WATER WITHDRAWAL AND USE IN MARYLAND, 1992-93

By Judith C. Wheeler

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 96-4314

Prepared in cooperation with the

MARYLAND DEPARTMENT OF THE ENVIRONMENT
WATER MANAGEMENT ADMINISTRATION
and the
MARYLAND DEPARTMENT OF NATURAL RESOURCES
MARYLAND GEOLOGICAL SURVEY

Baltimore, Maryland
1997

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GLOSSARY

[Definitions modified from Solley and others, 1993; Maryland Water Resources Administration, 1987; and Drever, 1982]

Aquaculture.--The controlled production of finfish, shellfish, and aquatic plants in fresh and saline water; also called fish farming or fish culture.

Aquifer.--A rock unit (including unconsolidated sediments) that will yield water in a usable quantity to wells or springs.

Brackish water.--Water that is too saline to be potable, but is significantly less saline than seawater. Total dissolved solids (TDS) concentration in brackish water ranges from 1,000 to 20,000 mg/L (milligrams per liter), whereas TDS concentration in seawater is about 35,000 mg/L.

Commercial water use.--Water withdrawn for motels, hotels, restaurants, office buildings, and other commercial facilities, and for educational, civilian, and military institutions. Laboratories and research facilities are also included in this category. Water can be obtained from a public supply or can be self-supplied.

Consumptive use (consumed water).--That quantity of water withdrawn that is evaporated, transpired, incorporated into products or absorbed by crops, consumed by humans or livestock, or otherwise removed from the immediate water environment.

Cooling water.--Water used to cool condensers, nuclear reactors, and other commercial and industrial equipment.

Domestic water use.--Water that is obtained from a public supply or is self-supplied and used for household purposes such as drinking, food preparation, bathing, washing dishes and clothes, flushing toilets, and watering lawns and gardens. Water withdrawn for home heating and cooling by ground-water heat pumps is also included in this category.

Evaporation.--The process by which water is changed from a liquid to a vapor phase.

Freshwater.--Water that contains less than 1,000 milligrams per liter (mg/L) of TDS; generally, more than 500 mg/L of TDS in water is undesirable for drinking and many industrial uses.

Ground water.--Generally, all subsurface water, as distinct from surface water; specifically, that part of subsurface water in the saturated zone (a zone in which all interconnected openings are filled with water) where the water is under pressure equal to or greater than that of the atmosphere.

Hydroelectric-power water use.--Water used in the generation of electricity at power plants where the turbine generators are driven by falling water; an instream use.

Industrial water use.--Water used for manufacturing or processing purposes, such as fabrication; washing, cooling, and separation processes; and boiler make-up. Includes use by industries such as steel, chemical and allied products, shipbuilding, petroleum refining, truck assembly, printers and publishers, clothing manufacturers, paper and allied products plants, and food and seafood processors.

Instream use.--Water use that takes place within the stream channel for such purposes as hydroelectric power, navigation, water-quality improvement, fish propagation, and recreation.

Irrigation water use.-- Artificial application of water on the land surface to assist in the growing of farm and nursery crops or to maintain vegetative growth in recreational lands, such as parks and golf courses.

Livestock water use.--Water used for livestock watering, feedlots, dairy operations, and other farm needs. Livestock includes cattle, dairy cows, sheep, hogs, and poultry.

Mining water use.--Water used for extracting minerals such as coal. Also includes uses associated with stone, sand, and gravel quarrying, dewatering, milling (crushing, screening, washing, flotation), and other preparations usually performed at the mine site or as part of a mining activity. Dewatering in the construction of subway tunnels is also included.

Public supply water use.--Water withdrawn by public and private water suppliers and delivered for a variety of uses, such as domestic, commercial, and industrial. Public water suppliers include municipalities, towns, or counties having incorporated governments. Private water suppliers include unincorporated communities, subdivisions with central water supplies, trailer parks, apartment buildings, and migrant labor camps with independent supply systems.

Reclaimed wastewater.--Wastewater-treatment-plant effluent that has been diverted or intercepted for use before it reaches a natural waterway or aquifer.

Saline water.--Water that contains more than 1,000 mg/L of TDS ("slightly saline"--1,000 to 3,000 mg/L; "moderately saline"--3,000 to 10,000 mg/L; "very saline"--10,000- 35,000 mg/L).

Self-supplied water.--Water withdrawn by a user of a surface-water or ground-water source and not furnished by a public supply. Homes and small communities relying on individual wells are included in this category.

Surface water.--A body of water on the land surface, such as a stream or a lake.

Thermoelectric power water use.--Water used in the process of the generation of thermoelectric power.

Withdrawal.--Water diverted from a surface-water source or removed from an aquifer for use.

Water Withdrawal And Use In Maryland,1992-93

By Judith C. Wheeler

ABSTRACT

This report summarizes the results of a study by the U.S. Geological Survey, in cooperation with the Maryland Department of the Environment, Water Management Administration and the Maryland Department of Natural Resources, Maryland Geological Survey, to estimate amounts of fresh and saline water withdrawn and used in Maryland during 1992 and 1993.

During 1992, about 1,430 Mgal/d (million gallons per day) of freshwater was withdrawn from surface-water and ground-water sources in Maryland. Of this amount, 1,190 Mgal/d (83 percent) was used in the State and 236 Mgal/d (17 percent) was transferred to surrounding States and the District of Columbia for water supply. About 6.09 Mgal/d of freshwater was imported from bordering States for use in Maryland.

During 1993, total freshwater withdrawals in Maryland increased to about 1,480 Mgal/d, with 1,240 Mgal/d used in the State and 243 Mgal/d transferred to surrounding States and the District of Columbia. About 6.34 Mgal/d of freshwater was imported from bordering States for use in Maryland.

