WATER USE IN OHIO, 1980

By Michael Eberle and Joyce A. McClure

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CONTENTS

ILLUSTRATIONS

TABLES

CONVERSION FACTORS

For the benefit of readers who prefer to use the International System of units (SI), conversion factors for terms used in this report are listed below:

Multiply inch-pound units	By	To obtain SI units
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
gallon (gal)	0.003785	cubic meter (m^3)
ton	0.9072	megagram (Mg) or metric ton (t)

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ABSTRACT

An estimated 13,389 million gallons of water per day was withdrawn in four major categories in Ohio in 1980. Of this total, 12,645 Mgal/d (million gallons per day) was supplied by surface-water sources whereas 744 Mgal/d was supplied by ground water. Totals for each category (in Mgal/d) were: thermoelectric power generation, 10,417; self-supplied manufacturing, 1,399; public water supplies, 1,432; and rural domestic and livestock, 141. In addition, miscellaneous uses (irrigation, rural commercial, and nonmanufacturing industrial) probably totaled about 300 Mgal/d.

The five counties that led the State in total water withdrawal were: Jefferson, 2,620 Mgal/d; Lucas, 1,150 Mgal/d; Gallia, 1,086 Mgal/d; Cuyahoga, 1,085 Mgal/d; and Lorain, 991 Mgal/d. These counties, in the same order, were the top five surface-water users.

The five leading counties in ground-water withdrawal were: Montgomery, 134 Mgal/d; Stark, 63 Mgal/d; Butler, 59 Mgal/d; Ross, 30 Mgal/d; and Hamilton, 29 Mgal/d.

INTRODUCTION

The picture on the cover of this report, a family of four enjoying themselves by a backyard swimming pool, is intended to illustrate two points. First, Ohio's water supplies have been so abundant throughout the State's history that curtailments of water use have been necessary only in rare instances. Access to water for recreational and luxury purposes has been relatively unrestricted for most of the population.

Second, the daily amount of water used per capita to support all domestic, commercial, industrial, and agricultural activity in Ohio is large. Dividing the total amount of water used in the State each day -- approximately 13.7 billion gallons -- by the population of the state -- approximately 10,800,000 people (U.S. Bureau of the Census, 1981) -- results in a per capita use of about 1,300 gal/d (gallons per day). By this reasoning, an Ohio family of four would account for 5,200 gal/d; a volume of water each day that would weigh 22 tons and would fill a swimming pool 4 feet deep and 15 feet in diameter.

On the average, only about 350 gal/d actually pass through the faucets of a single-family home (U.S. Water Resources Council, 1978, p. 32). However, the indirect use of the remaining 4,850 gal/d is no less vital to maintaining Ohio's standard of living. This large amount of water is necessary to generate the State's electricity, to produce the manufactured and agricultural products Ohioans consume and export, and to serve the innumerable miscellaneous needs of a technological society.

Purpose and Scope

Because of the importance of water-use data for answering questions of water supply versus water demand, the Ohio Department of Natural Resources, Division of Water (ODNR-DW), and the U.S. Geological Survey (USGS) have published reports periodically for various categories of water use in the State. This report is a county-by-county summary of estimates for major offstream water withdrawals in Ohio during calendar year 1980.

Data were tabulated by county for the four categories of water use in which large withdrawals are made (tables 1-6, at the back of this report). These categories -- thermoelectric power production, manufacturing, public water supplies, and rural domestic and livestock use -- probably account for 95 percent or more of Ohio's total offstream water withdrawal.

For the purposes of this report, "total" refers to the combined water withdrawals of these four major categories. Miscellaneous water uses -- crop and turf irrigation, nonmanufacturing industry, and rural commercial uses -- involve amounts of water that were too small to be estimated at the county level.

Data from these miscellaneous categories were not tabulated in this report; however, each of these is discussed briefly at the end of the data summary section.

Estimates for consumptive use in Ohio during 1980 were considered too speculative to be included in this report. Consumptive use refers to water that is evaporated or transpired, ingested by humans or animals, or incorporated into manufactured products. Water that is used but not consumed (household wastewater, for example), is returned fairly quickly to the environment and is available to be withdrawn again. However, this used water may be returned to a point far from where it was originally withdrawn, and it may be significantly altered in quality. Either the displacement or the change in quality could result in local water problems, regardless of how little water may actually have been consumed.

The data were collected for 1980 in conjunction with the activities of the National Water-Use Information Program (Mann and others, 1982). Because of subsequent revisions and corrections, water-use data in this report differ slightly from the Ohio data in the Survey's national summary of water use for 1980 (Solley and others, 1983). The data published herein were also entered into the National Water-Use Data System (NWUDS) of the USGS (Mann and others, 1982, p. 5). Table 7 (at the back of this report) relates the Ohio data to the 12 usage categories in the NWUDS System.

The data were compiled into a series of figures and tables that begins on page 14. The figures and tables are preceded by background information and by explanatory material for each of the water-use categories.

Previous Reports

Water-use information has been collected in Ohio since the late 1800's; however, early studies were infrequent and generally local in scope. Statewide water-use surveys were not systematically undertaken until 1950 when the USGS initiated a series of circulars on water use (MacKichan, 1951 and 1957; Mackichan and Kammerer, 1961; Murray, 1968; Murray and Reeves, 1972 and 1977; Solley and others, 1983).

Between 1959 and 1962, ODNR-DW produced four detailed water-use reports; one on the general water-use picture in Ohio (Rudnick, 1959); and one each on rural water use (Woldorf, 1959), industrial water use (Rudnick, 1960), and municipal water supplies (Rudnick, 1962). Each of these reports was based on a survey of users. A second, updated report on municipal water supplies was issued in 1977 (Rudnick, 1977).

In addition, a series of water development plans that contain water-use information for five areas of the State was published by ODNR-DW (Ohio Department of Natural Resources, Division of Water, 1967, 1972, 1976, 1977, and 1978).

The most recent water-use reports for Ohio are a summary of 1975 data published by the USGS (Hathaway and Eberle, 1981), and two publications of ODNR-DW; an information booklet (Groves, 1982) and a golf-course irrigation report (Black, 1983).

Definitions of Terms

The categories of water use discussed in this report are limited to offstream uses. "Offstream" refers to water that is withdrawn from a surface-water or ground-water source and conveyed to a point of use. "Instream," by contrast, refers to activities that utilize water in place, such as hydroelectric power generation, navigation, and maintenance of wildlife habitat.

The term "self-supplied" refers to residences or business concerns that have their own sources of water instead of (or in addition to) being served by a public water supply.

Sources of Data

The data on which this report is based were obtained with the help of the following people and agencies:

1.--Data for manufacturing water use and some of the data for public water supplies were furnished by ODNR-DW.

2.--Additional data for public water supplies were provided by the Ohio Environmental Protection Agency (Ohio EPA).

3.--M. L. Palmer of The Ohio State University College of Agriculture provided guidance on the farm irrigation, rural domestic, and livestock parts of the report. Population information that was necessary to compute rural use was furnished by the U.S. Department of Agriculture, Crop Reporting Service, and the Ohio Department of Development's Data User's Center.

4.--Information on water use in thermoelectric power generation was provided by utility companies and municipal powerplant managers.

CONDITIONS AFFECTING WATER USE IN OHIO

Hydrologic Conditions in 1980

Precipitation in Ohio averages about 37 inches annually (Harstine, 1981, p. 1). Of this, approximately 25 inches per year are lost through evapotranspiration. The 12 inches per year that remain available for use are equivalent to 25 billion gal/d, or about 1.8 times the State's average daily use. In addition to precipitation within Ohio, water from drainage basins outside the State provides 110 billion gal/d to Lake Erie and 42 billion gal/d to the Ohio River (Rudnick, 1960, p. 7). Lake Erie and the Ohio River furnish water for most of the State's electric power-plants and many of the heaviest water-using industries.

Overall, 1980 was a slightly wet year. Precipitation was uneven both in terms of regional distribution and occurrence throughout the year. The total precipitation for Ohio as a whole in 1980 was 39.58 inches; 2.54 inches above normal. Monthly precipitation was below normal for the State for 8 months of 1980. Nevertheless, the above-normal precipitation in March, June, July, and August was sufficient to raise the statewide yearly total above normal (Harstine, 1981, p. 1).

Although drought can disrupt normal patterns for all categories of water use in Ohio, precipitation in excess of normal has little effect on any of them. The exception is irrigation water use, which is, by nature, the most weather-sensitive water-use category in the State. Precipitation throughout the 1980 growing season was almost ideally distributed to meet crop needs. Irrigation was thus at a minimum in 1980 (M. L. Palmer, Ohio State University College of Agriculture, oral commun., 1980).

Population

Population change can also be a factor in water use. Ohio's population increased only 1.3 percent between 1970 and 1980 (U.S. Bureau of the Census, 1981), but considerable change in distribution continues as residents of large metropolitan areas leave the central city and resettle in rural and suburban parts of adjacent counties. Four of the five most populated counties in the State -- Cuyahoga, Hamilton, Montgomery, and Summit -- lost population during the decade. Five of the six counties with the largest percentage population increases were adjacent to large cities -- Clermont and Adams Counties near Cincinnati, Fairfield and Delaware Counties near Columbus, and Medina County near Cleveland (Ohio's counties and largest cities are shown in figure 1 at the back of this report).

