WATER-RESOURCES INVESTIGATIONS IN TENNESSEE: PROGRAMS AND ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY, 1988-89

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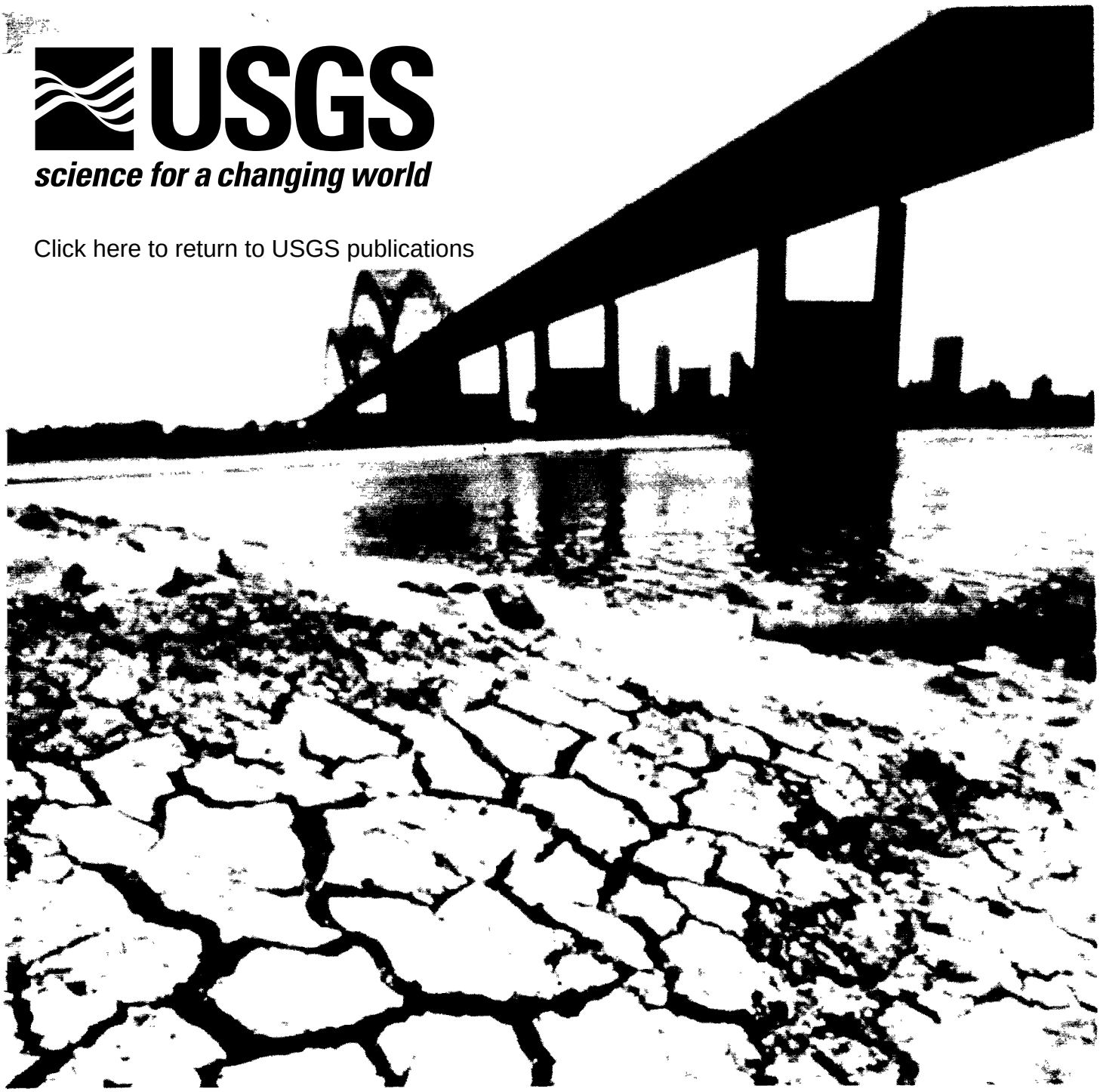


U.S. GEOLOGICAL SURVEY
Open-File Report 89-379

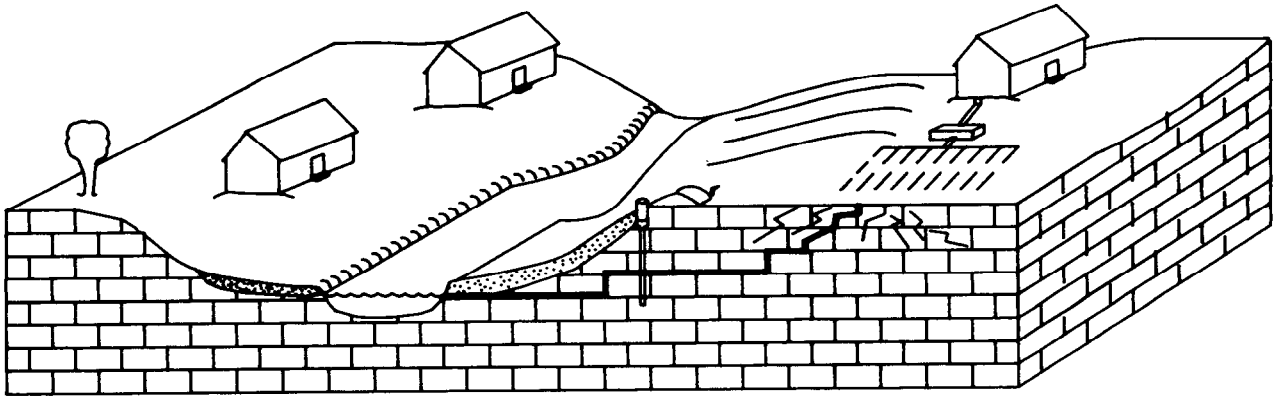
close correlation between concentrations of total organic carbon (TOC) and most trace metals at the sinkhole and the spring stations suggests that these constituents are transported together.

A report was published in 1988 summarizing the data collected during the first 6 months of the investigation. The project leader is hydrologist Anne Hoos, assisted by hydrologic technician Jerry Garrett.

IMPACT ON GROUND-WATER QUALITY OF BLASTED-IN SUBSURFACE SEWAGE SYSTEM FIELD LINES

Almost one-third of the population of Tennessee is served by subsurface sewage disposal systems, which are the largest contributors of wastewater to the ground. This problem is likely to be more significant in subdivided tracts in suburban areas, especially where field lines have been installed in blasted rock. The U.S. Geological Survey, in cooperation with the Tennessee Department of Health and Environment, Division of Construction Grants and Loans, is undertaking an investigation to establish the nature and degree of relation between ground-water contamination and blasted-in field lines. Ground water samples were collected at two test sites; one control site, where the subsurface is suitable for a septic system, and an experimental site, where the field lines have been blasted-in. Initial results indicate high levels of bacteria (fecal coliform) at discharge sites downgradient from blasted-in systems. Other constituents indicative of septic effluent have been below levels of adverse impact. A dye-trace study is planned at the experimental site to determine the degree of connection between blasted-in septic systems and ground water.

This study is being conducted by hydrologist Dorothea Hanchar.



Block diagram showing flow of field line effluence from subsurface sewage system into blasted rock, to household well, and to nearby creek in subdivision using individual well-septic systems.

CHARACTERIZATION OF INFLOW OF PESTICIDES AND NUTRIENTS FROM STORM RUNOFF INTO REELFOOT LAKE, WEST TENNESSEE

Reelfoot Lake, in West Tennessee, is one of the most important natural resources in the State. The lake and surrounding forests are a key tourism and recreation area in West Tennessee and has been a traditional commercial fishery. Intensive agricultural activity in the area surrounding Reelfoot Lake, and storm runoff from tributaries result in the discharge of fertilizer and pesticide residues into the lake. The annual budget of nutrients and pesticides entering the lake from these sources, and the extent of contribution by storms, have not been adequately defined.

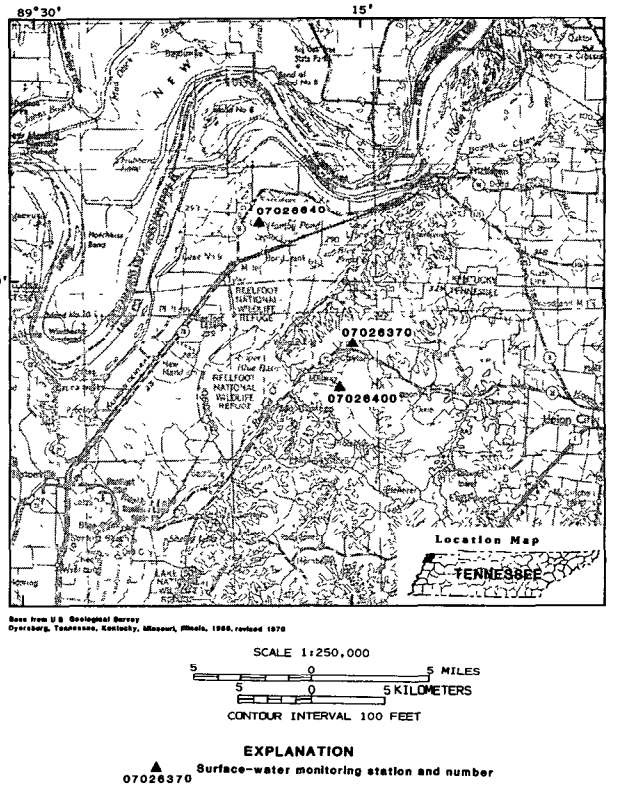
The U.S. Geological Survey, in cooperation with the Tennessee Department of Health and Environment, Division of Construction Grants and Loans, began an investigation in October 1987 to study the impact of agricultural activities on runoff into Reelfoot Lake. The 2-year investigation includes measurement of streamflow and collection and analysis of water samples from three tributaries (North Reelfoot Creek, South Reelfoot Creek, and Running Slough) to the lake during base flow and storms. Samples are analyzed for sediment concentration, nutrients, and triazine herbicides.