During 1992 and 1993, more than 80 percent of freshwater withdrawals (about 1,180 Mgal/d in 1992 and 1,200 Mgal/d in 1993) were from surface-water sources. The largest surface-water withdrawals in the State, greater than 100 Mgal/d, were in Montgomery and Baltimore Counties. Reservoirs and rivers in these counties were the sources for public suppliers that serve the Baltimore City and District of Columbia metropolitan areas. Nearly 70 percent of the fresh surface water (about 825 Mgal/d for each year) was withdrawn in the Potomac drainage basin whereas most ground water (about 178 Mgal/d during 1992 and 194 Mgal/d during 1993) was withdrawn in the Upper Chesapeake drainage basin. The Potomac Group aquifers were the largest source of ground water accounting for about 25 percent of total ground-water withdrawals during 1992 and 23 percent during 1993.

The population of Maryland served by public water-supply systems increased slightly from 4.02 million during 1992 to 4.08 million during 1993. In addition, during the peak tourist season (from May to September), the Ocean City water-supply system served approximately 280,000 more individuals than the base population of about 15,000. During both years, surface water was used by about 69 percent of the State's population and ground water was used by the remaining 31 percent.

Ten water-use categories represent the major demands on the surface-water and ground-water resources of the State during 1992 and 1993: Public supply, domestic, commercial, industrial, mining, thermoelectric power, hydroelectric power, livestock, irrigation, and aquaculture.

Notable facts about these uses are:

- *Public supply*--790 Mgal/d of freshwater was withdrawn in 1992 (812 Mgal/d during 1993) and delivered for use to residences, commercial establishments, and industries. Public suppliers withdrew the largest quantities of water in the State. The largest user of surface water for public supply was Baltimore City with about 126 Mgal/d withdrawn for use during 1992 and 129 Mgal/d during 1993.

- *Domestic*--478 Mgal/d of freshwater was used during 1992 (491 Mgal/d during 1993). About 407 Mgal/d during 1992 and 419 Mgal/d during 1993 were received from public suppliers. About 70.4 Mgal/d during 1992 and 71.6 Mgal/d during 1993 were self-supplied. All self-supplied domestic water withdrawals were from ground-water sources.

- *Industrial*--120 Mgal/d of freshwater was used during 1992 (118 Mgal/d during 1993). About 71.5 Mgal/d during 1992 and 69.3 Mgal/d during 1993 were self-supplied; the remaining water used was delivered by public suppliers. Industries also used 275 Mgal/d of saline or brackish surface water during 1992 (266 Mgal/d during 1993). About 62.5 Mgal/d of reclaimed wastewater was used during 1992 (62 Mgal/d during 1993).

- *Mining*--26.1 Mgal/d of freshwater was used during 1992 (33.5 Mgal/d during 1993). Brackish or saline surface-water withdrawals used in mining operations decreased 66 percent from 1.03 Mgal/d in 1992 to 0.35 Mgal/d in 1993 due mainly to reduced dredging operations.

- *Thermoelectric power*--362 Mgal/d of freshwater was used during 1992 (360 Mgal/d during 1993). In addition, about 5,350 Mgal/d of saline surface water was withdrawn for cooling condensers during 1992. During 1993, saline surface-water withdrawals increased to 5,840 Mgal/d.

- *Hydroelectric power (instream water use)*--24,900 Mgal/d of freshwater was used for the production of electricity during 1992 (26,000 Mgal/d during 1993). Although the amount of water to generate hydroelectric power in some plants was considerable, the amount of consumptive use was negligible.

- *Livestock*--About 11.3 Mgal/d of freshwater was used during each year of the 2-year period. About 3.48 Mgal/d was from surface-water sources and 7.79 Mgal/d was from ground-water sources.

- *Irrigation*--47.6 Mgal/d of freshwater was used during 1992 (69.4 Mgal/d during 1993). Most of the water (37.9 Mgal/d during 1992 and 58.2 Mgal/d during 1993) was used for irrigating farm crops.

- *Aquaculture*--24 Mgal/d of freshwater was used during 1992 (25.1 Mgal/d during 1993). Saline surface-water withdrawals decreased from 12.9 Mgal/d during 1992 to 12.5 Mgal/d during 1993.

INTRODUCTION

Maryland has a total land and water area of 12,303 mi^2 and is subdivided into 23 counties and Baltimore City (fig. 1). The State has abundant **surface-water**[1] and **ground-water** resources. As the demand for water increases, however, additional stress is placed on these resources. Effective water-resource management depends, in part, on current and accurate water-**withdrawal** and use data. Such data are valuable for evaluating effects of withdrawals on the State's water resources, identifying current water-use patterns, and estimating future water demands. The study on which this report is based was conducted by the U.S. Geological Survey, as part of the National Water-Use Information Program of collecting and compiling reliable site-specific and aggregate water-use information at State and national levels. The study was conducted in cooperation with the Maryland Department of the Environment, Water Management Administration (WMA) and the Maryland Department of Natural Resources, Maryland Geological Survey. The results of similar studies in 1986, 1987, and 1988-89 are summarized by Wheeler (1990; 1991; 1992; 1995).