This pattern of migration has resulted in a rapid expansion of public water-supply systems into urban-fringe areas, and a decrease in the number of Ohioans served by private wells or cisterns.

WATER-USE CATEGORIES AND DATA

An estimated 13,389 Mgal/d (million gallons per day) of water was used in four major categories in Ohio in 1980. Of this total, 744 Mgal/d (6 percent) was supplied by ground-water and 12,645 Mgal/d (94 percent) by surface water.

The five counties that led the State in total water use were: Jefferson, 2,620 Mgal/d; Lucas, 1,150 Mgal/d; Gallia, 1,086 Mgal/d; Cuyahoga, 1,085 Mgal/d; and Lorain, 991 Mgal/d (fig. 1, table 1). These counties, in the same order, were the top five surface-water users.

The five leading counties in ground-water use were: Montgomery, 134 Mgal/d; Stark, 63 Mgal/d; Butler, 59 Mgal/d; Ross, 30 Mgal/d; and Hamilton, 29 Mgal/d (fig. 1, table 1).

Thermoelectric Power Generation

The largest use of water in the State is for cooling water in thermoelectric (steam-generating) powerplants. Of the 10,417 Mgal/d withdrawn used by thermoelectric plants in 1980, 10,396 Mgal/d was surface water whereas the remaining 21 Mgal/d was ground water.

Thermoelectric plants produce tremendous quantities of heat energy, much of which is waste heat that must be dissipated. Water is an ideal transport medium for removing waste heat from the generating plant and releasing the heat energy to the atmosphere by evaporation. The evaporation can either be made a rapid process by the use of cooling towers, or it can take place more slowly in a surface-water body receiving the cooling water discharge.

Jefferson County led the State in the thermoelectric water-use category at 2,608 Mgal/d, followed by Gallia County at 1,083 Mgal/d and Lucas County at 957 Mgal/d (fig. 2, table 2).

Manufacturing

The data on self-supplied manufacturing water use were compiled by the USGS from survey forms that ODNR-DW mailed to manufacturing plants. The forms requested information on the plants' water use in 1978; but, because the forms were mailed late in 1979, it is probable that some of the respondents filled in 1979 data instead. These data were used as estimates for manufacturing water use for 1980.

The survey was mailed to approximately 7,000 manufacturing firms in Ohio that had either: (1) reported using more than 1,000 gal/d in previous ODNR-DW surveys, or (2) had started or expanded their facilities since 1970.

At the end of the survey period, 70 percent of the mailed forms had been returned. Follow-up telephone calls to the largest users among the nonrespondents were generally successful. The ODNR-DW estimated that 90 percent of the self-supplied water used for manufacturing in 1978 had been accounted for by the survey (A. R. Rudnick, Ohio Department of Natural Resources, Division of Water, written commun., 1981). The statewide totals from the survey are: surface water, 1,179 Mgal/d; ground water, 220 Mgal/d; total manufacturing water use, 1,399 Mgal/d.

In 1955, the amount of self-supplied water withdrawn in manufacturing was about three times the amount withdrawn by public supplies (Rudnick, 1960). The estimates for the 1980 survey show that self-supplied manufacturing water withdrawals trailed public supplies by 33 Mgal/d. This apparent change in rank results partly from continuing growth of public water systems; nevertheless, offstream withdrawal by manufacturers' private supplies has definitely declined. This may be a result of water-saving technologies that have been introduced into industry nationwide during the past few years. Cooling towers, in-plant recycling, and other conservation measures are lowering withdrawal demands for water-intensive industrial processes. The condition of the Ohio economy was probably a factor as well. Manufacturing slowdowns during the late 1970's forced the closing of numerous plants, among which were large water users such as primary metals and automotive operations.

Cuyahoga County led the State in the quantity of water withdrawn in manufacturing with a total of 314 Mgal/d. Washington County ranked second (281 Mgal/d), followed by Lorain County (172 gal/d), Lucas County (106 Mgal/d), and Trumbull County (83 Mgal/d) (fig. 3, table 3).

Public Water Supplies

In November 1980, Ohio EPA had record of 1,688 public water supply systems in Ohio, each of which had at least 15 service connections or served an average of at least 25 persons year-round. Nearly 9 million people -- 83 percent of Ohio's population -- are served by public water supplies (Ohio Environmental Protection Agency, 1980). An estimated 1,432 Mgal/d of water was withdrawn by public supplies in 1980; 1,044 Mgal/d (73 percent) of which was surface water and 388 Mgal/d (27 percent) of which was ground water.

Surface-water withdrawals predominate in volume as a result of the withdrawals by large cities situated near Lake Erie and major streams, but the importance of ground water to Ohio's public-supply picture cannot be overlooked. Nearly 80 percent of the public water-supply systems in the State depend to some extent on ground water as a source. Small public water supplies are numerous in Ohio; 66 percent of all public supplies serve fewer than 1,000 people. Ground water has been the most economical source

(sometimes the only feasible source) for many of these small systems that have developed in rural and suburban areas.

Per capita water use from public supplies averaged 159 gallons per day statewide. This average reflects a number of non-residential uses in addition to Ohio's domestic water demands. Some industrial and commercial use, fire protection and other municipal use, and transmission losses from leaky mains contribute to per capita totals in all but the smallest systems. Although per capita use in Ohio's public water systems typically ranges between 60 and 200 gallons per day, amounts as low as 20 gallons per day and as high as 380 gallons per day have been reported by the ODNR-DW (Ohio Department of Natural Resources, Division of Water, 1967, 1972, 1976, 1977, 1978).

The five leading counties in water withdrawal by public supplies were: Cuyahoga, 363 Mgal/d; Hamilton, 146 Mgal/d; Franklin, 110 Mgal/d; Montgomery, 97 Mgal/d; and Lucas, 87 Mgal/d (fig. 4, table 4).

Rural Domestic and Livestock Uses

An estimated 141 Mgal/d was withdrawn for rural domestic and livestock uses in 1980. This is only about one-seventh of the amount of water withdrawn by public supplies.

Domestic water use accounted for 101 Mgal/d of the total rural use. Approximately 2 million people in Ohio are served by individual water supplies, that is, water systems having fewer than 15 service connections or 25 people served throughout the year. Many of these "rural" users are actually in suburbs that lie outside the service areas of nearby public water supplies, and most are served by individual water wells. Ground water is generally available throughout the State in sufficient quantity to meet the needs of single-family homes and farmsteads, although there are a few areas where an adequate supply from a well is difficult to obtain. Cisterns for hauled water or rainwater storage continue to be alternative sources for individual supplies in such areas. Farm ponds are also important water sources throughout rural Ohio.

The number of rural water users was computed by subtracting the population served by public water supplies in each county from the total population for that county. The amount of water used by rural residents is influenced by a number of factors, including the size and location of the rural property, socioeconomic level of the residents, and the chemical quality and palatability of the water itself. For this report, a figure of 50 gallons per capita per day was used for computing rural domestic usage. Unfortunately, there are no data to corroborate this estimate or to indicate any regional variation that might exist within Ohio.

Water used by livestock amounted to 40 Mgal/d, which is about 40 percent of the rural domestic use. Livestock water-use figures were derived by multiplying animal population figures, (U.S. Department of Agriculture Ohio Crop Reporting Service, 1980) by the following per capita use rates (U.S. Environmental Protection Agency, 1974):

Milking cows	gallons per day	35
Other cattle, calves	do	12
Hogs and pigs	do	4
Sheep	do	2

The four leading counties for rural domestic and livestock water withdrawals were: Montgomery, 8.0 Mgal/d, Stark, 4.8 Mgal/d, Mahoning, 4.4 Mgal/d, and Wayne, 3.9 Mgal/d (fig. 5, table 5).

Miscellaneous Uses

Three miscellaneous water-use categories -- crop and turf irrigation, rural commercial (self-supplied), and nonmanufacturing industrial water use -- make up approximately 5 percent of the offstream water withdrawals in Ohio. No estimates are reported for any of these categories for 1980 inasmuch as: (1) the amount of water withdrawn in each category is relatively small, and (2) not enough information could be located in any of the categories to identify users or estimate withdrawals accurately for 1980.

In recent years, about 130 Mgal/d has been withdrawn for crop and turf irrigation during a typical 100-day growing season (Groves, 1982); this is about 36 Mgal/d averaged over an entire year. Black (1983) attributes about 21 Mgal/d to golf-course irrigation. As mentioned previously, the growing season in 1980 was not typical; the summer months were unusually wet. The irrigation total in Ohio for 1980 was probably lower as a result.

Rural and commercial water use consists of withdrawals by gas stations, restaurants, and retailers that have their own water supplies. Estimates have never been made for this water-use category in Ohio, but the authors believe that the amount of water used by rural commercial concerns was less than 1 percent of the 1980 total.

Nonmanufacturing industrial water use includes such subcategories as sand and gravel quarrying, coal mining and coal cleaning, other mining and mineral-related activities, and railroad operations. As much as 270 Mgal/d is withdrawn by industries in this category (Groves, 1982), but this figure probably

represents a considerable amount of recycled water. In sand and gravel operations, for example, it is not unusual for water to be withdrawn from a quarry pond, to be used to wash the aggregate and sort it by size, and to be returned to the same pond. Distinguishing between withdrawal and in-plant recycling is difficult in such cases (A. R. Rudnick, Ohio Department of Natural Resources, Division of Water, oral commun., 1981).