Specific objectives of the investigation are to:

- Identify variation in concentrations of nutrients and pesticides relative to seasonal effects and discharge for storm events, and
- Estimate the annual nutrient and pesticide loading for the three tributaries.

Samples collected in the first year of the investigation during base flows and winter storm events show that most of the nitrogen is in the form of organic nitrogen. Concentrations of most triazine pesticides were below the limits of analytical detection. The exception was atrazine, for which concentrations for these samples were as high as 1.6 micrograms per liter. In water samples collected during spring and summer storm events, most nitrogen occurred in the form of ammonia. Concentrations of atrazine and alachlor were as high as 57 and 45 micrograms per liter, respectively.

A report was published in 1988 presenting data collected during the first 6 months of the investigation. A final report summarizing data and interpretations of the study will be completed in 1989. The project leader is hydrologist Anne Hoos, assisted by hydrologic technician Jerry Garrett.



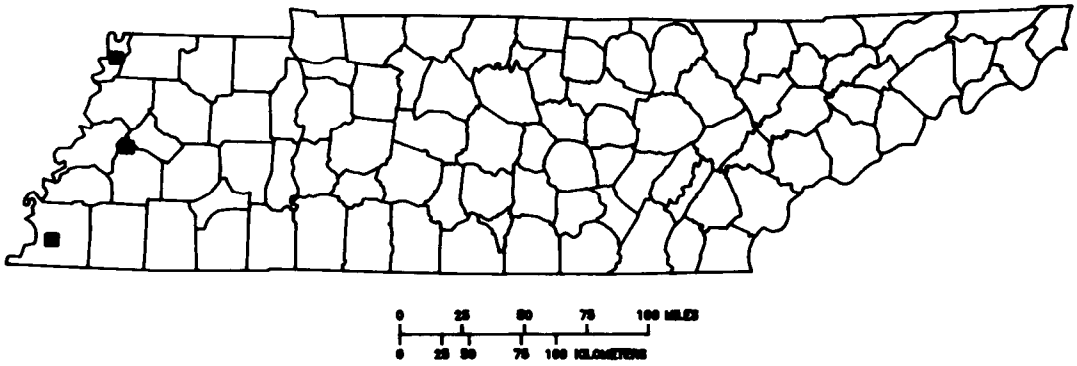
Location of project area, Reelfoot Lake, and surface-water monitoring stations.

RECONNAISSANCE OF THE IMPACT OF AGRICULTURAL CHEMICALS ON GROUND-WATER QUALITY

During 1988, the U.S. Geological Survey, in cooperation with the Tennessee Department of Health and Environment, Division of Construction, Grants, and Loans, conducted an investigation to determine the contribution of chemicals in agricultural runoff to ground water. Shallow wells at three sites were sampled for nitrogen species and pesticides. Sampling sites, located in Shelby, Lake, and Haywood Counties, were chosen as representing the three major agricultural practices of West Tennessee (corn, soybeans, and cotton). All wells were located near fields under active cultivation of these crops.

Samples were collected in January, February, and June 1988. Results from pesticide analyses showed concentrations were below analytical detection limits for triazine herbicides (used on all crop types to control grasses), and organophosphorus insecticides (used for the control of the boll weevil, and sampled for in Haywood County only). Results from nutrient analyses indicated a wide range of concentrations for nitrogen constituents. Relatively high concentrations of total nitrite plus nitrate (NO_2 + NO_3 as nitrogen) were detected in some of the wells sampled. These concentrations did not exceed the Federal or State standards for drinking water of 10 milligrams per liter of nitrite plus nitrate. The measured concentrations are indicative of the occurrence of nitrogen in ground water as a result of agricultural activities.

As a result of the project, one or more wells at each site are under consideration for inclusion in a long-term, statewide monitoring network for ground-water quality. A water-resources investigation report documenting the results of the study is in preparation. Hydrologist Dorothea Hanchar directed the project.



Location of sampling sites in Haywood, Lake, and Shelby Counties.

HYDROGEOLOGY AND DELINEATION OF WELLHEAD-PROTECTION AREAS AT JACKSON, TENNESSEE

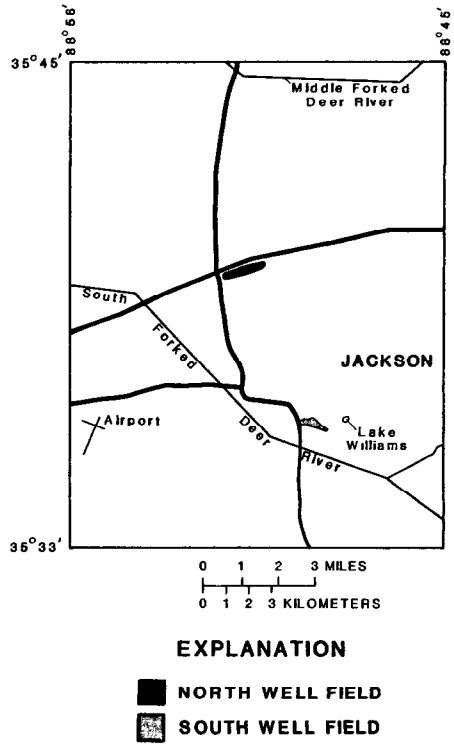
An investigation of the hydrogeology of the Jackson area, in West Tennessee as part of a local wellhead-protection program, was initiated by the U.S. Geological Survey in cooperation with the Jackson Utility Division (JUD) in 1988. The project is a continuation of a pilot investigation of the Jackson area begun in 1987 for the development of wellhead-protection areas for the two municipal well fields by the City of Jackson. The initial investigation included a preliminary assessment of the local hydrogeology, ground-water quality, and potential sources of contamination.

The purpose of the current phase is to describe in further detail the hydrogeology of the Jackson area. The detailed data will be used by the JUD to define short- and long-term threats to the quality of ground water, and adopt strategies to protect municipal supplies. Project tasks include:

- Mapping the lithology and geometry of the aquifers and confining layers in detail
- Mapping the configuration of the water-table and potentiometric-surfaces
- Mapping directions of ground-water flow
- Delineating areas of ground-water recharge and discharge
- Simulating the ground-water flow system
- Delineating areas that contribute ground water to the municipal wells

Potential sources of ground-water contamination were determined during the pilot investigation. During 1988 and early 1989, maps of subsurface geology and lithology, constructed on a regional scale by other investigators, were refined using additional local information from drillers' logs and borehole geophysical logs. Nearly 100 domestic and industrial wells were selected for water-level measurements, to be conducted in the spring of 1989. Stream discharge at numerous sites also was measured.

A finite-difference, ground-water flow model will be calibrated to average hydrologic conditions. An analytical program in the model will be used to estimate zones of ground-water contribution to wells in the municipal well fields. The project is directed by hydrologist Zelda Bailey.

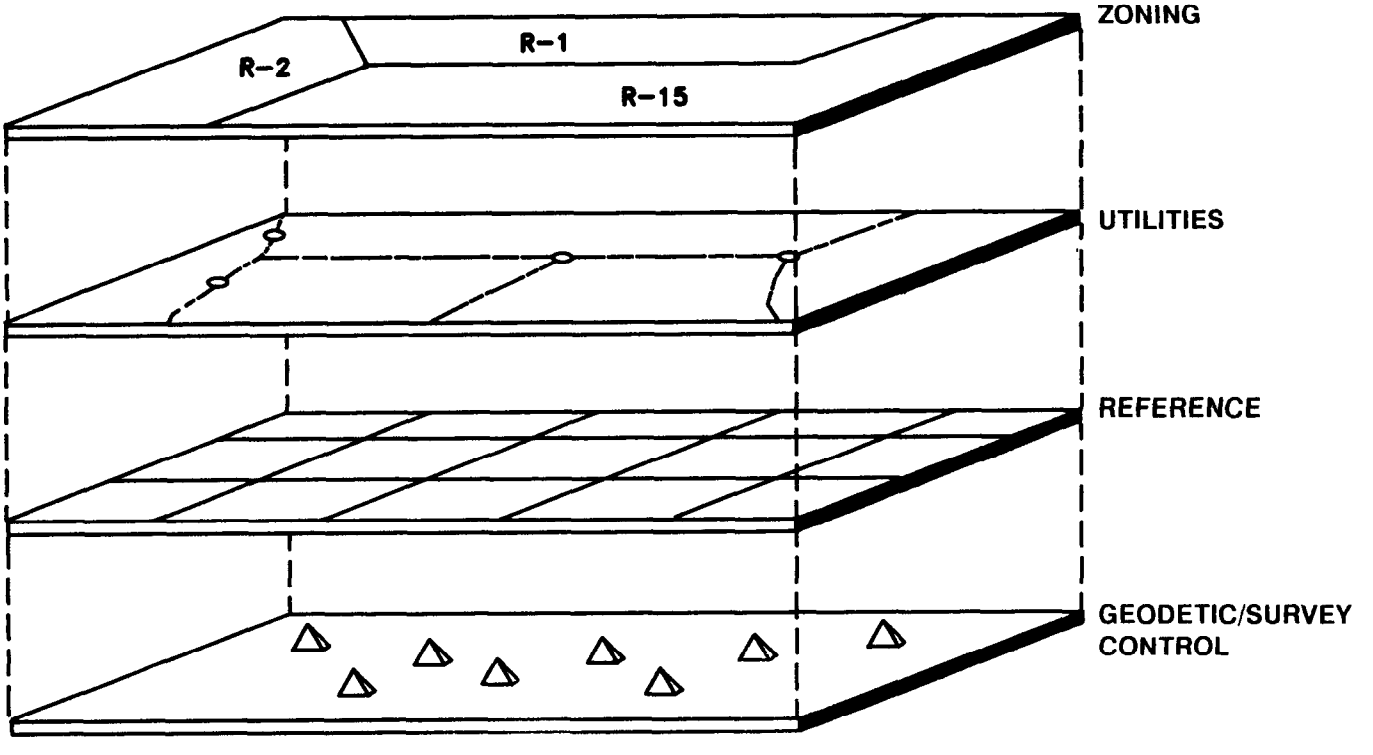


Location of Jackson study area.

