPPEROUS BRANCH ABOVE MOUTH NEAR EDDYVILLE, | 372750 | 0883324 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-16 | USGS | 03384475 | COPPEROUS BRANCH NEAR EDDYVILLE, IL | 372759 | 0883346 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-17 | USGS | 03384470 | COPPEROUS BRANCH BELOW TRIB NEAR EDDYVILLE, | 372801 | 0883408 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-18 | USGS | 03384465 | COPPEROUS BRANCH TRIB AT MOUTH NR EDDYVILLE, | 372806 | 0883411 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-19 | USGS | 03384460 | COPPEROUS BRANCH ABOVE TRIB NEAR EDDYVILLE, | 372812 | 0883412 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-20 | USGS | 03384450 | LUSK CREEK NEAR EDDYVILLE, IL | 372820 | 0883250 | 017 | 151 | SW | 1966 | | N | 42.90 | Y |
| 05140203 | SL1-21 | USGS | 03384455 | COPPEROUS BRANCH BELOW EDDYVILLE, IL | 372822 | 0883425 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-22 | USGS | 03384435 | MATTHIS BRANCH AT MOUTH NEAR EDDYVILLE, IL | 372912 | 0883216 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-23 | USGS | 03384430 | MATTHIS BRANCH NEAR EDDYVILLE, IL | 372918 | 0883221 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-24 | USGS | 03384420 | LUSK CREEK BL LITTLE LUSK CK NR EDDYVILLE, I | 372959 | 0883141 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140203 | SL1-25 | USGS | 03384400 | LUSK CREEK AB LITTLE LUSK CR NR EDDYVILLE, I | 373001 | 0883146 | 017 | 151 | SW | 1965 | 1965 | N | | |
| 05140204 | SL1-26 | USGS | 03382510 | EAGLE CREEK NEAR EQUALITY, IL | 373903 | 0882328 | 017 | 165 | SW | 1966 | | N | 8.51 | Y |
| 07140105 | SL1-27 | USGS | 05599640 | GREEN CREEK TRIB NEAR JONESBORO, IL | 372755 | 0891840 | 017 | 181 | SW | 1955 | | | .43 | |
| 07140106 | SL1-28 | IL004 | 1 | CRAB ORCHARD CREEK | 374150 | 0885930 | 017 | 199 | SW | 1972 | | | | |
| 07140106 | SL1-29 | IL004 | 2 | CRAB ORCHARD CREEK | 374210 | 0885750 | 017 | 199 | SW | 1972 | | | | |
| 07140106 | SL1-30 | USGS | 05598000 | CRAB ORCHARD LAKE NEAR CARTERVILLE, IL | 374246 | 0890332 | 017 | 199 | SW | 1951 | | Y | | |

| CODE NUMBER | STAGE (A) COMPLETE | STAGE (B) PEAK | STAGE (B) LOW | STAGE (C) STORAGE MEDIA | FLOW (D) COMPLETE | FLOW (B) PEAK | FLOW (B) LOW | FLOW (A) MISCELLANEOUS | FLOW (C) STORAGE MEDIA | VOLUME (E) TOTAL | VOLUME (E) CHANGE | VOLUME (C) STORAGE MEDIA | (F) TELEMETRY | (G) OTHER HYDROLOGIC DATA | (H) OTHER RELATED DATA | (I) DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL1-1 | E | E | | C | | E | 9 | | C | | | | | A578 | 6 | |
| SL1-2 | E | | E | P | E | | E | E | P | | | | | | | |
| SL1-3 | E | | | | | | | | | | | | | | | |
| SL1-4 | | E | | C | | E | | | C | | | | | 578 | 6 | |
| SL1-5 | E | 1 | | C | | 1 | | | C | | | | | 578 | 6 | |
| SL1-6 | E | 1 | | C | | 1 | | | C | | | | | | 6 | |
| SL1-7 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-8 | | | | | | | 9 | | P | | | | | | | |
| SL1-9 | E | E | | | 2 | E | | | C | | | | | | 6 | |
| SL1-10 | I | 1 | | C | 2 | 1 | 9 | | C | | | | | 578 | 6 | |
| SL1-11 | I | 1 | | C | 2 | 1 | 9 | | C | | | | | 67 | 6 | |
| SL1-12 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-13 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-14 | | 1 | | C | E | 1 | | | D | | | | | 67 | 6 | |
| SL1-15 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-16 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-17 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-18 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-19 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-20 | I | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| SL1-21 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-22 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-23 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-24 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-25 | E | E | E | | E | E | E | | | E | E | | | | | |
| SL1-26 | I | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |
| SL1-27 | Z | 1 | | C | | 1 | | | C | | | | | 578 | 6 | |
| SL1-28 | Y | | | | | 9 | | | | | | | | | 6 | |
| SL1-29 | Y | | | | | 9 | | | | | | | | | 6 | |
| SL1-30 | O | | | P | E | 9 | | | D | | | | | | 6 | |

* USE CODE TABLES (See right margin) Indicated by letter in () in column heading

# CODE TABLES

### TABLE (A)-COMPLETE STAGE and MISCELLANEOUS FLOW

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual (twice per year) |
| A | | 9 | Annual (once per year) |
| B | | | Other periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### TABLE (B)-STAGE and FLOW, PEAK or LOW

| Code | Meaning |
|---|---|
| 1 | Year-round |
| 2 | Seasonal |
| 8 | Annual maximum or minimum |
| 9 | Irregular |
| E | Eliminated activity |

### TABLE (C)-STORAGE MEDIA

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer,published,and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TABLE (D)-COMPLETE FLOW

| Code: Year-Round | Code: Seasonal | Meaning |
|---|---|---|
| 1 | 2 | Daily flow |
| 3 | 4 | Monthly flow determined |
| E | E | Eliminated activity |

### TABLE (E)-VOLUME

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Daily values | 9 | Irregular |
| 3 | Monthly values | E | Eliminated activity |

### TABLE (F)-TELEMETRY

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Telemeter-land lines | 5 | DARC |
| 2 | Telemeter-radio network | 6,8 | Other or type unspecified |
| 3 | Landsat | 7 | Two or more types |
| 4 | GOES | | |

### TABLE (G)-OTHER HYDROLOGIC DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | OW recurring | 7 | Flood frequency |
| 2 | OW nonrecurring | 8 | Coef. of roughness |
| 3 | Flood hydrograph | 9 | Time of travel |
| 4 | Sediment studies | A | Flood plain maps |
| 5 | Cross section | B | Tides |
| 6 | Flow duration | C | Surface inflow-outflow |

### TABLE (H)-OTHER RELATED DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Precipitation | 4 | Radiation (solar) |
| 2 | Wind | 5 | Soil moisture |
| 3 | Evaporation | 6 | Datum (mean sea level) |

### TABLE (I)-DATA BANK SOURCE

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA I: LISTING 2

Sources of surface-water-quality data in the Shawnee National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD YES NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA YES NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05140204 | SL2-1 | USFS | 080106 | SWIMMING BEACH S END POUNDS RES | 373643 | 0881615 | 017 | 059 | LK | 1974 | | | | |
| 05140204 | SL2-2 | USFS | 080105 | SWIMMING BEACH N END POUNDS RES | 373646 | 0881615 | 017 | 059 | LK | 1974 | | | | |
| | SL2-3 | USEPA | 170005 | OHIO R AT SHAWNEETOWN SR13 BRIDG | 373700 | 0881000 | 017 | 059 | SW | 1977 | 1977 | | | |
| 05140204 | SL2-4 | USFS | 082831 | EAGLE CK RT 1 BR AT GIBSONIA | 373839 | 0881553 | 017 | 059 | SW | 1975 | | | | |
| 05140204 | SL2-5 | ILOO1 | ATE 01 | EAGLE C RT 1 BR GIBSONIA | 373850 | 0881600 | 017 | 059 | SW | 1965 | | | | |
| 05140204 | SL2-6 | USFS | 082832 | EAGLE CK 6MI WEST GIBSONIA | 373912 | 0882224 | 017 | 059 | SW | 1975 | | | | |
| 05140204 | SL2-7 | ILOO1 | AT 04 | SALINE R RT 1 BR 3 MI S RT 13 | 374200 | 0881700 | 017 | 059 | SW | 1958 | | | | |
| 05140204 | SL2-8 | ILOO6 | 163139 | SALINE R RT-1BR 3MI SO OF RT-13 | 374213 | 0881715 | 017 | 059 | SW | 1958 | 1977 | N | | |
| 05140204 | SL2-9 | USGS | 03382450 | SALINE RIVER NEAR EQUALITY, IL | 374214 | 0881714 | 017 | 059 | SW | 1975 | | | | |
| 05140203 | SL2-10 | USFS | 082700 | BIG CREEK 4 MI N ELIZABETHTOWN | 372955 | 0881923 | 017 | 069 | SW | 1977 | | | | |
| 05140204 | SL2-11 | ILOO6 | 163138 | SALINE R AT SALINE LANDING | 373418 | 0880742 | 017 | 069 | SW | 1965 | 1977 | N | | |
| 05140204 | SL2-12 | ILOO1 | AT 02 | SALINE R OFF PIER A SALINE LANDING | 373420 | 0880740 | 017 | 069 | SW | 1965 | | | | |
| 07140106 | SL2-13 | USFS | 080207 | CEDAR BEACH S26 T10S RZW | 373702 | 0891730 | 017 | 077 | LK | 1975 | 1979 | | | |
| 07140106 | SL2-14 | USFS | 080209 | CEDAR BEACH NORTH | 373702 | 0891730 | 017 | 077 | LK | 1976 | 1979 | | | |
| 07140106 | SL2-15 | USFS | 080203 | CENTER OF SWIMMING AREA | 374742 | 0892625 | 017 | 077 | LK | 1974 | | | | |
| 07140106 | SL2-16 | USFS | 080208 | BUTTERMILK HILL BEACH NORTH | 374742 | 0892625 | 017 | 077 | LK | 1976 | | | | |
| | SL2-17 | USFS | 081201 | BUTTERMILK HILL TIMBER SALE CTRL | 374745 | 0892937 | 017 | 077 | SW | 1979 | | | | |
| 07140106 | SL2-18 | USFS | 081200 | BUTTERMILK HILL TIMBER SALE TMT | 374746 | 0892939 | 017 | 077 | SW | 1977 | | | | |
| 05140203 | SL2-19 | ILOO6 | 163132 | BIG BAY CK 8 MI SO OF GOLCONDA | 371719 | 0883230 | 017 | 151 | SW | 1959 | 1977 | N | | |
| 05140203 | SL2-20 | ILOO6 | 163133 | LUSK CK AT GDLCONDA RT-146 BR | 372216 | 0882918 | 017 | 151 | SW | 1959 | 1977 | N | | |
| 05140203 | SL2-21 | ILOO3 | 48846 | | 372425 | 0884025 | 017 | 151 | SW | 1961 | 1966 | N | | |
| 05140203 | SL2-22 | USFS | 080114 | GOLCONDA C C C | 372550 | 0882500 | 017 | 151 | LK | 1976 | | | | |
| 05140203 | SL2-23 | USGS | 03385000 | HAYES CREEK AT GLENDALE, IL | 372725 | 0884005 | 017 | 151 | SW | 1974 | 1975 | | 19.10 | |
| 05140203 | SL2-24 | ILOO6 | 163135 | B G PIERRE CK RT-146 BR W RT-34 | 372731 | 0883018 | 017 | 151 | SW | 1959 | 1977 | N | | |
| 05140203 | SL2-25 | ILOO6 | 163134 | LUSK CK 4MI SE OF EDDYVILLE | 372820 | 0883221 | 017 | 151 | SW | 1961 | | N | | |
| 05140203 | SL2-26 | USFS | 082502 | LUSK CREEK 4MI SE OF EDDYVILLE | 372820 | 0883221 | 017 | 151 | SW | 1975 | | | | |
| 05140203 | SL2-27 | USGS | 03384450 | LUSK CREEK NEAR EDDYVILLE, IL | 372820 | 0883250 | 017 | 151 | SW | 1974 | | | 42.90 | Y |
| 05140203 | SL2-28 | USFS | 082600 | BIG GRANDE PIERRE CREEK < | 372854 | 0882623 | 017 | 151 | SW | 1979 | | | | |
| 05140203 | SL2-29 | USFS | 082400 | BAY CREEK 4 MI N GLENDALE IL | 373104 | 0883936 | 017 | 151 | SW | 1977 | | | | |
| 05140204 | SL2-30 | USGS | 03382120 | LITTLE SALINE RIVER NEAR STONEFORT, IL | 373504 | 0884009 | 017 | 165 | SW | 1975 | 1975 | | | |
| 05140204 | SL2-31 | USFS | 082834 | EAGLE CK 9.0MI SW GIBSONIA | 373643 | 0882500 | 017 | 165 | SW | 1975 | | | | |
| 05140204 | SL2-32 | USFS | 082833 | EAGLE CK 6.2 MI N GIBSONIA | 373844 | 0882313 | 017 | 165 | SW | 1975 | | | | |
| 05140204 | SL2-33 | USGS | 03382510 | EAGLE CREEK NEAR EQUALITY, IL | 373903 | 0882328 | 017 | 165 | SW | 1974 | | | 8.51 | Y |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL: TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA | CHEMICAL: DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL2-1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-2 | A | | A | | | A | | D | | | | | | | | | | | | | | | | | | | | | |
| SL2-3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-4 | R | R | R | | | R | | D | | R | R | | | R | | R | | R | | | | | | | | | R | | D |
| SL2-5 | M | M | Q | | | Q | | D | M | Q | E | | M | | M | | Q | | | | | | | | E | | Q | | D |
| SL2-6 | K | K | K | | | K | | D | | K | K | | | K | | K | | K | | | | | | | | | K | | D |
| SL2-7 | M | M | Q | | | Q | | D | M | Q | E | | M | | M | | Q | | | | | | | | E | | Q | | D |
| SL2-8 | Q | Q | E | | | Q | K | D | R | R | 9 | | R | | | N | Q | R | E | | | R | | | E | E | Q | | D |
| SL2-9 | R | R | | | | R | | D | | R | | | | | | | | R | | | R | | | | | | R | R | D |
| SL2-10 | R | R | R | | | R | R | D | | R | | A | | R | R | R | | | | | | | | | | | R | | D |
| SL2-11 | Q | Q | E | | | Q | | D | 5 | 7 | E | | Q | | | 5 | E | Q | E | | | 7 | | | E | E | Q | | D |
| SL2-12 | M | M | Q | | | Q | | D | M | Q | E | | M | | M | | Q | | | | | | | | E | | Q | | D |
| SL2-13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-15 | | | | | | | | | | E | | E | | E | | E | | E | | | | | | | | | | | D |
| SL2-16 | | | A | | | A | | D | | | | | | | | | | | | | | | | | | | | | |
| SL2-17 | R | R | R | | | R | | D | | K | | | | R | R | R | | | | | | | | | | | | | D |
| SL2-18 | R | R | R | | | R | A | D | | K | | | | R | R | R | | A | | | | | | | | | | | D |
| SL2-19 | 5 | Q | E | | | 5 | | D | 5 | 7 | A | | Q | | | 5 | E | R | E | | | 7 | | | | E | 5 | | D |
| SL2-20 | A | K | E | | | A | | D | 6 | 7 | A | | A | | | 6 | E | R | E | | | 7 | | | | E | A | | D |
| SL2-21 | 7 | | 7 | | | | | D | R | 7 | 7 | 7 | | 7 | | 7 | | 7 | | | | | | | | | | | D |
| SL2-22 | A | A | A | | | A | | D | | A | | | | | | A | | A | | | | | | | | | | A | D |
| SL2-23 | N | | | | | | | D | | | | | | | | | | | | | | | | | | | | | |
| SL2-24 | A | Q | E | | | Q | | D | 5 | 7 | A | | Q | | | 5 | E | R | E | | | 7 | | | | E | Q | | D |
| SL2-25 | K | | E | | | K | | D | N | R | A | | K | | | N | | R | E | | | R | | | | E | K | | D |
| SL2-26 | R | R | R | | | R | R | D | | R | A | | | R | R | R | | R | | | | | | | | | R | | D |
| SL2-27 | Q | | | | | | K | D | | N | | | | | N | K | | N | | | | K | | | | K | N | | D |
| SL2-28 | R | R | R | | | R | R | D | | R | | | | R | R | R | | | | | | | | | | | R | | D |
| SL2-29 | N | N | N | | | N | N | D | | N | A | | | N | N | N | | | | | | | | | | | N | | D |
| SL2-30 | A | A | | | | A | | D | | A | | | | | | | | A | | | A | A | | | | | A | A | D |
| SL2-31 | K | K | K | | | R | K | D | | K | K | | | K | K | K | | K | | | | | | | | | K | | D |
| SL2-32 | K | K | K | | | K | | D | | K | K | | | K | R | K | | K | | | | | | | | | A | | D |
| SL2-33 | Q | | | | | | | D | | A | | | | | | | | A | | | | | | | | | | A | D |

| CODE NUMBER | BIOLOGIC: ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA | SEDIMENT: BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA | OTHER: TELEMETRY | S W STATION VIVES NINO | G W STATION VIVES NINO | DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL2-1 | R | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-2 | R | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-5 | Q | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-7 | Q | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-8 | Q | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-10 | K | | | | | | | | | | | | | | | | | | | | D | | A | | | | | | D | | | | |
| SL2-11 | 5 | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-12 | Q | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-13 | K | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-14 | K | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-15 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-16 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-18 | | | | | | | | | | | | | | | | | | | | | | | N | | | | | | D | | | | |
| SL2-19 | 5 | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-20 | 6 | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-22 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-24 | 5 | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-25 | N | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-26 | K | | | | | | | | | | | | | | | | | | | | D | | K | | | | | | D | | | | |
| SL2-27 | K | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-28 | K | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-29 | N | | | | | | | | | | | | | | | | | | | | D | | A | | | | | | D | | | | |
| SL2-30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL2-31 | K | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-32 | A | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| SL2-33 | | | | | | | | | | | | | | | | | | | | | | | A | A | | | A | | D | | | | |

## PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD Y-YES N-NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y-YES N-NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07140105 | SL2-34 | USFS | 082100 | HUTCHINS CK 10 MI NW JONESBORO | 373400 | 0892547 | 017 | 181 | SW | 1977 | | | | |
| 07140106 | SL2-35 | USEPA | 171203 | CRAB ORCHARD LAKE | 374145 | 0890220 | 017 | 199 | LK | 1973 | 1973 | | | |
| 07140106 | SL2-36 | IL003 | 48820 | | 374244 | 0890329 | 017 | 199 | SW | 1951 | 1956 | N | | |
| 07140106 | SL2-37 | USGS | 05598050 | CRAB ORCHARD C BL CRAB ORCHARD LK NR CARTERV | 374251 | 0890904 | 017 | 199 | SW | 1978 | | | 201.00 | N |
| 07140106 | SL2-38 | USEPA | 171202 | CRAB ORCHARD LAKE | 374310 | 0890525 | 017 | 199 | LK | 1973 | 1973 | | | |
| 07140106 | SL2-39 | USEPA | 171201 | CRAB ORCHARD LAKE | 374350 | 0890830 | 017 | 199 | LK | 1973 | 1973 | | | |

## TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL: Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media | CHEMICAL: Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL2-34 | N | N | N | | | N | N | D | | N | A | | | N | N | N | | A | | | | | | | | | N | | D |
| SL2-35 | R | R | R | | | R | | D | | R | | | R | R | R | R | | | | | | | | | | | R | | D |
| SL2-36 | E | | E | | | | | D | | E | E | | | | | | | E | | | | | | | | | | | D |
| SL2-37 | K | K | | | | K | K | D | | K | | | K | | A | K | | K | | | | | | | | K | K | | D |
| SL2-38 | R | R | R | | | R | | D | | R | | | R | R | R | R | | | | | | | | | | | R | | D |
| SL2-39 | R | R | R | | | R | | D | | R | | | R | R | R | R | | | | | | | | | | | R | | D |

| CODE NUMBER | BIOLOGIC: Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL2-34 | N | | | | | | | | | | | | | | | | | | | | D |
| SL2-35 | | | R | | | | | | | | | | | | | | | | | | D |
| SL2-36 | | | | | | | | | | | | | | | | | | | | | |
| SL2-37 | K | | | | | | | | | | | | | | | | | | | | D |
| SL2-38 | | | R | | | | | | | | | | | | | | | | | | D |
| SL2-39 | | | R | | | | | | | | | | | | | | | | | | D |

| CODE NUMBER | SEDIMENT: Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | OTHER: Telemetry | S W Station [illegible] | G W Station [illegible] | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL2-34 | | R | | | | | | D | | | | |
| SL2-35 | | | | | | | | | | | | |
| SL2-36 | | | | | | | | | | | | |
| SL2-37 | | | | | | | | | | | | |
| SL2-38 | | | | | | | | | | | | |
| SL2-39 | | | | | | | | | | | | |