If the estimates for the miscellaneous water uses are combined with the total for all major water uses, the resulting figure is 13,700 Mgal/d.

Comparisons with 1975 Water-Use Estimates

The estimated 13,389 Mgal/d of offstream withdrawals for the four major water-use categories in Ohio in 1980 is 3,002 Mgal/d less than the estimated total of 16,391 Mgal/d for those categories in 1975 (Hathaway and Eberle, 1981). About 66 percent of this difference between the totals is due to a decrease of 1,987 Mgal/d in the thermoelectric category. An additional 32 percent of the difference between totals is due to a 963-Mgal/d difference in self-supplied manufacturing. How much of an actual decrease this 963 Mgal/d represents is uncertain, as different methods were used to estimate withdrawals for this category; the 1975 estimate was based on discharge-permit data, whereas the 1980 estimate was derived from a survey of manufacturers. Unfortunately, there is no way to judge the accuracy of either method.

The estimate of total surface-water withdrawals in the major categories for 1980 was 12,645 Mgal/d, which is 83 percent of the amount estimated for 1975. Ground-water withdrawals in 1980 totaled 744 Mgal/d, 68 percent of the 1975 estimate. Again, some of this "decline" might be attributed to differences in methods used for the 1975 and 1980 estimates.

SUMMARY

Offstream water withdrawals in four major categories in Ohio in 1980 were as follows (in Mgal/d):

	Surface water	Ground water	Total
Thermoelectric	10,396	21	10,417
Manufacturing	1,179	220	1,399
Public water supplies	1,044	388	1,432
Rural domestic and livestock	26	115	141
Total	12,645	744	13,389

In addition, miscellaneous uses (irrigation, rural commercial, and nonmanufacturing industrial) probably totaled about 300 Mgal/d.

The total of 13,389 Mgal/d is substantially lower than the 16,391 Mgal/d reported for the four major categories in 1975. It is not known how much of this apparent decrease is attributable to differences in the methods used to make the estimates.

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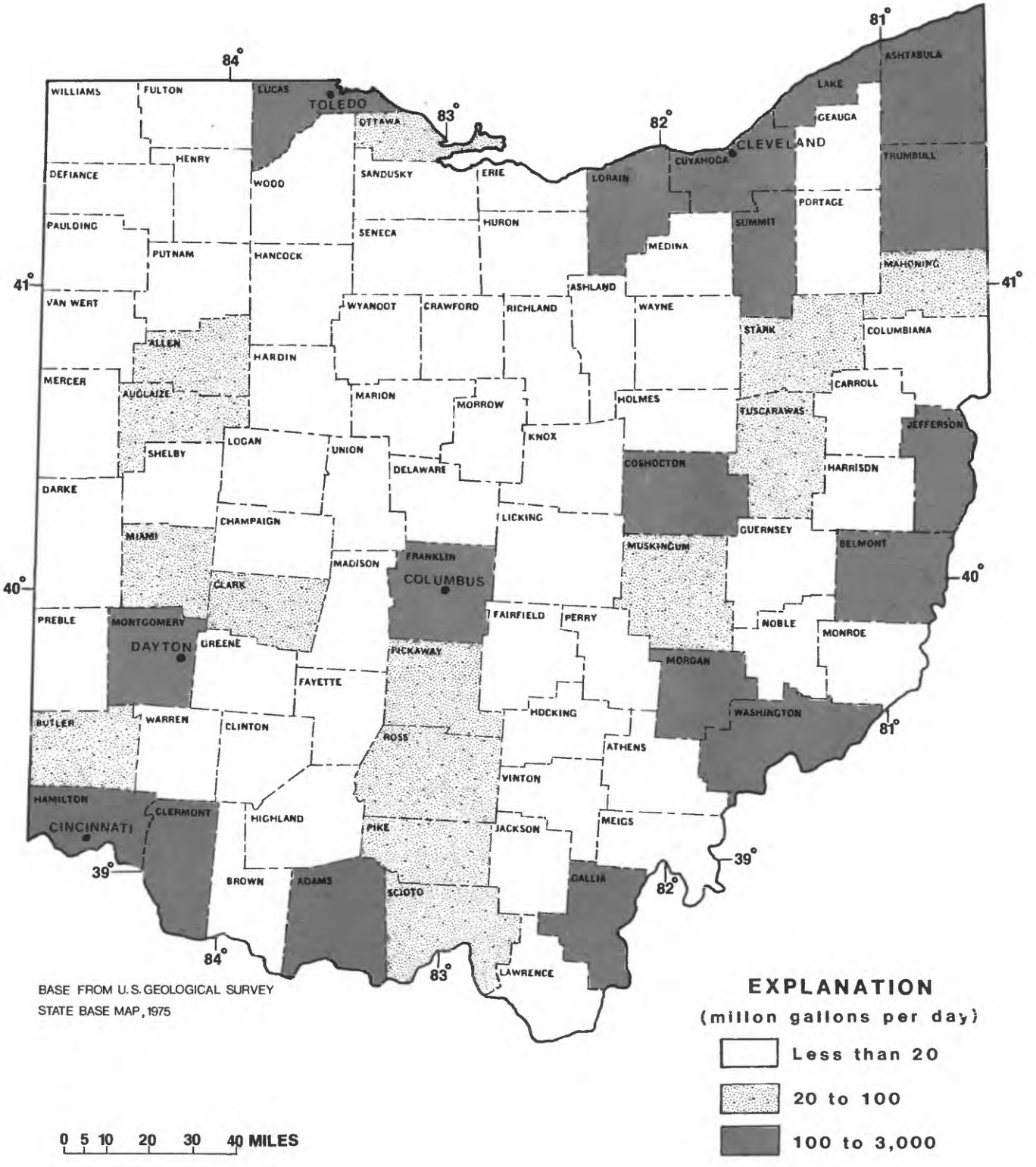

Figure 1.--Total offstream water withdrawal in Ohio by county, 1980.

Table 1.--Total offstream water withdrawal in Ohio, ranked by county, 1980

[All values are in million gallons per day]

County	Ground water	Surface water	Total	County	Ground water	Surface water	Total
Jefferson	7.7	2,612.2	2,619.9	Wood	4.7	4.4	9.1
Lucas	3.5	1,146.4	1,149.9	Athens	6.6	2.1	8.7
Gallia	2.8	1,083.4	1,086.2	Marion	2.0	6.3	8.3
Cuyahoga	0.6	1,084.8	1,085.4	Hancock	1.4	6.8	8.2
Lorain	1.9	989.1	991.0	Delaware	2.4	5.3	7.7
Adams	4.0	935.7	939.7	Medina	6.0	1.6	7.6
Lake	1.5	720.1	721.6	Knox	6.5	0.8	7.3
Morgan	3.1	652.2	655.3	Darke	4.1	2.9	7.0
Clermont	11.7	564.1	575.8	Geauga	5.0	1.9	6.9
Montgomery	133.8	328.0	461.8	Defiance	1.3	5.4	6.7
Ashtabula	2.4	377.5	379.9	Huron	1.3	4.7	6.0
Hamilton	28.6	312.9	341.5	Lawrence	2.6	3.3	5.9
Belmont	10.1	301.3	311.4	Ashland	5.3	.5	5.8
Washington	8.5	279.2	287.7	Guernsey	1.6	4.0	5.6
Trumbull	2.7	265.0	267.7	Crawford	2.1	3.5	5.6
Coshocton	9.2	213.6	222.8	Fulton	1.7	3.6	5.3
Summit	14.5	152.3	166.8	Williams	4.9	.3	5.2
Franklin	6.1	109.3	115.4	Mercer	3.3	1.8	5.1
Butler	58.5	34.8	93.3	Shelby	3.3	1.7	5.0
Stark	62.7	23.3	86.0	Logan	4.6	.3	4.9
Miami	7.5	58.7	66.2	Champaign	4.1	.4	4.5
Pickaway	11.8	44.5	56.3	Highland	2.8	1.6	4.4
Mahoning	4.4	49.8	54.2	Madison	4.1	.3	4.4
Scioto	3.0	44.4	47.4	Preble	3.2	.8	4.0
Tuscarawas	25.5	19.0	44.5	Jackson	1.7	2.2	3.9
Ross	29.7	11.2	40.9	Hocking	3.6	.1	3.7
Ottawa	1.1	30.6	31.7	Putnam	2.5	1.0	3.5
Auglaize	10.0	18.1	28.1	Union	2.5	1.0	3.5
Muskingum	12.4	10.7	23.1	Hardin	3.1	.3	3.4
Clark	19.7	3.0	22.7	Van Wert	1.4	2.0	3.4
Allen	9.7	12.9	22.6	Perry	1.2	2.1	3.3
Pike	19.0	1.0	20.0	Wyandot	1.9	1.4	3.3
Richland	8.1	11.6	19.7	Clinton	1.5	1.7	3.2
Licking	7.9	11.1	19.0	Holmes	2.6	.6	3.2
Wayne	14.0	3.3	17.3	Henry	1.4	1.7	3.1
Erie	1.7	15.3	17.0	Brown	1.5	1.2	2.7
Portage	13.3	1.5	14.8	Fayette	1.1	1.6	2.7
Greene	12.7	.7	13.4	Carroll	2.2	.3	2.5
Columbiana	6.5	6.6	13.1	Meigs	1.9	.2	2.1
Warren	10.2	1.6	11.8	Morrow	1.8	.3	2.1
Fairfield	10.9	.5	11.4	Paulding	1.3	.6	1.9
Sandusky	3.8	7.5	11.3	Harrison	1.1	.5	1.6
Monroe	5.2	4.6	9.8	Vinton	.9	.1	1.0
Seneca	2.1	7.4	9.5	Noble	.3	.6	.9
				Total	744.0	12,645.0	13,389.0