GEOGRAPHIC INFORMATION SYSTEM INVENTORY FOR THE STATE OF TENNESSEE

Within the last 4 years, the number of computerized Geographic Information Systems (GIS) within Tennessee has increased rapidly. In order to examine the present status of GIS efforts, the Tennessee State Planning Office, the Tennessee Comptroller of the Treasury, and the USGS entered into a cooperative agreement to collect information about mapping usage, computer equipment, GIS software, and existing digital data. The objectives of the project were to:

- Conduct an inventory of existing mapping coverage, location-specific data bases, available transformation software, and transfer techniques that exist at various state, federal, county, and municipal agencies
- Create a computer data base of the results of the survey
- Develop suggested standards for digitized data
- Describe, in general, communications techniques that can be used to transfer data from one computer system to another
- Create a map coverage of Tennessee and the 7.5-minute quadrangle maps within the State and program retrieval of existing map coverage for each
- Publish the results of the project



Typical GIS coverages.

The project was completed in October, 1988. The following are the summarized results:

- 263 agencies were inventoried
- 139 maintained one or more computers
- 4,741 computerized data coverage existed for areas within Tennessee
- 120 location-specific data bases were available
- 25 GIS systems were in operation

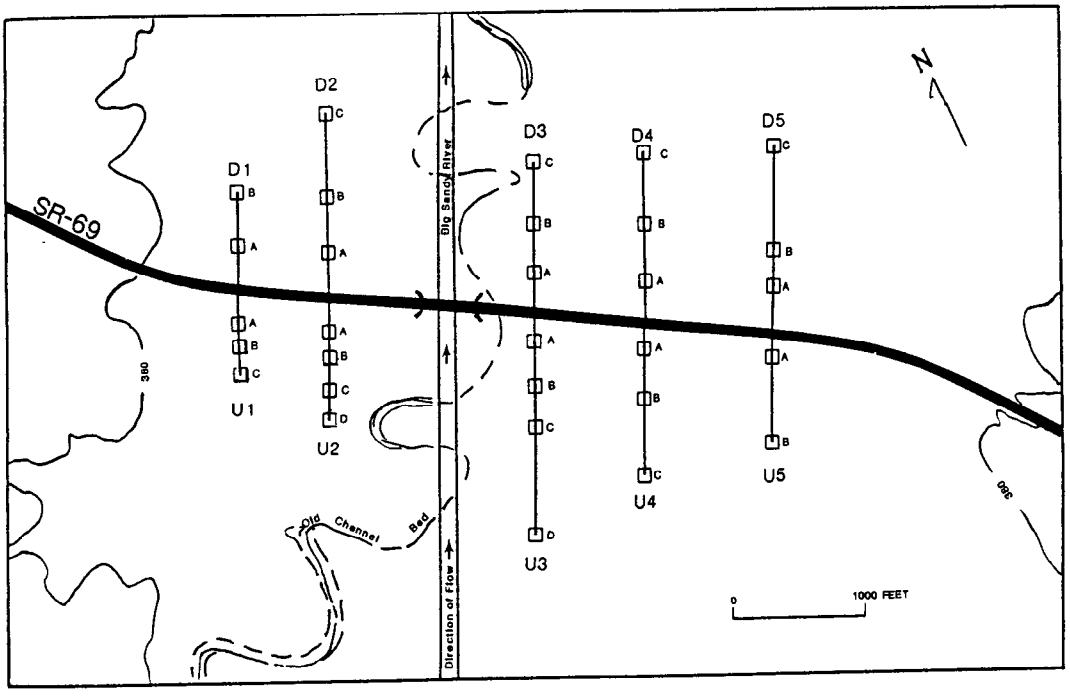
A data base called the GIS Inventory data base was completed for storage of the data. The data were entered into the data base and were cross-referenced by county, 7.5-minute quadrangle, and hydrologic unit code. A map coverage for each cross-referenced geographic unit was created for identification of existing coverage for that area.

A water-resources investigations report containing the summarized results of the project, general standards for digitized data, communication techniques for transfer of data, and an appendix containing guidelines for initiating a GIS is in review. Bill Barron, hydrologist, is the project chief.

SEDIMENT DEPOSITION AT WETLANDS NEAR BRIDGE CROSSINGS

The U.S. Geological Survey, in cooperation with the Tennessee Department of Transportation (TDOT), is investigating the impact of highway crossings on sediment deposition at wetlands in West Tennessee. The 10 sites selected represent bottomland-hardwood forests and cypress-tupelo swamps along broad flood plains, common in the Gulf Coastal Plain. Highway crossings generally consist of fill material across flood plains with relief openings across main and overflow channels. The principal concern of TDOT is to determine if highway crossings have wide-spread effects on sedimentation processes and ecology of wetlands.

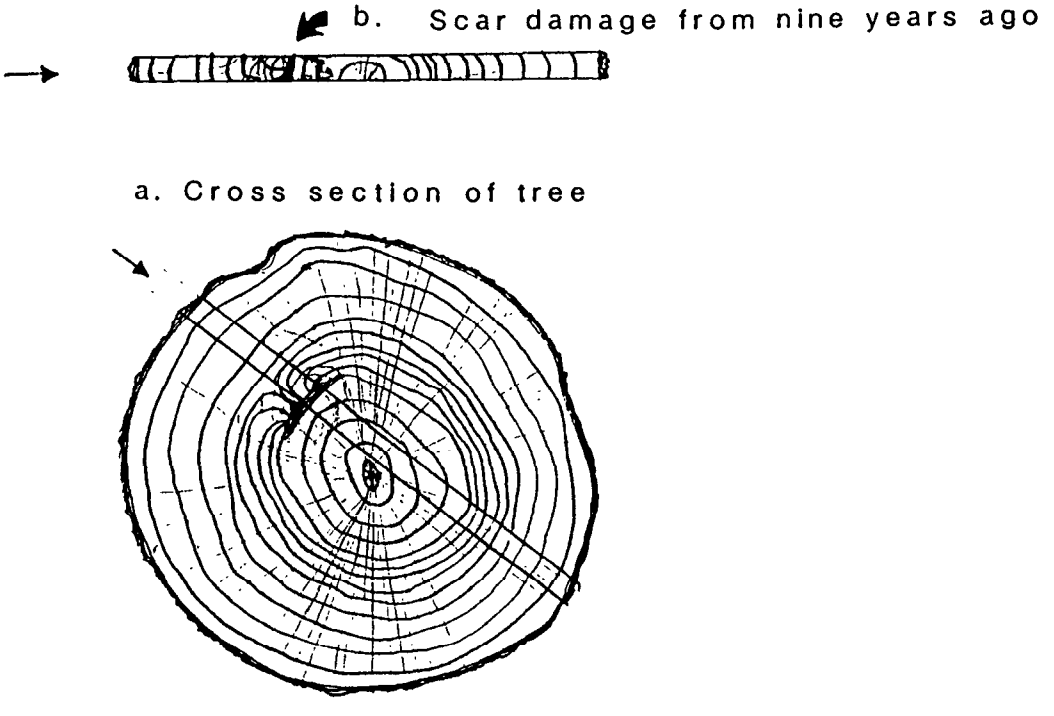
The study uses an interdisciplinary approach and includes techniques of hydrology, sedimentology, dendrochronology, geomorphology, and ecology. Dendrogeomorphic analysis provides the principal data for documentation of sediment deposition. The technique uses historic rates of deposition obtained by excavation of buried trees, which are then aged through tree-ring dating. This information allows for determination of rates of sediment accretion and for evaluation of spatial and temporal variation in sedimentation. Additionally, flow and sediment modeling are used to evaluate potential for deposition and to investigate cause and effect relations. In areas found to have altered sedimentation rates, the impact on wetlands ecology is evaluated. Ecological techniques include growth-trend analysis of tree-core samples and ecological analysis of vegetation-plot data. The 3-year study, scheduled for completion in 1990, is directed by Dr. Cliff Hupp, botanist.



Sampling layout at Big Sandy River at State Route 69, West Tennessee.

BOTANICAL TECHNIQUES USED FOR FLOOD-FREQUENCY INVESTIGATION

The Geomorphic-Ecological Research Unit of the Tennessee District is involved in developing a new method for estimating flood frequency on Tennessee streams. The project, in cooperation with TDOT, is concerned with improving flood-frequency estimates on gaged and ungaged streams using dendrogeomorphic techniques. The method utilizes tree-ring anomalies that indicate flood damage within riparian trees to develop a flood record. Dendrochronologic identification of anomalies indicates the year of occurrence of a flood. A magnitude may be determined from the elevation of the sample. The information learned from trees will reveal historic flood data as far back as the oldest trees. Age of riparian trees usually surpasses the length of systematic record. Historic years of occurrence provided by this method can be used to extend the total years of record for a gaged stream or create an indirect flood record for an ungaged stream. Extended length of record will decrease the standard error involved in flood-frequency estimation. The standard method used by the U.S. Geological Survey in flood-frequency estimation uses systematic gage record, a method which can not be used on ungaged streams. Standard estimates for ungaged streams are determined by use of regional equations which have a high standard error in respect to individual streams. Dendrogeomorphically reconstructed flood history on gaged or ungaged streams is being used most efficiently. Results have improved the degree of confidence placed on a data set and allow for the development of accurate flood-frequency determination at ungaged sites. The project leaders are Dr. Cliff R. Hupp, botanist, and Bradley A. Bryan, hydrologist.



Example of (a) cross section and (b) core sample of a 13-year-old tree.