### PARAMETER FREQUENCY CODES

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

### DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

## SUPPLEMENTAL DATA I: LISTING 3

Sources of ground-water-quality data in the Shawnee National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD Y=YES N=NO | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA Y=YES N=NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05140204 | SL3-1 | USFS | 080103 | PUMP AT SITE OF H.KNOB TOWER | 373621 | 0881908 | 017 | 059 | GW | 1974 | | | | |
| 05140204 | SL3-2 | USFS | 080109 | HAND PUMP ON DRILLED WELL AT ENT | 373636 | 0881643 | 017 | 059 | GW | 1974 | | | | |
| 05140204 | SL3-3 | USFS | 080107 | DRINKING WATER AT BOAT RENTAL | 373703 | 0881615 | 017 | 059 | GW | 1974 | | | | |
| 05140204 | SL3-4 | USFS | 080108 | DRINKING WATER AT CAMP GROUND | 373703 | 0881603 | 017 | 059 | GW | 1974 | | | | |
| | SL3-5 | USFS | 080113 | HAND PUMP AT PIC AREA | 372733 | 0881340 | 017 | 069 | GW | 1974 | | | | |
| 05140203 | SL3-6 | USFS | 080111 | HAND PUMP NEXT TO FURNACE | 372957 | 0881948 | 017 | 069 | GW | 1974 | | | | |
| 05140203 | SL3-7 | USFS | 080110 | OF ROUTINE BACTEE MONITORING OF | 373307 | 0881946 | 017 | 069 | GW | 1974 | | | | |
| 05140204 | SL3-8 | USFS | 080104 | PUMP AT WESTERN EDGE OF CGROUND | 373424 | 0881418 | 017 | 069 | GW | 1974 | | | | |
| 07140106 | SL3-9 | USFS | 080205 | TURKEY BAYOU OVERFLOW S2 T10SR3W | 374037 | 0892446 | 017 | 077 | GW | 1975 | 1975 | | | |
| 07140106 | SL3-10 | USFS | 080202 | HAND PUMP IN CAMPING AREA | 374042 | 0892748 | 017 | 077 | GW | 1974 | | | | |
| 07140106 | SL3-11 | USFS | 080206 | GUM RIDGE S23 T8S RAW, SW AVA IL | 374926 | 0893050 | 017 | 077 | GW | 1975 | | | | |
| 05140204 | SL3-12 | USFS | 080401 | | 373441 | 0885323 | 017 | 087 | GW | 1979 | | | | |
| 05140204 | SL3-13 | USFS | 080402 | HAND PUMP ON STORAGE TANK | 373441 | 0885324 | 017 | 087 | GW | 1974 | | | | |
| 05140204 | SL3-14 | USFS | 080403 | HAND PUMP ON STORAGE TANK | 373454 | 0885315 | 017 | 087 | GW | 1974 | | N | | |
| 05140203 | SL3-15 | USFS | 080409 | HAND PUMP OVER STORAGE TANK | 372228 | 0882915 | 017 | 151 | GW | 1974 | | | | |
| 05140203 | SL3-16 | USFS | 081410 | | 372436 | 0883953 | 017 | 151 | GW | 1979 | | | | |
| 05140203 | SL3-17 | USFS | 081412 | | 372436 | 0883953 | 017 | 151 | GW | 1979 | | | | |
| 05140203 | SL3-18 | USFS | 081414 | | 372436 | 0883953 | 017 | 151 | GW | 1979 | | | | |
| 05140203 | SL3-19 | USFS | 081401 | | 372454 | 0883947 | 017 | 151 | GW | 1979 | | | | |
| 05140203 | SL3-20 | USFS | 081402 | | 372454 | 0883947 | 017 | 151 | GW | 1979 | | | | |
| 05140203 | SL3-21 | USFS | 081403 | | 372454 | 0883947 | 017 | 151 | GW | 1979 | | | | |
| 05140203 | SL3-22 | USFS | 081404 | | 372454 | 0883947 | 017 | 151 | GW | 1979 | | | | |
| 05140203 | SL3-23 | USFS | 081405 | | 372454 | 0883947 | 017 | 151 | GW | 1979 | | | | |
| 05140203 | SL3-24 | USFS | 080406 | HAND PUMP OVER STORAGE TANK | 373118 | 0883923 | 017 | 151 | GW | 1974 | | | | |
| 05140203 | SL3-25 | USFS | 080407 | HAND PUMP OVER STORAGE TANK | 373118 | 0883923 | 017 | 151 | GW | 1974 | | | | |
| 05140203 | SL3-26 | USFS | 080408 | HAND PUMP OVER STORAGE TANK | 373237 | 0883827 | 017 | 151 | GW | 1974 | | | | |
| 05140204 | SL3-27 | USFS | 080101 | | 373636 | 0882304 | 017 | 165 | GW | 1979 | | | | |
| 05140204 | SL3-28 | USFS | 080102 | PUMP AT PHAROAH PICNIC GAROFGODS | 373636 | 0882303 | 017 | 165 | GW | 1974 | | | | |
| 07140105 | SL3-29 | USFS | 080301 | HAND PUMP IN CAMPGROUND | 373036 | 0892510 | 017 | 181 | GW | 1974 | | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL: Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media | CHEMICAL: Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL3-1 | E | E | E | | | E | | D | | E | | | | | | E | | E | | | | | | | | | | | D |
| SL3-2 | E | E | E | | | E | | D | | E | | | | | | E | | A | | | | | | | | | | | D |
| SL3-3 | A | A | A | | | A | | D | | A | | | | | | A | | A | | | | | | | | | | N | D |
| SL3-4 | E | E | E | | | E | | D | | E | | | | | | E | | E | | | | | | | | | | A | D |
| SL3-5 | E | E | E | | | E | | D | | E | | | | | | E | | E | | | | | | | | | | A | D |
| SL3-6 | A | A | A | | | A | | D | | A | | | | | | A | | R | | | | | | | | | | | D |
| SL3-7 | E | E | E | | | E | | D | | E | | | | | | E | | E | | | | | | | | | | A | D |
| SL3-8 | E | E | E | | | E | | D | | E | | | | | | E | | A | | | | | | | | | | | D |
| SL3-9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL3-10 | E | E | | | | E | | D | | E | | | | E | E | E | | R | | | | | | | | | | | D |
| SL3-11 | | | | | | | | | | | | | | | | | | | | | | | A | | | | | R | D |
| SL3-12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | D |
| SL3-13 | E | E | E | | | E | | D | | E | | | | | | E | | E | | | | | A | | | | | | D |
| SL3-14 | A | A | A | | | A | | D | | A | | | | | | A | | A | | | | | | | | | | A | D |
| SL3-15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | K | D |
| SL3-16 | A | A | | | | A | | D | | | | | | A | | A | | | | | | | | | | | | | D |
| SL3-17 | A | A | | | | A | | D | | | | | | A | | A | | | | | | | | | | | | | D |
| SL3-18 | A | A | | | | A | | D | | | | | | A | | A | | | | | | | | | | | | | D |
| SL3-19 | R | R | | | | R | | D | | | | | | R | | R | | | | | | | | | | | | | D |
| SL3-20 | R | R | | | | R | | D | | | | | | R | | R | | | | | | | | | | | | | D |
| SL3-21 | R | R | | | | R | | D | | | | | | R | | R | | | | | | | | | | | | | D |
| SL3-22 | A | A | | | | A | | D | | | | | | A | | A | | | | | | | | | | | | | D |
| SL3-23 | A | A | | | | A | | D | | | | | | A | | A | | | | | | | | | | | | | D |
| SL3-24 | E | E | E | | | E | | D | | E | | | | | | E | | E | | | | | | | | | | | D |
| SL3-25 | | | | | | | | | | | | | | | | | | | | | | | A | | | | | A | D |
| SL3-26 | E | E | E | | | E | | D | | E | | | | | | E | | E | | | | | | | | | | | D |
| SL3-27 | A | | | | | A | | D | | A | | | | | | | | A | | | | | | | | | | R | D |
| SL3-28 | E | E | E | | | E | | D | | E | | | | | | E | | E | | | | | | | | | | A | D |
| SL3-29 | A | E | E | | | A | | D | | E | | | | | | E | | R | | | | | A | | | | | | D |

| CODE NUMBER | BIOLOGIC: Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL3-1 | K | | | | | | | | | | | | | | | | | | | | D |
| SL3-2 | K | | | | | | | | | | | | | | | | | | | | D |
| SL3-3 | A | | | | | | | | | | | | | | | | | | | | D |
| SL3-4 | K | | | | | | | | | | | | | | | | | | | | D |
| SL3-5 | N | | | | | | | | | | | | | | | | | | | | D |
| SL3-6 | N | | | | | | | | | | | | | | | | | | | | D |
| SL3-7 | K | | | | | | | | | | | | | | | | | | | | D |
| SL3-8 | Q | | | | | | | | | | | | | | | | | | | | D |
| SL3-9 | R | | | | | | | | | | | | | | | | | | | | D |
| SL3-10 | K | | | | | | | | | | | | | | | | | | | | D |
| SL3-11 | A | | | | | | | | | | | | | | | | | | | | D |
| SL3-12 | R | | | | | | | | | | | | | | | | | | | | D |
| SL3-13 | K | | | | | | | | | | | | | | | | | | | | D |
| SL3-14 | S | | | | | | | | | | | | | | | | | | | | D |
| SL3-15 | R | | | | | | | | | | | | | | | | | | | | D |
| SL3-16 | | | | | | | | | | | | | | | | | | | | | |
| SL3-17 | | | | | | | | | | | | | | | | | | | | | |
| SL3-18 | | | | | | | | | | | | | | | | | | | | | |
| SL3-19 | | | | | | | | | | | | | | | | | | | | | |
| SL3-20 | | | | | | | | | | | | | | | | | | | | | |
| SL3-21 | | | | | | | | | | | | | | | | | | | | | |
| SL3-22 | | | | | | | | | | | | | | | | | | | | | |
| SL3-23 | | | | | | | | | | | | | | | | | | | | | |
| SL3-24 | A | | | | | | | | | | | | | | | | | | | | D |
| SL3-25 | N | | | | | | | | | | | | | | | | | | | | D |
| SL3-26 | K | | | | | | | | | | | | | | | | | | | | D |
| SL3-27 | R | | | | | | | | | | | | | | | | | | | | D |
| SL3-28 | K | | | | | | | | | | | | | | | | | | | | D |
| SL3-29 | K | | | | | | | | | | | | | | | | | | | | D |

| CODE NUMBER | SEDIMENT: Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | OTHER: Telemetry | S W Station Waves Wind | G W Station Waves Wind | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL3-1 | | | | | | | | | | | | |
| SL3-2 | | | | | | | | | | | | |
| SL3-3 | | | | | | | | | | | | |
| SL3-4 | | | | | | | | | | | | |
| SL3-5 | | | | | | | | | | | | |
| SL3-6 | | | | | | | | | | | | |
| SL3-7 | | | | | | | | | | | | |
| SL3-8 | | | | | | | | | | | | |
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| SL3-10 | | | | | | | | | | | | |
| SL3-11 | | | | | | | | | | | | |
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| SL3-20 | | | | | | | | | | | | |
| SL3-21 | | | | | | | | | | | | |
| SL3-22 | | | | | | | | | | | | |
| SL3-23 | | | | | | | | | | | | |
| SL3-24 | | | | | | | | | | | | |
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| SL3-26 | | | | | | | | | | | | |
| SL3-27 | | | | | | | | | | | | |
| SL3-28 | | | | | | | | | | | | |
| SL3-29 | | | | | | | | | | | | |

## PARAMETER FREQUENCY CODES

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | *Annual* |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA J

Annotated bibliography of investigations pertinent to coal mining and water resources in the Shawnee National Forest study area.

SUPPLEMENTAL DATA J: SUMMARY 1

Annotated bibliography of hydrologic studies performed in small areas of the Shawnee National Forest area.

REFERENCE CODE: S/S1-1

TITLE: Characterization of Runoff from Strip Mined Lands.

STARTING DATE: January 1975.

COMPLETION DATE: September 1980.

GEOGRAPHICAL AREA: Selected small basins in Illinois (one basin is in study area).

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
One objective of this project was to determine the differences in stream runoff caused by strip mining. Hydrologic flow statistics such as peak flows, flood flows at various recurrence intervals and sustained flows for various periods and recurrence intervals should differ according to the percent of strip mined land within a drainage basin. A second objective of the project was to define chemical concentrations and loads contributed to surface runoff by strip mined areas and non-strip mined areas. These loads were then compared based on percent of strip mined land and non-strip mined land within each basin.

Six monitoring stations (two located in the study area) are located within the strip mining areas in Illinois. All monitoring sites located on streams with small drainage areas (less than 15 square miles). Three of the monitoring sites were chosen such that a large portion of the drainage basin above the site had been mined. The remaining three sites were selected so as to reflect natural conditions. Each of the six sites were instrumented to measure streamflow, precipitation, specific conductance, and water temperature. Suspended sediment and water samples were collected on a monthly frequency and during storm events to define chemical changes.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Brabets, T. P., Runoff characteristics from strip mined lands in Illinois: U.S. Geological Survey Water Resources Investigation, Open-File Report.

AVAILABLE FROM:
U.S. Geological Survey
Urbana, Illinois 61801

REFERENCE CODE: S/S1-2

TITLE: Southern Illinois Mine Waste Control Plan--A Summary.

GEOGRAPHICAL AREA: Big Muddy and Saline River basins.

AREAL EXTENT: 300 $mi^2$

REFERENCE CODE: S/S1-2--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The results of a 2-year study aimed at assessing the 300 sq. mi. acid mine drainage impacted area within southern Illinois are summarized. Study program elements included the following activities: inventorying all mine waste sources within the Big Buddy and Saline River basins; conducting a long-term sampling and flow gaging program to provide water-quality data throughout the two watersheds; and developing a computer-based simulation model of the two river systems to allow for assessment of water quality for both present and future projected conditions as assessment of reclamation and mine waste control feasibility throughout the area. (Water Resources Abstracts)

PUBLISHED REPORTS AND(OR) ARTICLES:
Pisano, W. C., and Aronson, G. L., 1980, Southern Illinois mine waste control plan--a summary: American Society of Civil Engineers, Environmental Engineering Division Journal 106 (EE1), pp. 55-68.

REFERENCE CODE: S/S1-3

TITLE: Biological Investigation of the Crab Orchard Creek Basin.

STARTING DATE: Summer 1975.

GEOGRAPHICAL AREA: Williamson and Jackson Counties, Illinois.

AREAL EXTENT: $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A biological investigation of Crab Orchard Creek watershed in Williamson and Jackson Counties, Illinois was conducted during summer, 1975, at 70 stream locations. Fifteen locations in Crab Orchard Lake were sampled for benthic macroinvertebrates and toxic materials in bottom sediments. Water quality in the basin largely reflected existing land use patterns and population centers. Good water quality was generally found in streams in the southern part of the basin where Crab Orchard National Wildlife Refuge and Shawnee National Forest form a significant part of the watershed. Major degradation of streams occurred near the cities of Marion, Carterville, and Carbondale where point discharges exist and in sections of the watershed where coal mining takes place. (Adapted from the author's summary)

PUBLISHED REPORTS AND(OR) ARTICLES:
Hite, R. L., and King, Marvin, 1977, Biological investigation of the Crab Orchard Creek basin-summer, 1975: Illinois Environmental Protection Agency, Division of Water Pollution Control, 141 p.

REFERENCE CODE: S/S1-4

TITLE: Reclamation of Orphan Strip Mined Land in Southern Illinois and Western Kentucky.

GEOGRAPHICAL AREA: Williamson County, Illinois.

AREAL EXTENT: 0.3 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The Palzo Project is a 192-acre, surface-mined area which discharges acid drainage. It is being reclaimed by using sewage sludge as a spoil amendment and then revegetating. Water quality in the creek that drains the area was monitored at seven sampling stations by both chemical and biological analyses. Various biological diversity indexes used as indications of pollution are discussed and evaluated and found to be misleading. In Kentucky, the Clear Creek Swamp area has been caused by the filling of stream channels by erosion from farm lands. Some parts of the swamp are affected by acid drainage from mining in the watershed. Both water quality and biota of the swamp were studied. (Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Leuthart, C. A., 1975, Reclamation of orphan strip mined land in southern Illinois and western Kentucky, a field study of the Palzo Project of Willaimson County, Illinois and the Clear Creek Swamp of Webster and Hopkins Counties, Kentucky: Ph.D. Thesis, University of Louisville, University Microfilms 75-25, 471, 225 p.

REFERENCE CODE: S/S1-5

TITLE: Effects of Stripmine Wastes on the Ecology of the South Fork of the Saline River.

GEOGRAPHICAL AREA: Saline and Gallatin Counties, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Biotic and abiotic aspects of the South Fork of the Saline River, Saline and Gallatin Counties, Illinois, were studied from June, 1968 to March, 1971. The water clarity in the unaffected reaches could be described as murky (90 percent of tubidity determinations were above 50 JTU's). Affected stations generally had clearer water (30 percent of turbidity determinations were below 50 JTU's). Dissolved oxygen was highest in winter and tended to average 85 to 100 percent saturation during this period. Alkalinity was highest during summer and fall months when discharge was low. pH was highest in the upstream stations and reached low levels (2.9-2.7) downstream. Iron and manganese were high at downstream stations. Sulfate levels were high at all stations receiving drainage from mining areas. Iron was determined not to be a reliable detection parameter in tracing mine drainage. Sulfate proved to be a useful evaluation tool in determining if a drainage system was receiving mine drainage. Manganese was a

REFERENCE CODE: S/S1-5--Continued.

better evaluation tool than iron. Vascular aquatic plants, algae, zooplankton, benthic macroinvertebrates, fish, and vertebrates other than fishes were sampled and are discussed. It was concluded that acid mine drainage resulted in a lowering of pH and an increase in acidity, sulfate, iron, and manganese and also that acid mine drainage sufficient to destroy the buffering capacity (alkalinity) of the stream resulted in a great reduction of number and species of organisms. Minor amounts of acid mine drainage had no discernable effect on stream populations, although there was a tendency to depress pH and increase sulfate and manganese. (Adapted from author's summary)

PUBLISHED REPORTS AND(OR) ARTICLES:

Rosso, W. A., 1975, Effects of stripmine wastes on the ecology of the South Fork of the SAline River: Ph.D Dissertation, Southern Illinois University at Carbondale, Department of Zoology, Carbondale, IL 62901, 134 pp.

REFERENCE CODE: S/S1-6

TITLE: Physico-Chemical Characteristics of Ponds in Pyatt, Desoto, and Elkville Strip Mined Areas in Southern Illinois.

GEOGRAPHICAL AREA: Jackson and Perry Counties, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

The ponds were studied both in winter and in summer. Among the findings were that there was high concentration of dissolved oxygen in the thermocline, pH values ranged from 3 to 8, and specific conductance was high. Not all ponds supported fish. In the ponds where fish lived, green sunfish, bluegill, and largemouth bass were the most common species. (Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:

Lewis, W. M., and Peters, C., 1954, Physico-chemical characteristics of ponds in the Pyatt, Desoto, and Elkville strip mined areas of southern Illinois: Trans. of the American Fisheries Society 84, pp. 117-124.

SUPPLEMENTAL DATA J: SUMMARY 2

Annotated bibliography of studies concerned with the influence of coal mining on the water resources of any small areas in Illinois.

REFERENCE CODE: S/S2-1

TITLE: Hydrologic Effects of Storing Liquified Sludge in Strip-Mined Land.

STARTING DATE: October 1978.

COMPLETION DATE: September 1980.

GEOGRAPHICAL AREA: Fulton County, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The objective of this project was to construct a mathematical model simulating direction of flow, rate of ground-water movement, and rate of solute transport and/or attenuation.

Approximately 20 monitoring wells will be drilled to bedrock for water levels and water-quality samples. Aquifer properties will be estimated using the results of slug tests, pumping tests, and laboratory analyses of material of any contaminants. Changes in quality with distance from the lagoons will be used to estimate time-of-travel and attenuation. A mathematical model of the ground-water flow system will be constructed. Predictive simulations will then be done under various assumed operational conditions to estimate future effects of the sludge lagoons on local hydrologic conditions.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Patterson, G. L., Hydrologic effects of storing liquified sludge in strip-mined land: U.S. Geological Survey Water Resources Investigation, Open-File Report.

AVAILABLE FROM:
U.S. Geological Survey
Urbana, Illinois 61801

REFERENCE CODE: S/S2-2

TITLE: Hydrology of Surface Coal Mines in Illinois.

GEOGRAPHICAL AREA: Three abandoned surface mines throughout the State.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The impact of surface coal mining on ground water in Illinois is being investigated in a long-term study designed to characterize and compare mine spoil and unmined overburden, to determine pre- and post-mining ground-water conditions, and to develop a methodology for assessing the potential hydrogeologic impact of future surface mining. Because ground-water conditions vary in different types of spoil materials, three abandoned surface mines are currently being monitored. All three sites were mined during the 1940's.

REFERENCE CODE: S/S2-2--Continued.

The first site is near Ottawa in La Salle County. Before it was mined, the site was underlain largely by shale beneath a thin cover of glacial till. The spoil resulting from mining is 30 to 45 feet thick. The static ground-water level is at or near the base of the spoil; no lakes have formed in the spoil.

The predominant overburden material at the second mine, near Coal City in Grundy County, was aeolian sand. The spoil, primarily sand, is 40 to 60 feet thick, and contains several lakes. Ground-water and lake levels are comparable, indicating a connection between surface water and ground water.

At the third site, near Harrisburg in southern Illinois, the premining overburden consisted of 45 to 50 feet of sand and lacustrine silts and clays overlying 10 to 20 feet of limestone and shale. Water levels in wells suggest hydraulic continuity of ground water with a nearby final-cut lake. (Author's abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:

Lindorff, D. E., 1980, Hydrogeology of surface coal mines in Illinois: Symposium of Surface Mining Hydrology, Sedimentology, and Reclamation, Lexington, Kentucky, Proceedings, p. 33-40.

REFERENCE CODE: S/S2-3

TITLE: Groundwater Leaching of Pyritic Coal Mine Spoils and the Effects on Water Resources.

STARTING DATE: October 1979.

COMPLETION DATE: September 1980.

GEOGRAPHICAL AREA: Grundy County, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

The objective was to determine mechanisms of leaching and groundwater transport of contaminants from spoil material at Goose Lake (Grundy County), Illinois; assess the nature and magnitude of adverse impacts caused by groundwater transport; and provide information on groundwater systems in mined areas, monitoring design and reclamation methods effective in controlling hydrology and quality of groundwater resources.

The approach was to use ceramic-cup soil water samplers, installed in the unsaturated spoil, to collect water at various depths as it percolates through the spoil to determine effectiveness of reclamation in controlling subsurface pyrite oxidation and leaching. Characterize hydrology and chemistry of groundwater flow system within the spoil material, assess hydrologic relationships between ponds and groundwater in spoil, and determine potential problems of pond reclamation due to subsurface flow of acidic water into ponds. Monthly measurement, pumping tests and barometric efficiency tests, seasonal collections and analysis, collection of spoil samples, rain gage monitoring of precipitation, and evaporation pans will be employed.

REFERENCE CODE: S/S2-3--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:

Schubert, J. P., and Prodan, P., about 1980, Groundwater leaching of pyritic coal mine spoils and the effects on water resources: Performing organization-Southern Illinois University, Carbondale Campus, Graduate School, Cardondale, IL 62901; Sponsoring organization-U.S. Dept. of Interior, Office of Surface Mining Reclamation and Enforcement, Washington, D.C.

REFERENCE CODE: S/S2-4

TITLE: Suitability of Dredged Material for Reclamation of Surface-Mined Land, Final Report.

