

GROUND-WATER INFORMATION DATA BASE FOR MISSISSIPPI MAINTAINED BY THE U.S. GEOLOGICAL SURVEY

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Introduction

The U.S. Geological Survey (USGS) investigates the quantity, quality, distribution, and movement of the ground-water resources in Mississippi. The large amount of hydrologic data collected during these investigations provides valuable information that can be used to evaluate ground-water trends and conditions.

The Ground-Water Site Inventory (GWSI) is the computerized storage and retrieval system for ground-water data collected by the USGS and others. The system provides an easily accessible file of information about site (well) locations, well construction, and geohydrologic characteristics for about 67,000 sites in Mississippi. This information can be used to identify potential water-resources problems, to develop background information for ground-water investigations, and to study ground-water response to natural climatic variation and induced stresses.

The first GWSI was developed in 1971 as part of the USGS's Water Storage and Retrieval System (WATSTORE). It consisted of a centralized set of data bases housed on an Amdahl computer (use of specific product names is for information purposes only and does not constitute endorsement by the USGS) in the USGS Headquarters in Reston, Virginia (Luckey 1987). All records for streamflow, ground-water, and water-quality sites are kept in WATSTORE, which is the Primary source of data for use outside of the USGS (Baker and Foulk 1975). In the mid 1980's, the Amdahl was supplemented with a distributed system of Prime minicomputers located in the USGS district offices. Another set of data bases, identified as the National Water Information System (NWIS), which contained a series of four data bases including GWSI, was developed for this computer system. NWIS is a distributed data base where each minicomputer has its own copy of the data base software. Data stored in NWIS are routinely loaded into the WATSTORE system, which is used extensively by ground-water data users outside the USGS.

NWIS is an umbrella name for four major data base systems, each of which handles a different type of information. The four data bases are linked to a single file called the site file that stores general information about each site. A unique site identification number (15 digits for ground-water sites) allows data stored in the different data bases to be linked together. The following is a brief description of the four components of the NWIS system.

- (1) Automated Data Processing System (ADAPS) is the data base where continually-recorded data (primarily stream-flow records) are stored. In addition, ADAPS provides an extensive system of standardized water-data processing and tabling procedures (Dempster 1991).
- (2) Quality of Water Data (QWDATA) contains water-quality information for both surface- and ground-water sites.
- (3) Ground-Water Site Inventory data base (GWSI) is where information about wells, test holes, and springs is stored.
- (4) Site-Specific Water-Use Data System (SSWUDS) is the water-use data base. SSWUDS is where annual and monthly water-use information is stored.

Ground-Water Site Inventory

The Ground-Water Site Inventory is a data storage and retrieval system for ground-water data collected by the USGS and its cooperators. The user interface is by menus, and retrievals and updates may be made either interactively or in batch mode (Mathey 1990). The data base maintained in the USGS office in Mississippi contains only data collected in Mississippi.

The GWSI system can store approximately 300 data elements for ground-water sites such as wells, test holes, and springs. The information is stored in eight separate data files:

- (1) Site File is used to store general information about the site, including location information.
- (2) Construction File is used to store information related to the construction of the well, such as casing and screen data.
- (3) Water-Level File is used to store water-level data for ground-water sites.
- (4) Discharge File (or withdrawal file) is used to store water-level and discharge data needed to estimate well performance for both flowing and pumped wells.
- (5) Miscellaneous File is used to store data that do not relate to a specific category. In Mississippi, field water-quality measurements such as pH, temperature, and specific conductance are stored in the miscellaneous file.
- (6) Geologic Logs File is used to store geohydrologic data about the site. The file can be used to record the principal aquifer or aquifers for the well or an entire lithologic log.
- (7) Observation Well Heading File is used to specify headings for tables of water-level data.
- (8) Hydraulics File is used to store data that relate to the hydraulics of the aquifer. Transmissivity, horizontal conductivity, and storage coefficient values are recorded in this file.

History of the Mississippi Ground-Water Site Inventory

The USGS files contained records on about 3,300 water wells prior to the passage of a 1966 water law requiring well drillers to file a well completion report with the Mississippi Board of Water Commissioners (BOWC) within 30 days after a well was completed (State of Mississippi 1972). Prior to the enactment of this water law, well data were collected primarily during hydrologic field investigations conducted by personnel of State and Federal agencies. By 1975, the files of the BOWC and USGS contained records on about 50,600 wells. A cooperative agreement between the USGS and the BOWC began the process of entering these data into computer files in GWSI. The backlog of historical data was entered between

1975 and 1980. By 1985, reported information on all completed water wells had been coded and stored in the GWSI data base, and data for about 100 new sites were being entered into GWSI monthly.