Purpose and Scope

This report summarizes the amounts of fresh and **saline** water withdrawn and used in Maryland dur-

1. Words in bold type are defined in the "Glossary" section of the report.

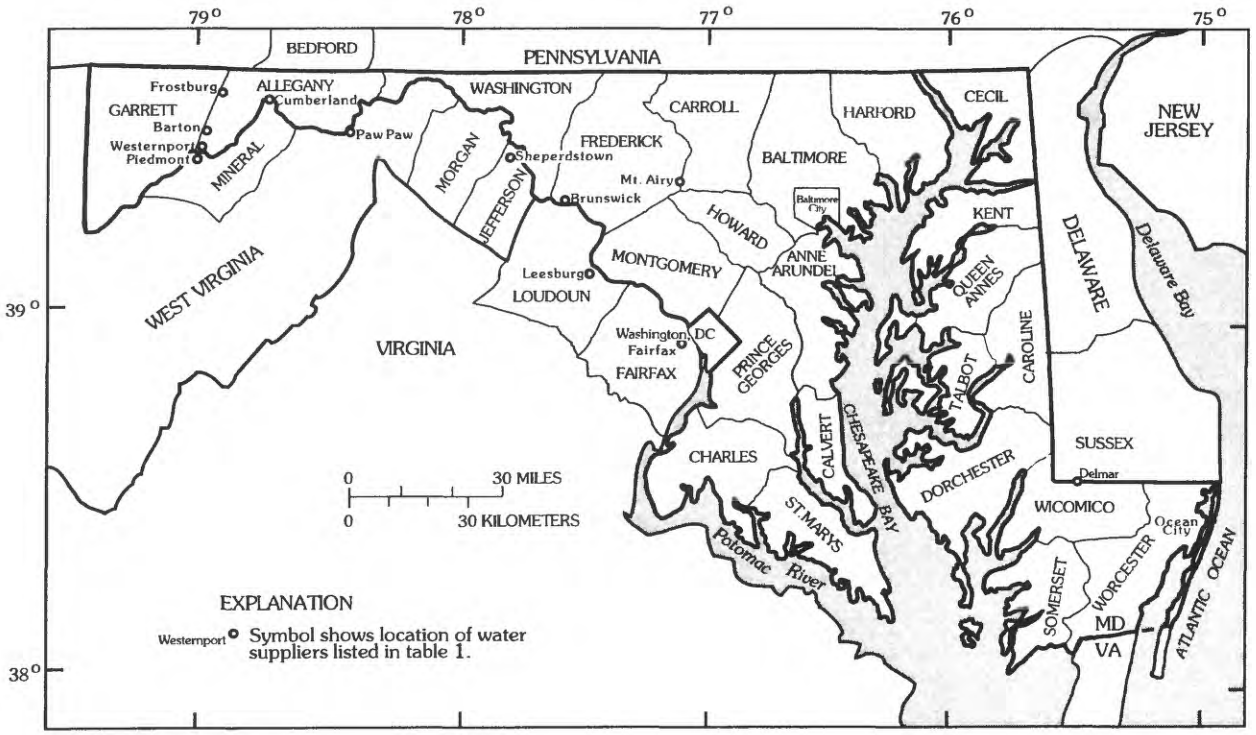


Figure 1. Counties in Maryland and selected adjacent counties in Virginia, West Virginia, and Pennsylvania.

ing 1992 and 1993. The water-use data are discussed briefly and presented in graphs, tables, and maps organized by counties, type of use, drainage basins, and **aquifers**.

In this report, the amount of water withdrawn from sources in each county is distinguished from the amount of water used in each county. Withdrawals in each county include all water withdrawn whether or not it is transferred to another county or State. Water use is the amount of water actually used in a particular county or drainage basin, including (1) water withdrawn for use in the county or basin and (2) water imported from another county, basin, or State. Amounts of self-supplied water and water delivered from **public-supply** systems are presented for each category of use.

The water-use categories discussed in this report are **public supply**, **domestic**, **commercial**, **industrial**, **mining**, **thermoelectric power**, **hydroelectric power**, **livestock**, **irrigation**, and **aquaculture**. Water withdrawn by a public or private water utility and delivered to a variety of users is designated as a "public supply." If a public supply is not available or is not used, the water is classified as **"self-supplied."** Homes and small communities relying on individual wells are classified as domestic self-supplied water users. Commercial use includes not only typical businesses such as restaurants, motels, car washes, and office buildings, but also institutions such as schools, churches, and military installations. Thermoelectric power includes electrical energy generated in steam-electric plants (fueled by coal, oil, or other conventional fuel) and those using nuclear fuel. Water used for the generation of electricity by hydroelectric powerplants also is discussed in this report but the quantities of water used are not included in the **freshwater** totals because this is considered an **"instream"** water use and not a withdrawal--that is, water use takes place within the stream channel at the dam where turbine generators are driven by falling water.

Methods of Data Collection and Estimation

Most of the water-use data on public suppliers, commercial and industrial facilities, mines, and thermoelectric powerplants were obtained from pumpage reports submitted to WMA by users withdrawing 0.01 Mgal/d or more. Monthly and annual withdrawal data are stored in a computerized data base by WMA. The U.S. Geological Survey, in cooperation with WMA, maintains the Maryland Site-Specific Water-Use Data System (SSWUDS), that is designed to store monthly water-withdrawal and return-flow data from the WMA for users that withdraw or return 0.01 Mgal/d or more. The WMA's data base and SSWUDS were used in the preparation of this report. Water-use data for users of less than 0.01 Mgal/d were estimated from the average daily allocations established in water-appropriation and use permits which are required by WMA for all water users except self-supplied domestic users and agricultural irrigators using less than 0.01 Mgal/d.

Data on domestic, hydroelectric power, livestock, and irrigation water use were estimated using the following methods:

Self-supplied domestic withdrawals were estimated on the basis of the percentage of year-round housing units served by public suppliers (U.S. Department of Commerce, 1990a, p. 92) and subtracting that number from the total population for each county (1990 county population data from U.S. Department of Commerce, 1990b, table 1, p. 1-12 and county population data compiled from Maryland Office of Planning, 1994). The total self-supplied population number was then multiplied by 80 gal/d, the estimated per capita water use in Maryland (J.R. Herring, Maryland Department of Natural Resources, oral commun., 1995).

Hydroelectric-power water use was estimated on the basis of annual electric-power generation data obtained from the Department of Energy, Energy Information Administration and a coefficient for water used per KWh (S.B. Weisberg, Martin Marietta Environmental Systems, written commun., 1986). Reported water-use data were used for some of the facilities.