GEOGRAPHICAL AREA: La Salle County, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:

Eroding ridges of acidic coal-mine spoil in La Salle County, Illinois, were leveled to form a gently-sloped raised plateau. Four test plots were constructed: a control plot and three treatment plots that received a 0.9-m-thick cover of dredged material obtained from the Metropolitan Sanitary District of Greater Chicago. Two treatment plots received lime applications and all plots were seeded with a mixture of grasses. Pressure-vaccum soil water samplers were installed, in duplicate, at two levels in the control plot and at three levels in each treatment plot. The three levels in the treatment plots coincided with dredged material, the dredged-material mine-spoil interface, and the underlying mine spoil. Surface water, soil water, and ground water were monitored for 29 water-quality parameters for one year. Rainfall, air temperature, runoff, and water-level elevation data were collected also. Detailed analysis of the data indicates that the dredged material used in the study does not adversely affect water quality; it supports abundent plant growth, lessens groundwater contamination, and controls acid runoff. The dredged material is judged to be a suitable material for use in reclamation of surface-mined land. (NTIS abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:

Harrison, W., and Van Luik, A., 1979, Suitabioity of dredged material for reclamation of surface-mined land, final report: Argonne National Laboratory, Illinois; Department of Energy, Washington, D.C., 138 p.

AVAILABLE FROM:

National Technical Information Service
Springfield, Virginia 22161
NTIS No. ANL/ES-73

REFERENCE CODE: S/S2-5

TITLE: Characterization of Three Acid Strip Mine Lakes in Gundy County, Illinois.

GEOGRAPHICAL AREA: Gundy County, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Three small lakes with acid water and one with circumneutral water at an abandoned strip mine site were characterized to identify factors limiting biological productivity. Dissolved oxygen, specific conductance, and temperature profiles were determined. Water samples were analyzed for 23 parameters and the lakes were examined for the presence of aquatic vascular plants and benthic inhabitants. The acid lakes ranged from 2.2 to 6.7 acres in surface area and from 3.1 m to 6.7 m in maximum depth. The mean pH of the acid lakes ranged from 3.1 to 3.9. Chemicals found at concentrations higher than Illinois surface water standards or federal criteria for the protection of aquatic life included Cd, Cu, Fe, Mn, $SO_4$, and Zn. A number of these chemicals were at sufficiently high concentrations to limit the survival and productivity of most aquatic fauna. The lake with the poorest water quality had the least diversity of aquatic vascular plants and benthic invertebrates, while the circumneutral lake had the greatest diversity of species. (NTIS abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Master, W. A., 1979, Characterization of three acid strip mine lakes in Gundy County, Illinois: Argonne National Lab., IL, Department of Energy, 69 p.

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22161

REFERENCE CODE: S/S2-6

TITLE: Black Water and Two Peculiar Types of Stratification in an Organically Loaded Strip-Mine Lake.

GEOGRAPHICAL AREA: Jackson County, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
During the summer of 1969, weekly water samples were taken from a lake near DeSoto, Jackson County, Illinois, to investigate the cause and distribution of black water. Along with a thermal stratification, two types of chemical stratification, due to the presence of ferrous sulfide, were observed. It was suggested that the one type of chemical stratification, produced by the process of photosynthesis and the reduction of sulfate, be employed to improve the water quality of strip-mine lakes. (Gleason, 1980)

PUBLISHED REPORTS AND(OR) ARTICLES:
Stahl, J. B., 1979, Black water and two peculiar types of stratification in an organically loaded strip-mine lake: Water Research 13 (5), pp. 467-471.

REFERENCE CODE: S/S2-7

TITLE: Multidisciplinary Approach to Reclamation of Abandoned Refuse Sites.

GEOGRAPHICAL AREA: Site in southwestern Illinois.

AREAL EXTENT: 0.05 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The Staunton 1 Reclamation Demonstration Project involves an evaluation of the reclamation process at an abandoned coal mine refuse site in southwestern Illinois. A multidisciplinary team of scientists and engineers selected the site, collected baseline environmental data, determined the final lane use, and developed and implemented detailed engineering plans. Refuse material at the 34-acre site was recontoured and covered to a minimum depth of one foot with soil obtained on-site. This same multidisciplinary approach is being used to evaluate post-construction environmental conditions at the site. Current investigations are monitoring conditions related to groundwater, surface water, aquatic ecosystems, revegetation, soils, erosion and runoff, soil microbial populations, and wildlife invastion. Information collected to date indicates that a significant improvement has occurred in the environmental quality of the site. The economic potential of the site is also being investigated and documented; a substantial increase in the economic potential of the site and adjacent properties has been recorded. The project is demonstrating methods that can be used to reclaim abandoned coal refuse sites and is providing design for future reclamation efforts of this type. (NTIS abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Zellmer, S., and Wilkey, M., 1979, Multidisciplinary approach to reclamation of abandoned refuse sites: Coal Conference and Expo V, Louisville, Kentucky, 23 Oct. 1979, 13 p.

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22161

REFERENCE CODE: S/S2-8

TITLE: Modeling Hydrologic Characteristics of Strip Mines.

STARTING DATE: October 1979.

GEOGRAPHICAL AREA: Two small basins in central and southern Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The objective of this study is to document the effects of strip mining and subsequent reclamation on the hydrology of a small basin and to develop models that could simulate those effects.

Two small basins (5 square miles or less), in which a high degree of mining activity is planned, will be selected, one each in the major coal mining regions of western and southern Illinois. Hydrologic data will be collected before, during, and after mining, documenting surface-water diversions; ground-water flow systems; and surface- and ground-water quality. The Distributed Routing Rainfall-Runoff Model and the quality component of the model will be utilized to simulate the quantity and quality of streamflow throughout the strip-mining process. The Finite-Difference Model for Aquifer Simulation in Two Dimensions will be used to simulate ground-water flow into and/or through the mine-disturbed area.

CONDUCTED BY:
U.S. Geological Survey
Urbana, Illinois 61801

REFERENCE CODE: S/S2-9

TITLE: Monitoring Hydrologic Effects of Strip-Mine Reclamation.

STARTING DATE: October 1978.

GEOGRAPHICAL AREA: Fulton County, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The objective of this project is to monitor the quantity, quality, and sediment transport of streams draining the area of strip-mine land being reclaimed.

Four existing gaging stations in the project area will be used to measure quantity of runoff. Two stations on Big Creek, one above and one below the project area, will be used to measure the overall effect of the project on streams in the area. Water quantity, quality, and sediment transport will be measured at these stations. Evelyn Branch, a tributary to Big Creek between the two above stations, will be used to directly measure quantity and quality of a large part of the area. Slug Run, another tributary to Big Creek, will be monitored for quantity, quality, and sediment transport. Samples for chemical analyses will be collected monthly at all sites. Specific conductance and temperature will be recorded at all sites. Samples of the sludge and bottom materials at all sites will be analyzed annually.

CONDUCTED BY:
U.S. Geological Survey
Urbana, Illinois 61801

REFERENCE CODE: S/S2-10

TITLE: Monitoring the Effects of Coal Refuse Disposal and Reclamation on the Water Quality in Southeastern Illinois.

GEOGRAPHICAL AREA: Near Staunton, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
To assess water-quality problems created by an abandoned and unreclaimed coal refuse disposal area, a site near Staunton, Ill., was monitored. Dissolved metals, low pH, high concentrations of acidity, and sulfate in drainage had a profound impact on water quality in streams during periods of rain. Shallow groundwater near the bog pile was poor quality, but quality was better more than 400 ft away. Residential wells in a 0.5 mi radius showed no contamination by leachate from the abandoned coal refuse area. (ENVIROLINE abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Schubert, J. P., Olson, R. D., and Zellmer, S. D., 1977, Monitoring the effects of coal refuse disposal and reclamation on water quality in southwestern Illinois: presented at Sensing of Environmental Pollutants 4th Joint Conference, New Orleans, LA, Nov. 6-11, 1977, P724 (8).

REFERENCE CODE: S/S2-11

TITLE: Environmental Impacts of Land Application of Sludge.

GEOGRAPHICAL AREA: Fulton County, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Data from the extensive environmental monitoring program of the Fulton County, Illinois, land reclamation site operated by the Metropolitan Sanitary District of Greater Chicago since 1971 are presented. Information pertaining to discharges from fields receiving digested sludge, stream water entering and leaving the site, groundwater from 23 wells drilled on the site, corn grain grown with digested sludge, and fish living in reservoirs draining the sludge-digested fields indicates that the project is environmentally sound. (ENVIROLINE abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Zenz, D. B., Peterson, J. R., Brooman, D. L., and Hue-Hing, Cecil, 1976, Environmental impacts of land application of sludge: Water Pollution Control Federation Journal, Vol. 48, No. 10, p. 2332.

REFERENCE CODE: S/S2-12

TITLE: Ground Water Quality at a Strip-Mine Reclamation Area in Westcentral Illinois.

GEOGRAPHICAL AREA: Fulton County, Illinois.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Twenty-four groundwater monitoring wells were established both on non-disturbed land and on strip-mined land in Fulton County, Illinois, to provide baseline environmental data for twenty-three chemical characteristics. These lands being reclaimed to agriculture by applications of digested sewage sludge from Metropolitan Sanitary District of Greater Chicago. Water samples were analyzed monthly from December, 1971 to December, 1973. Data show that mine spoil groundwaters have higher metal contents as well as greater concentrations of chlorine, sulfate, and Kjeldahl nitrogen. Also groundwaters of the mined areas have a greater number of significant monthly, seasonal, and well-to-well variations in the chemical constituents analyzed for. Data from a typical mined area monitoring well were used to explore the possibility of using the monitoring data for evaluation of future groundwater quality. (Gleason and Russell, 1977)

PUBLISHED REPORTS AND(OR) ARTICLES:
Pietz, R. I., 1974, Ground water quality at a strip-mine reclamation area in west central Illinois: National Coal Assoc./Bituminous Coal Research, Inc., Second Res. Applied Technol. Symp. Mined-Land Reclamation Preprints, Louisville, Kentucky, The Coal Building, 1130 Seventeenth Street, N.W., Washington, D.C. 20036, 124-144 p.

## SUPPLEMENTAL DATA J: SUMMARY 3

Annotated bibliography of large area studies pertinent to the hydrology of the Shawnee National Forest area.

REFERENCE CODE: S/S3-1

(Soon to be published)
Graf, J. B., Computation and Regionalization of Time of Concentration and Storage Coefficient Values for Illinois Streams: U.S. Geological Survey Water Resources Investigation, Open-File Report.

OBJECTIVE AND APPROACH:
The objective of this project will be twofold: (1) to calculate T and K values for gages sites in Illinois where sufficient data currently exists, and (2) to develop predictive equations for T and K based on relationships to physical basin characteristics.

T and K values have already been determined for 56 sites with drainage areas less than 10 square miles. The Corps' HEC-1 hydrologic computer model will be utilized to determine T and K values at additional sites with larger drainage areas as part of the study. Multiple regression techniques will then be employed to develop predictive equations. Other parameters necessary for the regression analysis area are available in the WRD basin characteristics file.

REFERENCE CODE: S/S3-2

(Soon to be published)
Hood, W., and Robinson, P., Geochemistry of cadmium and other selected heavy metals as related to coal strip mining: Southern Illinois Univerity, Carbondale Campus School of Science, Dept. of Geology, Carbondale, Illinois, 62901.

SUMMARY:
The project traces the occurrence of selected heavy metals from the overburden strata through the mining process to the final deposition stream sediment in Illinois coal strip mining. The metals are arsenic, cadmium, nickel, cobalt, chromium, and zinc.

Overburden samples, mine effluent samples, and stream water and sediment samples were analyzed to determine the influence and occurrence of the heavy metals in southern Illinois.

Many samples have been taken and seasonal variations are to be quantified. (From Current Research)

REFERENCE CODE: S/S3-3

Zuehls, E. E., Ryan, G. L., Peart, D. B., and Fitzgerald, K. K., 1981, Hydrology of area 35, eastern region, Interior Coal Province, Illinois and Kentucky: U.S. Geological Survey Water Resources Investigations Open-File Report 81-403, 68 p., (includes Shawnee National Forest area).

REFERENCE CODE: S/S3-3--Continued.

(Soon to be published)
Zuehls, E. E., Ryan, G. L., Peart, D. B., and Fitzgerald, K. K., 1981, Hydrology of Area 25, Eastern Region, Interior Coal Province, Illinois: U.S. Geological Survey Water Resources Investigations Open-File Report 81-636.

DESCRIPTION:
A nationwide need for information characterizing hydrologic conditions in mined and potentially mined areas has become paramount with the enactment of the Surface Mining Control and Reclamation Act of 1977.

The coal provinces of the country are divided into hydrologic reporting areas. Hydrologic information and sources are presented as text, tables, maps, and other illustrations useful to mine owners, operators, and consulting engineers in planning and impelmenting surface mine operations that comply with the environmental requirement of the Act.

REFERENCE CODE: S/S3-4

Gibb, J. P. and O'Hearn, M., 1980, Illinois groundwater quality data summary: Illinois State Water Survey Contract Report 230.

ABSTRACT:
None available.

REFERENCE CODE: S/S3-5

Krothe, N. C., Edkins, J. E., and Schubert, J. P., 1980, Leaching of metals and trace elements from sulfide-bearing coal waste in southeastern Illinois: Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, Lexington, Kentucky, Proceedings, p. 455-463.

ABSTRACT:
Metal sulfides, chiefly pyrite and monor sphalerite, associated with the Herrin (No. 6) coal member of the Pennsylvanian Carbondale Formation, have been concentrated in a coal refuse deposit in southern Illinois. Chemical, petrographic and X-ray diffraction data for 34 cores, show that the upper two meters of material have been leached of sulfides in the thirty years since washing operations ceased.

Oxidation of pyrite has produced highly acid waters with high concentrations of iron, zinc (up to 200 parts per million) and toxic trace elements that have leached downward to a water system perched on the underlying Illinoisan glacial drift. Deep well samples in the refuse pile are more saturated with metals than are the runoff waters and shallow well samples. Metal recovery does not appear to be economically feasible at this site. (Author's abstract)

REFERENCE CODE: S/S3-6

O'Hearn, M. and Gibb, J. P., 1980, Groundwater discharge to Illinois streams: Illinois State Water Survey Contract Report 246.

ABSTRACT:
None available.

REFERENCE CODE: S/S3-7

Toler, L. G., 1980, Some chemical characteristics of mine drainage in Illinois: U.S. Geological Survey Open-File Report 80-416, 47 pp.

ABSTRACT:
Surface mining for coal in Illinois has affected runoff from the mined areas and altered water quality in the streams. Average annual sulfate loads in streams are 3,000 to 4,000 tons per square mile of mined land in the Big Muddy and Saline River basins in southern Illinois. Relative high concentrations of dissolved aluminum, arsenic, chromium, copper, iron, manganese, and zinc are commonly associated with concentrations of sulfate greater than about 2,000 milligrams per liter. (Author's abstract)

REFERENCE CODE: S/S3-8

Cartwright, Keros and Hunt, C. S., 1978, Hydrogeology of underground coal mines in Illinois: Illinois State Geological Survey Reprint 1978N, 20 p.

ABSTRACT:
Little is known about the hydrogeology of the ground-water systems around underground coal mines. Illinois mines are generally "dry", with notable exceptions, despite their location in water-saturated rocks well below the water table. Reported pumpages of water from the mines vary from occasional pumping of pumps to pumpage in excess of 5,000 cubic meters per day. Most mines, however, report pumpages of less than 100 cubic meters per day. Some mines are reported to be "dry" even many years after being abandoned. These small volumes of water reported from the mines are directly related to the extremely low hydraulic conductivity of the rock associated with the coal. (From author's summary)

REFERENCE CODE: S/S3-9

Gibb, J. P. and Evans, R. L., 1978, Reconnaissance study of final cut impoundments: Illinois Institute for Environmental Quality Report 78/25.

Gibb, J. P. and Evans, R. L., 1978, Preliminary evaluation of final cut lakes: Illinois State Water Survey Circular 130, 87 pp.

REFERENCE CODE: S/S3-9--Continued.

ABSTRACT:
The feasibility of using final cut impoundments for public water supply, irrigation, and other uses in Illinois was evaluated. Four areas were studied: Grundy, St. Clair, Fulton, and Perry Counties. Three lakes of representative size and geologic-hydrologic setting in each county were assessed. The area and capacity of each lake was determined, and the sustained yield of each lake was estimated. The chemical, biological, and physical quality of the water in each lake was analyzed. On the basis of the sample lakes surveyed and maps of all lakes in Illinois' 40 counties where surface mining exists, the potential uses of the lakes are discussed in relation to water quality, quantity available, and estimated needs of the area. (ENVIROLINE abstract)

REFERENCE CODE: S/S3-10

Greater Egypt Regional Planning and Development Commission, 1978, Areawide waste treatment and water-quality management planning: P.O. Box 3160, Carbondale, Ill. 62901.

Appendix B-1, Nonpoint sources of water pollution in the 208 area: 100 p.

Appendix B-2, Pollution sources, agriculture: 114 p.

Appendix B-6, Land use in the 208 area: 132 p.

Appendix C-4, The 208 macroinvertebrate study report--the effects of acid mine drainage on mean species diversity in six southern Illinois streams: 69 p.

Appendix C-6, Geology of the coal-mining portion of the southern Illinois 208 area and it's applications to water-quality problems: 51 p.

Appendix F, Environmental assessment: 236 p.

ABSTRACT:
The report was prepared under Section 208 of the Water Pollution Control Act, as amended. It is a preliminary assessment of the alternative actions proposed in the southern Illinois 208 area. Also discussed are the existing environmental conditions in the 208 area, and projected environmental impacts of alternative actions which have been considered in the planning process. (NTIS abstract)

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22161
as PB-297 029 to PB-297 040.

REFERENCE CODE: S/S3-11

Visocky, A. P., Wehrmann, H. A., Kim, K. W., and Ringler, R. W., 1978, Assessment of public groundwater supplies in Illinois: Contract report prepared for the State Division of Water Resources by the State Water Survey and the State Geological Survey, Urbana, Illinois.

ABSTRACT:
None available.

REFERENCE CODE: S/S3-12

Wewarka, E. M., Williams, J. M., Vanderborgh, N. E., Harmon, A. W., and Wagner, P., 1978, Trace element characterization of coal wastes, second annual progress report, October 1, 1976-September 30, 1977: Los Alamos Scientific Lab., NM, Department of Energy, Report No. EPA-600/7-78-029a, 154 pp.

ABSTRACT:
Analyses of the trace elements and minor minerals in bulk refuse and coal samples from the Illinois Basin were completed. This activity was followed by studies to elucidate the structural relationships and associations among the trace elements. Several series of weathering and leaching experiments were conducted to define the environmental behavior of the trace elements in the refuse and coal samples under various environmental conditions. These investigations resulted in the identification of the trace elements of most environmental concern in typical Illinois Basin refuse and coal. Methods to control the trace element contamination of refuse and coal drainage are being investigated. These refuse materials are very complex. Some 55 elements have been identified in most of the refuse samples and undoubtly there are more. The most abundant of these elements, iron, aluminum, and silicon, compose the structures of the major mineral systems. A large number of elements generally considered to be environmentally sensitive are present in these refuse materials in significant quantities (greater than 30 mu g/g). Included among these are fluorine, aluminum, manganese, iron, cobalt, nickel, copper, zinc, arsenic, and lead. Although the relative amounts of some of these components are seemingly small, the absolute quantities available in a large or active waste dump could cause grave consequences in the surrounding environment if they were to be released and concentrated by natural processes. (NTIS abstract)

REFERENCE CODE: S/S3-13

Curtis, G. W., 1977, Technique for estimating the magnitude and frequency of floods in Illinois: U.S. Geological Survey Water Resources Investigation 77-117, 70 p.

REFERENCE CODE: S/S3-13--Continued.

ABSTRACT:
A technique is presented for estimating flood magnitudes at recurrence intervals ranging from 2 to 500 years, for unregulated rural streams in Illinois, with drainage areas ranging from 0.02 to 10,000 square miles (0.05 to 25,900 square kilometers). Multiple regression analyses, using streamflow data from 241 sampling sites, were used to define the flood-frequency relationships. The independent variables drainage area, slope, rainfall intensity, and an areal factor are used in the estimating equations to determine flood peaks. Examples are given to demonstrate a step-by-step procedure in computing a 100-year flood for a site on an ungaged stream and a site on a gaged stream in Illinois.

REFERENCE CODE: S/S3-14

Hood, W. C., 1977, Manganese in southern Illinois water: Geological Society of American Abstracts with Programs, Vol. 9, pp. 606-607.

ABSTRACT:
In southern Illinois streams that are not related to coal strip mining, manganese concentrations usually average less than the one mg/l Illinois general water quality standard, although individual grab samples from such streams occasionally have as much as two mg/l. Mine-influenced streams, on the other hand, usually contain manganese in excess of one mg/l, with values up to ten mg/l being commonplace. In standing bodies of water receiving runoff from mine spoil or gob, manganese concentrations are frequently in the 10 to 20 mg/l range and can go higher. In general, the highest values are observed in springs and seeps emerging from spoils or gob, where values over 50 mg/l are typical and may reach into the thousands. Manganese is widespread in the overburden rocks in the area and experimental work indicates the element can easily be leached from these rocks, especially if the water is acidic. The extensive strip mining in southern Illinois, coupled with the common occurrence of acid-producing overburden and gob, has thus made manganese a widespread environmental problem in the area. (GSA abstract)

REFERENCE CODE: S/S3-15

Nawrot, J. R., Haynes, R. J., Pursell, P. L., D'Antuono, J. R., Sullivan, R. L., and Klimstra, W. D., 1977, Illinois lands affected by undergrounding mining for coal: Illinois Institute for Environmental Quality, IIEQ Doc. 77/11, 309 W. Washington St., Chicago, IL 60606, 195 pp.

ABSTRACT:
The cooperative Wildlife Research Laboratory of Southern Illinois University at Carbondale surveyed all lands affected by undergrounding mining for coal as of 1 September 1976. The primary purpose of the survey was to delineate locations,

REFERENCE CODE: S/S3-15--Continued.

surface ownership, and environmental problems associated with abandoned mine sites. Historical and governmental records provided locations for 4,076 abandoned mines in 70 counties. Of the total affected acreage (6,955.9 acres), approximately 5,000 acres representing 508 mine sites were identified as potential problem areas. Deeply eroded, barren refuse areas and potentially hazardous or flowing openings characterized the most severe problem areas. Potential and observed mine drainage to off-site areas was also recorded at many sites. (Adapted from author's summary)

REFERENCE CODE: S/S3-16

Haynes, R. J., and Klimstra, W. D., 1975, Some properties of coal spoilbank and refuse materials resulting from surface-mining coal in Illinois: Illinois Institute for Environmental Quality, IIEQ Doc. No. 75-21, 126 p.