The amount of data received, processing time required, and problems reported with site locations made it necessary to establish a more selective system for adding new wells to the data base. In 1985, it was decided that data for water wells with casing diameters smaller than 6 inches would not be stored in GWSI unless either the pumping rate was 50 gallons per minute or greater, a geophysical log was obtained at the site, a water sample was collected at the site, measured water levels were available, or other significant data could be obtained from drillers logs for the well. Currently, the USGS receives drillers logs on about 200 water wells monthly from the Mississippi Department of Environmental Quality, Office of Land and Water Resources [OLWR (formerly the Board of Water Commissioners)] and about 25 of those well records are selected for input into the GWSI system.

The GWSI data base for Mississippi, the third largest GWSI data base in the country, currently contains information on approximately 67,000 wells. Most of the wells (69 percent) are private wells which supply water for domestic use (fig. 1). Most of these wells were completed prior to 1985, at which time the criteria for entering wells into GWSI changed. Of the 67,000 wells in GWSI, only 127 are more than 2,000 feet deep. About 4 percent (2,748 wells) are more than 1,000 feet deep. Wells yielding more than 1,000 gallons per minute account for 8.5 percent of the wells in the Mississippi GWSI. About 20 percent of the wells currently in GWSI have casing diameters greater than 6 inches, about 14 percent have a geophysical log, 6 percent have historical water levels, and 4 percent have water-quality data available.

The counties with the largest number of wells in GWSI are located on the Gulf Coast: Harrison, with almost 4,000 wells, and Jackson, with about 3,000 wells (fig. 2). The large number of wells reflects the abundance of shallow, good-quality water, and the relatively high population density in this area. Bolivar and Washington Counties, located in the Delta in northwest Mississippi, also have records for more than 2,000 wells stored in GWSI. More than 95 percent of the irrigation in Mississippi is in the Delta, accounting for the large number of wells in these counties.

Data in the GWSI data base can be retrieved in a variety of output options (Mathey 1990). The list of

sites can be retrieved by the site identification number, a county code or codes, aquifer, hydrologic unit (river basin), water-use code, or range of latitude or longitude. The list can be restricted further by using an area bounded by a latitude-longitude polygon, or by up to 20 limiting qualifiers on any of the data fields. For example, a user could choose to retrieve all sites in Harrison County which fall within a 1-mile radius of a specified location and which have a well depth less than 150 feet. After selecting the site, the user chooses which of the 300 data elements are needed in the retrieval. After the user has selected which sites and data elements he wishes to retrieve, he has a choice of a formatted table with headings across the page (fig. 3), or a "dump-format" which lists the data element names and stored values vertically on the page (fig. 4). Water-level data also can be retrieved as a hydrograph (fig. 5) and well locations can be retrieved in the form of generated maps (fig. 6).

Summary

The Mississippi GWSI, part of the USGS National Water Information System, stores information on 67,000 wells in the State. Data stored in the GWSI system are easily retrieved and can be output as tables, hydrographs, or location maps. Information in the data bases allows hydrologists to develop background data for project studies and water managers to monitor changes and trends in the State's ground-water resources.

References

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Dempster, G.R., Jr., 1991. National water information system user's manual, Automated Data Processing System: U.S. Geological Survey Open-File Report 0-116, v. 2, chap. 3.

Luckey, R.R., 1987. The distributed ground-water data base of the U.S. Geological Survey, in James, Larry G., and English, M.J., eds., Irrigation systems of the 21st century: American Society of Civil Engineers Irrigation and Drainage Division Specialty Conference, Portland, Oregon, July 28-30, 1987, proceedings, p. 263-269.

Mathey, S.B. (ed), 1990. National water information systems user's manual, Ground-Water Site Inventory System: U.S. Geological Survey Open-File Report 89-587, v. 2, chap. 4.