DOCUMENTATION OF MILLINGTON FLOOD

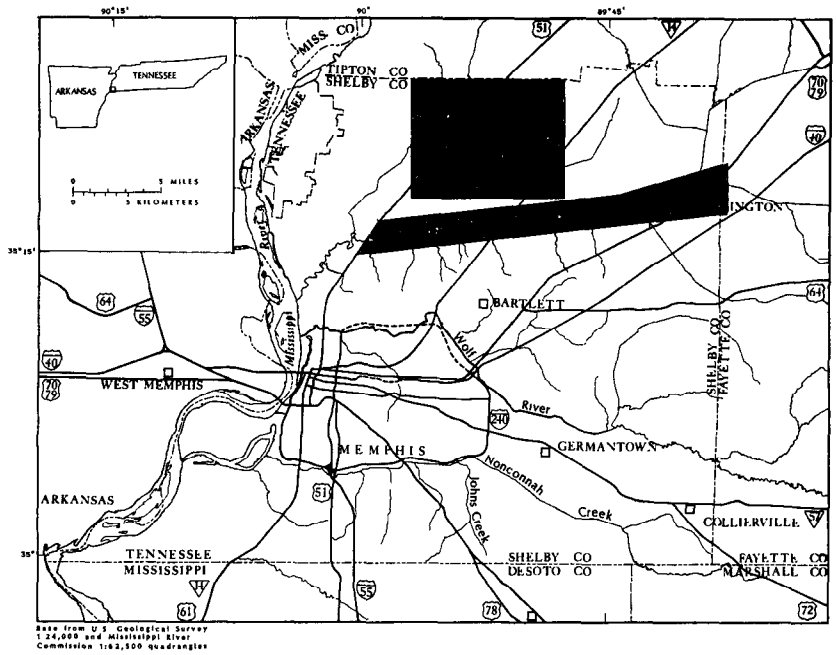
In cooperation with Shelby County and the City of Millington, Tennessee, the U.S. Geological Survey has completed a project to document the flood of December 25, 1987, in the city and the northern part of the county. The data collected indicates that the flood on the Loosahatchie River had a recurrence interval in excess of 75 years, while the peak discharge on Big Creek was almost twice the discharge of the 100-year flood. For North Fork Creek, the flood was about equal to a 100-year flood.

The documentation of the flood included:

- Data on rainfall that caused the flood
- Flood profiles for the streams involved
- Computation of peak discharges and frequencies
- Delineation of flooded areas and flood depths in Millington

The data will be published as a hydrologic atlas for use by local officials in planning for future flood-protection measures, zoning, and updating of flood-insurance studies.

The project chief was Jim Lewis, hydrologic technician from the Knoxville Subdistrict office.

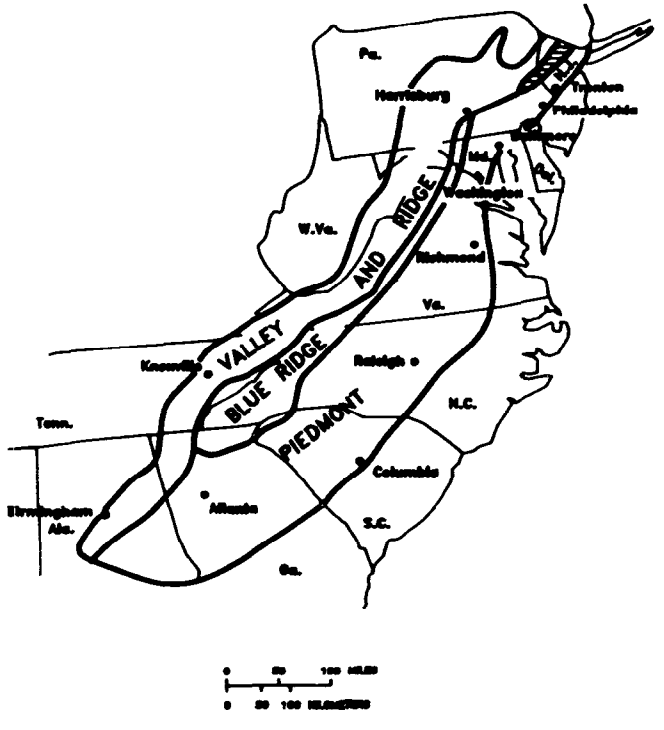


Location of the Millington study area.

APPALACHIAN VALLEYS-PIEDMONT REGIONAL AQUIFER-SYSTEM ANALYSIS

The APRASA (Appalachian Valleys-Piedmont Regional Aquifer-System Analysis) is one of 28 studies across the United States authorized by the U.S. Congress as a result of the drought of 1977. The purpose of each federally funded study is to define the regional hydrology and geology and to establish a framework of background information on geology, hydrology, and water chemistry of the Nation's important aquifer systems. The APRASA study area covers 145,000 square miles and is occupied by 26 million people. Surface-water resources have been well allocated in the most populated areas, but are now over stressed. Increasing emphasis is being given to additional development of the ground-water resources. The Tennessee District is responsible for the Valley and Ridge part (45,000 square miles) of the APRASA.

Accomplishments during 1988 include fully staffing the APRASA headquarters office in Richmond, Va. Seven districts, Alabama, Georgia, South Carolina, North Carolina, Tennessee, Virginia, and West Virginia, are compiling data and converting the data into machine-readable formats. Three other districts Maryland, Pennsylvania, and New Jersey are extracting and interpreting data in available computer files. A draft of the planning report which defines the problems in the study area and describes the objectives and approaches of the study is being revised. A report on the discharge of large springs in Tennessee is in review. In the Valley and Ridge province the hundreds of geologic units are being identified as principal aquifers, minor aquifers, and nonaquifers. Interpretation of chemical quality of water in the aquifers has just begun. Discussions are underway to identify the typical hydrogeologic settings and ground-water flow systems that characterize the study area. The project leader for the Valley and Ridge part of the APRASA is E.F. "Pat" Hollyday. The project is scheduled for completion in 1992.



Location of the Appalachian Valleys-Piedmont Regional Aquifer-System Analysis study area.

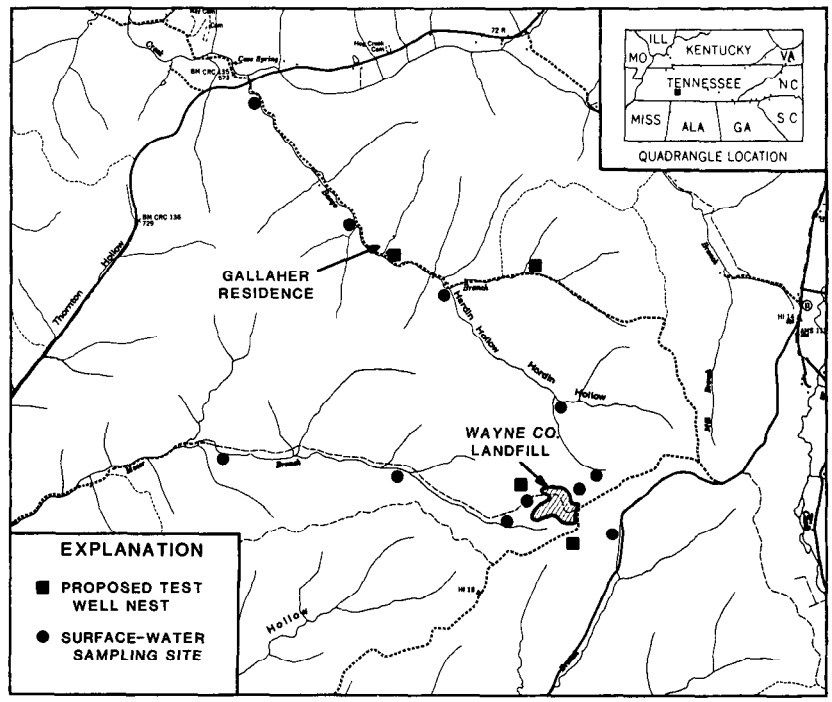
WAYNE COUNTY LANDFILL INVESTIGATION

In 1987, the U.S. Geological Survey, in cooperation with the Tennessee Department of Health and Environment, Division of Superfund, initiated an investigation of the hydrogeology of the Wayne County landfill and adjoining area. The objectives of the project included:

- Determination of potential pathways of contaminants from the landfill to nearby surface and ground waters.
- Determination of water-quality conditions in ground water underlying the landfill, in leachate emanating from it, and in nearby streams.
- Determination of the nature and extent of contaminants, if any, in water and fauna in streams adjoining the site.

During 1988, drilling of 16 observation wells was completed. Preliminary characterization of the chemistry of leachate in seeps on the slopes of the landfill was completed. Samples were also collected from streams adjacent to the site. Samples of aquatic organisms in these streams were collected for preliminary analyses of contaminants in animal tissue.

Late in 1988 the project was temporarily halted while funding was obtained to complete the final phases. The project was re-activated in June 1989. A new schedule was prepared to complete sampling from wells, biological monitoring, interpretation of the data, and report preparation. Hydrologists Roger Lee and Arthur Bradfield assisted by hydrologic technician N. Carolyn Short is in charge of the project. The project is scheduled for completion in April 1990.



Location of Wayne County landfill study area.