ABSTRACT:
This publication reports the results of analyses of 2,084 spoil samples and 22 coal refuse samples collected during the 1970-71 survey of surface-mined land in Illinois. Although some surface materials from all mined areas yielded a pH of less than 4.1, most samples had pH's ranging from 5.1 to 8.1. Acid spoils showed properties deleterious to most vegetation. These properties included high exchangeable acidity and soluble salts; possibly toxic concentrations of soluble sulfate, iron, manganese, and aluminum; and low potassium, calcium, and base saturations. (Adapted from author's summary)

REFERENCE CODE: S/S3-17

Schleuger, R. L., 1975, Problems and policy alternatives-mining: in Proceedings-workshop on non-point sources of water pollution, March 20-21, 1975, Illinois University at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, pp. 20-24.

ABSTRACT:
The operational characteristics of mining are considered in relation to non-point source water pollution, especially in Illinois coal mining, where an estimated 400 miles of streams and rivers are affected by mine drainage. Of this, 265 stream miles in southern Illinois are affected to such a degree that they are either void of fish and aquatic life or will not support them. Polluting mine wastes include refuse piles, slurry lagoons, and polluting chemicals such as iron, manganese, aluminum and sulfates of calcium and mangnesium. Mining-related water pollution in Illinois comes predominantly from surface drainage over and through mine refuse heaps and from drainage over the massive areas of spoil banks and exposed mineral seams. Coal mine refuse piles pose a particular threat of water pollution because they contain iron sulfide (pyrite) which upon oxidation and contact with water can produce drainage containing sulfuric acid and iron. Such oxidation can produce

REFERENCE CODE: S/S3-17--Continued.

198 lbs. of acidity per acre of refuse per day. Most of the contaminants come from about 1,600 abandoned mines in 69 Illinois counties. Possible effects of coal-gasification plans on water quality also need to be considered. Overall goals and objectives of a coal mine wastes program in Illinois are reviewed. (WRSIC abstract)

REFERENCE CODE: S/S3-18

Smith, W. H. and Stall, J. B., 1975, Coal and water resources for coal conversion in Illinois: Illinois State Water/Geological Survey Cooperative Resources Report 4, 82 pp.

ABSTRACT:
Illinois has enormous reserves of coal and water. These resources could supply raw materials for many coal conversion plants to help meet the rapidly increasing need for new energy sources in the Midwest and the East. A current assessment of the State's most promising resources of coal and water is presented. Remaining in-place reserves 42 or more inches thick total 59 billion tons for Herrin coal and 38 billion tons for Harrisburg-Springfield coal. Also, Harrisburg-Springfield and Herrin coals less than 42 inches thick.

REFERENCE CODE: S/S3-19

Cederstrom, D. J., 1971, Hydrologic effects of strip mining west of Appalachia: Mining Congress Journal, vol. 57, no. 3, p. 46-50.

ABSTRACT:
In the Midwest the problem of acidic water is seemingly much less acute than in Appalachia. In part, this may be due to the fact that the topography is gentle and pyritic material is generally less exposed to oxygenated waters. In Midwest fields, thousands of small lakes have been created in the resultant ridge and furrow topography. These lakes constitute a reservoir of significant magnitude. Further, upon pumping from lakes, saturated bank material, made up of moderately permeable shale fragments or highly permeable sandstone and limestone fragments, will contribute water to the lakes. In this sense, the, the lakes may be thought of as a series of dug wells in which considerable storage is present in each. The ponds and lakes created by disturbed ground are commonly hydrologic benefits in the sense of improvement of the functioning of the hydrologic cycle and also in a secondary sense in that the ponds and lakes are, or can be, distinct recreational assets. (WRSIC abstract)

REFERENCE CODE: S/S3-20

Csallany, Sandor, 1966, Yields of Pennsylvanian and Mississippian rocks in Illinois: Illinois State Water Survey Report of Investigation 55, 42 p.

REFERENCE CODE: S/S3-20--Continued.

ABSTRACT:
Summarizes studies of yields of wells in thick rocks of Pennsylvanian and Mississippian ages (well depths average only 170 and 250 feet because of poor water quality with depth); includes results of aquifer tests and well-production tests on several hundred wells which show influence of location, depth, construction, and age, as well as effects of well treatment; describes availability of groundwater supplies from these rocks in 88 counties;. shows well yields are inconsistent and low (commonly less than 25 gallons per minute), but wells are only source for several thousand small farms and homes and several hundred small municipalities and industries in areas of southern three-fourths of state.

REFERENCE CODE: S/S3-21

Gluskoter, H. J., 1965, Composition of ground water associated with coal in Illinois and Indiana: Economic Geology, V. 60, no. 3, p. 614-620.

ABSTRACT:
Mineral constituents of uncontaminated ground water from coal seams are predominantly alkalies and chloride, with chloride accounting for about 60 percent of total dissolved solids. Total dissolved solids and total chloride increase with depth. Median pH is 7.7. (Author's abstract)

REFERENCE CODE: S/S3-22

Gluskoter, H. J., and Rees, O. W.- 1964, Chlorine in Illinois coal: Illinois State Geological Survey Circular 372, 23 p.

ABSTRACT:
The percentage of chlorine in Herrin (No. 6) Coal in Illinois generally increases toward the deeper parts of the Illinois Basin. Chlorine values range from zero near the coal outcrop the values exceeding 0.60 percent in the deeper part of the basin. Samples of both coal and its associated ground water were taken from 13 mines and the chloride content of the coal was found to be more closely related to chlorine content of the ground water than to depth. (GEOREF abstract)

REFERENCE CODE: S/S3-23

Roberts, W. J., Hanson, Ross, Huff, F. A., Changnon, S. A., Jr., Larson, T. E., and others, 1962, Potential water resources of southern Illinois: Illinois State Water Survey Report of Investigation 31, 100 p.

REFERENCE CODE: S/S3-23--Continued.

ABSTRACT:
Brings together information on surface and groundwater resources, meteorological relations, and water quality for 17 southern counties where the potential for water resource development is very large; describes 113 reservoir sites capable of development, and lists available data on existing impoundments. (From list of Illinois State Water Survey publications)

REFERENCE CODE: S/S3-24

Bell, R., 1956, Aquatic and marginal vegetation of strip mine waters in southern Illinois: Illinois Academy of Science Transactions 48, p. 85-91.

ABSTRACT:
Fifty-two of the numerous surface mine ponds in the area were included in this study. Plant distribution was correlated with physiochemical characteristics. Species listed were categorized as submerged, floating, emergent, moist soil, and recession zone vegetation. (Gleason and Russell, 1977)

REFERENCE CODE: S/S3-25

Pryor, W. A., 1956, Groundwater geology in southern Illinois--a preliminary geologic report: Illinois State Geological Survey Circular 212, 25 p.

ABSTRACT:
The likelihood of finding groundwater for private, municipal, and industrial supplies in southern Illinois ranges from poor to excellent. This report summarizes, in general, the geologic conditions controlling the occurrence and availability of groundwater and suggests efficient ways to obtain it under prevailing conditions. Maps indicate probable occurrence of (1) water-yielding sand-and-gravel deposits, (2) water-yielding bedrock formations, and (3) undeveloped groundwater sources that may be suitable for private, municipal, industrial, and water-flood supplies. The best potential sources of large supplies of water are sand and gravel deposits in the major valley systems. Unfavorable conditions generally prevail elsewhere because water-yielding sand and gravel is absent, the bedrock formations are tight, or the available groundwater is of poor quality. (Author's abstract)

SUPPLEMENTAL DATA K

NAWDEX listings of sources of monitoring-site data found in the Wayne National Forest study area.

SUPPLEMENTAL DATA K: LISTING 1

Sources of streamflow and stage data in the Wayne National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD (Y/N) | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05030204 | WL1-1 | USGS | 392606082112800 | 051MONDAY C (20-1) AT DOANVILLE OH | 392606 | 0821128 | 039 | 009 | SW | 1980 | | | | |
| 05030204 | WL1-2 | USGS | 03158200 | MONDAY C AT DOANVILLE OH | 392607 | 0821130 | 039 | 009 | SW | 1956 | 1971 | Y | 114.00 | |
| 05090101 | WL1-3 | USGS | 385029082311900 | 051BLACK F (2-5) AT GALLIA OH | 385029 | 0823119 | 039 | 053 | SW | 1980 | | | | |
| 05090101 | WL1-4 | USGS | 385124082321400 | 051BLACK R (2-4) NR GALLIA OH | 385124 | 0823214 | 039 | 053 | SW | 1980 | | | | |
| 05040004 | WL1-5 | USGS | 03158100 | HAYDEN RN NR HAYDENVILLE OH | 392857 | 0821906 | 039 | 073 | SW | 1965 | 1977 | | 1.04 | |
| 05030204 | WL1-6 | USGS | 393453082162800 | 051MONDAY C (20-5) AT OREVILLE OH | 393453 | 0821628 | 039 | 073 | SW | 1980 | | | | |
| 05090103 | WL1-7 | USGS | 383711082443900 | 051SPERRY F (4-3) NR PINE GROVE OH | 383711 | 0824439 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL1-8 | USGS | 383735082445700 | 051SPERRY F (4-2) NR PINE GROVE OH | 383735 | 0824457 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL1-9 | USGS | 383805082405400 | 051ELLISONVILLE C (4-5) AT PEDRO OH | 383805 | 0824054 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL1-10 | USGS | 383833082402800 | 051L PINE C (4-6) AT PEDRO OH | 383833 | 0824028 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL1-11 | USGS | 384034082422100 | 051PINE C (4-7) NR PEDRO OH | 384034 | 0824221 | 039 | 087 | SW | 1980 | | | | |
| 05030201 | WL1-12 | USGS | 03115300 | L MUSKINGUM R NR RINARD MILLS OH | 393625 | 0810721 | 039 | 111 | SW | 1971 | 1977 | | 130.00 | Y |
| 05030201 | WL1-13 | USGS | | TRAIL RUN NEAR ANTIOCH OH | 393729 | 0810254 | 039 | 111 | SW | 1978 | | | 5.45 | N |
| 05030204 | WL1-14 | USGS | 393610082124400 | 051SHAWNEE C (20-8) AT SHAWNEE OH | 393610 | 0821244 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL1-15 | USGS | 393622082150500 | 051MONDAY C (20-6) NR SHAWNEE OH | 393622 | 0821505 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL1-16 | USGS | 393627082145700 | 051UNAM TR TO MONDAY C (20-7) NR SHAWNEE OH | 393627 | 0821457 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL1-17 | USGS | 393649082135300 | 051MONDAY C (20-12) NR SHAWNEE OH | 393649 | 0821353 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL1-18 | USGS | 393739082140600 | 051UNAM TR TO MONDAY C (20-9) AT MCCUNEVILLE | 393739 | 0821406 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL1-19 | USGS | 393742082135800 | 051MONDAY C (20-10) AT MCCUNEVILLE OH | 393742 | 0821358 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL1-20 | USGS | 393743082183600 | 051L MONDAY C (20-11) NR MAXVILLE OH | 393743 | 0821836 | 039 | 127 | SW | 1980 | | | | |
| 05090103 | WL1-21 | USGS | 384146082424600 | 051PINE C (4-8) NR BARTLES OH | 384146 | 0824246 | 039 | 145 | SW | 1980 | | | | |
| 05090103 | WL1-22 | USGS | 384657082421300 | 051HALES C (4-9) NR S WEBSTER OH | 384657 | 0824213 | 039 | 145 | SW | 1980 | | | | |
| 05090103 | WL1-23 | USGS | 384839082403100 | 051HALES C (4-10) NR EIFORT OH | 384839 | 0824031 | 039 | 145 | SW | 1980 | | | | |
| 05030201 | WL1-24 | USCE | | OHIO RIVER L&D 16 OHIO | 392800 | 0810700 | 039 | 167 | SW | 1913 | | | | |
| 05030201 | WL1-25 | USGS | | M/SS RUN NEAR WINGETT OH | 392824 | 0811852 | 039 | 167 | SW | 1978 | | | 1.30 | N |
| 05030201 | WL1-26 | USGS | 03115500 | L MUSKINGUM R AT FAY OH | 392848 | 0811709 | 039 | 167 | SW | 1915 | 1935 | Y | 258.00 | |
| 05030201 | WL1-27 | USGS | | GRAHAM RUN NEAR BLOOMFIELD OH | 393236 | 0811232 | 039 | 167 | SW | 1978 | | | .13 | N |
| 05030201 | WL1-28 | USGS | 03115400 | L MUSKINGUM R AT BLOOMFIELD OH | 393347 | 0811214 | 039 | 167 | SW | 1958 | | N | 210.00 | N |

| CODE NUMBER | STAGE (A) COMPLETE | STAGE (B) PEAK | STAGE (B) LOW | STAGE (C) STORAGE MEDIA | FLOW (D) COMPLETE | FLOW (B) PEAK | FLOW (B) LOW | FLOW (A) MISCELLANEOUS | FLOW (C) STORAGE MEDIA | VOLUME (E) TOTAL | VOLUME (E) CHANGE | VOLUME (C) STORAGE MEDIA | (F) TELEMETRY | (G) OTHER HYDROLOGIC DATA | (H) OTHER RELATED DATA | (I) DATA BANK SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL1-1 | | | | | | | | S | | | | | | 2 | | |
| WL1-2 | | | | | | | 9 | | P | | | | | 1 | | |
| WL1-3 | | | | | | | | S | | | | | | 2 | | T |
| WL1-4 | | | | | | | | S | | | | | | 2 | | T |
| WL1-5 | | 1 | | C | | 1 | | | C | | | | | | 6 | |
| WL1-6 | | | | | | | | S | | | | | | 2 | | |
| WL1-7 | | | | | | | | S | | | | | | 2 | | T |
| WL1-8 | | | | | | | | S | | | | | | 2 | | T |
| WL1-9 | | | | | | | | S | | | | | | 2 | | T |
| WL1-10 | | | | | | | | S | | | | | | 2 | | T |
| WL1-11 | | | | | | | | S | | | | | | 2 | | T |
| WL1-12 | | | | | | | 9 | | P | | | | | | | |
| WL1-13 | | 1 | | | | 1 | | | | | | | | 7 | | |
| WL1-14 | | | | | | | | S | | | | | | 2 | | |
| WL1-15 | | | | | | | | S | | | | | | 2 | | |
| WL1-16 | | | | | | | | S | | | | | | 2 | | |
| WL1-17 | | | | | | | | S | | | | | | 2 | | |
| WL1-18 | | | | | | | | S | | | | | | 2 | | |
| WL1-19 | | | | | | | | S | | | | | | 2 | | |
| WL1-20 | | | | | | | | S | | | | | | 2 | | |
| WL1-21 | | | | | | | | S | | | | | | 2 | | T |
| WL1-22 | | | | | | | | S | | | | | | 2 | | T |
| WL1-23 | | | | | | | | S | | | | | | 2 | | T |
| WL1-24 | O | | | | | 9 | | | | | | | | | 6 | |
| WL1-25 | | 1 | | | | 1 | | | | | | | | 7 | | |
| WL1-26 | E | E | | C | 2 | E | | | C | | | | | | 6 | |
| WL1-27 | | 1 | | | | 1 | | | | | | | | 7 | | |
| WL1-28 | I | 1 | | C | 1 | 1 | | | D | | | | | | 6 | |

* USE CODE TABLES (See right margin) indicated by letter in () in column heading

# CODE TABLES

### TABLE (A)-COMPLETE STAGE and MISCELLANEOUS FLOW

| Code: Year-Round | Code: Seasonal | Code: Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual (twice per year) |
| A | | 9 | Annual (once per year) |
| B | | | Other periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

### TABLE (B)-STAGE and FLOW, PEAK or LOW

| Code | Meaning |
|---|---|
| 1 | Year-round |
| 2 | Seasonal |
| 8 | Annual maximum or minimum |
| 9 | Irregular |
| E | Eliminated activity |

### TABLE (C)-STORAGE MEDIA

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

### TABLE (D)-COMPLETE FLOW

| Code: Year-Round | Code: Seasonal | Meaning |
|---|---|---|
| 1 | 2 | Daily flow |
| 3 | 4 | Monthly flow determined |
| E | E | Eliminated activity |

### TABLE (E)-VOLUME

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Daily values | 9 | Irregular |
| 3 | Monthly values | E | Eliminated activity |

### TABLE (F)-TELEMETRY

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Telemeter-land lines | 5 | DARC |
| 2 | Telemeter-radio network | 6,8 | Other or type unspecified |
| 3 | Landsat | 7 | Two or more types |
| 4 | GOES | | |

### TABLE (G)-OTHER HYDROLOGIC DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | OW recurring | 7 | Flood frequency |
| 2 | OW nonrecurring | 8 | Coef. of roughness |
| 3 | Flood hydrograph | 9 | Time of travel |
| 4 | Sediment studies | A | Flood plain maps |
| 5 | Cross section | B | Tides |
| 6 | Flow duration | C | Surface inflow-outflow |

### TABLE (H)-OTHER RELATED DATA

| Code | Meaning | Code | Meaning |
|---|---|---|---|
| 1 | Precipitation | 4 | Radiation (solar) |
| 2 | Wind | 5 | Soil moisture |
| 3 | Evaporation | 6 | Datum (mean sea level) |

### TABLE (I)-DATA BANK SOURCE

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA K: LISTING 2

Sources of surface-water-quality data in the Wayne National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD X = YES | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA X = YES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05030204 | WL2-1 | USEPA | 384132 | HOCKING R.STUDY ABD DRIFT MINE | 392444 | 0821230 | 039 | 009 | SW | 1971 | 1971 | | | |
| 05030204 | WL2-2 | USFS | 110603 | SUBSTATION RUN 1.5MI SE KIMBERLY | 392448 | 0821148 | 039 | 009 | SW | 1979 | | | | |
| 05030204 | WL2-3 | USEPA | 384093 | HOCKING R.STUDY STREAM SAMPLE | 392519 | 0821114 | 039 | 009 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-4 | OHOO4 | 60163 | MONDAY CR NR NELSONVILLE | 392520 | 0821115 | 039 | 009 | SW | 1973 | | | | |
| 05030204 | WL2-5 | OHOO4 | 601630 | MONDAY CREEK NEAR NELSONVILLE | 392520 | 0821115 | 039 | 009 | SW | 1973 | | | | |
| 05030204 | WL2-6 | USGS | 392606082112800 | 051MONDAY C (20-1) AT DOANVILLE OH | 392606 | 0821128 | 039 | 009 | SW | 1980 | | | | |
| 05030204 | WL2-7 | USGS | 03158200 | MONDAY C AT DOANVILLE OH | 392607 | 0821130 | 039 | 009 | SW | 1966 | 1975 | | 114.00 | |
| 05030204 | WL2-8 | USEPA | 382854 | HOCKING R.STUDY ABD STRIP MINE | 392615 | 0821037 | 039 | 009 | SW | 1970 | 1970 | | | |
| 05040004 | WL2-9 | USEPA | 382836 | HOCKING R.STUDY ABD DRIFT MINE | 392624 | 0821143 | 039 | 009 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-10 | USEPA | 384141 | HOCKING R.STUDY ABD DRIFT MINE | 392626 | 0821636 | 039 | 009 | SW | 1971 | 1971 | | | |
| 05030204 | WL2-11 | USEPA | 384144 | HOCKING R.STUDY ABD DRIFT MINE | 392713 | 0821602 | 039 | 009 | SW | 1971 | 1971 | | | |
| 05030204 | WL2-12 | USEPA | 384140 | HOCKING R.STUDY ABD DRIFT MINE | 392716 | 0821612 | 039 | 009 | SW | 1971 | 1971 | | | |
| 05030204 | WL2-13 | USGS | 392738082104700 | SNOW F STATION 5 NR MURRAY CITY | 392738 | 0821047 | 039 | 009 | SW | 1976 | 1976 | | | |
| 05090103 | WL2-14 | USEPA | 384334 | RACCOON CR.STUDY ABD STRIP MINE | 384019 | 0823822 | 039 | 053 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-15 | USFS | 110531 | BLACKFORK CK 1.9 MI NE GALLIA,OH | 385027 | 0822943 | 039 | 053 | SW | 1979 | | | | |
| 05090101 | WL2-16 | USGS | 385028082305800 | BLACK F NR GALLIA OH | 385028 | 0823058 | 039 | 053 | SW | 1975 | 1975 | | | |
| 05090101 | WL2-17 | USGS | 385029082311900 | 051BLACK F (2-5) AT GALLIA OH | 385029 | 0823119 | 039 | 053 | SW | 1980 | | | | |
| 05090101 | WL2-18 | USGS | 385124082321400 | 051BLACK R (2-4) NR GALLIA OH | 385124 | 0823214 | 039 | 053 | SW | 1980 | | | | |
| 05090101 | WL2-19 | USFS | 110606 | UNNAMED CREEK 1.6 MI SW STARR,OH | 392328 | 0822310 | 039 | 073 | SW | 1979 | | | | |
| 05090101 | WL2-20 | USFS | 110607 | TICK FORK 1.1 MI W STARR, OHIO | 392348 | 0822245 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-21 | USEPA | 384136 | HOCKING R.STUDY ABD DRIFT MINE | 392453 | 0821218 | 039 | 073 | SW | 1971 | 1971 | | | |
| | WL2-22 | USFS | 110668 | RACCOON CK 9.5 MJ SE LOGAN, OHIO | 392517 | 0821848 | 039 | 073 | SW | 1979 | | | | |
| 05090101 | WL2-23 | USEPA | 384179 | RACCOON CR.STUDY ABO STRIP MINE | 392518 | 0821814 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-24 | USEPA | 384184 | RACCOON CR.STUDY ABD STRIP MINE | 392521 | 0821838 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-25 | USEPA | 384180 | RACCOON CR.STUDY ABD STRIP MINE | 392523 | 0821823 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05030204 | WL2-26 | USEPA | 382852 | HOCKING R.STUDY ABD DRIFT MINE | 392526 | 0821112 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05090101 | WL2-27 | USEPA | 384191 | RACCOON CR.STUDY ABD STRIP MINE | 392527 | 0821916 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05030204 | WL2-28 | USEPA | 382851 | HOCKING R.STUDY ABD DRIFT MINE | 392528 | 0821106 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05090101 | WL2-29 | USEPA | 384182 | RACCOON CR.STUDY ABD STRIP MINE | 392528 | 0821833 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-30 | USEPA | 384183 | RACCOON CR.STUDY ABD STRIP MINE | 392528 | 0821838 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-31 | USEPA | 384193 | RACCOON CR.STUDY ABD STRIP MINE | 392532 | 0821903 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-32 | USEPA | 384177 | RACCOON CR.STUDY ABD STRIP MINE | 392533 | 0821816 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-33 | USEPA | 384178 | RACCOON CR.STUDY ABD STRIP MINE | 392533 | 0821816 | 039 | 073 | SW | 1971 | 1971 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