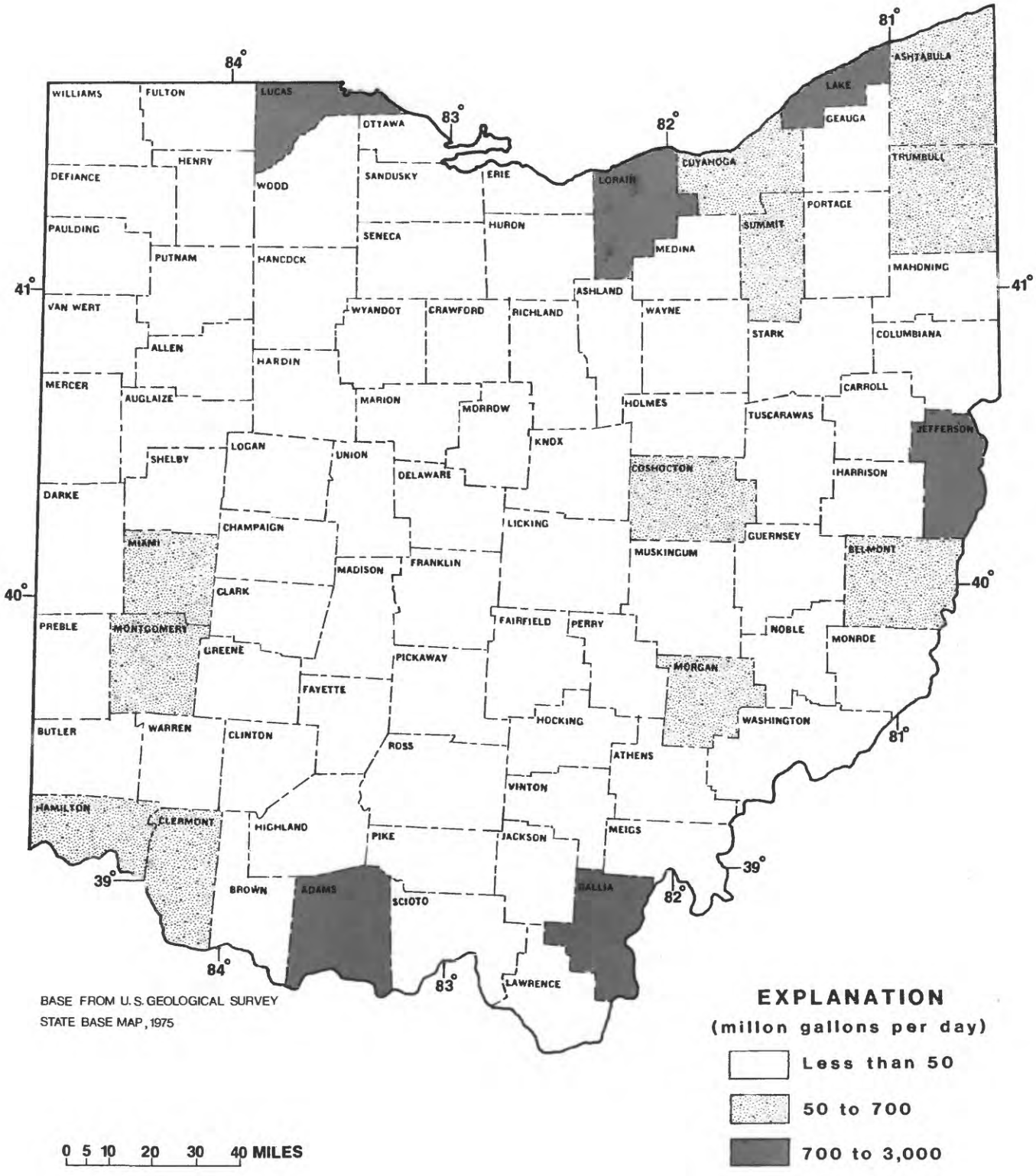

Figure 2.--Offstream water withdrawal by county for thermelectric power generation in Ohio, 1980.

Table 2.--Offstream water withdrawal for thermoelectric power generation in Ohio, ranked by county, 1980

[All values are in million gallons per day]

County	Ground water	Surface water	Total	County	Ground water	Surface water	Total
Jefferson	2.5	2,605.6	2,608.1	Hancock	0	0	0
Gallia	0	1,083.1	1,083.1	Hardin	0	0	0
Lucas	0	957.0	957.0	Harrison	0	0	0
Adams	1.0	932.0	933.0	Henry	0	0	0
Lorain	0	777.2	777.2	Highland	0	0	0
Lake	0	706.1	706.1	Hocking	0	0	0
Morgan	0	652.0	652.0	Holmes	0	0	0
Clermont	2.0	563.4	565.4	Huron	0	0	0
Cuyahoga	0	408.5	408.5	Jackson	0	0	0
Ashtabula	0	350.7	350.7	Knox	0	0	0
Montgomery	9.6	327.0	336.6	Lawrence	0	0	0
Belmont	0	300.0	300.0	Licking	0	0	0
Coshocton	0	213.3	213.3	Logan	0	0	0
Hamilton	2.0	174.5	176.5	Madison	0	0	0
Trumbull	0	123.0	123.0	Mahoning	0	0	0
Summit	0	64.2	64.2	Marion	0	0	0
Miami	0	54.1	54.1	Medina	0	0	0
Pickaway	0	43.7	43.7	Meigs	0	0	0
Ottawa	0	24.3	24.3	Mercer	0	0	0
Tuscarawas	0	17.3	17.3	Monroe	0	0	0
Auglaize	0	15.0	15.0	Morrow	0	0	0
Athens	4.0	0	4.0	Muskingum	0	0	0
Clark	0	2.5	2.5	Noble	0	0	0
Butler	0	1.0	1.0	Paulding	0	0	0
Wayne	0.2	0	0.2	Perry	0	0	0
Allen	0	0	0	Pike	0	0	0
Ashland	0	0	0	Portage	0	0	0
Brown	0	0	0	Preble	0	0	0
Carroll	0	0	0	Putnam	0	0	0
Champaign	0	0	0	Richland	0	0	0
Clinton	0	0	0	Ross	0	0	0
Columbiana	0	0	0	Sandusky	0	0	0
Crawford	0	0	0	Scioto	0	0	0
Darke	0	0	0	Seneca	0	0	0
Defiance	0	0	0	Shelby	0	0	0
Delaware	0	0	0	Stark	0	0	0
Erie	0	0	0	Union	0	0	0
Fairfield	0	0	0	Van Wert	0	0	0
Fayette	0	0	0	Vinton	0	0	0
Franklin	0	0	0	Warren	0	0	0
Fulton	0	0	0	Washington	0	0	0
Geauga	0	0	0	Williams	0	0	0
Greene	0	0	0	Wood	0	0	0
Guernsey	0	0	0	Wyandot	0	0	0
				Total	21.3	10,395.5	10,416.8