HYDROGEOLOGY IN THE VICINITY OF THE Y-12 PLANT AT THE OAK RIDGE RESERVATION

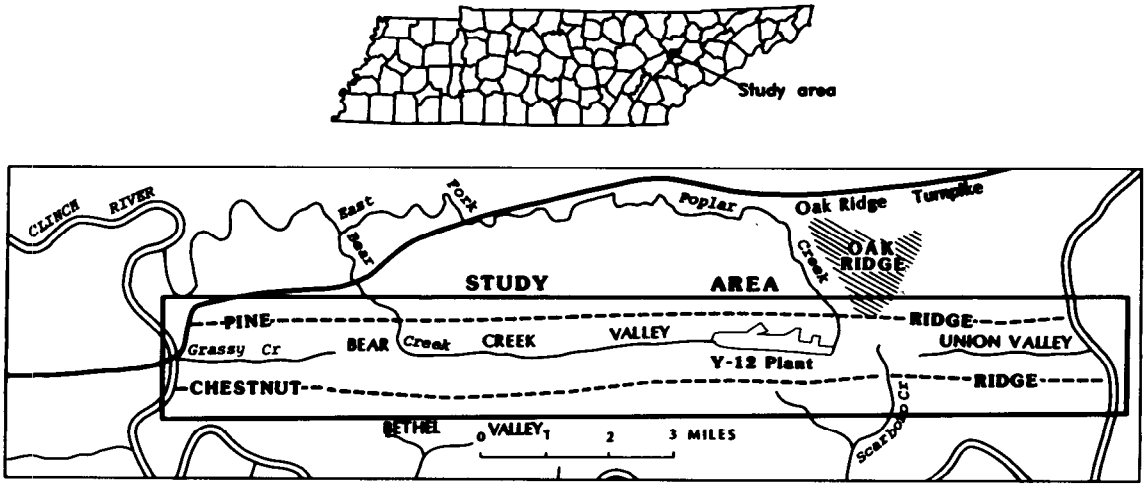
Several hazardous-waste disposal sites where contaminants may be leaching into ground and surface water are located in Bear Creek Valley, within the Oak Ridge Reservation. An investigation of Bear Creek Valley and Union Valley conducted in cooperation with the U.S. Department of Energy began in 1984. The objectives of the investigation of the hydrogeology were to:

- Formulate an understanding of the ground-water flow system.
- Determine the potential extent of contaminant migration.

Project tasks included:

- Assessment and use of existing geologic and hydrologic data.
- Installation of well clusters on the hydrologic boundaries of the valley.
- Collection of surface-water flow and water-quality data.
- Description of ground-water flow based on potentiometric and geochemical interpretations.
- Analysis of hydraulic-conductivity data by statistical and regression-model techniques.
- Simulation of ground-water flow system using a three-dimensional plow model.

Four data reports and three interpretive reports have been published, and two additional interpretive reports are in the process of publication. The project report summarizes the hydrogeologic findings of the study and present the results of the ground-water flow modeling and geochemical analyses. The project was directed by Zelda Bailey (geologist) assisted by Roger Lee (geochemist) and Dr. Joseph Connell (engineer).



Location of Bear Creek Valley study area.

OTHER ACTIVITIES

GROUND-WATER INFORMATION UNIT

In 1989, the U.S. Geological Survey organized a "Ground-Water Information Unit" in the Tennessee District. The objectives of this support unit are to ensure maximum utilization of ground-water data collected in Tennessee and to provide diverse support for all ground-water activities in the District. Specific functions of the unit are:

- Storage of new ground-water data
- Cleanup and maintenance of ground-water data bases
- Assistance to personnel in retrieving and plotting data
- Answering information requests from cooperators, officials, and the public

A computerized data base maintained by the Tennessee District as part of the National Ground-Water Information System operated by the USGS, currently contains information on over 2,600 ground-water sites in Tennessee. Data from the District's data base can be output directly as tables and hydrographs, or to the Geographic Information System (GIS) for graphical and statistical analyses.

GEOGRAPHIC INFORMATION SYSTEM (GIS)

The GIS in the Tennessee District has been operational for about 1 year. During this preceding year various coverages have been assembled, and software support has been developed to facilitate project work. Interfaces between GIS and U.S. Geological Survey data bases were developed. The following are 1988 highlights of goals achieved:

1. The following coverages were acquired or developed:
   a. Hydrography coverages for the State at 1:100,000 scale. These coverages have polygon, line, and point features that represent lakes, streams, springs, and gaging stations.
   b. Transportation coverages for the State at 1:100,000 scale.
      (1) Roads and trails divided into five different categories;
      (2) Railroads
      (3) Pipelines, transmission lines, and miscellaneous transportation.
   c. Land use and land cover coverage for the State at 1:250,000 scale. This coverage is divided into 9 general categories that are further subdivided into 37 sub-categories. The several categories include Urban, Agricultural, Forest, Water and so forth
   d. County outline coverage at 1:250,000 and 1:2,500,000 scale.
   e. Statewide streams, geology, and hydrologic units at a 1:2,500,000 scale.
   f. Topographic coverage with 20- and 100-foot contour intervals for the Oak Ridge Reservation.

COMPUTER SECTION AND ACTIVITIES

The Computer Unit of the Tennessee District continued to improve and to expand its capabilities in support of programs and cooperators. During 1988, the following milestones were accomplished:

1. A 16-channel multiplexor replaced an 8-channel multiplexor in the Knoxville and Memphis Subdistrict Offices, and each was placed on a dedicated phone line. This provided faster communications from the field office to the main computer in Nashville. An additional 16-channel multiplexor was added at the District Office to accommodate additional terminals.

2. Several new computer peripherals were purchased:
   a. A Macintosh II system was installed in the Publications Section for more efficient graphics production.
   b. Two AST Premium 286 personal computers were added to assist and enhance report typing and desktop publishing.
   c. All of the personal computers in the Hydrologic Investigations Section were connected to a print-sharing device connected to a laser printer.
   d. A GIS workstation was installed consisting of an Altek digitizer and a Tektronix 4207 graphics terminal.
   e. A CD ROM drive was installed including an optical disk containing a file of the WRSIC abstracts and USGS's historical streamflow data.
   f. A 36" X 48" Calcomp digitizer was procured for use with computerized drafting software in the Publications Section.

3. Data processing in the sediment laboratory in the Nashville Subdistrict was computerized.

4. Computing capabilities in the Investigation Section were enhanced by the installation of state-of-the-art word processing, statistics, and graphics programs.

5. Data coverage in the GIS system were expanded and applications in several surface and ground-water projects were developed.

The computer staff currently consists of Bill Barron, site manager; Joe Connell, GIS Administrator; Leticia Ables, computer operator; and Charlie McCoy, programmer trainee.

REGIONAL PUBLICATION CENTER

The Tennessee District operates a Regional Publication Center and Clearinghouse in support of projects within the District and the 10 other states in the Southeastern Region. Barbara Balthrop is the Chief of the Publication Center. The following is a list of the Center's accomplishments during 1988 and its goals for 1989.

Accomplishments for 1988:

- Acquisition of two personal computers and graphics software for production of publication-quality illustrations for reports
- Upgrade of personal computer used for desktop publishing

Goals for 1989:

- Acquire advance training for personnel preparing computer graphics
- Compile and publish the National Computer Technology Meeting proceedings for Headquarters

RECENT PUBLICATIONS

The Tennessee Center prepared for publication 4 Water-Resources Investigations Reports, 12 Open-File Reports, 21 journal articles, abstracts, and symposia articles, and the annual data report. The Tennessee Center also compiled and printed a publication for the First Tennessee Hydrology Symposium containing 36 abstracts, along with printing 11 out-of-District reports, and 5 bi-monthly bulletins. Currently, there are approximately 25 reports in various stages of preparation.

Reports Published

Bailey, Z.C., 1988, Preliminary evaluation of ground-water flow in Bear Creek Valley, the Oak Ridge Reservation, Tennessee: U.S. Geological Survey Water-Resources Investigations Report 88-4010.

Bailey, Z.C., and Withington, D.B., 1988, Well construction, lithology, and geophysical logs for boreholes in Bear Creek Valley near Oak Ridge, Tennessee: U.S. Geological Survey Water-Resources Investigations Report 88-4068, 21 p.

Broshears, R.E., 1988, Tennessee ground-water quality: U.S. Geological Survey Open-File Report 87-0753, 8 p.

Carey, W.P., Brown, R.T., and Chatham, C.G., 1988, History of suspended-sediment data collection and inventory of available data for the Tennessee and Cumberland River basins: U.S. Geological Survey Open-File Report 88-497, 51 p.

Carmichael, J.K., 1989, An investigation of shallow ground-water quality near East Fork Poplar Creek, Oak Ridge, Tennessee: U.S. Geological Survey Water-Resources Investigations Report 88-4219, 49 p.

Garrett, J.W., 1988, Hydrologic and suspended-sediment data for Reelfoot Lake, Obion and Lake Counties, northwestern Tennessee, May 1985-September 1986: U.S. Geological Survey Open-File Report 88-170, 50 p.

Hanchar, D.W., 1988, Geology of an area near Brentwood, Williamson County, Tennessee: U.S. Geological Survey Water-Resources Investigations Report 88-4176, 24 p.

Hanchar, D.W., 1988, Construction, geologic, and water-level data for observation wells near Brentwood, Williamson County, Tennessee: U.S. Geological Survey Open-File Report 87-248, 27 p.

Hoos, A.B., 1988, Water quality of runoff to the Clarksville Memorial Hospital drainage well and of Mobley Spring, Clarksville, Tennessee, February - March 1988: U.S. Geological Survey Open-File Report 88-310, 26 p.

Hutson, S.S. Hutson, 1988, Estimated use of water in Tennessee, 1985: U.S. Geological Survey Open-File Report 88-438, 1 sheet. (Map)

McMaster, B.W., and Parks, W.S., 1988, Concentrations of selected trace inorganic constituents and synthetic organic compounds in the water-table aquifers in the Memphis area, Tennessee: U.S. Geological Survey Open-File Report 88-485, 23 p.

Quinones, Ferdinand, 1988, U.S. Geological Survey ground-water studies in Tennessee: U.S. Geological Survey Open-File Report 88-145, 2 p.

Quinones, Ferdinand, Balthrop, B.H., and Baker, E.G., 1988, Water-Resources investigations in Tennessee: Programs and activities of the U.S. Geological Survey, 1987-1988: U.S. Geological Survey Open-File Report 88-322, 66 p.

Tucci, Patrick, and Hanchar, D.W., 1988, Lithologic, geophysical, and well-construction data for observation wells in the Melton Valley area, Oak Ridge Reservation, Tennessee: U.S. Geological Survey Water-Resources Investigations Report 88-4197, 22 p.

Webster, D.A., and Bradley, M.W., 1988, Hydrology of the Melton Valley radioactive-waste burial grounds at Oak Ridge National Laboratory, Tennessee: U.S. Geological Survey Open-File Report 87-686, 115 p.