PHYSICAL

| CODE NUMBER | TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | pH | SUSPENDED SOLIDS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|
| WL2-1 | | A | | | | A | | D |
| WL2-2 | A | A | A | | | A | | D |
| WL2-3 | | A | | | | A | | D |
| WL2-4 | M | M | | | | M | M | C |
| WL2-5 | A | A | | | | A | A | D |
| WL2-6 | S | S | | | | S | | |
| WL2-7 | A | A | S | | | A | | D |
| WL2-8 | | A | | | | A | | D |
| WL2-9 | | A | | | | A | | D |
| WL2-10 | | A | | | | A | | D |
| WL2-11 | | A | | | | A | | D |
| WL2-12 | | A | | | | A | | D |
| WL2-13 | A | A | A | | | A | | D |
| WL2-14 | | A | | | | A | | D |
| WL2-15 | A | A | A | | | A | | D |
| WL2-16 | A | A | A | | | A | | D |
| WL2-17 | S | S | | | | S | | |
| WL2-18 | S | S | | | | S | | |
| WL2-19 | A | A | A | | | A | | D |
| WL2-20 | A | A | A | | | A | | D |
| WL2-21 | | A | | | | A | | D |
| WL2-22 | A | A | A | | | A | | D |
| WL2-23 | | A | | | | A | | D |
| WL2-24 | | A | | | | A | | D |
| WL2-25 | | A | | | | A | | D |
| WL2-26 | | A | | | | A | | D |
| WL2-27 | | A | | | | A | | D |
| WL2-28 | | A | | | | A | | D |
| WL2-29 | | A | | | | A | | D |
| WL2-30 | | A | | | | A | | D |
| WL2-31 | | A | | | | A | | D |
| WL2-32 | | A | | | | A | | D |
| WL2-33 | | A | | | | A | | D |

CHEMICAL

| CODE NUMBER | DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL2-1 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-2 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-3 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-4 | | M | | | | | | | | | | | | | | | | | | | C |
| WL2-5 | A | A | A | | A | E | A | A | | A | | | | | | | A | | A | | D |
| WL2-6 | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-7 | E | A | A | | E | | | E | | S | | | S | S | | | | | S | A | D |
| WL2-8 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-9 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-10 | | A | A | | | | | | | | | | | | | | | | | | D |
| WL2-11 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-12 | | A | A | | | | | | | | | | | | | | | | | | D |
| WL2-13 | | A | A | | | | | | | A | | | A | A | | | | | A | | D |
| WL2-14 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-15 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-16 | | A | A | | | | | | | A | | | A | A | | | | | A | A | D |
| WL2-17 | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-18 | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-19 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-20 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-21 | | A | A | | | | | | | | | | | | | | | | | | D |
| WL2-22 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-23 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-24 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-25 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-26 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-27 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-28 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-29 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-30 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-31 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-32 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-33 | | A | A | | | | | | | A | | | | | | | | | | | D |

BIOLOGIC

| CODE NUMBER | ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL2-1 | | | | | | | | | | | | | | | | | | | | | |
| WL2-2 | | | | | | | | | | | | | | | | | | | | | |
| WL2-3 | | | | | | | | | | | | | | | | | | | | | |
| WL2-4 | | | | | | | | | | | | | | | | | | | | | |
| WL2-5 | A | | | | | | | | | | | | | | | | | | | | D |
| WL2-6 | | | | | | | | | | | | | | | | | | | | | |
| WL2-7 | | | | | | | | | | | | | | | | | | | | | |
| WL2-8 | | | | | | | | | | | | | | | | | | | | | |
| WL2-9 | | | | | | | | | | | | | | | | | | | | | |
| WL2-10 | | | | | | | | | | | | | | | | | | | | | |
| WL2-11 | | | | | | | | | | | | | | | | | | | | | |
| WL2-12 | | | | | | | | | | | | | | | | | | | | | |
| WL2-13 | | | | | | | | | | | | | | | | | | | | | |
| WL2-14 | | | | | | | | | | | | | | | | | | | | | |
| WL2-15 | | | | | | | | | | | | | | | | | | | | | |
| WL2-16 | | | | | | | | | | | | | | | | | | | | | |
| WL2-17 | | | | | | | | | | | | | | | | | | | | | |
| WL2-18 | | | | | | | | | | | | | | | | | | | | | |
| WL2-19 | | | | | | | | | | | | | | | | | | | | | |
| WL2-20 | | | | | | | | | | | | | | | | | | | | | |
| WL2-21 | | | | | | | | | | | | | | | | | | | | | |
| WL2-22 | | | | | | | | | | | | | | | | | | | | | |
| WL2-23 | | | | | | | | | | | | | | | | | | | | | |
| WL2-24 | | | | | | | | | | | | | | | | | | | | | |
| WL2-25 | | | | | | | | | | | | | | | | | | | | | |
| WL2-26 | | | | | | | | | | | | | | | | | | | | | |
| WL2-27 | | | | | | | | | | | | | | | | | | | | | |
| WL2-28 | | | | | | | | | | | | | | | | | | | | | |
| WL2-29 | | | | | | | | | | | | | | | | | | | | | |
| WL2-30 | | | | | | | | | | | | | | | | | | | | | |
| WL2-31 | | | | | | | | | | | | | | | | | | | | | |
| WL2-32 | | | | | | | | | | | | | | | | | | | | | |
| WL2-33 | | | | | | | | | | | | | | | | | | | | | |

SEDIMENT

| CODE NUMBER | BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA |
|---|---|---|---|---|---|---|---|---|
| WL2-1 | | | | | | | | |
| WL2-2 | | | | | | | | |
| WL2-3 | | | | | | | | |
| WL2-4 | | | | | | | | |
| WL2-5 | | | | | | | | |
| WL2-6 | | | | | | | | |
| WL2-7 | | | | | | | | |
| WL2-8 | | | | | | | | |
| WL2-9 | | | | | | | | |
| WL2-10 | | | | | | | | |
| WL2-11 | | | | | | | | |
| WL2-12 | | | | | | | | |
| WL2-13 | | | | | | | | |
| WL2-14 | | | | | | | | |
| WL2-15 | | | | | | | | |
| WL2-16 | | | | | | | | |
| WL2-17 | | | | | | | | |
| WL2-18 | | | | | | | | |
| WL2-19 | | | | | | | | |
| WL2-20 | | | | | | | | |
| WL2-21 | | | | | | | | |
| WL2-22 | | | | | | | | |
| WL2-23 | | | | | | | | |
| WL2-24 | | | | | | | | |
| WL2-25 | | | | | | | | |
| WL2-26 | | | | | | | | |
| WL2-27 | | | | | | | | |
| WL2-28 | | | | | | | | |
| WL2-29 | | | | | | | | |
| WL2-30 | | | | | | | | |
| WL2-31 | | | | | | | | |
| WL2-32 | | | | | | | | |
| WL2-33 | | | | | | | | |

OTHER

| CODE NUMBER | TELEMETRY | S W STATION [illegible] | G W STATION [illegible] | DATA BANK SOURCE |
|---|---|---|---|---|
| WL2-1 | | | | S |
| WL2-2 | | | | S |
| WL2-3 | | | | S |
| WL2-4 | | | | |
| WL2-5 | | | | S |
| WL2-6 | | | | |
| WL2-7 | | | | S |
| WL2-8 | | | | S |
| WL2-9 | | | | S |
| WL2-10 | | | | S |
| WL2-11 | | | | S |
| WL2-12 | | | | S |
| WL2-13 | | | | S |
| WL2-14 | | | | S |
| WL2-15 | | | | S |
| WL2-16 | | | | S |
| WL2-17 | | | | |
| WL2-18 | | | | |
| WL2-19 | | | | S |
| WL2-20 | | | | S |
| WL2-21 | | | | S |
| WL2-22 | | | | S |
| WL2-23 | | | | S |
| WL2-24 | | | | S |
| WL2-25 | | | | S |
| WL2-26 | | | | S |
| WL2-27 | | | | S |
| WL2-28 | | | | S |
| WL2-29 | | | | S |
| WL2-30 | | | | S |
| WL2-31 | | | | S |
| WL2-32 | | | | S |
| WL2-33 | | | | S |

PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | 1 | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |

| Code Year-Round | Code Seasonal | Code Eliminated | MEANING |
|---|---|---|---|
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DAROC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05090101 | WL2-34 | USEPA | 384192 | RACCOON CR.STUDY ABD STRIP MINE | 392533 | 0821916 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-35 | USEPA | 384176 | RACCOON CR.STUDY ABD STRIP MINE | 392534 | 0821806 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-36 | USEPA | 384256 | RACCOON CR.STUDY ABD STRIP MINE | 392534 | 0822017 | 039 | 073 | SW | 1971 | 1971 | | | |
| | WL2-37 | USFS | 110667 | YOST CREEK 9.5 MI SE LOGAN, OHIO | 392534 | 0821837 | 039 | 073 | SW | 1979 | | | | |
| | WL2-38 | USFS | 110665 | RACCOON CK 9.5 MI SE LOGAN, OHIO | 392540 | 0821812 | 039 | 073 | SW | 1979 | | | | |
| 05090101 | WL2-39 | USEPA | 384181 | RACCOON CR.STUDY ABD STRIP MINE | 392541 | 0821817 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-40 | USEPA | 384197 | RACCOON CR.STUDY ABD STRIP MINE | 392542 | 0821928 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-41 | USEPA | 384175 | RACCOON CR.STUDY ABD STRIP MINE | 392543 | 0821806 | 039 | 073 | SW | 1971 | 1971 | | | |
| | WL2-42 | USFS | 110609 | E BR STARR RUN .6 MI N STARR, OH | 392546 | 0822131 | 039 | 073 | SW | 1979 | | | | |
| 05090101 | WL2-43 | USEPA | 384187 | RACCOON CR.STUDY ABD STRIP MINE | 392551 | 0821848 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-44 | USEPA | 384196 | RACCOON CR.STUDY ABD STRIP MINE | 392551 | 0821940 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-45 | USEPA | 384194 | RACCOON CR.STUDY ABD STRIP MINE | 392553 | 0821918 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-46 | USEPA | 384255 | RACCOON CR.STUDY ABD STRIP MINE | 392557 | 0822015 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05030204 | WL2-47 | USEPA | 382853 | HOCKING R.STUDY ABD DRIFT MINE | 392558 | 0821113 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05090101 | WL2-48 | USEPA | 384188 | RACCOON CR.STUDY ABD STRIP MINE | 392559 | 0821847 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-49 | USEPA | 384189 | RACCOON CR.STUDY ABD STRIP MINE | 392601 | 0821844 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-50 | USEPA | 384145 | HOCKING R.STUDY ABD STRIP MINE | 392604 | 0822116 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-51 | USEPA | 384146 | HOCKING R.STUDY ABD DRIFT MINE | 392604 | 0822116 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-52 | USEPA | 384199 | RACCOON CR.STUDY ABD STRIP MINE | 392604 | 0821924 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-53 | USEPA | 384252 | RACCOON CR.STUDY ABD STRIP MINE | 392605 | 0821946 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-54 | USEPA | 384198 | RACCOON CR.STUDY ABD STRIP MINE | 392608 | 0821931 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05090101 | WL2-55 | USEPA | 384251 | RACCOON CR.STUDY ABD STRIP MINE | 392634 | 0821946 | 039 | 073 | SW | 1971 | 1971 | | | |
| | WL2-56 | USFS | 110670 | DORR RUN 1.7 MI WN NELSONVILLE,O | 392823 | 0821540 | 039 | 073 | SW | 1979 | | | | |
| | WL2-57 | USFS | 110615 | UNNAMED CK 1.6M E HAYDENVILLE,OH | 392836 | 0821848 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-58 | USEPA | 384190 | RACCOON CR.STUDY ABD STRIP MINE | 392841 | 0821835 | 039 | 073 | SW | 1971 | 1971 | | | |
| 05030204 | WL2-59 | USEPA | 382866 | HOCKING R.STUDY ABD COMB MINE | 392851 | 0821344 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-60 | USEPA | 382878 | HOCKING R.STUDY ABD COMB MINE | 392851 | 0821440 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-61 | USEPA | 382875 | HOCKING R.STUDY ABD COMB MINE | 392853 | 0821425 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05040004 | WL2-62 | USEPA | 382881 | HOCKING R.STUDY ABD STRIP MINE | 392900 | 0821535 | 039 | 073 | SW | 1970 | 1970 | | | |
| | WL2-63 | USFS | 110669 | DORR RUN 2.5 MI NW NELSONVILLE,O | 392904 | 0821636 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-64 | USEPA | 382877 | HOCKING R.STUDY ABD COMB MINE | 392906 | 0821457 | 039 | 073 | SW | 1970 | 1970 | | | |
| | WL2-65 | USFS | 110616 | WALNUT RUN 1.1M NE HADENVILLE,OH | 392907 | 0821846 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-66 | USEPA | 382879 | HOCKING R.STUDY ABD COMB MINE | 392908 | 0821544 | 039 | 073 | SW | 1970 | 1970 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL | | | | | | | | CHEMICAL | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | PH | SUSPENDED SOLIDS | STORAGE MEDIA | DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
| WL2-34 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-35 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-36 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-37 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-38 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-39 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-40 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-41 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-42 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-43 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-44 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-45 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-46 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-47 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-48 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-49 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-50 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-51 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-52 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-53 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-54 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-55 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-56 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-57 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-58 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-59 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-60 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-61 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-62 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-63 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-64 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-65 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-66 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |

| CODE NUMBER | BIOLOGIC | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA |
| WL2-34 | | | | | | | | | | | | | | | | | | | | | |
| WL2-35 | | | | | | | | | | | | | | | | | | | | | |
| WL2-36 | | | | | | | | | | | | | | | | | | | | | |
| WL2-37 | | | | | | | | | | | | | | | | | | | | | |
| WL2-38 | | | | | | | | | | | | | | | | | | | | | |
| WL2-39 | | | | | | | | | | | | | | | | | | | | | |
| WL2-40 | | | | | | | | | | | | | | | | | | | | | |
| WL2-41 | | | | | | | | | | | | | | | | | | | | | |
| WL2-42 | | | | | | | | | | | | | | | | | | | | | |
| WL2-43 | | | | | | | | | | | | | | | | | | | | | |
| WL2-44 | | | | | | | | | | | | | | | | | | | | | |
| WL2-45 | | | | | | | | | | | | | | | | | | | | | |
| WL2-46 | | | | | | | | | | | | | | | | | | | | | |
| WL2-47 | | | | | | | | | | | | | | | | | | | | | |
| WL2-48 | | | | | | | | | | | | | | | | | | | | | |
| WL2-49 | | | | | | | | | | | | | | | | | | | | | |
| WL2-50 | | | | | | | | | | | | | | | | | | | | | |
| WL2-51 | | | | | | | | | | | | | | | | | | | | | |
| WL2-52 | | | | | | | | | | | | | | | | | | | | | |
| WL2-53 | | | | | | | | | | | | | | | | | | | | | |
| WL2-54 | | | | | | | | | | | | | | | | | | | | | |
| WL2-55 | | | | | | | | | | | | | | | | | | | | | |
| WL2-56 | | | | | | | | | | | | | | | | | | | | | |
| WL2-57 | | | | | | | | | | | | | | | | | | | | | |
| WL2-58 | | | | | | | | | | | | | | | | | | | | | |
| WL2-59 | | | | | | | | | | | | | | | | | | | | | |
| WL2-60 | | | | | | | | | | | | | | | | | | | | | |
| WL2-61 | | | | | | | | | | | | | | | | | | | | | |
| WL2-62 | | | | | | | | | | | | | | | | | | | | | |
| WL2-63 | | | | | | | | | | | | | | | | | | | | | |
| WL2-64 | | | | | | | | | | | | | | | | | | | | | |
| WL2-65 | | | | | | | | | | | | | | | | | | | | | |
| WL2-66 | | | | | | | | | | | | | | | | | | | | | |

| CODE NUMBER | SEDIMENT | | | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA | TELEMETRY | S W STATION WAVES NINO | G W STATION WAVES NINO | DATA BANK SOURCE |
| WL2-34 | | | | | | | | | | | | S |
| WL2-35 | | | | | | | | | | | | S |
| WL2-36 | | | | | | | | | | | | S |
| WL2-37 | | | | | | | | | | | | S |
| WL2-38 | | | | | | | | | | | | S |
| WL2-39 | | | | | | | | | | | | S |
| WL2-40 | | | | | | | | | | | | S |
| WL2-41 | | | | | | | | | | | | S |
| WL2-42 | | | | | | | | | | | | SSS |
| WL2-43 | | | | | | | | | | | | S |
| WL2-44 | | | | | | | | | | | | S |
| WL2-45 | | | | | | | | | | | | S |
| WL2-46 | | | | | | | | | | | | S |
| WL2-47 | | | | | | | | | | | | S |
| WL2-48 | | | | | | | | | | | | S |
| WL2-49 | | | | | | | | | | | | S |
| WL2-50 | | | | | | | | | | | | S |
| WL2-51 | | | | | | | | | | | | S |
| WL2-52 | | | | | | | | | | | | S |
| WL2-53 | | | | | | | | | | | | S |
| WL2-54 | | | | | | | | | | | | S |
| WL2-55 | | | | | | | | | | | | S |
| WL2-56 | | | | | | | | | | | | S |
| WL2-57 | | | | | | | | | | | | S |
| WL2-58 | | | | | | | | | | | | S |
| WL2-59 | | | | | | | | | | | | S |
| WL2-60 | | | | | | | | | | | | S |
| WL2-61 | | | | | | | | | | | | S |
| WL2-62 | | | | | | | | | | | | S |
| WL2-63 | | | | | | | | | | | | S |
| WL2-64 | | | | | | | | | | | | S |
| WL2-65 | | | | | | | | | | | | S |
| WL2-66 | | | | | | | | | | | | S |

PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| O | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD (YES NO) | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA (YES NO) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05030204 | WL2-67 | USEPA | 382883 | HOCKING R.STUDY ABD STRIP MINE | 392910 | 0821512 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-68 | USEPA | 382880 | HOCKING R.STUDY ABD STRIP MINE | 392913 | 0821559 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-69 | USEPA | 382882 | HOCKING R.STUDY ABD COMB MINE | 392914 | 0821537 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-70 | USEPA | 382873 | HOCKING R.STUDY ABD STRIP MINE | 392926 | 0821316 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-71 | USEPA | 382876 | HOCKING R.STUDY ABD COMB MINE | 392928 | 0821458 | 039 | 073 | SW | 1970 | 1970 | | | |
| | WL2-72 | USFS | 110617 | DIXON RUN 2 MI E CARBON HILL, OH | 392928 | 0821237 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-73 | USEPA | 382874 | HOCKING R.STUDY ABD STRIP MINE | 392931 | 0821326 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05040004 | WL2-74 | USEPA | 382885 | HOCKING R.STUDY ABD STRIP MINE | 392935 | 0821621 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-75 | USEPA | 382895 | HOCKING R.STUDY ABD ORIFT MINE | 392937 | 0821243 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-76 | USEPA | 382871 | HOCKING R.STUDY ABD COMB MINE | 392938 | 0821334 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-77 | USEPA | 382872 | HOCKING R.STUDY ABD COMB MINE | 392938 | 0821326 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-78 | USEPA | 382884 | HOCKING R.STUDY ABD COMB MINE | 392938 | 0821622 | 039 | 073 | SW | 1970 | 1970 | | | |
| | WL2-79 | USFS | 110618 | UNNAMED CK .5MI S CARBON HILL, O | 392942 | 0821501 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-80 | USEPA | 382870 | HOCKING R.STUDY ABD COMB MINE | 392959 | 0821416 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-81 | OHOO4 | 010683 | CARBON HILL WATER ASSN INC | 393000 | 0821440 | 039 | 073 | SW | 1973 | | | | |
| 05030204 | WL2-82 | USEPA | 384003 | HOCKING R.STUDY ABD COMB MINE | 393001 | 0821549 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-83 | USEPA | 382897 | HOCKING R.STUDY ABD COMB MINE | 393014 | 0821311 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-84 | USEPA | 382898 | HOCKING R.STUDY ABD COMB MINE | 393016 | 0821251 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-85 | USEPA | 382896 | HOCKING R.STUDY ABD COMB MINE | 393021 | 0821318 | 039 | 073 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-86 | USGS | 393109082162900 | MONDAY C NR GREENDALE OH | 393109 | 0821629 | 039 | 073 | SW | 1975 | 1975 | | | |
| | WL2-87 | USFS | 110626 | SAND RUN 1.2 MINW CARBON HILL,OH | 393113 | 0821534 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-88 | USEPA | 382890 | HOCKING R.STUDY ABD COMB MINE | 393143 | 0821349 | 039 | 073 | SW | 1970 | 1970 | | | |
| | WL2-89 | USFS | 110628 | LITTLE MONDAY CK 7 MI E LOGAN,OH | 393227 | 0821634 | 039 | 073 | SW | 1973 | 1978 | Y | | |
| | WL2-90 | USFS | 110635 | MONDAY CREEK 8 MI E LOGAN, OHIO | 393251 | 0821536 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-91 | USEPA | 382892 | HOCKING R.STUDY ABD DRIFT MINE | 393308 | 0821346 | 039 | 073 | SW | 1970 | 1970 | | | |
| | WL2-92 | USFS | 110662 | N F LOST RUN 8.2 MI E LOGAN, OH | 393315 | 0821536 | 039 | 073 | SW | 1979 | | | | |
| 05030204 | WL2-93 | USGS | 393453082162800 | 051MONDAY C (20-5) AT OREVILLE OH | 393453 | 0821628 | 039 | 073 | SW | 1980 | | | | |
| | WL2-94 | USFS | 110632 | GORE RUN .6 MI N GORE, OHIO | 393518 | 0821731 | 039 | 073 | SW | 1979 | | | | |
| 05090101 | WL2-95 | USEPA | 384250 | RACCOON CR.STUDY ABD STRIP MINE | 392553 | 0821934 | 039 | 079 | SW | 1971 | 1971 | | | |
| 05090103 | WL2-96 | USGS | 383624082375300 | LAKE VESUVIUS AB DAM NR IRONTON | 383624 | 0823753 | 039 | 087 | LK | 1975 | 1975 | | | |
| 05090103 | WL2-97 | USGS | 383638082440900 | UNION B SPERRY C NR IRONTON OH | 383638 | 0824409 | 039 | 087 | SW | 1975 | 1975 | | | |
| 05090103 | WL2-98 | USGS | 383711082443900 | 051SPERRY F (4-3) NR PINE GROVE OH | 383711 | 0824439 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL2-99 | USGS | 383729082391400 | ELLISONVILLE C NR ETNA OH | 383729 | 0823914 | 039 | 087 | SW | 1975 | 1975 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL | | | | | | | | CHEMICAL | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature | Specific conductance | Turbidity | Color | Odor | pH | Suspended solids | Storage media | Dissolved solids | Major ions | Hardness | Silica | Phosphorus | Phosphorus species | Nitrogen | Nitrogen species | Detergents | Other minor elements | Radioactivity | Radiochemical species | Carbon | Organic groups | Pesticides species | Other organic species | Biochemical oxygen demand | Chemical oxygen demand | Dissolved oxygen | Other dissolved gases | Storage media |
| WL2-67 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-68 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-69 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-70 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-71 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-72 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-73 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-74 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-75 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-76 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-77 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-78 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-79 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-80 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-81 | | A | A | A | | A | | D | A | A | A | | | A | | A | A | A | | | | | | | | | | | D |
| WL2-82 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-83 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-84 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-85 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-86 | S | S | S | | | S | | D | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |
| WL2-87 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-88 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-89 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-90 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-91 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-92 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-93 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-94 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-95 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-96 | R | R | R | R | | R | A | D | A | R | A | R | R | | R | R | | A | | | R | | | | R | R | R | R | D |
| WL2-97 | S | S | S | | | S | | D | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |
| WL2-98 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-99 | S | S | S | | | S | | D | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |