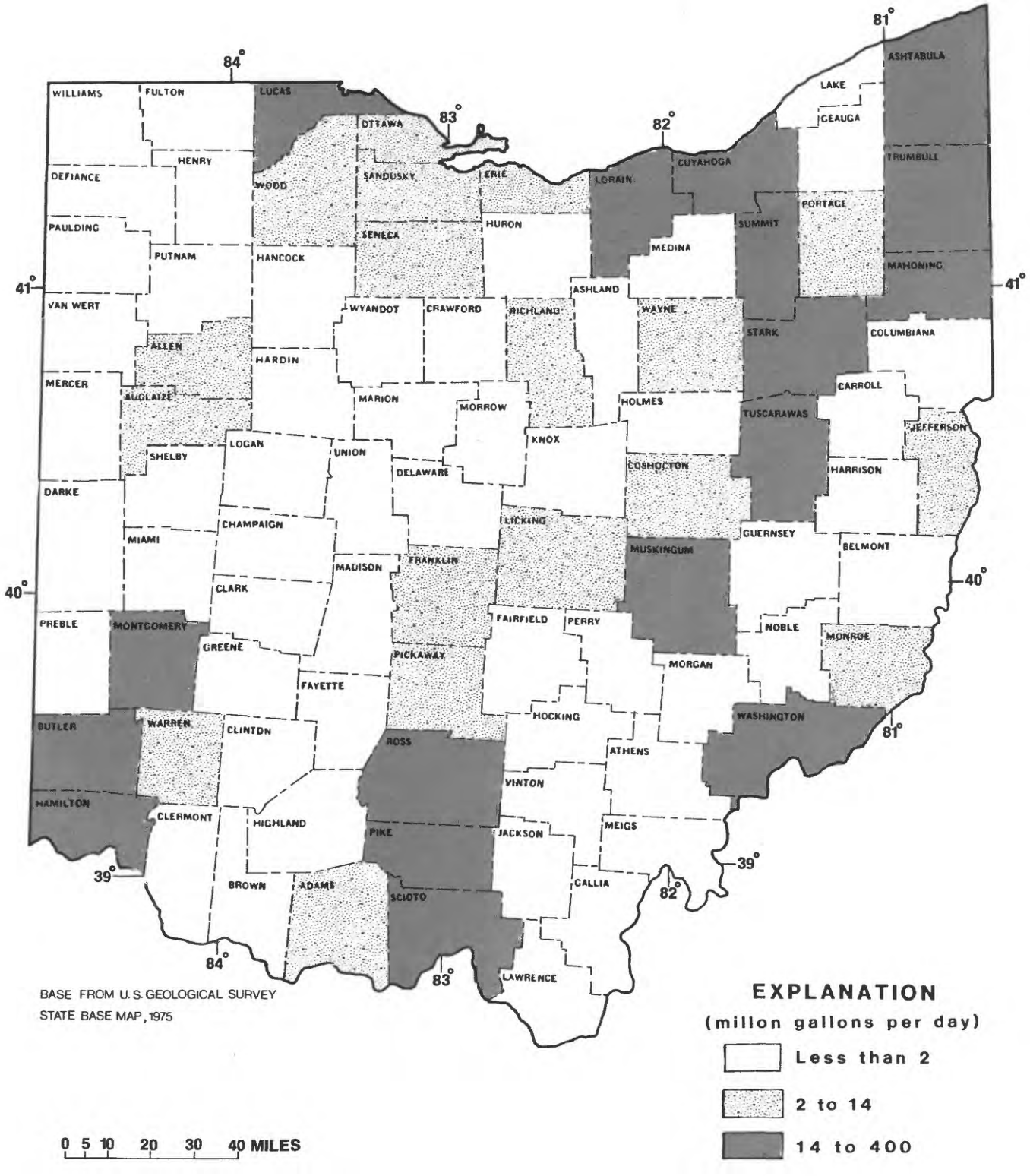

Figure 3.--Offstream water withdrawal by county for self-supplied manufacturing in Ohio, 1980.

Table 3.--Offstream water withdrawal for self-supplied manufacturing in Ohio, ranked by county, 1980

[All values are in million gallons per day]

County	Ground water	Surface water	Total	County	Ground water	Surface water	Total
Cuyahoga	0	313.9	313.9	Perry	0	0.7	0.7
Washington	2.4	278.8	281.2	Union	0.7	0	.7
Lorain	0	171.9	171.9	Highland	.1	.5	.6
Lucas	3.2	103.0	106.2	Mercer	.6	0	.6
Trumbull	0.9	82.4	83.3	Wyandot	.4	.1	.6
Butler	23.8	33.4	57.2	Hocking	.5	0	.5
Mahoning	0	43.0	43.0	Madison	.5	0	.5
Scioto	.4	36.8	37.2	Medina	.3	.2	.5
Stark	24.6	11.3	35.9	Miami	.5	0	.5
Summit	5.7	30.2	35.9	Preble	0	.5	.5
Ross	23.3	10.9	34.2	Paulding	.2	.2	.4
Montgomery	20.1	0.1	20.2	Hardin	.3	0	.3
Hamilton	18.9	.5	19.4	Marion	.3	0	.3
Pike	17.3	.9	18.2	Van Wert	.3	0	.3
Ashtabula	0	17.8	17.8	Vinton	.3	0	.3
Tuscarawas	16.5	.1	16.6	Ashland	.2	0	.2
Muskingum	4.2	9.9	14.1	Darke	.2	0	.2
Monroe	4.4	4.0	8.4	Putnam	.2	0	.2
Auglaize	5.0	2.7	7.7	Carroll	.1	0	.1
Pickaway	7.0	.5	7.5	Champaign	.1	0	.1
Wayne	3.3	2.3	5.6	Clark	.1	0	.1
Allen	5.3	.1	5.4	Crawford	.1	0	.1
Sandusky	1.6	3.2	4.8	Gallia	.1	0	.1
Franklin	2.8	1.7	4.5	Holmes	0	.1	.1
Ottawa	.3	3.6	3.9	Huron	.1	0	.1
Adams	.1	3.4	3.5	Shelby	.1	0	.1
Richland	1.6	1.4	3.0	Williams	.1	0	0
Coshocton	2.6	0	2.6	Athens	0	0	0
Erie	0	2.6	2.6	Belmont	0	0	0
Licking	2.2	0	2.2	Brown	0	0	0
Warren	.9	1.3	2.2	Clermont	0	0	0
Jefferson	2.1	0	2.1	Clinton	0	0	0
Seneca	.7	1.4	2.1	Defiance	0	0	0
Portage	.9	1.1	2.0	Fayette	0	0	0
Wood	1.3	.5	1.8	Fulton	0	0	0
Fairfield	1.7	0	1.7	Guernsey	0	0	0
Geauga	.1	1.5	1.6	Hancock	0	0	0
Morgan	1.6	0	1.6	Harrison	0	0	0
Columbiana	1.5	0	1.5	Henry	0	0	0
Knox	1.2	.3	1.5	Lake	0	0	0
Delaware	1.3	.1	1.4	Logan	0	0	0
Greene	1.3	.1	1.4	Meigs	0	0	0
Lawrence	.7	0	.7	Morrow	0	0	0
Jackson	.7	0	.7	Noble	0	0	0
				Total	219.7	1,179.4	1,399.1

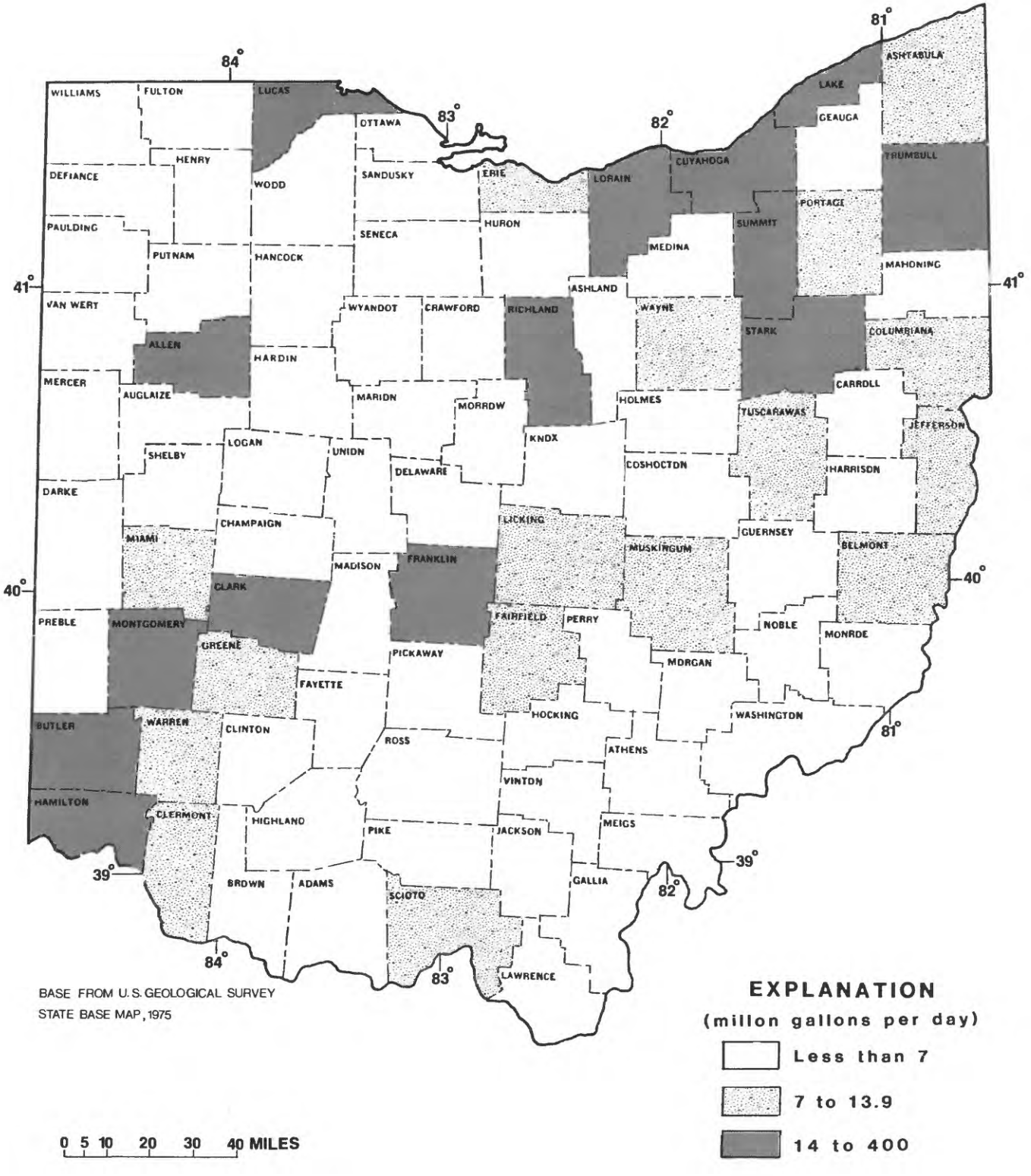

Figure 4.--Offstream water withdrawal by county for public water supplies in Ohio, 1980.