Livestock water use was estimated on the basis of the number of farm animals in each county (U.S. Department of Commerce, 1994) and the average amount of water used for drinking and maintenance per animal (U.S. Environmental Protection Agency, 1973, p. 15). Because the most recent agricultural census was conducted during 1992, the same number of animals and the same water use were assumed for 1992-93. The estimates also are based on the assumption that grazing animals such as cattle and sheep consumed surface water, and poultry, hogs, and dairy cows consumed ground water.

Irrigation water use for crops was estimated from the number of acres irrigated and amount of rainfall during the growing season (L.E. Carr, Maryland Cooperative Extension Service, oral commun., 1994). For 1992, a water-application rate of 0.67 (acre-ft)/yr per acre or about 598 gal/d per acre was used for counties on the Eastern Shore of Maryland (Caroline, Dorchester, Kent, Queen Annes, Somerset, Talbot, Wicomico, and Worcester). Irrigation water use for 1993 was estimated using 1 (acre-ft)/yr per acre or about 893 gal/d per acre (L.E. Carr, oral commun., 1994).

WATER WITHDRAWAL AND USE

During 1992, approximately 1,430 Mgal/d of freshwater was withdrawn from surface-water and ground-water sources in Maryland. Of this amount, 1,190 Mgal/d (83 percent) was used in the State and 236 Mgal/d (17 percent) was transferred to surrounding States and the District of Columbia for water supply. About 6.09 Mgal/d of freshwater was imported from bordering States for use in Maryland. During 1993, about 1,480 Mgal/d of freshwater was withdrawn. Of this amount, 1,240 Mgal/d (84 percent) was used in the State and 243 Mgal/d (16 percent) was transferred to surrounding areas. About 6.34 Mgal/d of freshwater was imported from bordering States for use in Maryland. In addition, some public suppliers in Maryland withdraw or deliver water across county and State boundaries. Suppliers that withdraw or deliver water across county and State boundaries and the quantities delivered are shown in table 1.

Table 1.--Maryland water suppliers cross-boundary withdrawals and deliveries, 1992-93

[See fig. 1 for locations]

Water supplier	County and State of withdrawal	County and State of use	Amount delivered, in million gallons per day	
			1992	1993
Baltimore City	Baltimore, Md.	Anne Arundel, Md.	7.63	9.00
		Baltimore City	126.21	128.62
		Carroll, Md.	1.27	1.35
		Howard, Md.	19.01	19.07
Barton	Garrett, Md.	Allegany, Md.	.03	.03
Brunswick	Washington, Md.	Frederick, Md.	.20	.29
	Loudoun, Va.	Frederick, Md.	.08	.08
Cumberland	Bedford, Pa.	Allegany, Md.	5.74	5.97
Delmar	Sussex, Del.	Wicomico, Md.	.26	.28
Frostburg	Garrett, Md.	Allegany, Md.	1.76	1.08
Fairfax County Water Authority	Montgomery, Md.	Fairfax, Va.	52.93	53.50
Gorman	Grant, W. Va.	Garrett, Md.	.01	.01
Leesburg	Montgomery, Md.	Loudoun, Va.	1.73	2.05
Mt. Airy	Frederick, Md.	Carroll, Md.	.20	.20
Paw Paw	Allegany, Md.	Morgan, W. Va.	.04	.04
Piedmont	Garrett, Md.	Mineral, W. Va.	.08	.09
Ridgeley	Allegany, Md.	Mineral, W. Va.	.10	.10
Shepherdstown	Washington, Md.	Jefferson, W. Va.	.34	.32
Washington Aqueduct	Montgomery, Md.	District of Columbia	180.36	186.39
Washington Suburban Sanitary Commision	Montgomery, Md.	Prince Georges, Md.	37.12	36.55
	Prince Georges, Md.	Howard, Md.	3.00	3.00
Westernport	Garrett, Md.	Allegany, Md.	.78	.76
Wilely Ford	Allegany, Md.	Mineral, W. Va.	.08	.08

Withdrawals of freshwater by county are shown in figure 2. The largest surface-water withdrawals (more than 100 Mgal/d) were in Baltimore and Montgomery Counties. The reservoirs and rivers in these counties provide water sources for public suppliers that serve the Baltimore City and District of Columbia metropolitan areas. The smallest withdrawals (less than 4.5 Mgal/d) were in Howard County. The county is served primarily by the Baltimore City public-supply system and the Washington Suburban Sanitary Commission (WSSC) system with water sources in Montgomery and Prince Georges Counties.

Freshwater withdrawals by category of use are summarized in figure 3. Withdrawal and use data by county in 1992 and 1993 are presented in tables 3-13 in the appendix. Table 3a summarizes total withdrawals by county in 1992; table 3b summarizes total withdrawals by county in 1993.

A comparison of total fresh surface-water and ground-water withdrawals by county during 1992 and 1993 is shown in figure 4. During each year, more than 80 percent of total freshwater withdrawals (1,180 Mgal/d during 1992 and 1,200 Mgal/d during 1993) were withdrawn from surface-water sources, compared to 248 Mgal/d (17 percent) withdrawn from ground-water sources during 1992 and 272 Mgal/d (19 percent) during 1993. Most fresh surface water (more than 100 Mgal/d) was withdrawn in Montgomery and Baltimore Counties (tables 3a and 3b), whereas most ground water (more than 25 Mgal/d) was withdrawn in Anne Arundel County.