| CODE NUMBER | BIOLOGIC | | | | | | | | | | | | | | | | | | | | | SEDIMENT | | | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enteric bacteria | Native bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro invertebrates | Macro invertebrates | Vertebrates | Fungi | Viruses | Primary productivity | Secondary productivity | Chemosynthetic activity | Biostimulatory activity | Toxicity test | Other bioassay test | Chemical tissue test | Histopathological analysis | Other tissue analysis | Storage media | Bed load | Concentration (suspended) | Sediment discharge (suspended) | Concentration (total) | Sediment discharge (total) | Particle size (suspended) | Particle size (bed material) | Storage media | Telemetry | S W station | G W station | Data bank source |
| WL2-67 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-68 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-69 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-70 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-71 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-72 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-73 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-74 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-76 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-77 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-78 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-79 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-81 | S | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| WL2-82 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-83 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-84 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-85 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-86 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-87 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-88 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-89 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-90 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-91 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-92 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-93 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-94 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-96 | R | | R | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | S |
| WL2-97 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-98 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB. AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05090103 | WL2-100 | USGS | 383735082445700 | 051SPERRY F (4-2) NR PINE GROVE OH | 383735 | 0824457 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL2-101 | USFS | 110542 | PADDLE CR 10 MI N. IRONTON,OHIO | 383755 | 0823553 | 039 | 087 | SW | 1979 | | | | |
| 05090103 | WL2-102 | USFS | 110544 | STORMS CR 10 MI N. IRONTON,OHIO | 383755 | 0823546 | 039 | 087 | SW | 1979 | | | | |
| 05090103 | WL2-103 | USFS | 110543 | ALDRIDGE CR 10 MI N.IRONTON,OHIO | 383759 | 0823549 | 039 | 087 | SW | 1979 | | | | |
| 05090103 | WL2-104 | USGS | 383759082355800 | STORMS C AB LK VESUVIUS NR IRONT | 383759 | 0823558 | 039 | 087 | SW | 1975 | 1975 | | | |
| 05090103 | WL2-105 | USGS | 383805082405400 | 051ELLISONVILLE C (4-5) AT PEDRO OH | 383805 | 0824054 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL2-106 | USFS | 110510 | CRAZY CREEK .8 MI NW PEDRO. OHIO | 383824 | 0824122 | 039 | 087 | SW | 1972 | | | | |
| 05090103 | WL2-107 | USGS | 383833082402800 | 051L PINE C (4-6) AT PEDRO OH | 383833 | 0824028 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL2-108 | USFS | 110545 | STORMS CR 10 MI N. IRONTON, OHIO | 383838 | 0823747 | 039 | 087 | SW | 1979 | | | | |
| 05090103 | WL2-109 | USGS | 384028082404400 | BEAR RN AT SUPERIOR OH | 384028 | 0824044 | 039 | 087 | SW | 1975 | 1975 | | | |
| 05090103 | WL2-110 | USGS | 384034082422100 | 051PINE C (4-7) NR PEDRO OH | 384034 | 0824221 | 039 | 087 | SW | 1980 | | | | |
| 05090103 | WL2-111 | USFS | 110522 | PINE CREEK 1.1 MI S BUCKHORN OH | 384403 | 0823743 | 039 | 087 | SW | 1979 | | | | |
| 05090103 | WL2-112 | USFS | 110521 | PAINTER CR 1.2MI SE BUCKHORN, OH | 384406 | 0823728 | 039 | 087 | SW | 1979 | | | | |
| 05090103 | WL2-113 | USFS | 110519 | BUCKHORN CR 1.1M SW BUCKHORN, OH | 384428 | 0823843 | 039 | 087 | SW | 1979 | | | | |
| 05090103 | WL2-114 | USGS | 384452082381000 | PINE C NR BUCKHORN OH | 384452 | 0823810 | 039 | 087 | SW | 1975 | 1975 | | | |
| 05090103 | WL2-115 | USFS | 110517 | KIMBLE CR 1.1MI N BUCKHORN, OHIO | 384455 | 0823809 | 039 | 087 | SW | 1979 | | | | |
| 05060002 | WL2-116 | USFS | 110520 | NEGRO CREEK .8 MI E BUCKHORN OH | 384458 | 0823730 | 039 | 087 | SW | 1979 | | | | |
| 05060002 | WL2-117 | USFS | 110518 | KIMBLE CR .1 MI. NW BUCKHORN, OH | 384536 | 0823730 | 039 | 087 | SW | 1972 | 1977 | Y | | |
| 05090103 | WL2-118 | USFS | 110516 | OLIVE CK AT OLIVE FURNACE, OHIO | 384542 | 0823749 | 039 | 087 | SW | 1979 | | | | |
| 05090101 | WL2-119 | USFS | 110515 | BRUSHY FORK 1 MI NW BUCKHORN, OH | 384622 | 0823937 | 039 | 087 | SW | 1979 | | | | |
| | WL2-120 | USFS | 110805 | CLEAR FORK 11 MI S WOODSFIELD,OH | 393603 | 0810928 | 039 | 111 | SW | 1979 | | | | |
| | WL2-121 | USFS | 110809 | L MUSKINGUM R 11 MI S WOODSFD,OH | 393603 | 0810926 | 039 | 111 | SW | 1979 | | | | |
| | WL2-122 | USFS | 110804 | STRAIGHT FK 11 M S WOODSFIELD,OH | 393610 | 0810810 | 039 | 111 | SW | 1979 | | | | |
| 05030201 | WL2-123 | USGS | 03115300 | L MUSKINGUM R NR RINARD MILLS OH | 393625 | 0810721 | 039 | 111 | SW | 1972 | 1977 | | 130.00 | Y |
| | WL2-124 | USFS | 110803 | WITTEN FK 10 MI SE WOODSFIELD OH | 393755 | 0810302 | 039 | 111 | SW | 1979 | | | | |
| | WL2-125 | USFS | 110808 | L MUSKINGUM R 9 MI SE WOODSFD,OH | 393802 | 0810406 | 039 | 111 | SW | 1979 | | | | |
| | WL2-126 | USFS | 110802 | RICH FORK 4.5 MI S WOODSFIELD,OH | 394157 | 0810837 | 039 | 111 | SW | 1979 | | | | |
| | WL2-127 | USFS | 110801 | CRANENEST 4.5 MI S WOODSFIELD,OH | 394210 | 0810838 | 039 | 111 | SW | 1979 | | | | |
| | WL2-128 | USFS | 110642 | CEDAR RUN 3.2 MI. E CORNING, OH | 393522 | 0820142 | 039 | 115 | SW | 1979 | | | | |
| 05030201 | WL2-129 | USGS | 394158081083600 | RICH F NR WOODSFIELD OH | 394158 | 0810836 | 039 | 115 | SW | 1975 | 1975 | | | |
| 05030204 | WL2-130 | USEPA | 382894 | HOCKING R.STUDY ABD STRIP MINE | 393314 | 0821423 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-131 | USEPA | 382893 | HOCKING R.STUDY ABD STRIP MINE | 393316 | 0821422 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-132 | USEPA | 384004 | HOCKING R.STUDY ABD STRIP MINE | 393335 | 0821752 | 039 | 127 | SW | 1970 | 1970 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

**PHYSICAL**

| CODE NUMBER | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media |
|---|---|---|---|---|---|---|---|---|
| WL2-100 | S | S | | | | S | | |
| WL2-101 | A | A | A | | | A | | D |
| WL2-102 | A | A | A | | | A | | D |
| WL2-103 | A | A | A | | | A | | D |
| WL2-104 | A | A | A | A | | A | | D |
| WL2-105 | S | S | | | | S | | |
| WL2-106 | A | A | A | | | A | | D |
| WL2-107 | S | S | | | | S | | |
| WL2-108 | A | A | A | | | A | | D |
| WL2-109 | S | S | S | | | S | | D |
| WL2-110 | S | S | | | | S | | |
| WL2-111 | A | A | A | | | A | | D |
| WL2-112 | A | A | A | | | A | | D |
| WL2-113 | A | A | A | | | A | | D |
| WL2-114 | S | S | S | | | S | | D |
| WL2-115 | A | A | A | | | A | | D |
| WL2-116 | A | A | A | | | A | | D |
| WL2-117 | S | S | S | | | S | | D |
| WL2-118 | A | A | A | | | A | | D |
| WL2-119 | A | A | A | | | A | | D |
| WL2-120 | A | A | A | | | A | | D |
| WL2-121 | A | A | A | | | A | | D |
| WL2-122 | A | A | A | | | A | | D |
| WL2-123 | A | A | | | | A | | D |
| WL2-124 | A | A | A | | | A | | D |
| WL2-125 | A | A | A | | | A | | D |
| WL2-126 | A | A | A | | | A | | D |
| WL2-127 | A | A | A | | | A | | D |
| WL2-128 | A | A | A | | | A | | D |
| WL2-129 | S | S | S | | | S | | D |
| WL2-130 | | A | | | | A | | D |
| WL2-131 | | A | | | | A | | D |
| WL2-132 | | A | | | | A | | D |

**CHEMICAL**

| CODE NUMBER | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL2-100 | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-101 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-102 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-103 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-104 | | | | | A | | A | A | | | | | A | | | | | | A | | D |
| WL2-105 | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-106 | | A | | | | | | | | A | | | | | | | | | | | D |
| WL2-107 | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-108 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-109 | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |
| WL2-110 | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-111 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-112 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-113 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-114 | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |
| WL2-115 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-116 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-117 | | S | | | | | | | | | | | | | | | | | | | D |
| WL2-118 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-119 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-120 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-121 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-122 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-123 | A | A | A | A | A | | | A | | A | | | | | | | | | A | A | D |
| WL2-124 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-125 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-126 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-127 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-128 | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-129 | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |
| WL2-130 | | A | A | | | | | | | | | | | | | | | | | | D |
| WL2-131 | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-132 | | A | A | | | | | | | A | | | | | | | | | | | D |

**BIOLOGIC**

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL2-100 | | | | | | | | | | | | | | | | | | | | | |
| WL2-101 | | | | | | | | | | | | | | | | | | | | | |
| WL2-102 | | | | | | | | | | | | | | | | | | | | | |
| WL2-103 | | | | | | | | | | | | | | | | | | | | | |
| WL2-104 | | | | | | | | | | | | | | | | | | | | | |
| WL2-105 | | | | | | | | | | | | | | | | | | | | | |
| WL2-106 | | | | | | | | | | | | | | | | | | | | | |
| WL2-107 | | | | | | | | | | | | | | | | | | | | | |
| WL2-108 | | | | | | | | | | | | | | | | | | | | | |
| WL2-109 | | | | | | | | | | | | | | | | | | | | | |
| WL2-110 | | | | | | | | | | | | | | | | | | | | | |
| WL2-111 | | | | | | | | | | | | | | | | | | | | | |
| WL2-112 | | | | | | | | | | | | | | | | | | | | | |
| WL2-113 | | | | | | | | | | | | | | | | | | | | | |
| WL2-114 | | | | | | | | | | | | | | | | | | | | | |
| WL2-115 | | | | | | | | | | | | | | | | | | | | | |
| WL2-116 | | | | | | | | | | | | | | | | | | | | | |
| WL2-117 | E | | | | | | | | | | | | | | | | | | | | D |
| WL2-118 | | | | | | | | | | | | | | | | | | | | | |
| WL2-119 | | | | | | | | | | | | | | | | | | | | | |
| WL2-120 | | | | | | | | | | | | | | | | | | | | | |
| WL2-121 | | | | | | | | | | | | | | | | | | | | | |
| WL2-122 | | | | | | | | | | | | | | | | | | | | | |
| WL2-123 | | | | | | | | | | | | | | | | | | | | | |
| WL2-124 | | | | | | | | | | | | | | | | | | | | | |
| WL2-125 | | | | | | | | | | | | | | | | | | | | | |
| WL2-126 | | | | | | | | | | | | | | | | | | | | | |
| WL2-127 | | | | | | | | | | | | | | | | | | | | | |
| WL2-128 | | | | | | | | | | | | | | | | | | | | | |
| WL2-129 | | | | | | | | | | | | | | | | | | | | | |
| WL2-130 | | | | | | | | | | | | | | | | | | | | | |
| WL2-131 | | | | | | | | | | | | | | | | | | | | | |
| WL2-132 | | | | | | | | | | | | | | | | | | | | | |

**SEDIMENT / OTHER**

| CODE NUMBER | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | Telemetry | S W Station Types | G W Station Types | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL2-100 | | | | | | | | | | | | |
| WL2-101 | | | | | | | | | | | | S |
| WL2-102 | | | | | | | | | | | | S |
| WL2-103 | | | | | | | | | | | | S |
| WL2-104 | | | | | | | | | | | | S |
| WL2-105 | | | | | | | | | | | | |
| WL2-106 | | | | | | | | | | | | S |
| WL2-107 | | | | | | | | | | | | |
| WL2-108 | | | | | | | | | | | | S |
| WL2-109 | | | | | | | | | | | | S |
| WL2-110 | | | | | | | | | | | | |
| WL2-111 | | | | | | | | | | | | S |
| WL2-112 | | | | | | | | | | | | S |
| WL2-113 | | | | | | | | | | | | S |
| WL2-114 | | | | | | | | | | | | S |
| WL2-115 | | | | | | | | | | | | S |
| WL2-116 | | | | | | | | | | | | S |
| WL2-117 | | | | | | | | | | | | SSSS |
| WL2-118 | | | | | | | | | | | | S |
| WL2-119 | | | | | | | | | | | | S |
| WL2-120 | | | | | | | | | | | | S |
| WL2-121 | | | | | | | | | | | | S |
| WL2-122 | | | | | | | | | | | | S |
| WL2-123 | | | | | | | | | | | | S |
| WL2-124 | | | | | | | | | | | | S |
| WL2-125 | | | | | | | | | | | | S |
| WL2-126 | | | | | | | | | | | | S |
| WL2-127 | | | | | | | | | | | | S |
| WL2-128 | | | | | | | | | | | | S |
| WL2-129 | | | | | | | | | | | | S |
| WL2-130 | | | | | | | | | | | | S |
| WL2-131 | | | | | | | | | | | | S |
| WL2-132 | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | 1 | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |

| Year-Round | Seasonal | Eliminated | MEANING |
|---|---|---|---|
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05030204 | WL2-133 | USGS | 393413082123600 | SNOW F STATION 1 NR MURRAY CITY | 393413 | 0821236 | 039 | 127 | SW | 1976 | 1976 | | | |
| | WL2-134 | USFS | 110661 | GORE RUN .75 MI. SW GORE, OHIO | 393434 | 0821828 | 039 | 127 | SW | 1979 | | | | |
| | WL2-135 | USFS | 110658 | OREVILLE RUN 7.9 MI NE LOGAN, OH | 393501 | 0821606 | 039 | 127 | SW | 1979 | | | | |
| 05030204 | WL2-136 | USEPA | 382899 | HOCKING R.STUDY ABD DRIFT MINE | 393526 | 0821421 | 039 | 127 | SW | 1970 | 1970 | | | |
| | WL2-137 | USFS | 110629 | LITTLE MONDAY CK 5MI NE LOGAN,OH | 393529 | 0822018 | 039 | 127 | SW | 1979 | | | | |
| | WL2-138 | USFS | 110631 | SALT RUN 3.2 MI NW STRAITSVILLE | 393601 | 0821612 | 039 | 127 | SW | 1979 | | | | |
| 05030204 | WL2-139 | USGS | 393610082124400 | 051SHAWNEE C (20-8) AT SHAWNEE OH | 393610 | 0821244 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL2-140 | USEPA | 384059 | HOCKING R.STUDY ABD REFUSE PILE | 393613 | 0821416 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-141 | USGS | 393622082150500 | 051MONDAY C (20-6) NR SHAWNEE OH | 393622 | 0821505 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL2-142 | USGS | 393627082145700 | 051UNAM TR TO MONDAY C (20-7) NR SHAWNEE OH | 393627 | 0821457 | 039 | 127 | SW | 1980 | | | | |
| | WL2-143 | USFS | 110634 | UNNAMED CK 2 MI W SHAWNEE, OHIO | 393628 | 0821457 | 039 | 127 | SW | 1979 | | | | |
| | WL2-144 | USFS | 110660 | SHAWNEE CR .65 MI NW SHAWNEE, OH | 393639 | 0821334 | 039 | 127 | SW | 1979 | | | | |
| | WL2-145 | USFS | 110659 | ROCK RUN 1.95 MI W SHAWNEE, OHIO | 393640 | 0821421 | 039 | 127 | SW | 1979 | | | | |
| 05030204 | WL2-146 | USGS | 393649082135300 | 051MONDAY C (20-12) NR SHAWNEE OH | 393649 | 0821353 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL2-147 | USEPA | 384033 | HOCKING R.STUDY ABD STRIP MINE | 393703 | 0821452 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-148 | USEPA | 384005 | HOCKING R.STUDY ABD COMB MINE | 393712 | 0821753 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-149 | USEPA | 384035 | HOCKING R.STUDY ABD STRIP MINE | 393718 | 0821437 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-150 | USEPA | 384034 | HOCKING R.STUDY ABD STRIP MINE | 393722 | 0821457 | 039 | 127 | SW | 1970 | 1970 | | | |
| | WL2-151 | USFS | 110633 | DIXIE HOL .1 MI S MECUNEVILLE,OH | 393739 | 0821406 | 039 | 127 | SW | 1979 | | | | |
| 05030204 | WL2-152 | USGS | 393739082140600 | 051UNAM TR TO MONDAY C (20-9) AT MCCUNEVILLE | 393739 | 0821406 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL2-153 | USGS | 393742082135800 | 051MONDAY C (20-10) AT MCCUNEVILLE OH | 393742 | 0821358 | 039 | 127 | SW | 1980 | | | | |
| | WL2-154 | USFS | 110630 | LITTLE MONDAY CK 7MI NE LOGAN,OH | 393743 | 0821834 | 039 | 127 | SW | 1979 | | | | |
| 05030204 | WL2-155 | USGS | 393743082135800 | MONDAY C AT MC CUNEVILLE OH | 393743 | 0821358 | 039 | 127 | SW | 1975 | 1975 | | | |
| 05030204 | WL2-156 | USGS | 393743082183600 | 051L MONDAY C (20-11) NR MAXVILLE OH | 393743 | 0821836 | 039 | 127 | SW | 1980 | | | | |
| 05030204 | WL2-157 | USGS | 393745082183300 | L MONDAY C NR MAXVILLE OH | 393745 | 0821833 | 039 | 127 | SW | 1975 | 1975 | | | |
| 05040004 | WL2-158 | USEPA | 384014 | HOCKING R.STUDY ABD COMB MINE | 393824 | 0821653 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-159 | USEPA | 384010 | HOCKING R.STUDY ABD STRIP MINE | 393825 | 0821622 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-160 | USEPA | 384028 | HOCKING R.STUDY ABD STRIP MINE | 393833 | 0821559 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-161 | USEPA | 384029 | HOCKING R.STUDY ABD STRIP MINE | 393833 | 0821608 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-162 | USEPA | 384032 | HOCKING R.STUDY ABD STRIP MINE | 393835 | 0821551 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-163 | USEPA | 384013 | HOCKING R:STUDY ABD STRIP MINE | 393836 | 0821647 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-164 | USEPA | 384026 | HOCKING R.STUDY ABD STRIP MINE | 393836 | 0821647 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05040004 | WL2-165 | USEPA | 384037 | HOCKING R.STUDY ABD STRIP MINE | 393844 | 0821518 | 039 | 127 | SW | 1970 | 1970 | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

| CODE NUMBER | PHYSICAL | | | | | | | | CHEMICAL | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TEMPERATURE | SPECIFIC CONDUCTANCE | TURBIDITY | COLOR | ODOR | pH | SUSPENDED SOLIDS | STORAGE MEDIA | DISSOLVED SOLIDS | MAJOR IONS | HARDNESS | SILICA | PHOSPHORUS | PHOSPHORUS SPECIES | NITROGEN | NITROGEN SPECIES | DETERGENTS | OTHER MINOR ELEMENTS | RADIOACTIVITY | RADIOCHEMICAL SPECIES | CARBON | ORGANIC GROUPS | PESTICIDES SPECIES | OTHER ORGANIC SPECIES | BIOCHEMICAL OXYGEN DEMAND | CHEMICAL OXYGEN DEMAND | DISSOLVED OXYGEN | OTHER DISSOLVED GASES | STORAGE MEDIA |
| WL2-133 | A | A | A | | | A | | D | | A | | | | | | | | A | | | A | A | | | | | A | A | D |
| WL2-134 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-135 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-136 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-137 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-138 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-139 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-140 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-141 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-142 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-143 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-144 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-145 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-146 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-147 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-148 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-149 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-150 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-151 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-152 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-153 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-154 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-155 | S | S | S | | | S | | D | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |
| WL2-156 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-157 | S | S | S | | | S | | D | | S | S | | | | | | | S | | | S | A | | | | | S | S | D |
| WL2-158 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-159 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-160 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-161 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-162 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-163 | | A | | | | A | | D | | A | A | | | | | | | | | | | | | | | | | | D |
| WL2-164 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-165 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |

| CODE NUMBER | BIOLOGIC | | | | | | | | | | | | | | | | | | | | | SEDIMENT | | | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ENTERIC BACTERIA | NATIVE BACTERIA | PHYTOPLANKTON | ZOOPLANKTON | PERIPHYTON | MACROPHYTON | MICRO INVERTEBRATES | MACRO INVERTEBRATES | VERTEBRATES | FUNGI | VIRUSES | PRIMARY PRODUCTIVITY | SECONDARY PRODUCTIVITY | CHEMOSYNTHETIC ACTIVITY | BIOSTIMULATORY ACTIVITY | TOXICITY TEST | OTHER BIOASSAY TEST | CHEMICAL TISSUE TEST | HISTOPATHOLOGICAL ANALYSIS | OTHER TISSUE ANALYSIS | STORAGE MEDIA | BED LOAD | CONCENTRATION (SUSPENDED) | SEDIMENT DISCHARGE (SUSPENDED) | CONCENTRATION (TOTAL) | SEDIMENT DISCHARGE (TOTAL) | PARTICLE SIZE (SUSPENDED) | PARTICLE SIZE (BED MATERIAL) | STORAGE MEDIA | TELEMETRY | S W STATION WAVES NWNO | G W STATION WAVES NWNO | DATA BANK SOURCE |
| WL2-133 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-134 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-135 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-136 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-137 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-138 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-139 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-140 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-141 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-142 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-143 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-144 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-145 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-146 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-147 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-148 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-149 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-150 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-151 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-152 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-153 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-154 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-155 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-156 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL2-157 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-158 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-159 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-160 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-161 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-162 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-163 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-164 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |
| WL2-165 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |

| Code Year-Round | Code Seasonal | Code Eliminated | MEANING |
|---|---|---|---|
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