Table 4.--Offstream water withdrawal by public water supplies in Ohio, ranked by county, 1980

[All values are in million gallons per day]

County	Ground water	Surface water	Total	County	Ground water	Surface water	Total
Cuyahoga	0.6	362.4	363.0	Crawford	1.0	3.2	4.2
Hamilton	7.6	137.9	145.5	Darke	1.9	2.3	4.2
Franklin	2.1	107.4	109.5	Medina	3.0	0.9	3.9
Montgomery	97.0	0	97.0	Williams	3.9	0	3.9
Lucas	0.3	86.4	86.7	Knox	3.8	0	3.8
Summit	8.6	57.9	66.5	Lawrence	0.9	2.9	3.8
Trumbull	1.5	59.6	61.1	Pickaway	3.8	0	3.8
Stark	34.0	11.4	45.4	Ashland	3.7	0	3.7
Lorain	0	39.7	39.7	Auglaize	3.7	0	3.7
Butler	33.6	0.1	33.7	Fulton	0.2	3.2	3.4
Clark	17.7	0	17.7	Logan	3.4	0	3.4
Allen	2.7	12.5	15.2	Shelby	2.0	1.2	3.2
Richland	4.5	9.8	14.3	Champaign	3.0	0	3.0
Lake	.2	13.8	14.0	Ottawa	.4	2.6	3.0
Licking	3.0	10.5	13.5	Madison	2.9	0	2.9
Erie	.6	12.6	13.2	Jackson	.6	2.1	2.7
Belmont	9.4	1.1	10.5	Highland	1.8	0.8	2.6
Greene	9.5	0.2	9.7	Hocking	2.3	0	2.3
Clermont	9.1	.6	9.7	Mercer	1.1	1.2	2.3
Portage	9.5	0	9.5	Adams	2.1	0	2.1
Miami	5.1	4.2	9.3	Gallia	2.0	.1	2.1
Ashtabula	.5	8.5	9.0	Henry	.6	1.5	2.1
Scioto	1.5	7.4	8.9	Van Wert	.3	1.8	2.1
Jefferson	2.3	6.5	8.8	Geauga	1.9	0	1.9
Columbiana	2.7	6.0	8.7	Hardin	1.9	0	1.9
Tuscarawas	7.2	1.3	8.5	Wyandot	.8	1.1	1.9
Muskingum	7.2	.6	7.8	Clinton	.4	1.4	1.8
Warren	7.6	.1	7.7	Putnam	1.1	.7	1.8
Wayne	7.5	.1	7.6	Fayette	.3	1.4	1.7
Fairfield	7.0	0	7.0	Preble	1.7	0	1.7
Hancock	.3	6.6	6.9	Meigs	1.5	0	1.5
Mahoning	.4	6.4	6.8	Union	.8	.7	1.5
Marion	.7	6.0	6.7	Brown	.5	.9	1.4
Seneca	.3	5.8	6.1	Perry	.2	1.2	1.4
Defiance	.4	5.1	5.5	Pike	1.1	0	1.1
Coshocton	5.4	0	5.4	Carroll	1.0	0	1.1
Delaware	.1	5.1	5.2	Holmes	.9	0	0.9
Ross	5.2	0	5.2	Harrison	.5	.3	.8
Washington	4.9	0	4.9	Morgan	.8	0	.8
Huron	.3	4.4	4.7	Morrow	.7	0	.7
Sandusky	.6	4.1	4.7	Paulding	.4	.3	.7
Guernsey	.9	3.7	4.6	Monroe	.2	.4	.6
Athens	2.4	2.0	4.4	Noble	0	.5	.5
Wood	.7	3.6	4.3	Vinton	.2	0	.2
				Total	388.0	1,044.1	1,432.1

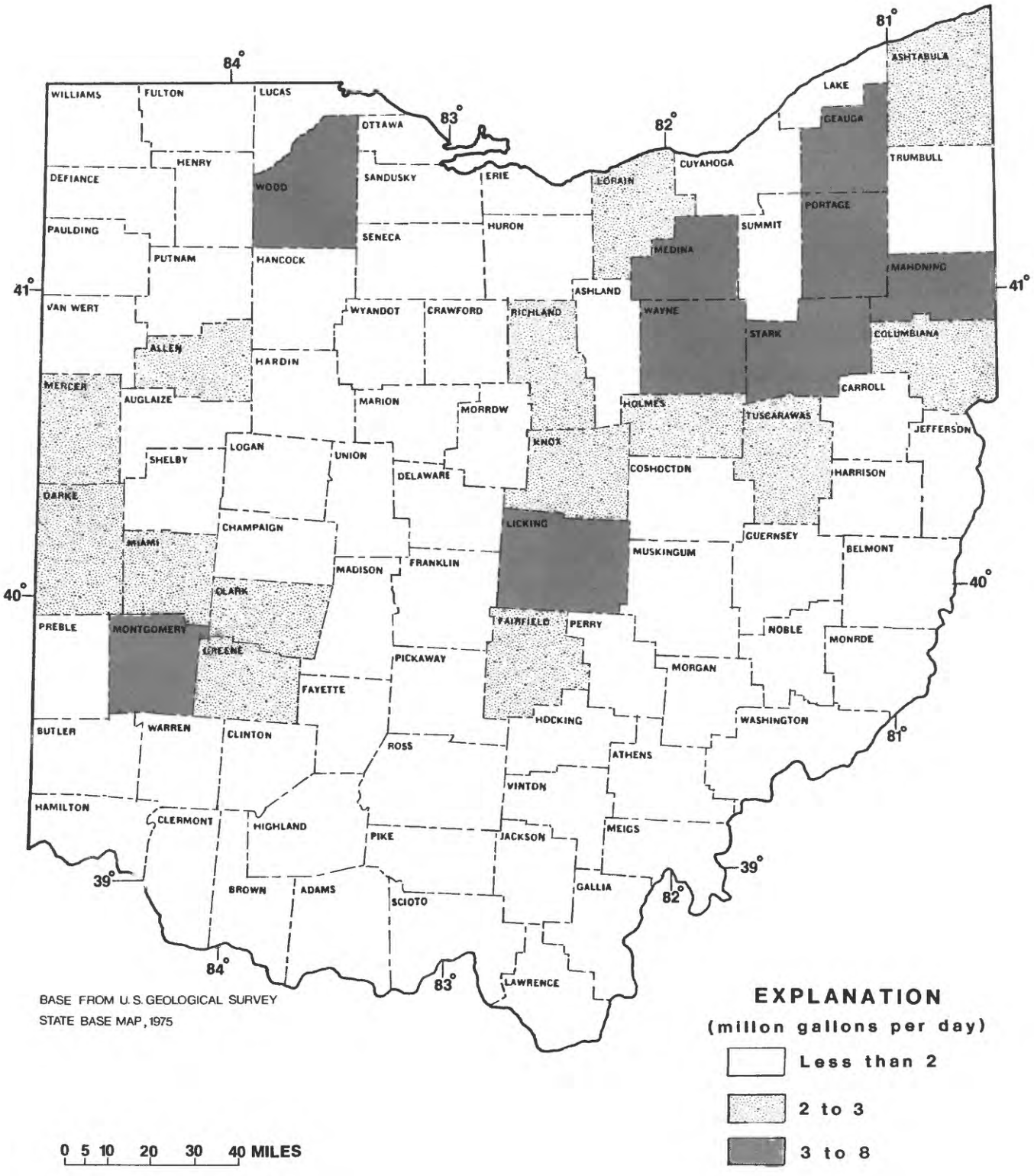

Figure 5.--Offstream water withdrawal by county for rural domestic and livestock purposes in Ohio, 1980.

Table 5.--Offstream water withdrawal for rural domestic and livestock uses in Ohio, ranked by county, 1980

[All values are in million gallons per day]

County	Ground water	Surface water	Total	County	Ground water	Surface water	Total
Montgomery	7.1	0.9	8.0	Union	1.1	0.3	1.4
Stark	4.1	0.7	4.8	Highland	1.0	.3	1.3
Mahoning	3.9	.5	4.4	Marion	1.1	.2	1.3
Wayne	3.0	.9	3.9	Muskingum	1.0	.3	1.3
Geauga	2.9	.4	3.3	Scioto	1.1	.2	1.3
Licking	2.7	.6	3.3	Seneca	1.0	.3	1.3
Portage	2.9	.4	3.3	Williams	1.0	.3	1.3
Medina	2.7	.5	3.2	Adams	0.9	.3	1.2
Wood	2.7	.4	3.1	Brown	1.0	.2	1.2
Columbiana	2.3	.5	2.8	Crawford	1.0	.2	1.2
Fairfield	2.3	.4	2.7	Defiance	1.0	.2	1.2
Darke	1.9	.6	2.5	Erie	1.0	.2	1.2
Ashtabula	1.9	.5	2.4	Hardin	.9	.3	1.2
Clark	1.9	.5	2.4	Huron	.9	.3	1.2
Richland	2.0	.4	2.4	Perry	1.0	.2	1.2
Mercer	1.7	.6	2.3	Delaware	.9	.2	1.1
Miami	1.9	.4	2.3	Lawrence	1.0	.1	1.1
Greene	1.8	.4	2.2	Madison	.8	.3	1.1
Holmes	1.7	.5	2.2	Fayette	.7	.3	1.0
Lorain	1.9	.3	2.2	Henry	.8	.2	1.0
Tuscarawas	1.7	.4	2.1	Van Wert	.8	.2	1.0
Allen	1.7	.3	2.0	Gallia	.7	.2	0.9
Knox	1.6	.4	2.0	Guernsey	.7	.2	.9
Ashland	1.4	.5	1.9	Hocking	.8	.1	.9
Warren	1.6	.3	1.9	Jefferson	.7	.2	.9
Fulton	1.4	.4	1.8	Belmont	.6	.2	.8
Preble	1.4	.4	1.8	Harrison	.6	.2	.8
Sandusky	1.5	.3	1.8	Monroe	.6	.2	.8
Auglaize	1.3	.4	1.7	Morgan	.6	.2	.8
Shelby	1.3	.4	1.7	Paulding	.7	.1	.8
Washington	1.3	.3	1.6	Wyandot	.6	.2	.8
Putnam	1.2	.3	1.5	Clermont	.6	.1	.7
Champaign	1.1	.4	1.5	Meigs	.5	.1	.6
Coshocton	1.2	.3	1.5	Pike	.5	.1	.6
Logan	1.1	.4	1.5	Vinton	.5	.1	.6
Morrow	1.2	.3	1.5	Jackson	.4	.1	.5
Ross	1.2	.3	1.5	Ottawa	.4	.1	.5
Butler	1.1	.3	1.4	Noble	.3	.1	.4
Carroll	1.1	.3	1.4	Trumbull	.2	.2	.4
Clinton	1.1	.3	1.4	Athens	.2	.1	.3
Franklin	1.2	.2	1.4	Summit	.2	0	.2
Lake	1.3	.1	1.4	Hamilton	.1	0	.1
Hancock	1.1	.3	1.4	Lucas	.1	0	.1
Pickaway	1.1	.3	1.4	Cuyahoga	0	0	0
				Total	115.1	26.2	141.3