Withington, D.B., 1988, Quality of ground water in shallow wells in agricultural areas of Haywood, Shelby, Lake, and Obion Counties, Tennessee, January and February 1988: U.S. Geological Survey Open-File Report 88-309, 12 p.

Yurewicz, M.C., Carey, W.P., and Garrett, J.W., 1988, Streamflow and water-quality data for three major tributaries to Reelfoot Lake, West Tennessee, October 1987-March 1988: U.S. Geological Survey Open-File Report 88-311, 20 p.

ADMINISTRATIVE SERVICES SECTION

Administrative services to the Tennessee District headquarters and field offices are provided by a unit of four employees directed by Nancy Tedder, Administrative Officer. Personnel management, payroll, training, procurement, inventory control, budgeting, and accounting services are efficiently handled through computerized systems.

APPENDIX 1

Active Recording Surface-Water Stations in Tennessee as of 3/1/89

[mi^2, square miles; Lat, latitude; Long, longitude]

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	CUMBERLAND RIVER BASIN				
03408500	New River at New River	382	362308	843317	1934
03409500	Clear Fork near Robbins	272	362318	843749	1930
03414500	E Fork Obey River nr Jamestown	202	362458	850135	1942
03416000	Wolf River near Byrdstown	106	363337	850423	1942
03417500	Cumberland River at Celina	7,307	363315	853052	1922
03417600	Cumberland River at Penitentiary Branch	7,440	362621	853542	
03418070	Roaring River above Gainsboro	210	362104	853245	1974
03421000	Collins River near McMinnville	640	354232	854346	1925
03422500	Caney Fork near Rock Island	1,678	354826	853744	1911
03425000	Cumberland River at Carthage	10,690	361453	855719	1922
03425100	Cumberland River at Rome	10,866	361550	860410	
03425400	Cumberland River at Hunters Point	11,107	361757	861549	1986
03426800	East Fork Stones River at Woodbury	39.1	354941	860436	1962
03427500	East Fork Stones River nr Lascassas	262	355506	862002	1951
03428200	W Fork Stones River at Murfreesboro	128	355410	862548	1972-82, 1986
03428500	West Fork Stones River near Smyrna	237	355625	862754	1965
03430118	McCrory Cr at Ironwood Dr, at Donelson	7.31	360908	863901	1977
03431000	Mill Creek near Antioch	64.0	360454	864050	1953-75, 1976
03431062	Mill Creek trib. at Glenrose Ave., at Woodbine	1.17	360702	864337	1977
03431490	Pages Branch at Avondale	2.01	361222	864624	1977
03431500	Cumberland River at Nashville	12,806	360945	854617	1892-1954,1986
03431517	Cummings Branch at Lickton	2.40	361825	864800	1975
03431700	Richland Creek at Charlotte Avenue, at Nashville.	24.3	360904	865116	1964
03431800	Sycamore Creek near Ashland City	97.2	361912	870304	1961
03432350	Harpeth River at Franklin	191	355514	865156	1974
03432400	Harpeth River below Franklin	210	355653	865254	1986
03433500	Harpeth River at Bellevue	408	360316	865542	1920
03434500	Harpeth River near Kingston Springs	681	360719	870556	1925
03435000	Cumberland River below Cheatham Dam	14,163	361926	871332	1954
03435008	Cumberland River nr Clarksville	14,421	362956	871948	

APPENDIX 1--Continued

Active Recording Surface-Water Stations in Tennessee as of 3/1/89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	CUMBERLAND RIVER BASIN--Continued				
03436000	Sulphur Fork Red River near Adams	186	363055	850332	1939
03436100	Red River at Port Royal	935	363317	870831	1961
03436500	Cumberland River at Clarksville	16,000	363228	872204	1924-44, 1986
03436690	Yellow Creek at Ellis Mills	103	361839	873315	1980
03437000	Cumberland River at Dover	16,530	362926	875020	1986
	TENNESSEE RIVER BASIN				
03455000	French Broad River near Newport	1,858	355854	830940	1900
03465500	Nolichucky River at Embreeville	805	361035	822727	1920
03466228	Sinking Creek at Afton	13.7	361155	824431	1977
03487550	Reedy Creek at Orebank	36.3	363342	822736	1963
03490500	Holston River at Surgoinsville	2,874	362819	825050	1941
03491000	Big Creek near Rogersville	47.3	362534	825707	1957
13491544	Crockett Creek below Rogersville	---	362247	830248	1989
03495500	Holston River near Knoxville	3,747	360056	834954	1930
03497300	Little River above Townsend	106	353952	834241	1963
03498500	Little River near Maryville	269	354710	835304	1951
03498850	Little River near Alcoa	300	354832	835536	1986
03528000	Clinch River above Tazewell	1,474	362530	832354	1918
03535912	Clinch River at Melton Hill Dam	3,343	355307	841803	1936
03536320	White Oak Creek near Melton Hill	1.31	355556	841820	1987
03536380	Whiteoak Creek near Wheat	2.10	355530	841852	1987
03536440	Northwest Tributary near Oak Ridge	.67	355518	841913	1987
03536450	First Creek near Oak Ridge	.33	355521	841910	1987
03536550	Whiteoak Creek bl Melton Valley Drive near Oak Ridge	3.28	355510	841902	1985
03537050	Melton Branch trib. (East Seven) near Oak Ridge	.24	355507	841743	1987
03537100	Melton Branch near Melton Hill, nr Oak Ridge	.52	355459	841753	1985
03537200	Melton Branch trib. (Center Seven) near Oak Ridge	.07	355503	841754	1987
03537300	Melton Branch trib. (West Seven) near Oak Ridge	.15	355511	841808	1987
03538225	Poplar Creek near Oak Ridge	82.5	355955	842023	1960
03538250	East Fork Poplar Creek near Oak Ridge	19.5	355758	842130	1960
035382672	Bear Creek trib. abv Bear Creek Road near Wheat	.30	355641	841927	1986

APPENDIX 1--Continued

Active Recording Surface-Water Stations in Tennessee as of 3/1/89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	TENNESSEE RIVER BASIN--Continued				
035382673	Bear Creek near Wheat	3.20	355639	841927	1986
035382677	Bear Creek tributary near Wheat	.14	355628	841955	1987
03538270	Bear Creek at St. Hwy 95 near Oak Ridge	4.34	355617	842029	1985
03538272	Bear Creek trib. at Hwy 95 near Wheat	.14	355626	842032	1986
03538273	Bear creek at Pine Ridge near Wheat	5.00	355632	842037	1986
03540500	Emory River at Oakdale	764	355859	843329	1927
03543500	Sewee Creek near Decatur	117	353453	844453	1934
03560500	Davis Mill Creek at Copperhill	5.16	345943	842256	1940-41, 1948-78, 1986
03563000	Ocoee River at Emf	524	350548	843207	1913
03564500	Ocoee River at Parksville	595	350548	843915	1911-16, 1921
03565500	Oostanaula Creek near Sanford	57.0	351939	844219	1954
03566000	Hiwassee River at Charleston	2,298	351716	844507	1898-1903, 1914-40, 1963
03566420	Wolftever Creek near Ooltewah	18.8	350343	850359	1964
03567500	South Chickamauga Creek nr Chickamauga	428	350051	851235	1928-78, 1980
03567900	Tennessee River at Citico Bar at Chattanooga	21,372	350319	861704	--
03568000	Tennessee River at Chattanooga	21,380	350512	851643	1874
03571000	Sequatchie River near Whitwell	402	351222	852948	1920
03580995	East Fork Mulberry Creek below Jack Daniels Distillery at Lynchburg	23.3	351656	862217	1988
03584500	Elk River near Prospect	1,784	350139	865652	1904-08, 1919
03588000	Shoal Creek at Lawrenceburg	55.4	351440	872102	1932-34, 1967
03588500	Shoal Creek at Iron City	348	350127	873444	1925
03593005	Tennessee River at Pickwick Landing Dam	32,820	350354	881508	1975
03593500	Tennessee River at Savannah	33,140	351329	881526	1930
03598000	Duck River near Shelbyville	481	352849	862957	1934
03600088	Carters Creek at Butler Rd at Carters Creek	20.1	354302	865945	1986

APPENDIX 1--Continued

Active Recording Surface-Water Stations in Tennessee as of 3/1/89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	TENNESSEE RIVER BASIN--Continued				
03600500	Big Bigby Creek at Sandy Hook	17.5	352919	871359	1953
03602219	Piney River at Cedar Hill	46.6	355943	872622	1988
03602500	Piney River at Vernon	193	355216	873005	1925
03603000	Duck River above Hurricane Mills	2,557	355548	874435	1925
03604000	Buffalo River near Flat Woods	447	352945	874958	1920
03604500	Buffalo River near Lobelville	707	354846	874751	1927
	OBION RIVER BASIN				
07024300	Beaver Creek at Huntingdon	55.5	355956	882601	1962
07024500	S. Fork Obion River nr Greenfield	383	360705	884839	1929
07025500	N. Fork Obion River at Union City	480	362359	885943	1989
07026000	Obion River at Obion	1,852	361504	891133	1929-58, 1966
07026370	North Reelfoot Creek at State Hwy 22 nr Clayton	56.3	362750	891513	1980-83 1984
07026400	South Reelfoot Creek near Clayton	38.6	362620	891537	1984
07026640	Running Slough near Ledford, Ky.	10.8	363228	891859	1982-83, 1984
07027000	Reelfoot Lake near Tiptonville	240	362109	892507	1940
07027500	S.F. Forked Deer River at Jackson	495	353338	884852	1988
	HATCHIE RIVER BASIN				
07029500	Hatchie River at Bolivar	1,480	361631	885836	1929
	LOOSAHATCHIE RIVER BASIN				
07030240	Loosahatchie River near Arlington	262	351837	893823	1969
070303573	Loosahatchie River at North Watkins Street, at Memphis	728	351515	900134	1986
	WOLF RIVER BASIN				
07031660	Wolf River at Walnut Grove Road, at Memphis	709	350758	895118	1986
07031740	Wolf River at Hollywood St., at Memphis	788	351116	895832	1986