PHYSICAL / CHEMICAL

| CODE NUMBER | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL2-166 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-167 | | | | | | | | | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-168 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-169 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-170 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-171 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-172 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-173 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-174 | | A | | | | A | | D | | A | A | | | | | | | A | | | | | | | | | | | D |
| WL2-175 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-176 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-177 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-178 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-179 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-180 | S | S | | | | S | | | S | | S | | | | | | | S | | | | | | | | | S | | |
| WL2-181 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-182 | S | S | S | | | S | | D | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |
| WL2-183 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-184 | S | S | S | | | S | | D | | S | S | | | | | | | S | | | S | S | | | | | S | S | D |
| WL2-185 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-186 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-187 | A | A | A | | | A | | D | | A | | | | | | | | | | | | | | | | | | | D |
| WL2-188 | S | S | | | | S | | D | S | S | R | S | S | E | | R | | R | | | R | | | | R | | S | S | D |

BIOLOGIC

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL2-166 | | | | | | | | | | | | | | | | | | | | | |
| WL2-167 | | | | | | | | | | | | | | | | | | | | | |
| WL2-168 | | | | | | | | | | | | | | | | | | | | | |
| WL2-169 | | | | | | | | | | | | | | | | | | | | | |
| WL2-170 | | | | | | | | | | | | | | | | | | | | | |
| WL2-171 | | | | | | | | | | | | | | | | | | | | | |
| WL2-172 | | | | | | | | | | | | | | | | | | | | | |
| WL2-173 | | | | | | | | | | | | | | | | | | | | | |
| WL2-174 | | | | | | | | | | | | | | | | | | | | | |
| WL2-175 | | | | | | | | | | | | | | | | | | | | | |
| WL2-176 | | | | | | | | | | | | | | | | | | | | | |
| WL2-177 | | | | | | | | | | | | | | | | | | | | | |
| WL2-178 | | | | | | | | | | | | | | | | | | | | | |
| WL2-179 | | | | | | | | | | | | | | | | | | | | | |
| WL2-180 | | | | | | | | | | | | | | | | | | | | | |
| WL2-181 | | | | | | | | | | | | | | | | | | | | | |
| WL2-182 | | | | | | | | | | | | | | | | | | | | | |
| WL2-183 | | | | | | | | | | | | | | | | | | | | | |
| WL2-184 | | | | | | | | | | | | | | | | | | | | | |
| WL2-185 | | | | | | | | | | | | | | | | | | | | | |
| WL2-186 | | | | | | | | | | | | | | | | | | | | | |
| WL2-187 | | | | | | | | | | | | | | | | | | | | | |
| WL2-188 | | | | | | | | | | | | | | | | | | | | | |

SEDIMENT / OTHER

| CODE NUMBER | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | Telemetry | S W Station | G W Station | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL2-166 | | | | | | | | | | | | S |
| WL2-167 | | | | | | | | | | | | S |
| WL2-168 | | | | | | | | | | | | S |
| WL2-169 | | | | | | | | | | | | S |
| WL2-170 | | | | | | | | | | | | S |
| WL2-171 | | | | | | | | | | | | S |
| WL2-172 | | | | | | | | | | | | S |
| WL2-173 | | | | | | | | | | | | S |
| WL2-174 | | | | | | | | | | | | S |
| WL2-175 | | | | | | | | | | | | |
| WL2-176 | | | | | | | | | | | | S |
| WL2-177 | | | | | | | | | | | | S |
| WL2-178 | | | | | | | | | | | | S |
| WL2-179 | | | | | | | | | | | | |
| WL2-180 | | | | | | | | | | | | |
| WL2-181 | | | | | | | | | | | | S |
| WL2-182 | | | | | | | | | | | | S |
| WL2-183 | | | | | | | | | | | | S |
| WL2-184 | | | | | | | | | | | | S |
| WL2-185 | | | | | | | | | | | | S |
| WL2-186 | | | | | | | | | | | | S |
| WL2-187 | | | | | | | | | | | | S |
| WL2-188 | E | E | E | | | E | | D | | | | SW |

PARAMETER FREQUENCY CODES

| Year-Round | Seasonal | Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | 1 | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCONTINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05030204 | WL2-166 | USEPA | 384012 | HOCKING R.STUDY ABD STRIP MINE | 393854 | 0821638 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-167 | USEPA | 384036 | HOCKING R.STUDY ABD STRIP MINE | 393857 | 0821527 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-168 | USEPA | 384031 | HOCKING R.STUDY ABD STRIP MINE | 393858 | 0821612 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05040004 | WL2-169 | USEPA | 384011 | HDCKING R.STUDY ABD STRIP MINE | 393906 | 0821632 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-170 | USEPA | 384062 | HOCKING R.STUDY ABD STRIP MINE | 393908 | 0821438 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05040004 | WL2-171 | USEPA | 384038 | HOCKING R.STUDY ABD STRIP MINE | 393913 | 0821516 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-172 | USEPA | 384030 | HOCKING R.STUDY ABD STRIP MINE | 393916 | 0821559 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-173 | USEPA | 384025 | HOCKING R.STUDY ABD STRIP MINE | 393927 | 0821544 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05030204 | WL2-174 | USEPA | 384039 | HDCKING R.STUDY ABD STRIP MINE | 393931 | 0821520 | 039 | 127 | SW | 1970 | 1970 | | | |
| 05090103 | WL2-175 | USGS | 384146082424600 | 051PINE C (4-8) NR BARTLES OH | 384146 | 0824246 | 039 | 145 | SW | 1980 | | | | |
| 05090103 | WL2-176 | USFS | 110514 | BRUSHY FORK 2.5MI NW BUCKHORN,OH | 384521 | 0823843 | 039 | 145 | SW | 1979 | | | | |
| 05090101 | WL2-177 | USFS | 110523 | UNNAMED CR 2.7 MI NW BUCKHORN,OH | 384528 | 0823933 | 039 | 145 | SW | 1979 | | | | |
| 05090103 | WL2-178 | USFS | 110513 | PINE CREEK 2.8 MI NW LYRA, OHIO | 384613 | 0824225 | 039 | 145 | SW | 1979 | | | | |
| 05090103 | WL2-179 | USGS | 384657082421300 | 051HALES C (4-9) NR S WEBSTER OH | 384657 | 0824213 | 039 | 145 | SW | 1980 | | | | |
| 05090103 | WL2-180 | USGS | 384839082403100 | 051HALES C (4-10) NR EIFORT OH | 384839 | 0824031 | 039 | 145 | SW | 1980 | | | | |
| | WL2-181 | USFS | 110812 | L MUSKINGUM.R 5 MI E MARIETTA,OH | 392612 | 0812133 | 039 | 167 | SW | 1979 | | | | |
| 05030201 | WL2-182 | USGS | 392826081185300 | MOSS RN TR AT MOSS RUN OH | 392826 | 0811853 | 039 | 167 | SW | 1975 | 1975 | | | |
| | WL2-183 | USFS | 110807 | FIFTEENMILE CR 10 MI MARIETTA,OH | 392840 | 0811740 | 039 | 167 | SW | 1979 | | | | |
| 05030201 | WL2-184 | USGS | 392845081191000 | MOSS RN NR MOSS RUN OH | 392845 | 0811910 | 039 | 167 | SW | 1975 | 1975 | | | |
| | WL2-185 | USFS | 110806 | ARCHERS FK 11 MI NE MARIETTA, OH | 392855 | 0811554 | 039 | 167 | SW | 1979 | | | | |
| | WL2-186 | USFS | 110811 | L MUSKINGUM R 11 M NE MARIETTA,O | 392857 | 0811554 | 039 | 167 | SW | 1979 | | | | |
| | WL2-187 | USFS | 110810 | L MUSKINGUM R AT BLOOMFIELD, OH | 393346 | 0811215 | 039 | 167 | SW | 1979 | | | | |
| 05030201 | WL2-188 | USGS | 03115400 | L MUSKINGUM R AT BLOOMFIELD OH | 393347 | 0811214 | 039 | 167 | SW | 1964 | | | 210.00 | N |

## SUPPLEMENTAL DATA K: LISTING 3

Sources of ground-water-quality data in the Wayne National Forest area.

| HYDROLOGIC UNIT CODE | CODE NUMBER | AGENCY REPORTING | AGENCY STATION NUMBER | STATION NAME | LATITUDE | LONGTITUDE | STATE | COUNTY | SITE | PERIOD OF RECORD BEGAN | PERIOD OF RECORD DISCON-TINUED | INTERRUPTED RECORD | DRAINAGE AREA (SQUARE MILES) | INCLUDES NON-CONTRIB. AREA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05030204 | WL3-1 | OH004 | 043303 | NELSONVILLE | 392746 | 0821500 | 039 | 009 | GW | 1977 | | | | |
| 05030204 | WL3-2 | USFS | 110548 | | 393128 | 0821556 | 039 | 073 | GW | 1979 | | | | |
| 05030204 | WL3-3 | OH004 | 045103 | NEW STRAIGHTSVILLE | 393434 | 0821357 | 039 | 127 | GW | 1973 | | | | |
| 05030204 | WL3-4 | OH004 | 057003 | SHAWNEE | 393610 | 0821245 | 039 | 127 | GW | 1974 | | | | |
| 05030201 | WL3-5 | OH004 | 038703 | MATAMORAS | 393123 | 0810340 | 039 | 167 | GW | 1970 | | | | |

TYPES OF DATA (USE CODE TABLES AT BOTTOM OF SHEET)

**PHYSICAL**

| CODE NUMBER | Temperature | Specific Conductance | Turbidity | Color | Odor | pH | Suspended Solids | Storage Media |
|---|---|---|---|---|---|---|---|---|
| WL3-1 | | | | | | A | | D |
| WL3-2 | | A | A | | | A | | D |
| WL3-3 | | A | A | A | | A | | D |
| WL3-4 | | A | A | A | | A | | D |
| WL3-5 | | A | A | A | | A | | D |

**CHEMICAL**

| CODE NUMBER | Dissolved Solids | Major Ions | Hardness | Silica | Phosphorus | Phosphorus Species | Nitrogen | Nitrogen Species | Detergents | Other Minor Elements | Radioactivity | Radiochemical Species | Carbon | Organic Groups | Pesticides Species | Other Organic Species | Biochemical Oxygen Demand | Chemical Oxygen Demand | Dissolved Oxygen | Other Dissolved Gases | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL3-1 | A | A | | | | | | A | A | A | Q | | | | A | | | | | | D |
| WL3-2 | | A | | | | | | A | | A | | | | | | | | | | | D |
| WL3-3 | A | A | A | | | A | | A | A | A | E | | | | | | | | | | D |
| WL3-4 | A | A | A | | | A | | A | | A | | | | | | | | | | | D |
| WL3-5 | A | A | A | | | A | | A | A | A | R | | | | | | | | | | D |

**BIOLOGIC**

| CODE NUMBER | Enteric Bacteria | Native Bacteria | Phytoplankton | Zooplankton | Periphyton | Macrophyton | Micro Invertebrates | Macro Invertebrates | Vertebrates | Fungi | Viruses | Primary Productivity | Secondary Productivity | Chemosynthetic Activity | Biostimulatory Activity | Toxicity Test | Other Bioassay Test | Chemical Tissue Test | Histopathological Analysis | Other Tissue Analysis | Storage Media |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL3-1 | N | | | | | | | | | | | | | | | | | | | | D |
| WL3-2 | | | | | | | | | | | | | | | | | | | | | |
| WL3-3 | R | | | | | | | | | | | | | | | | | | | | D |
| WL3-4 | R | | | | | | | | | | | | | | | | | | | | D |
| WL3-5 | Q | | | | | | | | | | | | | | | | | | | | D |

**SEDIMENT** and **OTHER**

| CODE NUMBER | Bed Load | Concentration (Suspended) | Sediment Discharge (Suspended) | Concentration (Total) | Sediment Discharge (Total) | Particle Size (Suspended) | Particle Size (Bed Material) | Storage Media | Telemetry | S W Station WWES NINO | G W Station WWES NINO | Data Bank Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WL3-1 | | | | | | | | | | | | S |
| WL3-2 | | | | | | | | | | | | S |
| WL3-3 | | | | | | | | | | | | S |
| WL3-4 | | | | | | | | | | | | S |
| WL3-5 | | | | | | | | | | | | S |

## PARAMETER FREQUENCY CODES

| Code Year-Round | Code Seasonal | Code Eliminated | Meaning |
|---|---|---|---|
| I | J | L | Continuous-Recorder Instrument |
| C | D | T | Continuous |
| O | P | 2 | Daily |
| W | X | 3 | Weekly |
| F | G | 4 | Biweekly |
| M | N | 5 | Monthly |
| H | K | 6 | Bimonthly |
| Q | R | 7 | Quarterly |
| S | | 8 | Semiannual |
| A | | 9 | Annual |
| B | | | Other Periodic (less often than once per year) |
| | Y | | Seasonal (no time period specified) |
| Z | | E | Irregular or unspecified frequency |
| U | | | Unique (one-time) measurement |

## STORAGE MEDIA CODES

| Code | Meaning |
|---|---|
| C | Computer recognizable |
| D | Computer and published |
| E | Computer and microform |
| F | Computer, published, and microform |
| G | Microform and published |
| M | Microform |
| P | Published |

## TELEMETRY CODES

| Code | Meaning |
|---|---|
| 1 | Telemeter-land lines |
| 2 | Telemeter-radio network |
| 3 | Landsat |
| 4 | GOES |
| 5 | DARDC |
| 6,8 | Other or type unspecified |
| 7 | Two or more types |

## DATA SOURCE CODES

| Code | Meaning |
|---|---|
| S | STORET |
| W | WATSTORE |

SUPPLEMENTAL DATA L

Annotated bibliography of investigations pertinent to coal mining and water resources in the Wayne National Forest study area.

SUPPLEMENTAL DATA L: SUMMARY 1

Annotated bibliography of hydrologic studies performed in small areas of the Wayne National Forest area.

REFERENCE CODE: W/S1-1

TITLE: Acid Mine Pollution: Effects on Survival, Reproduction, and Aging of Stream Bottom Microinvertebrates.

GEOGRAPHICAL AREA: Athens, Vinton, and Hocking Counties, Ohio.

AREAL EXTENT: 1 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Relationships between mining and occurrence and diversity of microinvertebrate species is established. Laboratory testing on species collected in the streams, using varying concentrations of acid mine water and prepared ion-concentration solution, shows changes in longevity and reproduction rates.

PUBLISHED REPORTS AND(OR) ARTICLES:
Annual reports with same title as above.

AVAILABLE FROM:
Water Resources Center
Ohio State University
1791 Neil Avenue
Columbus, Ohio 43210

REFERENCE CODE: W/S1-2

TITLE: Impact on Stream Quality of Reclamation of an Abandoned Surface Mine.

STARTING DATE: May, 1981.

GEOGRAPHICAL AREA: Hocking County, Ohio.

AREAL EXTENT: 0.5 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A small watershed in the Wayne National Forest containing abandoned surface mines will be monitored before, during, and after reclamation. Stream-flow water quality, and sediment data will be collected, and benthic invertebrates will be sampled periodically. The success of the reclamation will be evaluated.

PUBLISHED REPORTS AND(OR) ARTICLES:
An interim report will be published in 1983.

REFERENCE CODE: W/S1-3

TITLE: Meiofaunal Abundance Acid-Mine Polluted, Reclaimed, and Unpolluted Streams in Southeastern Ohio.

REFERENCE CODE: W/S1-3--Continued.

GEOGRAPHICAL AREA: Athens, Vinton, and Hocking Counties, Ohio.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Meiofauna samples were collected at each of two sites on seven streams in Athens, Vinton, and Hocking counties. Streams represented unmined, reclaimed, and unreclaimed watersheds. Species were identified and statistical analyses were performed to show diversity comparisons amongst the streams.

PUBLISHED REPORTS AND(OR) ARTICLES:
Hummon, W. D., Evans, W. A., Hummon, M. R., Doherty, F. G., Wainberg, R. H., and Stanley, W. S., 1977, Meiofaunal abundance in acid-mine polluted, reclaimed, and unpolluted streams in southwestern Ohio: in "Energy and environmental stress in aquatic systems," J. H. Thorp and J. W. Gibbons, Eds. Selected papers from a symposium held at Augusta, Georgia, Nov. 2-4, 1977: U.S. DOE, Technical Information Center, CONF-771114 (1978), p. 188-203.

AVAILABLE FROM:
Technical Information Center
U.S. Department of Energy
Publication CONF-771114

REFERENCE CODE: W/S1-4

TITLE: A Comparison of Benthic Oligochaete Populations in Acid and Neutral Lenthic Environments in Southeastern Ohio.

GEOGRAPHICAL AREA: Vinton and Athens Counties, Ohio.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The report presents data from monthly faunal, water, and sediment samples collected from comparable coves in Lake Hope (Vinton County), and acid-pollution impoundment, and Dow Lake (Athens County), a neutral impoundment. Abundance of individuals in the two areas was similar, but the species diversity at Lake Hope was significantly lower.

PUBLISHED REPORTS AND(OR) ARTICLES:
Orciari, R. D. and Hummon, W. D., 1975, A comparison of benthic oligochaete populations and acid and neutral lenthic environments in southeastern Ohio: (Ohio University, Department of Zoology and Microbiology), Ohio Journal of Science vol. 75 no. 1, p. 44-49.

AVAILABLE FROM:
The Ohio Journal of Science
Botany and Zoology Building
1735 Neil Avenue
Columbus, Ohio 43210

SUPPLEMENTAL DATA L: SUMMARY 2

Annotated bibliography of studies concerned with the influence of coal mining on the water resources of any small areas in Ohio.

REFERENCE CODE: W/S2-1

TITLE: Hydrologic Effects of Mine Sealing on Surface and Ground-Water Resources in Lake Hope Basin, Ohio.

STARTING DATE: July 1978.

COMPLETION DATE: June 1982.

GEOGRAPHICAL AREA: Vinton County, Ohio.

AREAL EXTENT: 1 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The project involves installation and operation of a monitoring program which will provide data for evaluating the effects of mine sealing on surface and ground-water systems of two tributaries to Lake Hope.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Nichols, V. E., Drift mine reclamation project above Lake Hope, Ohio: U.S. Geological Survey.

AVAILABLE FROM:
U.S. Geological Survey
975 West Third Street
Columbus, Ohio 43212

REFERENCE CODE: W/S2-2

TITLE: Surface Mining Influences on Sedimentation Characteristics of Basins in the Allegheny and Monongahela Geologic Series in Ohio.

STARTING DATE: October 1978.

COMPLETION DATE: December 1982.

GEOGRAPHICAL AREA: Coshocton and Jefferson Counties, Ohio.

AREAL EXTENT: 2 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The objectives of the study are: 1) to define sediment transportation and deposition for unmined and reclaimed surface-mined basins located within the two predominant geologic series containing strippable coal, 2) to describe particle-size distribution of fluvial sediment from the two types of basins, 3) to define chemical characteristics (trace metals, organics, nutrients) of waters draining the basins, 4) to define sedimentation in terms of time since reclamation.

REFERENCE CODE: W/S2-2--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:
Publication intended for 1982.

AVAILABLE FROM:
U.S. Geological Survey
975 West Third Street
Columbus, Ohio 43212

REFERENCE CODE: W/S2-3

TITLE: Report on Acid Mine-Drainage Control for State Reclamation Lands, Perry County, Ohio.