The largest drainage basins in Maryland are the Potomac and the Upper Chesapeake (fig. 5). During 1992 and 1993, nearly 70 percent of total fresh surface-water withdrawals were from streams in the Potomac Basin. During 1992, about 825 Mgal/d of fresh surface water was withdrawn for use from the Potomac Basin compared to 341 Mgal/d withdrawn from the Upper Chesapeake Basin. About 15 Mgal/d of the fresh surface water withdrawn from the Potomac Basin was transferred to the Chesapeake Basin for use; whereas, more than 37 Mgal/d of the fresh surface water with-

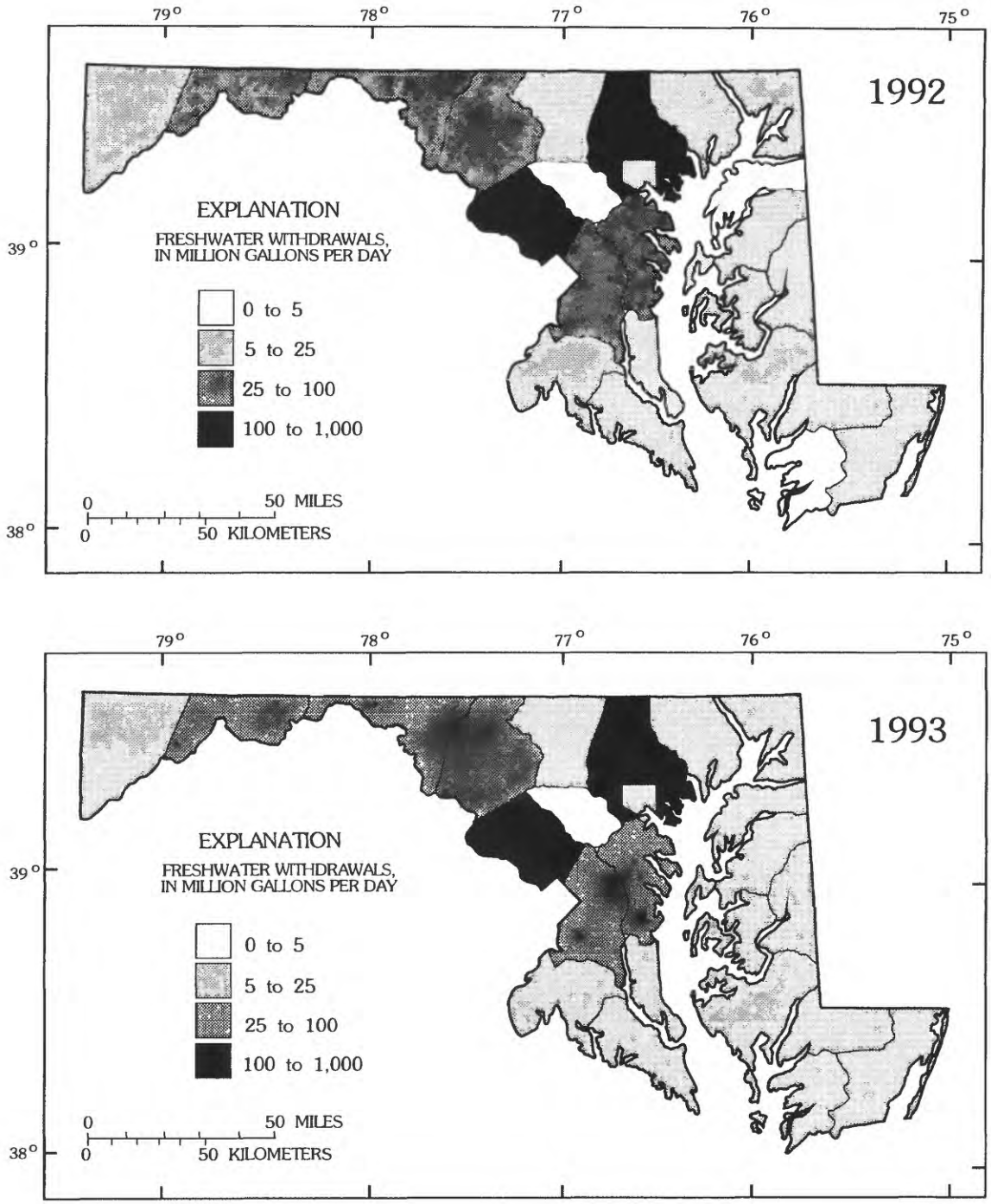


Figure 2. Freshwater withdrawals in Maryland, by county, 1992-93.