APPENDIX 1--Continued

Active Recording Surface-Water Stations in Tennessee as of 3/1/89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	NONCONNAH CREEK BASIN				
07032200	Nonconnah Creek near Germantown	68.2	350259	894908	1969
07032251	Nonconnah Creek at Rivergate Road, at Memphis	182	350432	900355	1986

APPENDIX 1--Continued

Active Crest-Stage Stations in Tennessee as of 3/1/89

[mi^2, square miles; Lat, latitude; Long, longitude; *, Operated as a continuous-record station]

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	CUMBERLAND RIVER BASIN				
03409000	White Oak Creek at Sunbright	13.5	361438	844014	1934, 1955-82, 1985
03418201	Doe Creek at Gainesboro	5.72	362123	853920	1978
03420360	Mud Creek tributary No. 2 near Summitville	2.28	353610	860133	1967
03420600	Owen Branch near Centertown	4.60	354230	855305	1955
03421200	Charles Creek near McMinnville	31.1	354300	854605	1955
03424900	Mulherrin Creek near Gordonsville	26.9	361128	855711	1982, 1986
03425045	Peyton Creek at Monoville	44.7	361837	855921	1986
03425357	Darwin Branch tributary at Hartsville	.66	362354	860908	1986
03425365	Second Creek near Walnut Grove	3.47	362401	861248	1986
03425500	Spring Creek near Lebanon	35.3	361049	861429	1955-61*, 1962
03425700	Spencer Creek near Lebanon	3.32	361420	862403	1955
03426874	Brawleys Fork below Bradyville	15.4	354444	861014	1983
034269424	Reed Creek near Bradyville	3.52	354444	861231	1983
03428043	Lytle Creek at Sanbyrne Drive at Murfreesboro	17.6	354938	862328	1978
03430400	Mill Creek at Nolensville	12.0	355732	864031	1965
03431000	Mill Creek near Antioch	64.0	360454	864050	1954-61*, 1962-63, 1964-75*, 1976
03431040	Sevenmile Creek at Blackman Road at Nolensville	12.2	360421	864400	1965
03431060	Mill Creek at Thompson Lane, near Woodbine	93.4	360704	864308	1965
03431120	West Fork Browns Creek at General Bates Drive, at Nashville	3.30	360629	864707	1965
03431240	East Fork Browns Creek at Baird-Ward Printing Company, at Nashville	1.58	360633	864600	1965
03431340	Browns Creek at Factory Street, at Nashville	13.2	360826	464531	1965
03431550	Earthman Fork at Whites Creek	6.29	361555	864951	1965
03431573	Ewing Creek at Richmond Hill Drive at Parkwood	2.17	361350	864628	1976
03431575	Ewing Creek at Brick Church Pike at Parkwood	3.02	361358	864654	1976
03431578	Ewing Creek at Gwynwood Drive near Jordonia	9.98	361358	864732	1976

APPENDIX 1--Continued

Active Crest-Stage Stations in Tennessee as of 3/1/89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	CUMBERLAND RIVER BASIN--Continued				
03431581	Ewing Creek below Knight Road, near Bordeaux	13.3	361355	864814	1976
03431677	Sugartree Creek at YMCA Access Road, at Green Hills	1.51	360613	864912	1976
03431679	Sugartree Creek at Abbott Martin Road, at Green Hills	2.19	360623	864917	1976
03431795	Bednigo Branch trib. at Chestnut Grove	.47	362510	865411	1986
03432470	Murfrees Fork above Burwood	7.43	354858	865720	1986
03432925	Little Harpeth River at Granny White Pike, at Brentwood	22.0	360130	864909	1978
03434590	Jones Creek near Burns	13.3	360615	871905	1984
03434616	Hall Branch near Charlotte	.50	361148	872030	1984
034350021	Bartons Creek near Cumberland Furnace	22.29	361502	872000	1984
0343500213	Bartons Creek tributary near Stayton	.51	361519	871912	1984
034351113	Honey Run Creek below Cross Plains	25.8	363231	864214	1986
03435770	Sulphur Fork Red River above Springfield	65.6	363047	865144	1975
03435930	Spring Creek tributary near Cedar Hill	1.40	363208	865926	1986
03436505	Cummings Creek nr Dotsonville	2.65	362918	872806	1984
03436700	Yellow Creek near Shiloh	124	362055	873220	1957-80*, 1982
	TENNESSEE RIVER BASIN				
03461230	Caney Creek near Cosby	1.62	354703	831211	1967
03465607	Cherokee Creek near Embreeville	22.9	361224	822923	1984
03465780	Clear Fork near Fairview	10.5	361933	823347	1983
03466890	Lick Creek near Albany	172	361454	825534	1984
03467480	Bent Creek at Taylor Gap	2.18	361408	830641	1986
03467992	Carter Branch near White Pine	4.25	360705	831855	1986
03467993	Cedar Creek near Valley Home	2.01	360803	831847	1986
03467998	Sinking Fork at White Pine	6.38	360721	831744	1986
03470215	Dumplin Creek at Mt. Hareb	3.65	360459	832551	1986
03476960	Indian Creek at Childress	6.79	362538	821554	1983
03478615	Evans Creek near Blountville	2.50	363119	821812	1983
03481600	Corn Creek at Mountain City	5.34	362923	814852	1959-61, 1963
03487507	Horse Creek at Sullivan Gardens	26.0	362813	823552	1983

APPENDIX 1--Continued

Active Crest-Stage Stations in Tennessee as of 3/1/89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	TENNESSEE RIVER BASIN--Continued				
03490522	Forgey Creek at Zion Hill	0.86	362912	825308	1986
03491490	Dodson Creek tributary near Rogersville	.32	362119	825703	1983
03491540	Robertson Creek near Persia	14.6	362024	830227	1986
03494714	Dry Land Creek trib. near New Market	.20	360333	833413	1986
03494990	Flat Creek at Luttrell	22.4	361145	834444	1986
03519610	Baker Creek tributary near Binfield	2.10	354156	840246	1966-77, 1979
03519640	Baker Creek near Greenback	16.0	354021	864628	1965-75*, 1976
03527800	Big War Creek at Luther	22.3	362718	831429	1986
03528390	Crooked Creek near Maynardville	2.23	361556	835025	1986
03534000	Coal Creek at Lake City	24.5	361314	840927	1932-34*, 1955
03535180	Willow Fork near Halls Crossroads	3.23	360559	835427	1967
03555900	Coker Creek near Ironsburg	22.4	351305	842028	1983
03566599	North Chickamauga Creek at Greens Mill, near Hixson	99.5	351030	851340	1925, 1944, 1953-56, 1980
03569168	Stringers Branch at Leawood Drive, at Red Bank	1.54	350700	851728	1980
03571500	Little Sequatchie River at Sequatchie	116	350747	853510	1925, 1929-30, 1932-34*, 1944 1951-54, 1965, 1979
03571730	Standifer Branch at Jasper	15.3	350422	853656	1982
03571800	Battle Creek near Monteagle	50.4	350803	854615	1955
03583200	Chicken Creek at McBurg	7.66	351103	864847	1955
03583300	Richland Creek near Cornersville	47.5	351910	865220	1962-68*, 1969
035944242	Owl Creek at Lexington	2.50	353826	882213	1984
03597300	Wartrace Creek above Bell Buckle	4.99	353745	862122	1966
03599200	East Rock Creek at Farmington	43.1	353005	864250	1954
035999716	Rutherford Creek trib. at Moores Lane near Kedron	0.25	354203	865503	1987
03602170	West Piney River at Hwy 70 nr Dickson	2.16	360521	872812	1984
03604070	Coon Creek tributary near Hohenwald	.51	353407	874002	1967
03604080	Hugh Hollow Branch near Hohenwald	1.52	353459	874036	1967
03604090	Coon Creek above Chop Hollow, near Hohenwald	6.02	353519	874109	1967
03604580	Blue Creek near New Hope	13.2	360352	873858	1984
03604595	Little Blue Creek trib. near Gorman	.62	361944	874213	1984
03605555	Trace Creek above Denver	31.9	360308	875427	1963
03605880	Cane Creek at Stewart	4.12	361909	875021	1984

APPENDIX 1--Continued

Active Crest-Stage Stations in Tennessee as of 3/1/89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	OBION RIVER BASIN				
07024225	Neil Ditch near Henry	4.07	361019	882333	1984
07024370	Little Reedy Creek near Huntingdon	0.91	355544	882950	1984
07028505	North Fork Forked Deer River at U.S. Highway 45W Bypass at Trenton	73.9	355858	885549	1987
07029090	Lewis Creek near Dyersburg	25.5	360314	892142	1955-78, 1980-83, 1985

APPENDIX 1--Continued

Active Surface-Water Low-Flow Stations in Tennessee as of 3-1-89

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	CUMBERLAND RIVER BASIN				
03418935	Beaverdam Creek at Latana Road near Bellview	17.0	354407	851143	1979-81, 1983
03418950	Bee Creek near Herbert Domain	59.6	354624	851358	1985
03420116	Rocky River at Rocky River Road at Riverview	72.0	354204	853440	1979-81, 1983
03420470	North Prong Barren Fork at Oak Grove	29.8	354240	855725	1983
03420720	Hickory Creek near Viola	58.2	353432	855102	1954, 1979-81, 1983
03421150	Charles Creek at Daylight	13.8	354432	855112	1983
03432334	Harpeth River at Interstate Hwy 65 near Franklin	168	355332	864946	1975, 1986
03432470	Murfrees Fork above Burwood	7.43	354858	865720	1975, 1986
03432474	West Prong Murfrees Fork near Burwood	4.93	354940	865755	1975, 1986
03432495	Murfrees Fork above Leipers Fork	26.3	355157	865738	1975, 1986
03432925	Little Harpeth River at Granny White Pike at Brentwood	22.0	360130	864909	1978
03433660	South Harpeth River at Fernvale	27.6	355715	870443	1974-75, 1978
03433902	Big Turnbull Creek near Liberty Hill	12.5	355759	871156	1981, 1983
03434620	Town Branch near Charlotte	8.33	361044	871815	1974-76, 1978
034351113	Honey Run Creek below Cross Plains	25.8	363231	864214	1985
03435320	Red River at Adams	594	363537	870333	1937, 1983
	TENNESSEE RIVER BASIN				
03455050	Clear Creek at Parrotville	9.07	350036	830545	1986
034611996	Crying Creek above Cosby	2.94	354654	831301	1983
03461450	English Creek near Newport	9.74	355447	831242	1983
03465603	Little Cherokee Creek at Garber	8.73	361256	822803	1986
03465620	Clark Creek at Graham Mill	11.5	361004	823227	1986
03465780	Clear Fork near Fairview	10.5	361933	823347	1983
03465800	Muddy Fork at Fairview	9.86	361852	823238	1955-73, 1986
03466256	College Creek at Tusculum	3.48	360955	824517	1986
03466295	Camp Creek at Camp Creek	9.99	360539	824537	1961, 1983-86
03467993	Cedar Creek near Valley Home	2.01	360803	831847	1986