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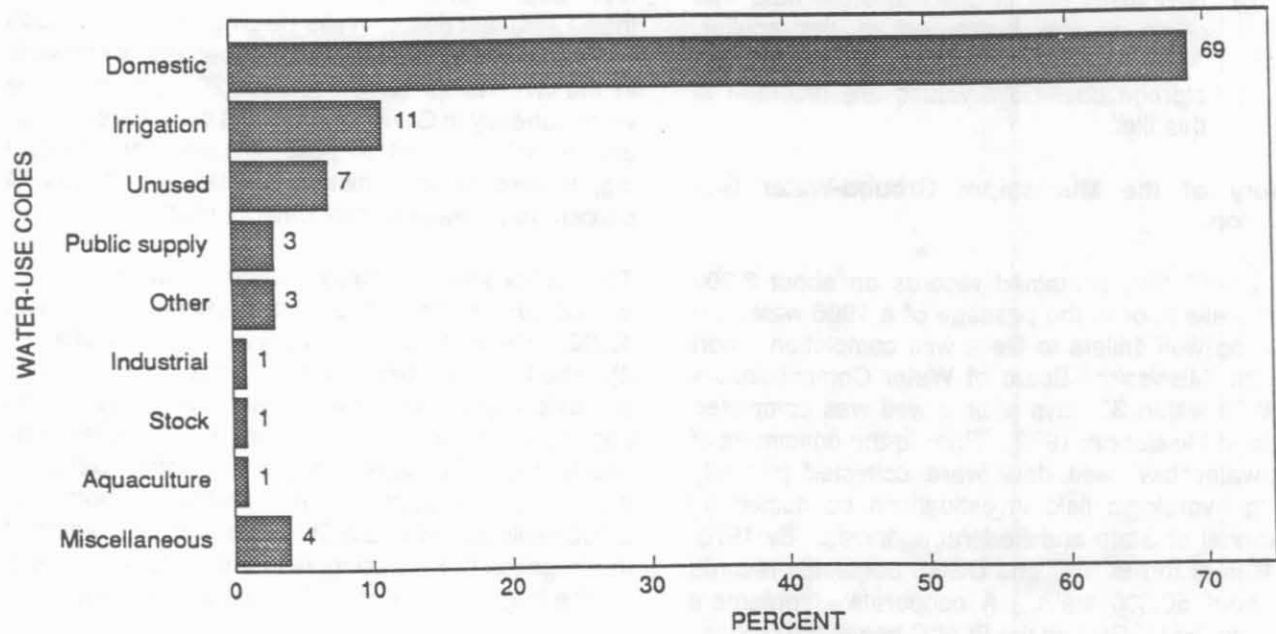


Figure 1.--Percentage of wells in the Mississippi Ground-Water Site Inventory data base by water-use code. The Miscellaneous use codes are Air conditioning, Commercial, Dewatering, Desalination, Fire, Industrial (cooling), Institutional, Medicinal, Power, and Recreation, and uncoded sites.