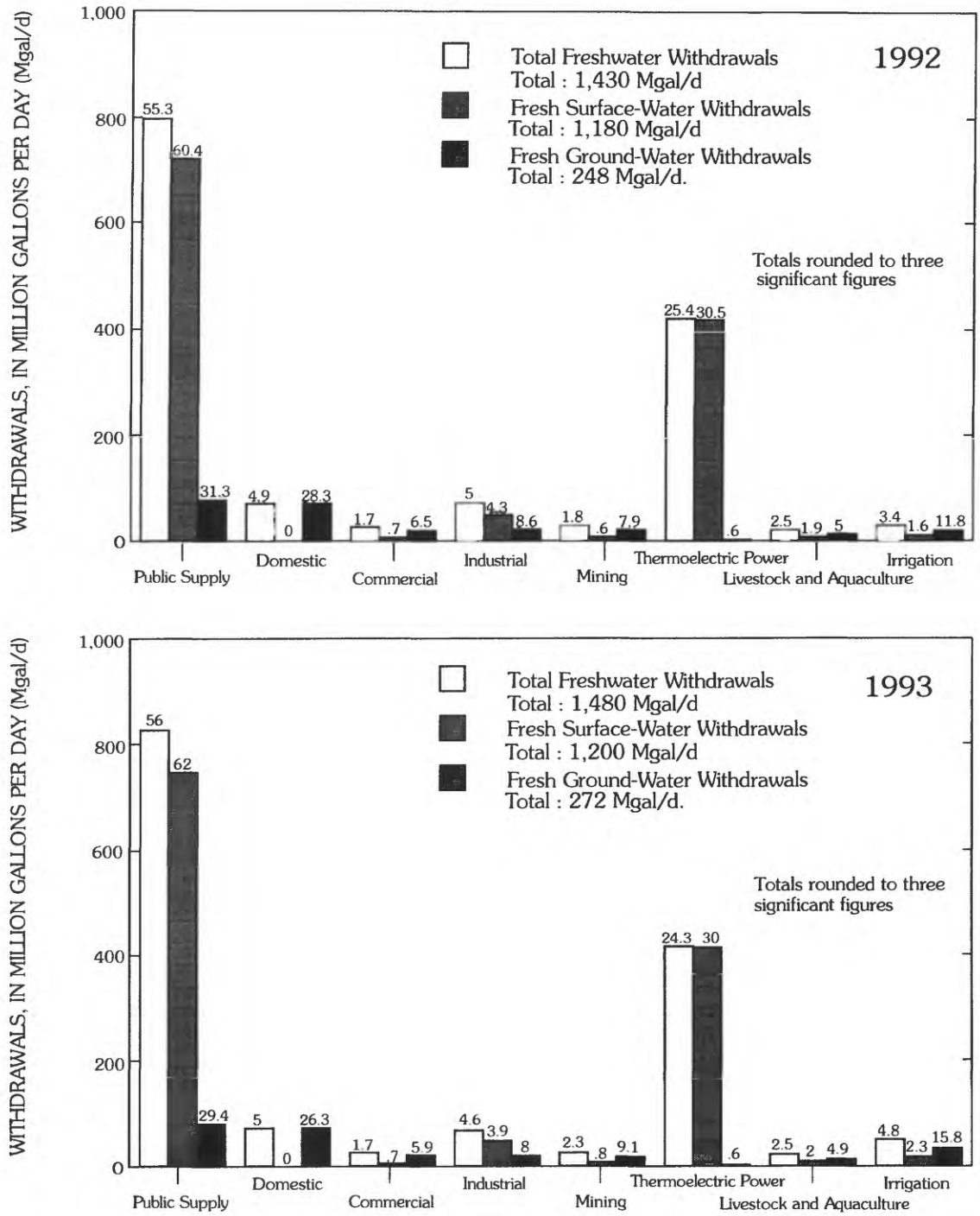


Figure 3. Freshwater withdrawals and source of water in Maryland, by category of use, 1992-93.

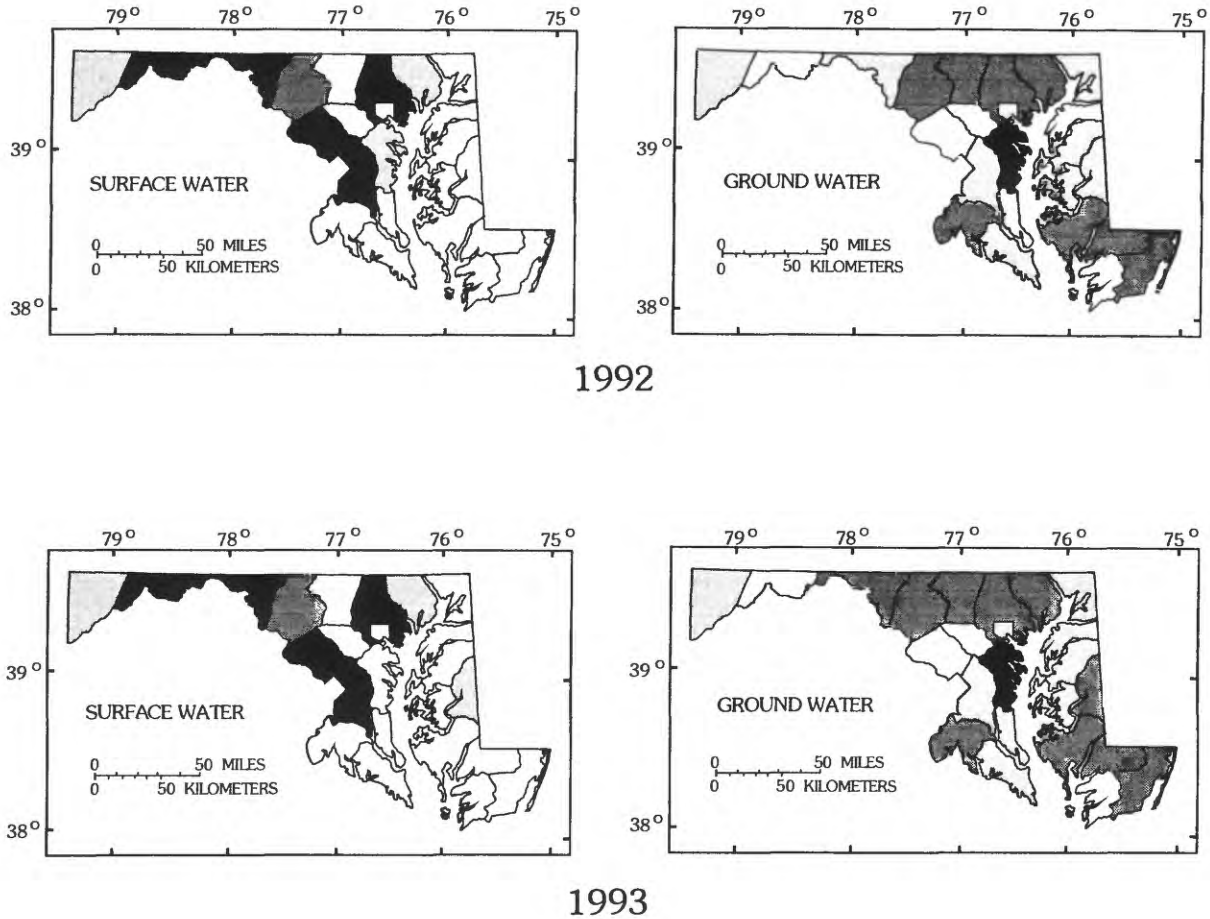
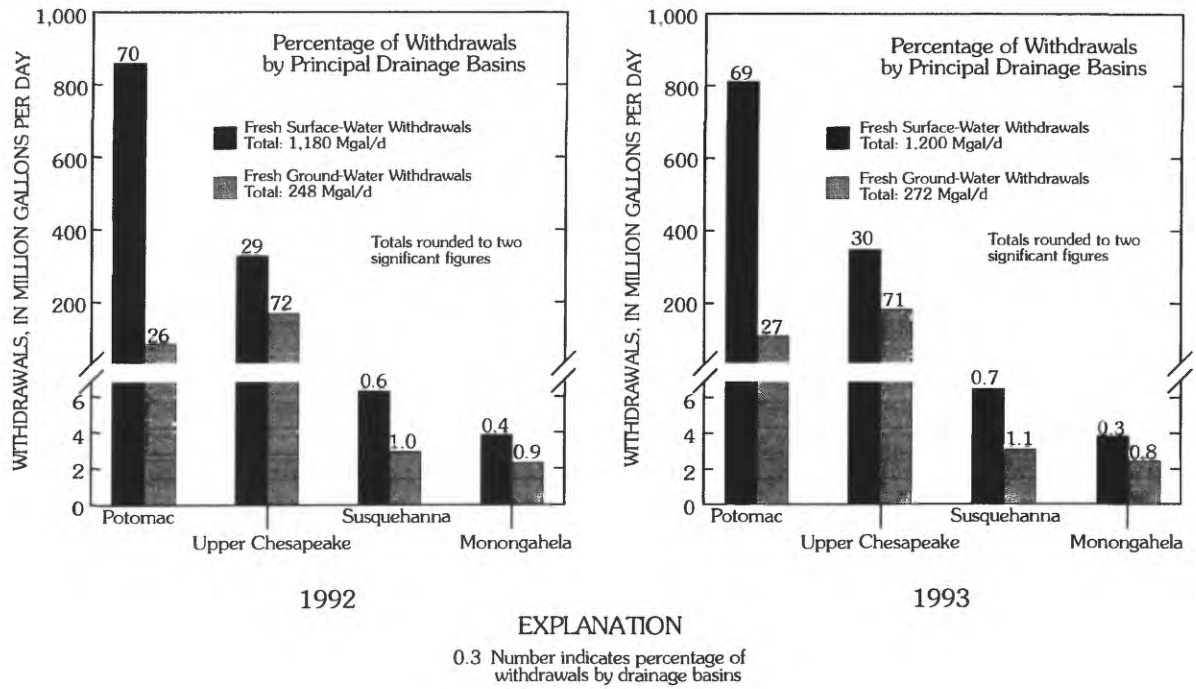