Table 6.--Offstream water withdrawal in Ohio counties, 1980

[All values are in million gallons per day; totals do not add because of rounding]

County and water source	Category of use				
	Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Adams					
Ground water-----	1.0	0.1	2.1	0.9	4.0
Surface water----	932.0	3.4	0	.3	935.7
Total----------	933.0	3.5	2.1	1.2	939.7
Allen					
Ground water-----	0	5.3	2.7	1.7	9.7
Surface water----	0	.1	12.5	.3	12.9
Total----------	0	5.4	15.2	2.0	22.6
Ashland					
Ground water-----	0	.2	3.7	1.4	5.3
Surface water----	0	0	0	.5	0.5
Total----------	0	.2	3.7	1.9	5.8
Ashtabula					
Ground water-----	0	0	0.5	1.9	2.4
Surface water----	350.7	17.8	8.5	.5	377.5
Total----------	350.7	17.8	9.0	2.4	379.9
Athens					
Ground water-----	4.0	0	2.4	.2	6.6
Surface water----	0	0	2.0	.1	2.1
Total----------	4.0	0	4.4	.3	8.7
Auglaize					
Ground water-----	0	5.0	3.7	1.3	10.0
Surface water----	15.0	2.7	0	.4	18.1
Total----------	15.0	7.7	3.7	1.7	28.1
Belmont					
Ground water-----	0	0	9.4	.6	10.1
Surface water----	300.0	0	1.1	.2	301.3
Total----------	300.0	0	10.5	.8	311.4
Brown					
Ground water-----	0	0	.5	1.0	1.5
Surface water----	0	0	.9	.2	1.2
Total----------	0	0	1.4	1.2	2.7
Butler					
Ground water-----	0	23.8	33.6	1.1	58.5
Surface water----	1.0	33.4	.1	.3	34.8
Total----------	1.0	57.2	33.7	1.4	93.3

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use: Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Carroll					
Ground water-----	0	0.1	1.0	1.1	2.2
Surface water----	0	0	0	0.3	0.3
Total----------	0	.1	1.0	1.4	2.5
Champaign					
Ground water-----	0	.1	3.0	1.1	4.1
Surface water----	0	0	0	.4	.4
Total----------	0	.1	3.0	1.5	4.5
Clark					
Ground water-----	0	.1	17.7	1.9	19.7
Surface water----	2.5	0	0	.5	3.0
Total----------	2.5	.1	17.7	2.4	22.7
Clermont					
Ground water-----	2.0	0	9.1	.6	11.7
Surface water----	563.4	0	0.6	.1	564.1
Total----------	565.4	0	9.7	.7	575.8
Clinton					
Ground water-----	0	0	.4	1.1	1.5
Surface water----	0	0	1.4	.3	1.7
Total----------	0	0	1.8	1.4	3.2
Columbiana					
Ground water-----	0	1.5	2.7	2.3	6.5
Surface water----	0	0	6.0	.5	6.6
Total----------	0	1.5	8.7	2.8	13.1
Coshocton					
Ground water-----	0	2.6	5.4	1.2	9.2
Surface water----	213.3	0	0	.3	213.6
Total----------	213.3	2.6	5.4	1.5	222.8
Crawford					
Ground water-----	0	.1	1.0	1.0	2.1
Surface water----	0	0	3.2	.2	3.5
Total----------	0	.1	4.2	1.2	5.6
Cuyahoga					
Ground water-----	0	0	.6	0	.6
Surface water----	408.5	313.9	362.4	0	1,084.8
Total----------	408.5	313.9	363.0	0	1,085.4

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use: Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Darke					
Ground water-----	0	0.2	1.9	1.9	4.1
Surface water----	0	0	2.3	0.6	2.9
Total----------	0	.2	4.2	2.5	7.0
Defiance					
Ground water-----	0	0	0.4	1.0	1.3
Surface water----	0	0	5.1	.2	5.4
Total----------	0	0	5.5	1.2	6.7
Delaware					
Ground water-----	0	1.3	.1	.9	2.4
Surface water----	0	.1	5.1	.2	5.3
Total----------	0	1.4	5.2	1.1	7.7
Erie					
Ground water-----	0	0	.6	1.0	1.7
Surface water----	0	2.6	12.6	.2	15.3
Total----------	0	2.6	13.2	1.2	17.0
Fairfield					
Ground water-----	0	1.7	7.0	2.3	10.9
Surface water----	0	0	0	.4	0.5
Total----------	0	1.7	7.0	2.7	11.4
Fayette					
Ground water-----	0	0	.3	.7	1.1
Surface water----	0	0	1.4	.3	1.6
Total----------	0	0	1.7	1.0	2.7
Franklin					
Ground water-----	0	2.8	2.1	1.2	6.1
Surface water----	0	1.7	107.4	.2	109.3
Total----------	0	4.5	109.5	1.4	115.4
Fulton					
Ground water-----	0	0	.2	1.4	1.7
Surface water----	0	0	3.2	.4	3.6
Total----------	0	0	3.4	1.8	5.3
Gallia					
Ground water-----	0	.1	2.0	.7	2.8
Surface water----	1,083.1	0	.1	.2	1,083.4
Total----------	1,083.1	.1	2.1	.9	1,086.2

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use				
	Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Geauga					
Ground water-----	0	0.1	1.9	2.9	5.0
Surface water----	0	1.5	0	0.4	1.9
Total----------	0	1.6	1.9	3.3	6.9
Greene					
Ground water-----	0	1.3	9.5	1.8	12.7
Surface water----	0	.1	0.2	.4	0.7
Total----------	0	1.4	9.7	2.2	13.4
Guernsey					
Ground water-----	0	0	.9	.7	1.6
Surface water----	0	0	3.7	.2	4.0
Total----------	0	0	4.6	.9	5.6
Hamilton					
Ground water-----	2.0	18.9	7.6	.1	28.6
Surface water----	174.5	.5	137.9	0	312.9
Total----------	176.5	19.4	145.5	.1	341.5
Hancock					
Ground water-----	0	0	.3	1.1	1.4
Surface water----	0	0	6.6	.3	6.8
Total----------	0	0	6.9	1.4	8.2
Hardin					
Ground water-----	0	.3	1.9	.9	3.1
Surface water----	0	0	0	.3	.3
Total----------	0	.3	1.9	1.2	3.4
Harrison					
Ground water-----	0	0	.5	.6	1.1
Surface water----	0	0	.3	.2	.5
Total----------	0	0	.8	.8	1.6
Henry					
Ground water-----	0	0	.6	.8	1.4
Surface water----	0	0	1.5	.2	1.7
Total----------	0	0	2.1	1.0	3.1
Highland					
Ground water-----	0	.1	1.8	1.0	2.8
Surface water----	0	.5	.8	.3	1.6
Total----------	0	.6	2.6	1.3	4.4

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use: Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Hocking					
Ground water-----	0	0.5	2.3	0.8	3.6
Surface water----	0	0	0	.1	0.1
Total----------	0	.5	2.3	.9	3.7
Holmes					
Ground water-----	0	0	0.9	1.7	2.6
Surface water----	0	.1	0	.5	.6
Total----------	0	.1	.9	2.2	3.2
Huron					
Ground water-----	0	.1	.3	.9	1.3
Surface water----	0	0	4.4	.3	4.7
Total----------	0	.1	4.7	1.2	6.0
Jackson					
Ground water-----	0	.7	.6	.4	1.7
Surface water----	0	0	2.1	.1	2.2
Total----------	0	.7	2.7	.5	3.9
Jefferson					
Ground water-----	2.5	2.1	2.3	.7	7.7
Surface water----	2,605.6	0	6.5	.2	2,612.2
Total----------	2,608.1	2.1	8.8	.9	2,619.9
Knox					
Ground water-----	0	1.2	3.8	1.6	6.5
Surface water----	0	.3	0	.4	.8
Total----------	0	1.5	3.8	2.0	7.3
Lake					
Ground water-----	0	0	.2	1.3	1.5
Surface water----	706.1	0	13.8	.1	720.1
Total----------	706.1	0	14.0	1.4	721.6
Lawrence					
Ground water-----	0	.7	.9	1.0	2.6
Surface water----	0	.3	2.9	.1	3.3
Total----------	0	1.0	3.8	1.1	5.9
Licking					
Ground water-----	0	2.2	3.0	2.7	7.9
Surface water----	0	0	10.5	.6	11.1
Total----------	0	2.2	13.5	3.3	19.0