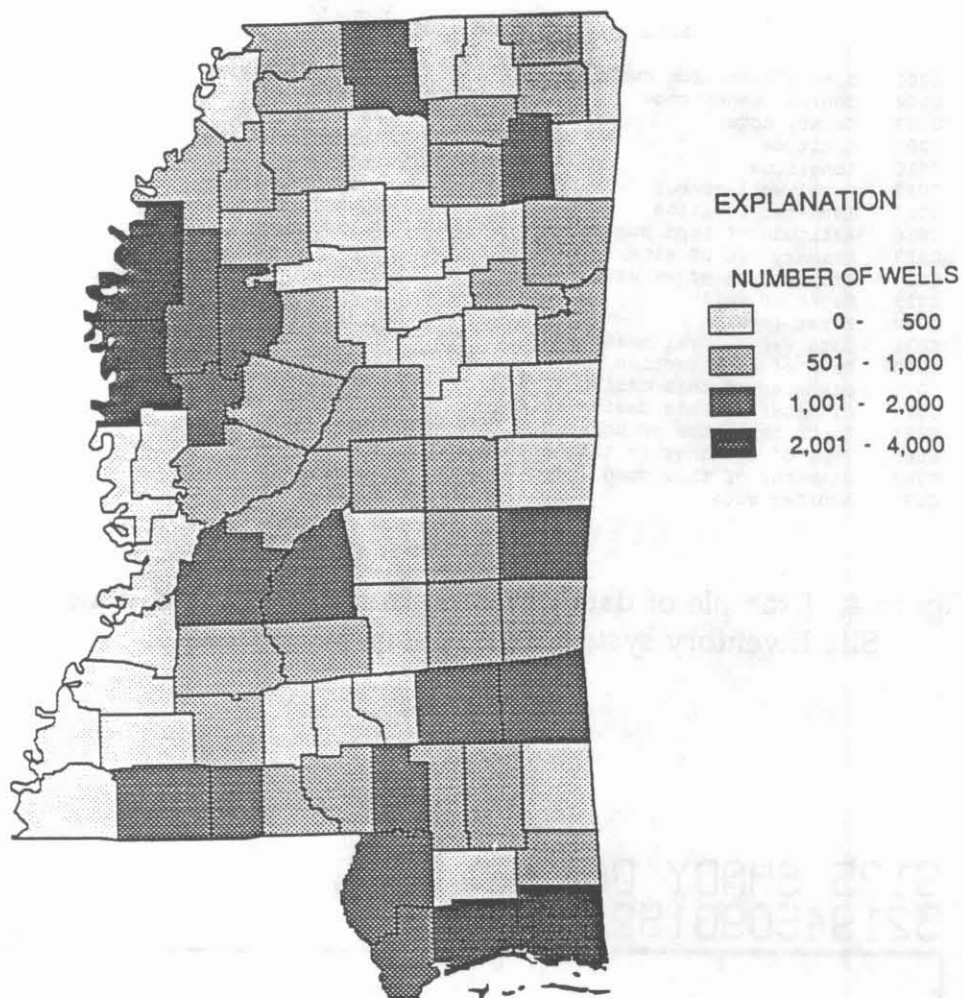


Figure 2.--Number of wells in the Mississippi Ground-Water Site Inventory data base, by county.

WATER WELLS LOCATED WITHIN 1 MILE RADIUS OF RIDGELAND SITE.					
LOCAL WELL NUMBER	LAND- NET LOCATION	LATITUDE (DEGREES)	LONGITUDE (DEGREES)	PRIMARY USE OF WATER	DEPTH OF WELL (FEET)
W009 NATCHEZ TRACE PK	SWNWS23T07NR02E	322600	0900415	-	943
W015 T E WEBB	SWSWS15T07NR02E	322642	0900518	H	590.
W021 MISS POWER CO	NWSES23T07NR02E	322620	0900415	-	600
W029 L L CULLEY	--NES22T07NR02E	322620	0900437	H	643.
W042 GEORGE ELLIOTT	SENWS22T07NR02E	322610	900505	H	536
W050 N TRACE VILLAGE	NWNES22T07NR02E	322633	900451	U	688
W060 LOUIS L CULLEY	----S15T07NR02E	322645	900500	U	696
W063 BEAR CREEK W A	--NES16T07NR02E	322710	900530	P	694
W064 BEAR CREEK W A	NWSWS15T07NR02E	322656	900511	P	674

Figure 3.--Example of data retrieved from the Ground-Water Site Inventory system as a formatted table.

WELL G182 COLUMBUS LOWNDES CO MS.

C001	Site ID (station number)	333052088234101
C004	Source agency code	USGS
C008	County code	087
C009	Latitude	333052
C010	Longitude	0882346
C012	Local well number	G185 COLUMBUS
C013	Land-net location	SWNWS11T18SR18W
C016	Altitude of land surface	178.00
C023	Primary use of site	O
C024	Primary use of water	U
C028	Depth of well	878
C030	Water level	12.50
C031	Date water level measured	19821201
C060	Date of construction	19770328
C079	Diameter of this casing string	6.00
C079	Diameter of this casing string	3.00
C084	Depth to bottom of this open interval	878.00
C085	Type of openings in this interval	S
C087	Diameter of this open interval	3.00
C093	Aquifer code	211COKR

Figure 4.--Example of data retrieved from the Ground-Water Site Inventory system as a "dump-format" table.