Figure 4. Fresh surface-water and ground-water withdrawals in Maryland, by county, 1992-93.



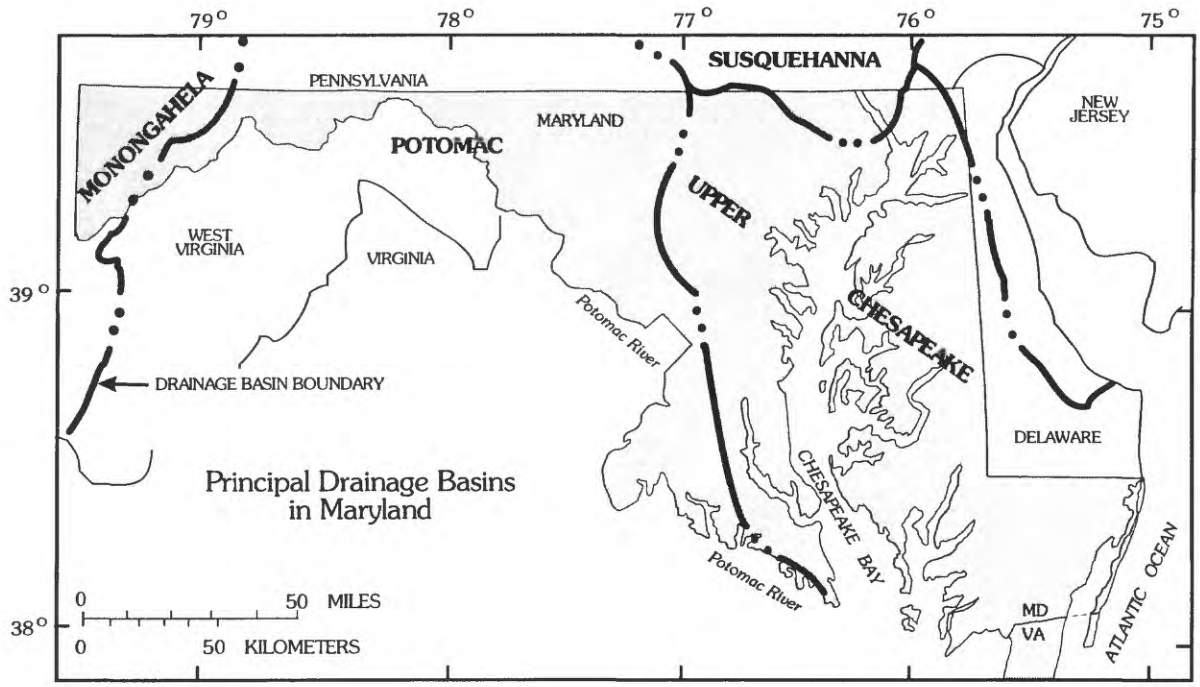


Figure 5. Fresh surface-water and ground-water withdrawals in Maryland, by principal drainage basin, 1992-93.

drawn from the Upper Chesapeake Basin was transferred to the Potomac Basin for use.