GEOGRAPHICAL AREA: Perry County, Ohio.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The study was conducted by an engineering firm for the Ohio Department of Natural Resources to provide data for developing a program to reduce acid drainage. Data collected included stream discharges, stream water quality (acidity, pH, total iron), lake water quality. Field work was conducted to identify sources of acid drainage.

PUBLISHED REPORTS AND(OR) ARTICLES:
Baker, A. R., and Koehrsen, L. G., undated, Report on acid mine-drainage control for State reclamation lands, Perry County, Ohio: Stanley Engineering Co. Report to Ohio Dept. of Nat. Res., 99 p.

REFERENCE CODE: W/S2-4

TITLE: Abandoned Subsurface Coal Mines as a Source of Water for Coal Conversion in Eastern Ohio.

STARTING DATE: January 1977.

COMPLETION DATE: March 1979.

GEOGRAPHICAL AREA: Guernsey County, Ohio.

AREAL EXTENT: 17 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The availability of groundwater from abandoned coal mines in part of the Cambridge Coal Field is evaluated. Water quantity, quality, and degree of hydraulic connection between mines are determined. Practical sustained yield is estimated and surface water in the area is evaluated as a possible additional source of water.

REFERENCE CODE: W/S2-4--Continued.

PUBLISHED REPORTS AND(OR) ARTICLES:
Crouch, T. M., Collins, H. R., and Helgesen, J. O., 1980, Abandoned subsurface coal mines as a source of water for coal conversion in eastern Ohio: Ohio Geological Survey Report of Investigations, No. 118, 25 p.

AVAILABLE FROM:
Ohio Department of Natural Resources
Division of Geological Survey
Fountain Square, Building B
Columbus, Ohio 43224

REFERENCE CODE: W/S2-5

TITLE: Preliminary Observation of Surface-Mine Impacts on Ground Water in Two Small Watersheds in Eastern Ohio.

GEOGRAPHICAL AREA: Coshocton and Muskingum Counties, Ohio.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Groundwater flow and water quality in two small watersheds in eastern Ohio are being studied to document the impacts of surface mining. The watersheds are underlain by coal-bearing stratified rocks of the Pennsylvanian System. Before mining, two major perched aquifers occurred within the top 250 feet in each watershed. Water in these aquifers constituted local flow systems, whereas deeper water was part of regional systems.

Quasi-three-dimensional digital models have facilitated an understanding of the premining ground-water flow systems. Model results are most sensitive to ground-water recharge rate and underclay leakance. Groundwater quality varies considerably between and within watersheds. Much of the shallowest water is of the calcium bicarbonate type; deeper water is of variable types and more mineralized.

Mining of the top coal in each watershed has resulted in destruction of the top aquifer. Two years of postmining data reflect a slow rate of resaturation of overburden spoils. No significant effects of mining on deeper groundwater are evident. (Author's abstract)

PUBLISHED REPORTS AND(OR) ARTICLES:
Helgesen, J. O. and Razem, A. C., 1980, Preliminary observation of surface-mine impacts on ground water in two small watersheds in eastern Ohio: Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, Lexington, Kentucky, Proceedings, p. 351-360.

REFERENCE CODE: W/S2-6

TITLE: The Effects of Surface Mining on the Ground-Water Hydrology of East Rush Creek Basin, Perry County, Ohio.

GEOGRAPHICAL AREA: Perry County, Ohio.

AREAL EXTENT: 5 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The study involves (1) comparison of ground water samples taken within 1 mile of active, abandoned, or reclaimed surface mines and samples taken with the study area but not adjacent to surface mines, (2) preparation of shallow-aquifer water-level map, (3) use of air photos and satellite images to determine areal extent of mined land and to explore fracture-trace analysis as a possible influence on hydrology, and (4) chemical analysis of reclaimed and unreclaimed overburden and spoil banks and comparison with undisturbed land.

PUBLISHED REPORTS AND(OR) ARTICLES:
Vogel, Donald A., 1980, The effects of surface mining on the ground-water hydrology of East Rush Creek basin, Perry County, Ohio: unpublished M.S. Thesis, Department of Geology, Ohio University, Athens, Ohio.

REFERENCE CODE: W/S2-7

TITLE: Effects of Strip Mining on the Ground-Water Hydrology of Small Watersheds.

STARTING DATE: September, 1975.

COMPLETION DATE: January, 1983.

GEOGRAPHICAL AREA: Eastern Ohio.

AREAL EXTENT: 1 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The objectives of the study are to describe the hydrogeology of four small watersheds associated with different coal seams; to document groundwater flow and water quality characteristics for pre- and post-mining conditions; to develop a ground-water flow and transport model to simulate the movement of solutes through the aquifer systems of the watersheds.

PUBLISHED REPORTS AND(OR) ARTICLES:
Helgesen, J. O., and Weiss, E. J., 1978, Preliminary description of ground-water hydrology of strip mine areas in eastern Ohio (Pre-mining conditions): U.S. Geological Survey Administrative Report.

AVAILABLE FROM:
U.S. Geological Survey
975 West Third Street
Columbus, Ohio 43212

REFERENCE CODE: W/S2-8

TITLE: Effect of Strip Mining on Water Quality.

GEOGRAPHICAL AREA: Coshocton County, Ohio.

AREAL EXTENT: 27 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The report presents the results of 236-week water quality sampling project, in which samples were collected at four points downstream from a strip mine. Results of a related project, an attempt to correlate spoil characteristics with spoil infiltration rates, are also presented.

PUBLISHED REPORTS AND(OR) ARTICLES:
Vimmerstedt, J. P., Finney, J. H., and Sutton, P., 1973, Effect of strip mining on water quality: Ohio Agricultural Research and Development Center, Wooster, Ohio, Report to Ohio State University Water Resources Center, Columbus, OH, 54 p.

AVAILABLE FROM:
National Information Service
Springfield, Virginia 22161
as PB-217 872

REFERENCE CODE: W/S2-9

TITLE: Coal Mining and Its Effect on Water Quality.

GEOGRAPHICAL AREA: Eastern Ohio.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The effects of surface and deep mining on water quality are discussed in detail with conditions of mines in Ohio serving as the main examples.

PUBLISHED REPORTS AND(OR) ARTICLES:
Ahmad, M. U., 1971, Coal mining and its effect on water quality: Proceedings of Groundwater Pollution Conference, St. Louis, MO, p. 13-52.

REFERENCE CODE: W/S2-10

TITLE: Feasibility Study--Upper Meander Creek Mine Drainage Abatement Project.

GEOGRAPHICAL AREA: Mahoning County, Ohio.

AREAL EXTENT: 40 $mi^2$

REFERENCE CODE: W/S2-10--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The report, an evaluation of feasibility of a mine drainage control demonstration project, contains water quality, streamflow, and land use data.

PUBLISHED REPORTS AND(OR) ARTICLES:
Anderson, R. H., Stanley Consultants, 1971, Feasibility study--Upper Meander Creek mine drainage abatement project: Report to EPA, Office of Research Monitoring, Water Pollution Control Research Series 14010 HBQ 09/71, 53 p.

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22161
as PB-206 232

REFERENCE CODE: W/S2-11

TITLE: Pilot Scale Study of Acid Mine Drainage.

GEOGRAPHICAL AREA: Vinton County, Ohio.

AREAL EXTENT: 1 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The report summarizes data collected during the first several years at the McDaniels Mine, a small, long-abandoned drift mine. The project studied the effect of oxygen concentration on acid production, located sites of pyrite oxidation in overburden, and described the significance of bacterial catalysis on oxidation rates.

PUBLISHED REPORTS AND(OR) ARTICLES:
The Ohio State University Research Foundation, 1971, Pilot scale study of acid mine drainage: Report to EPA, WQO, Water Pollution Control Research Series 14010 EXA 03/71, 84 p.

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22161
as PB-214 771

REFERENCE CODE: W/S2-12

TITLE: The Effects of Strip Mining on a Natural System: A Water Quality Study of Piedmont Lake, Ohio.

GEOGRAPHICAL AREA: Belmont and Harrison Counties, Ohio.

REFERENCE CODE: W/S2-12--Continued.

AREAL EXTENT: 86 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The report is from a college course and presents data on pH, Ca, Mg, Na, and K for grab samples collected at 19 discharge points from surface-mined areas that surround Piedmont Lake.

PUBLISHED REPORTS AND(OR) ARTICLES:
Neely, J. C., III, 1970, The effects of strip mining on a natural system: a water-quality study of Piedmont Lake, Ohio: Case Western Reserve University, Intersession Project, Biology 933, 6 p. unpublished.

REFERENCE CODE: W/S2-13

TITLE: Development of Biological Indices to Pollution Levels in Streams Affected by Acid Mine Drainage and Oil Field Brine Wastes.

GEOGRAPHICAL AREA: Central and southeastern Ohio.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The upper Oleutangy River and Whetstone Creek, affected by organic and oil field brine pollution, were compared with Raccoon Creek, which is affected by acid mine drainage but very little by organic pollution. Good correlation was found between the species diversity index and presence of acidity (more acidity, less species diversity) but little correlation was found between species diversity index and presence of organic or brine pollutants.

PUBLISHED REPORTS AND(OR) ARTICLES:
Dambach, C. A. and Olive, J. H., 1969, Development of biological indices to pollution levels in streams affected by acid mine drainage and oil field brine wastes: Ohio State University Natural Resources Institute and Water Resources Center, Research Completion Report to U.S. Office of Water Resources Research, 90 p.

REFERENCE CODE: W/S2-14

TITLE: Lake Hope Acid Mine Drainage Abatement Program.

GEOGRAPHICAL AREA: Vinton County, Ohio.

AREAL EXTENT: 10 $mi^2$

REFERENCE CODE: W/S2-14--Continued.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
A field study was conducted to verify sources of acid pollution to Lake Hope, which was found to have a pH range of 4.5 to 5.5. The fish population in the lake was found to be small. The report also evaluates various pollution control techniques and their costs.

PUBLISHED REPORTS AND(OR) ARTICLES:
Koehrsen, L. G., Stanley Consultants, 1969, Lake Hope acid mine drainage abatement program: Report to Ohio Department of Natural Resources, 38 p.

REFERENCE CODE: W/S2-15

TITLE: Analysis of Water Quality of the Mahoning River in Ohio.

GEOGRAPHICAL AREA: Mahoning River above Leavittsburg, Ohio.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The report shows that the Mahoning River above Leavittsburg, Ohio, is affected mainly by mine drainage, while below Leavittsburg, municipal and industrial wastes predominate. Tables, charts, graphs, and maps are used to present water-quality data and show variations of constituents.

PUBLISHED REPORTS AND(OR) ARTICLES:
Bednar, G. A., Collier, C. R., and Cross, W. P., 1968, Analysis of water quality of the Mahoning River in Ohio: U.S. Geological Survey Water-Supply Paper 1859-C, 32 p.

REFERENCE CODE: W/S2-16

TITLE: Sources of Coal Mine Drainage Pollution, Wheeling Creek Watershed, Ohio.

GEOGRAPHICAL AREA: Belmont County, Ohio.

AREAL EXTENT: 108 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Samples were collected from 120 mine drainage sources, which were identified as to location, type of mining operation, and whether active or inactive.

PUBLISHED REPORTS AND(OR) ARTICLES:
U.S. Department of Interior, Federal Water Pollution Control Administration, Wheeling Field Station, 1968, Sources of coal mine drainage pollution, Wheeling Creek watershed, Ohio: FWPCA Work Document No. 28, 45 p.

REFERENCE CODE: W/S2-16

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22162
Accession Number 69 ROOO 5202

REFERENCE CODE: W/S2-17

TITLE: Stream Pollution by Coal Mine Drainage, Captina Creek Basin, Ohio.

GEOGRAPHICAL AREA: Belmont County, Ohio.

AREAL EXTENT: 180 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
Twelve sources of mine drainage to Captina Creek were located and sampled. The report includes results of analyses of samples and mine drainage discharges.

PUBLISHED REPORTS AND(OR) ARTICLES:
U.S. Department of Interior, Federal Water Pollution Control Administration, Wheeling Field Station, 1968, Stream pollution by coal mine drainage, Captina Creek basin, Ohio: FWPCA Work Document No. 23, 14 p.

REFERENCE CODE: W/S2-18

TITLE: Recommendations for Water Pollution Control, Raccoon Creek Basin, Ohio.

GEOGRAPHICAL AREA: Vinton, Jackson, Gallia Counties, Ohio.

AREAL EXTENT: 700 $mi^2$

PURPOSE, OBJECTIVES AND(OR) RESULTS:
The report includes detailed descriptions of several subwatershed areas and a mine-drainage source inventory.

PUBLISHED REPORTS AND(OR) ARTICLES:
U.S. Department of Interior, Federal Water Pollution Control Administration, Wheeling Field Station, 1967, Recommendations for water pollution control, Raccoon Creek Basin, Ohio: 81 p.

AVAILABLE FROM:
National Technical Information Service
Springfield, Virginia 22161
Accession Number 69 ROOO 5661

REFERENCE CODE: W/S2-19

TITLE: The Sheban Project.

GEOGRAPHICAL AREA: Mahoning County, Ohio.

AREAL EXTENT: 10 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
The Sheban project was an experiment in controlling mine drainage by impoundment of water in an abandoned surface mining operation which had been preceded by an underground mining operation. Data obtained from sampling the impounded water and any seeps are reported.

PUBLISHED REPORTS AND(OR) ARTICLES:
Hall, E. P., 1965, The Sheban Project; Symposium on Acid Mine Drainage Research Preprints, Pittsburgh, Pennsylvania, 1965, p. 145-160.

Unpublished progress report, 1960.

REFERENCE CODE: W/S2-20

TITLE: Studies of Acid Mine Water with Particular Reference to the Raccoon Creek Watershed.

GEOGRAPHICAL AREA: Vinton, Jackson, Meigs Counties, Ohio.

AREAL EXTENT: 700 $mi^2$

PURPOSE, OBJECTIVES, AND(OR) ARTICLES:
A comprehensive examination of the acid mine water problem in the Raccoon Creek watershed, covering sources of acid (strip, drift, slope, shaft mines, gob piles), neutralization, abatement through mine sealing, reservoir, and drainage control, cost analysis of various approaches, and presence of other minerals and their overall influence on the problem.

PUBLISHED REPORTS AND(OR) ARTICLES:
Clifford, J. E., and Shavely, C. A., 1954, Studies of acid mine water with particular reference to the Raccoon Creek watershed: Report by Battelle Memorial Institute, Columbus, Ohio, to Ohio Department of Natural Resources, Division of Wildlife.

AVAILABLE FROM:
Ohio Department of Natural Resources
Publications Division
Fountain Square, Building B
Columbus, Ohio 43224

SUPPLEMENTAL DATA L: SUMMARY 3

Annotated bibliography of large area studies pertinent to the hydrology of the Wayne National Forest area.

REFERENCE CODE: W/S3-1

TITLE: Stream Water Quality in the Coal Region of Ohio.

GEOGRAPHICAL AREA: Selected counties in Appalachian coal region.

PURPOSE, OBJECTIVES, AND(OR) RESULTS:
This study was undertaken with the primary objective of establishing a water quality data base for small first order unmined and surface-mined watersheds throughout Appalachia. There is a need for data which explicitly show changes in water quality attributable to both old and recent surface mining. Most previous water quality data in the study area was from watersheds so large that it was impossible to isolate the effects of surface mining from the confounding effects of other activities of man.

Small streams were sampled in selected counties in the State where coal is surface mined. Sampling was at approximate monthly intervals. The water-quality data from these streams are presented in this report and should help fill the need for data from small watersheds in Appalachia.

PUBLISHED REPORTS AND(OR) ARTICLES:
(Soon to be published)
Dyer, K. L., Stream water quality in the coal region of Ohio, Part 3 of water quality of Appalachia, U.S. Department of Agriculture, Forest Service, Berea, Kentucky.

AVAILABLE FROM:
U.S. Department of Agriculture
Forest Service
Northeastern Forest Experiment Station
Route 2, Kentucky Highway 21 East
Berea, Kentucky 40403

REFERENCE CODE: W/S3-2

(Soon to be published)
Engelke, M. J., and Roth, D. K., Hydrologic assessment eastern coal province, area No. 7: U.S. Geological Survey WRI/Open File Report.

(Soon to be published)
Roth, D. K., and Engelke, M. J., Hydrologic assessment eastern coal province, area No. 4: U.S. Geological Survey WRD/Open File Report.

DESCRIPTION:
The project will establish a network of surface-water gaging and sampling stations in the coal area of eastern Ohio. This network will provide a standardized data base of flow, biological, suspended sediment, and chemical data. Mining impact will be evaluated by means of a model incorporating data on geology, predominance of various mining activities, degree of reclamation, climatology, stream quality, and hydrology.

REFERENCE CODE: W/S3-3

(Soon to be published)
Norris, S. E., Blackhand sandstone aquifer: U.S. Geological Survey, WRI/Open File Report.

DESCRIPTION:
The study will determine character and areal extent of individual aquifers associated with coal deposits, delineate recharge and discharge areas, prepare potentiometric surface maps, determine yields of wells and pumpage from aquifers, investigate their hydraulic properties and connection with surface streams. Areal variability in quality of water in specific aquifers will be studied. An assessment will be made of the probable environmental effects resulting from previous and anticipated future mining of associated coal beds.

REFERENCE CODE: W/S3-4

Moulton, E. Q., undated, Editor, The acid mine-drainage problem in Ohio; Ohio State University, Engineering Experiment Station, Bulletin 166, 158 p.

SUMMARY:
The report presents results of a nine-month research program in acid mine drainage, in which the problem is reviewed and discussed, future research is suggested, and a bibliography is included.

REFERENCE CODE: W/S3-5

Pfaff, C. L., Helsal, D. R., Johnson, D. P., and Angelo, C. G., 1981, Assessment of water-quality in streams draining the coal-producing area of Ohio, U.S. Geological Survey Water Resources Investigations Open-File Report 81-409.

DESCRIPTION:
In the first phase of the project, 150 sites were sampled twice and sample results were related to land use with regard to coal mining (unmined, strip mined and abandoned or reclaimed, underground mined). In the second phase, four watersheds (stripped and abandoned, stripped and reclaimed, actively being stripped, abandoned drift mined) were sampled in detail and water quality in the watersheds was related to mining.

REFERENCE CODE: W/S3-6

Lamb, J. and Klinedinst, P., 1980, Surface-mine erosion and alluvial valley sedimentation in Ohio: part of Master of Science thesis, Department of Geology and Mineralogy, Ohio State University, Columbus, Ohio, unpublished report.

SUMMARY:
Landscape gradation in three Ohio counties was studied by direct measurement. Baseline data were assembed to determine the effectiveness of reclamation of abandoned land in the area. Basic data on spoil bank erosion was assembled and the reponse of fluvial-system sediment overloading was investigated.

REFERENCE CODE: W/S3-7

McKenzie, G. D. and Studlick, J. R., 1979, Erodibility of surface-mine spoil banks in southeastern Ohio: an approximation: Journal of Soil and Water Conservation, vol. 34, no. 4, p. 187-190.

ABSTRACT:
Accumulated sediment in interbank basins of unreclaimed strip mines was measured and the average annual soil loss from unvegetated, 18-year-old spoil banks was determined. Using the universal soil loss equation, values for erodibility were calculated. The techniques can be applied to unreclaimed mines where interbank basins trap slope-derived sediment.

REFERENCE CODE: W/S3-8

Ohio State University Research Foundation, 1971, Acid mine-drainage formation and abatement: Report to U.S. EPA, Water Pollution Control Research Series 14010 FPR 04/71, 82 p.

SUMMARY:
The interpretation of data from field projects on deep and surface mines in eastern Ohio is discussed in this report. The report also discusses physical, chemical, and biological factors involved in the rate of acid formation.

REFERENCE CODE: W/S3-9

Biesecker, J. E. and George, J. R., 1966, Stream quality in Appalachia as related to coal-mine drainage, 1965: U.S. Geological Survey Circular 526, 27 p.

REFERENCE CODE: W/S3-9--Continued.

ABSTRACT:
A stream-quality reconnaissance at 318 locations in May 1965 offered the first opportunity for a contemporaneous regional collection and appraisal of water-quality data in Appalachia. The results provide a means of regional comparison of the influence of coal-mine drainage on stream quality at approximately median streamflow. The results disclose that the chemical quality of the water at nearly 200 sites did not meet recommended drinking-water standards. At many of these sites, inferior quality was caused by excessive concentrations of solutes commonly associated with coal-mine waters.

Water-quality damage from mine drainage is particularly severe in the more heavily mined northern one-third of the region where high sulfate content, free mineral acidity, and low pH are typical of most affected streams. A deficiency in natural stream alkalinity in this part of the coal region contributes greatly to the massive effect of mine drainage upon stream quality. However, data collected from streams affected by mine drainage along the west edge of this part of the coal field suggest extensive neutralization of mine water. In southern Appalachia coal-mine drainage had less influence on stream quality than in northern Appalachia. Fewer streams in this area were influenced by mine drainage, and the magnitude of stream damage for affected streams was less than in northern Appalachia. (Author's abstract)

REFERENCE CODE: W/S3-10

Musser, J. J., 1965, Water Resources of the Appalachian Region: Pennsylvania to Alabama; U.S. Geological Survey Hydrologic Investigation Atlas HA-198, Sheet 9.

SUMMARY:
Acid Streams in the Appalachian region are identified and discussed, and the amount of acidity as $H_2SO_4$ discharged annually into several streams is tabulated.

REFERENCE CODE: W/S3-12

The Ohio Journal of Science, March 1964 - entire issue.

AVAILABLE FROM:
The Ohio Journal of Science
Botany and Zoology Building
1735 Neil Avenue
Columbus, Ohio 43210

DESCRIPTION:
Several studies relating to coal hydrology in Ohio are summarized within this symposium. These studies address the formation of acid drainage in strip mine spoils.

REFERENCE CODE: W/S3-13

Riley, C. V., 1960, The ecology of water areas associated with coal strip-mined lands in Ohio; Ohio Journal of Science, vol. 60, no. 2, p. 106-121.

SUMMARY:
The report presents data from an 11-year study. The objectives were: to identify and determine ecological relationships of plants and animals inhabiting the water and its environs; to determine which materials in the overburden were important contributors to the formation of acid; to determine practical methods of managing watersheds and strip ponds.