APPENDIX 1--Continued

Active Surface-Water Low-Flow Stations in Tennessee as of 3-1-89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	TENNESSEE RIVER BASIN--Continued				
03467998	Sinking Fork at White Pine	6.38	360721	831744	1986
03469610	Cove Creek at Hatchertown	2.64	354347	833743	1983
03476515	Beidleman Creek near Caywood Ford	27.4	363128	820753	1975-81, 1983
03481600	Corn Creek at Mountain City	5.34	362923	814852	1986
03486313	Sinking Creek at Johnson City	10.4	361908	821917	1986
03487509	Bear Creek at Sullivan Gardens	3.39	362823	823550	1986
03487545	Boozy Creek near Orebank	10.8	363424	822444	1966, 1986
03490530	Forgey Creek near Surgoinsville	4.59	362720	825139	1962, 1986
03494990	Flat Creek at Luttrell	22.4	361145	834444	1986
03495400	Roseberry Creek at Shipetown	12.2	360443	834614	1986
03495550	Love Creek at Knoxville	8.28	360030	835020	1986
03527800	Big War Creek near Luther	22.3	362718	831429	1986
03528385	Fall Creek at Lickskillet	3.78	361715	834800	1986
03528390	Crooked Creek near Maynardville	2.23	361536	835025	1986
03534927	Bullrun Creek near Luttrell	9.51	361418	834443	1986
03534975	North Fork Bullrun Creek below Maynardville	6.79	361347	834918	1986
03534990	Raccoon Creek at Paulette	5.10	361112	835319	1986
03555882	Barney Creek near Coker Creek	4.29	351429	841904	1983
03556610	Junebug Creek at Reliance	2.20	351124	843022	1986
03566111	Little South Mouse Creek near Charleston	5.58	351613	844655	1967, 1986
03566200	Brymer Creek near McDonald	9.68	350720	845700	1983
03566253	Greasy Creek at Hopewell	3.12	351217	845311	1979-81, 1983
03582205	Norris Creek below Howell	15.1	351333	863356	1952, 1975, 1978-81, 1983
03593115	Lick Creek near Michie	9.93	350430	882547	1982
03599960	Aenon Creek near Spring Hill	14.2	354339	865420	1986
03599965	Rutherford Creek near Spring Hill	39.3	354257	865502	1986
03599970	McCutcheon Creek near Spring Hill	10.2	354339	865527	1986
03599980	Rutherford Creek near Neapolis	58.2	354136	865706	1986
03600085	Carters Creek at Petty Lane near Carters Creek	16.6	354339	865919	1986
03600086	Carters Creek tributary near Carters Creek	2.94	354334	865919	1986

APPENDIX 1--Continued

Active Surface-Water Low-Flow Stations in Tennessee as of 3-1-89--Continued

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began
	TENNESSEE RIVER BASIN--Continued				
03600093	Carters Creek near Darks Mill	32.7	354125	870033	1960, 1986
03600360	Snow Creek near Sante Fe	11.1	354331	870736	1962-63, 1965, 1986
03600370	Snow Creek near Williamsport	23.2	354141	871118	1944, 1953-54, 1986
03600380	Leipers Creek at Williamsport	37.5	354143	871210	1944, 1953-54, 1986
03601100	Big Bigby Creek at Needmore	48.3	353243	871405	1934, 1969, 1972-73, 1978-81, 1983
03602192	West Piney River near Dickson	21.2	360140	872700	1950-52, 1962-63, 1965, 1979-81, 1983
03602194	West Piney River below State Highway 48 near Dickson	25.7	360043	872633	1981, 1984
03602209	Piney River near Oak Grove	44.1	360036	872638	1984
03602230	Piney River above Pinewood	77.5	355711	872753	1984
03602265	Piney River at Pinewood	150	355437	872804	1984
03604750	Birdsong Creek at Holladay	15.7	355253	880839	1975-78, 1980
03606350	Big Sandy River at Westport	110	355334	881832	1975-78, 1980
	OBION RIVER BASIN				
07024310	Rock Creek near Huntingdon	4.51	360023	882717	1986
07024760	Spring Creek near Greenfield	93.4	361124	884553	1955, 1975-78, 1980
07025190	Mud Creek near Sharon	45.6	361559	885005	1958, 1975-78, 1980
07025300	North Fork Obion River at Jones Mill	83.7	362646	882757	1958-61, 1964, 1975-78, 1980
07026090	Cool Springs Branch near Trimble	10.7	361115	891103	1986
07026100	Reeds Creek near Trimble	51.8	361048	891515	1975-78, 1980
07027270	Tar Creek at Oak Grove	16.4	352402	883454	1982
07027280	Jacks Creek at Jacks Creek	17.9	352816	883121	1975-78, 1980
	HATCHIE RIVER BASIN				
07030160	Indian Creek at Gilt Edge	65.9	353309	894920	1976-78, 1980-81, 1983

APPENDIX 2

Active ground-water network in Tennessee as of 3/1/89

[Lat, latitude; Long, longitude]

Station No.	Local well No.	Lat	Long	Date began
	RECORDER--60-MINUTE PUNCH INTERVAL			
361738082132900	Ct: H-1	361738	821329	1964
360835086441100	Dv:L-10	360835	864411	1985
350234085181200	Hm:G-36	350234	851812	1981
351428085003600	Hm:O-15	351428	850036	1975
360020087573300	Hs:H-1	360020	875733	1962
353839089493500	Ld:F-4	353839	894935	1966
354158089384300	Ld:G-12	354158	893843	1980
354357089271701	Ld:J-5	354357	892717	1982
354552089455900	Ld:L-2	354552	894559	1980
355251089350500	Ld:S-2	355251	893505	1980
350035086423100	Li:G-2	350035	864231	1988
352610087182401	Ln:R-014	352610	871824	1985
354223088380200	Md:N-1	354223	883802	1949
360543084343101	Mg:F-5	360543	843431	1984
360521085432601	Pm:C-1	360521	854326	1968
353922083345600	Sv:E-2	353922	833456	1979
350514089553700	Sh:K-75	350514	895537	1948
351435090005200	Sh:O-1	351435	900052	1940
350735089593300	Sh:P-76	350735	895933	1928
350900089482300	Sh:Q-1	350900	894823	1940
350958090173800	Ar:C-1	350958	901738	1983
350344090130000	Ar:H-2	350344	901300	1983
351349090062800	Ar:O-1	351349	900628	1983
	TAPE DOWN			
350503084505000	Br:E-1	350503	845050	1950-1955, 1964
354823086104400	Cn:D-1	354823	861044	1967
360200089280100	Dy:H-1	360200	892801	1955
360147089230700	Dy:H-7	360147	892307	1954
352226089330101	Fa:R-1	352226	893301	1949
352226089330102	Fa:R-2	352226	893301	1949
352112089571200	Sh:U-1	352112	895712	1946
352112089571300	Sh:U-2	352112	895713	1953
355505086541100	Wm:M-1	355505	865411	1950

APPENDIX 3

List of water-quality and suspended-sediment stations

[mi^2, square miles; Lat, latitude; Long, longitude; Q, chemical; B, bacteriological; S, sediment]

Station No.	Name	Drainage area (mi^2)	Lat	Long	Date began	Data type
	CUMBERLAND RIVER BASIN					
03418420	Cumberland River below Cordell Hull Dam	8,095	361712	855627	1980	Q
03425000	Cumberland River at Carthage	10,690	361453	855719	1975	Q,B,S
03426310	Cumberland River at Old Hickory Dam (Tailwater)	11,673			1979	Q
03427500	East Fork Stones River nr Lascassas	262	355506	862002	1975	Q
03428200	W Fork Stones River at Murfreesboro	177	355410	862548	1986	Q
03428500	West Fork Stones River near Smyrna	237	355625	862754	1965	Q
	TENNESSEE RIVER BASIN					
03495500	Holston River near Knoxville	3,747	360056	834954	1965, 1977	Q,B,S
03497300	Little River above Townsend	106	353952	834241	1964-82, 1986	Q,B,S
03535912	Clinch River at Melton Hill Dam	3,343	355307	841803	1973	Q,B,S
03593005	Tennessee River at Pickwick Landing Dam	32,820	350354	881508	1975	Q,B,S
03600085	Carters Creek at Petty Lane near Carters Creek	16.6	354340	865920	1986	Q,B,S
03600086	Carters Creek Trib near Carters Creek	2.94	354334	865920	1986	Q,B,S
03600088	Carters Creek at Butler Road at Carters Creek	20.1	354303	865945	1986	Q,B,S
03604000	Buffalo River near Flat Woods	447	352945	874958	1964	Q,B,S
	OBION RIVER BASIN					
07026000	Obion River at Obion	1,852	361504	891133	1975	Q,B,S
	HATCHIE RIVER BASIN					
07029500	Hatchie River at Bolivar	1,480	361631	885836	1964, 1968, 1977	Q,B,S

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