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use: Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Logan					
Ground water-----	0	0	3.4	1.1	4.6
Surface water----	0	0	0	0.4	0.3
Total----------	0	0	3.4	1.5	4.9
Lorain					
Ground water-----	0	0	0	1.9	1.9
Surface water----	777.2	171.9	39.7	.3	989.1
Total----------	777.2	171.9	39.7	2.2	991.0
Lucas					
Ground water-----	0	3.2	0.3	.1	3.5
Surface water----	957.0	103.0	86.4	0	1,146.4
Total----------	957.0	106.2	86.7	.1	1,149.9
Madison					
Ground water-----	0	0.5	2.9	.8	4.1
Surface water----	0	0	0	.3	.3
Total----------	0	.5	2.9	1.1	4.4
Mahoning					
Ground water-----	0	0	.4	3.9	4.4
Surface water----	0	43.0	6.4	.5	49.8
Total----------	0	43.0	6.8	4.4	54.2
Marion					
Ground water-----	0	.3	.7	1.1	2.0
Surface water----	0	0	6.0	.2	6.3
Total----------	0	.3	6.7	1.3	8.3
Medina					
Ground water-----	0	.3	3.0	2.7	6.0
Surface water----	0	.2	.9	.5	1.6
Total----------	0	.5	3.9	3.2	7.6
Meigs					
Ground water-----	0	0	1.5	.5	1.9
Surface water----	0	0	0	.1	.2
Total----------	0	0	1.5	.6	2.1
Mercer					
Ground water-----	0	.6	1.1	1.7	3.3
Surface water----	0	0	1.2	.6	1.8
Total----------	0	.6	2.3	2.3	5.1

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use: Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Miami					
Ground water-----	0	0.5	5.1	1.9	7.5
Surface water----	54.1	0	4.2	0.4	58.7
Total----------	54.1	.5	9.3	2.3	66.2
Monroe					
Ground water-----	0	4.4	0.2	.6	5.2
Surface water----	0	4.0	.4	.2	4.6
Total----------	0	8.4	.6	.8	9.8
Montgomery					
Ground water-----	9.6	20.1	97.0	7.1	133.8
Surface water----	327.0	.1	0	.9	328.0
Total----------	336.6	20.2	97.0	8.0	461.8
Morgan					
Ground water-----	0	1.6	.8	.6	3.1
Surface water----	652.0	0	0	.2	652.2
Total----------	652.0	1.6	.8	.8	655.3
Morrow					
Ground water-----	0	0	.7	1.2	1.8
Surface water----	0	0	0	.3	0.3
Total----------	0	0	.7	1.5	2.1
Muskingum					
Ground water-----	0	4.2	7.2	1.0	12.4
Surface water----	0	9.9	.6	.3	10.7
Total----------	0	14.1	7.8	1.3	23.1
Noble					
Ground water-----	0	0	0	.3	0.3
Surface water----	0	0	.5	.1	.6
Total----------	0	0	.5	.4	.9
Ottawa					
Ground water-----	0	.3	.4	.4	1.1
Surface water----	24.3	3.6	2.6	.1	30.6
Total----------	24.3	3.9	3.0	.5	31.7
Paulding					
Ground water-----	0	.2	.4	.7	1.3
Surface water----	0	.2	.3	.1	.6
Total----------	0	.4	.7	.8	1.9

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use: Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Perry					
Ground water-----	0	0	0.2	1.0	1.2
Surface water----	0	0.7	1.2	0.2	2.1
Total----------	0	.7	1.4	1.2	3.3
Pickaway					
Ground water-----	0	7.0	3.8	1.1	11.8
Surface water----	43.7	.5	0	.3	44.5
Total----------	43.7	7.5	3.8	1.4	56.3
Pike					
Ground water-----	0	17.3	1.1	.5	19.0
Surface water----	0	.9	0	.1	1.0
Total----------	0	18.2	1.1	.6	20.0
Portage					
Ground water-----	0	.9	9.5	2.9	13.3
Surface water----	0	1.1	0	.4	1.5
Total----------	0	2.0	9.5	3.3	14.8
Preble					
Ground water-----	0	0	1.7	1.4	3.2
Surface water----	0	.5	0	.4	0.8
Total----------	0	.5	1.7	1.8	.4.0
Putnam					
Ground water-----	0	.2	1.1	1.2	2.5
Surface water----	0	0	.7	.3	1.0
Total----------	0	.2	1.8	1.5	3.5
Richland					
Ground water-----	0	1.6	4.5	2.0	8.1
Surface water----	0	1.4	9.8	.4	11.6
Total----------	0	3.0	14.3	2.4	19.7
Ross					
Ground water-----	0	23.3	5.2	1.2	29.7
Surface water----	0	10.9	0	.3	11.2
Total----------	0	34.2	5.2	1.5	40.9
Sandusky					
Ground water-----	0	1.6	.6	1.5	3.8
Surface water----	0	3.2	4.1	.3	7.5
Total----------	0	4.8	4.7	1.8	11.3

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use				
	Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Scioto					
Ground water-----	0	0.4	1.5	1.1	3.0
Surface water----	0	36.8	7.4	0.2	44.4
Total----------	0	37.2	8.9	1.3	47.4
Seneca					
Ground water-----	0	0.7	0.3	1.0	2.1
Surface water----	0	1.4	5.8	.3	7.4
Total----------	0	2.1	6.1	1.3	9.5
Shelby					
Ground water-----	0	.1	2.0	1.3	3.3
Surface water----	0	0	1.2	.4	1.7
Total----------	0	.1	3.2	1.7	5.0
Stark					
Ground water-----	0	24.6	34.0	4.1	62.7
Surface water----	0	11.3	11.4	.7	23.3
Total----------	0	35.9	45.4	4.8	86.0
Summit					
Ground water-----	0	5.7	8.6	.2	14.5
Surface water----	64.2	30.2	57.9	0	152.3
Total----------	64.2	35.9	66.5	.2	166.8
Trumbull					
Ground water-----	0	.9	1.5	.2	2.7
Surface water----	123.0	82.4	59.6	.2	265.0
Total----------	123.0	83.3	61.1	.4	267.7
Tuscarawas					
Ground water-----	0	16.5	7.2	1.7	25.5
Surface water----	17.3	.1	1.3	.4	19.0
Total----------	17.3	20.2	8.5	2.1	44.5
Union					
Ground water-----	0	.7	.8	1.1	2.5
Surface water----	0	0	.7	.3	1.0
Total----------	0	.7	1.5	1.4	3.5
Van Wert					
Ground water-----	0	.3	.3	.8	1.4
Surface water----	0	0	1.8	.2	2.0
Total----------	0	.3	2.1	1.0	3.4

Table 6.--Offstream water withdrawal in Ohio counties, 1980--Continued

County and water source	Category of use: Thermo-electric	Manufac-turing	Public supply	Rural do-mestic and livestock	Total
Vinton					
Ground water-----	0	0.3	0.2	0.5	0.9
Surface water----	0	0	0	.1	.1
Total----------	0	.3	.2	.6	1.0
Warren					
Ground water-----	0	.9	7.6	1.6	10.2
Surface water----	0	1.3	.1	.3	1.6
Total----------	0	2.2	7.7	1.9	11.8
Washington					
Ground water-----	0	2.4	4.9	1.3	8.5
Surface water----	0	278.8	0	.3	279.2
Total----------	0	281.2	4.9	1.6	287.7
Wayne					
Ground water-----	0.2	3.3	7.5	3.0	14.0
Surface water----	0	2.3	.1	.9	3.3
Total----------	.2	5.6	7.6	3.9	17.3
Williams					
Ground water-----	0	.1	3.9	1.0	4.9
Surface water----	0	0	0	.3	.3
Total----------	0	.1	3.9	1.3	5.2
Wood					
Ground water-----	0	1.3	.7	2.7	4.7
Surface water----	0	.5	3.6	.4	4.4
Total----------	0	1.8	4.3	3.1	9.1
Wyandot					
Ground water-----	0	.4	.8	.6	1.9
Surface water----	0	.2	1.1	.2	1.4
Total----------	0	.6	1.9	.8	3.3
Grand total---	10,416.8	1,399.1	1,432.1	141.3	13,389.0

Table 7.--Types of Ohio water-use data for 1980 available through the National Water-Use Data System (NWUDS)

[x, offstream-use data; p, population data; n, no data collected or tabulated; o, no use in this category]

NWUDS water-use category	Available data	
	By hydrologic unit[1]	By county
Agriculture:		
Irrigation	n	n
Nonirrigation	n	x, p[2]
Commercial	n	n
Domestic	n	x, p
Power generation		
Fossil fuel	x	x
Geothermal	o	o
Hydroelectric	n	n
Nuclear	x	x
Industrial	x	x
Mining	n	n
Public water supplies	x, p	x, p
Sewage treatment	n	n

[1]U.S. Geological Survey, 1974
[2]Animal populations reported for this category

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