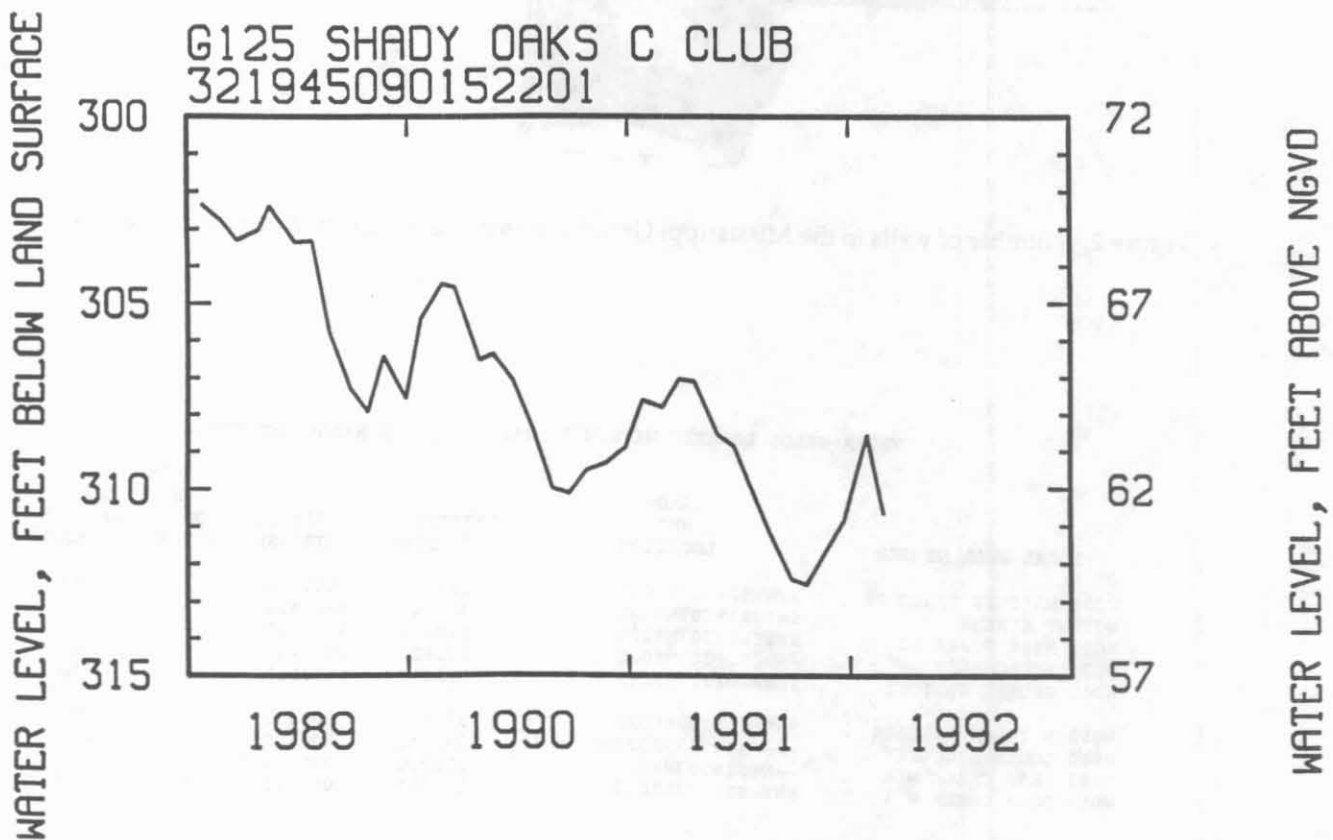


Figure 5.--Example of hydrograph generated by GWSI.

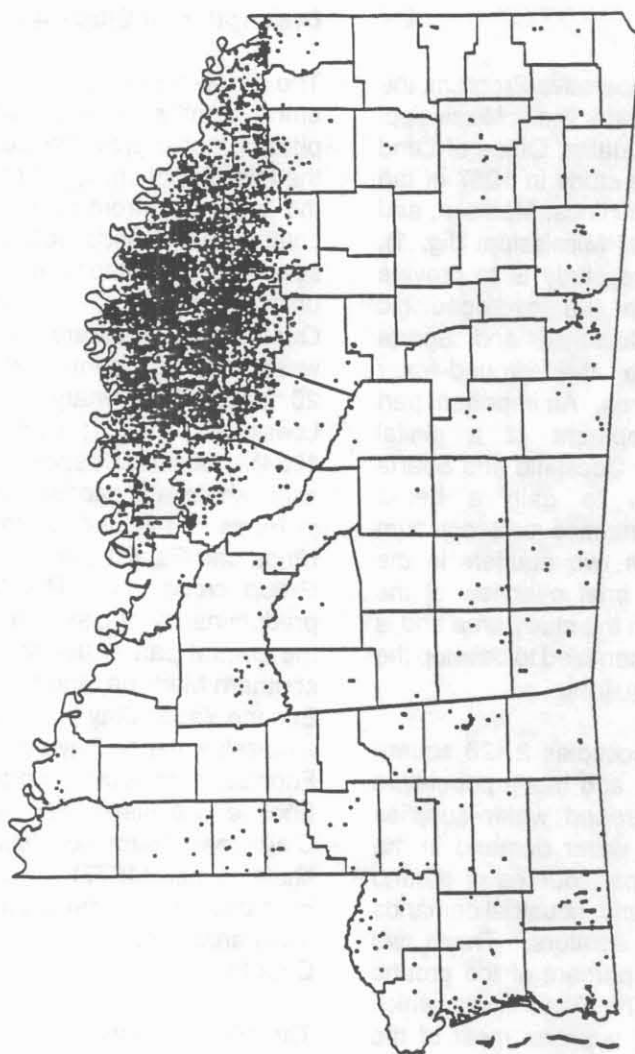


Figure 6.--Example of well location map generated by GWSI.