During 1992 and 1993, about 825 Mgal/d of fresh surface water was withdrawn from the Potomac Basin compared to 341 Mgal/d withdrawn from the Upper Chesapeake Basin during 1992 and 367 Mgal/d during 1993. About 15 Mgal/d of the fresh surface water withdrawn for use from the Potomac Basin was transferred to the Upper Chesapeake Basin, whereas nearly 45 Mgal/d of the fresh surface water withdrawn for use from the Upper Chesapeake Basin was transferred to the Potomac Basin. Each year, less than 1 percent of all fresh surface water withdrawn was from parts of the Monongahela, Susquehanna, and Delaware River (amount too small to show on graph) drainage basins in Maryland.

During 1992, about 72 percent (178 Mgal/d) of fresh ground water was withdrawn in the Upper Chesapeake Basin, compared to about 26 percent (65 Mgal/d) in the Potomac Basin. During 1993, total ground-water withdrawals increased in both basins to 194 Mgal/d (71 percent) in the Upper Chesapeake Basin and to 73 Mgal/d (27 percent) in the Potomac Basin. Only about 2 percent of total ground-water withdrawals were from sites in the Monongahela, Susquehanna, and Delaware River (amount too small to show on graph) drainage basins.

Estimated percentages of ground-water withdrawals by principal aquifers during 1992 and 1993 are shown in figure 6. The map and hydrogeologic section show the geographic distribution of the principal aquifers in Maryland (U.S. Geological Survey, 1990, p. 294). The Potomac Group aquifers were the largest source of ground water with about 61 Mgal/d withdrawn (25 percent of total ground-water withdrawals) during 1992 and 64 Mgal/d during 1993 (23 percent of total ground-water withdrawals), followed by the Columbia aquifer with 42 Mgal/d during 1992 (49 Mgal/d during 1993), and Piedmont and Blue Ridge Crystalline aquifers with about 37 Mgal/d during 1992 and 38 Mgal/d during 1993. The smallest amount of water was withdrawn from the Newark Group aquifers with about 2 Mgal/d withdrawn each year.

Population and Water-Use Trends

The population of Maryland increased from 4,870,000 in 1992 to 4,940,000 in 1993 (estimates based on projections from Maryland Office of Planning, 1994). Population and water-use data for 1992 and 1993 are presented in table 2. The population served by public water-supply systems increased from 4.02 million during 1992 to 4.08 million during 1993. During each year, surface water was used by about 69 percent of the population and ground water was used by 31 percent of the population.

Population and water-use trends in Maryland from 1950 to 1993 are shown in figure 7. During 1950, about 2.34 million people used approximately 400 Mgal/d of freshwater. Population and water use increased steadily through the 1950's and 1960's. Subsequently, however, population growth slowed, increasing from 3.92 million people in 1970 to 4.94 million in 1993. Water use during the same period leveled off in the early 1970's at about 1,500 Mgal/d, then decreased over the rest of the decade. During 1980, water use was about 1,400 Mgal/d. Possible explanations for the decrease in water use include changing economic conditions, declining water use among certain industries, and increasing use of conservation techniques, including low-water volume fixtures. However, freshwater use increased overall from 1985 to 1993, from about 1,400 Mgal/d to about 1,480 Mgal/d, primarily because of increased withdrawals for cooling purposes by powerplants, and for irrigation and public-supply distribution.

Public Supply

The largest amount of water withdrawn in the State, 790 Mgal/d during 1992 and 812 Mgal/d during 1993 (about 55 percent of total freshwater withdrawals; fig. 3), was by public-supply systems operated by municipalities, counties and towns, and private utilities. Public suppliers delivered water to 83 percent of the total population during both 1992 and 1993 (table 2). Water was delivered for a variety of uses including domestic, commercial, and industrial uses (tables 4a and 4b). In addition, each year during the peak tourist season (May

through September), the Ocean City water-supply system in Worcester County served about 280,000 more people than the base population of about 15,000 (Worcester County Commissioners, 1994, p. 2-8).

Most public suppliers in central and western Maryland rely on surface-water sources. Some of these suppliers withdraw and deliver water across county and State boundaries as shown in table 1. The largest user of surface water for public supply is Baltimore City. During 1992, about 126 Mgal/d was withdrawn for use by the city compared to about 129 Mgal/d during 1993. In addition, Baltimore City supplied about 122 Mgal/d during 1992 and 127 Mgal/d during 1993 to parts of Baltimore, Howard, Anne Arundel, and Carroll Counties. Another large user of surface water for public supply in Maryland is WSSC, which withdrew 172 Mgal/d during 1992 and 175 Mgal/d during 1993 and delivered water to most of Montgomery and Prince Georges Counties and part of Howard County.

The Potomac River in Maryland is a water source for several public suppliers in Virginia and West Virginia and for the U.S. Army Corps of Engineers, which delivers water to the District of Columbia through the Washington Aqueduct. During 1992, about 55.3 Mgal/d of fresh surface water was withdrawn from the river and transferred to Virginia and West Virginia for use, compared to 56.2 Mgal/d withdrawn and transferred during 1993. During 1992, the Washington Aqueduct conveyed about 180 Mgal/d from the Potomac River for public-supply deliveries to the District, compared to 186 Mgal/d conveyed during 1993.

Several municipalities in Maryland obtained all or part of their water supply from bordering States during 1992 and 1993, including Cumberland in Allegany County, which received 5.74 Mgal/d of surface water during 1992 (5.97 Mgal/d during 1993) from two impoundments on Evitts Creek in Bedford County, Pennsylvania; Brunswick in Frederick County, which received about 0.08 Mgal/d each year from springs in Loudoun County, Virginia; Gorman in Garrett County, which received about 0.01 Mgal/d each year from water sources in Grant County, West Virginia; and Delmar in Wicomico County, which received about 0.26 Mgal/d during 1992 (0.28 Mgal/d during 1993) from wells in Sussex County, Delaware.

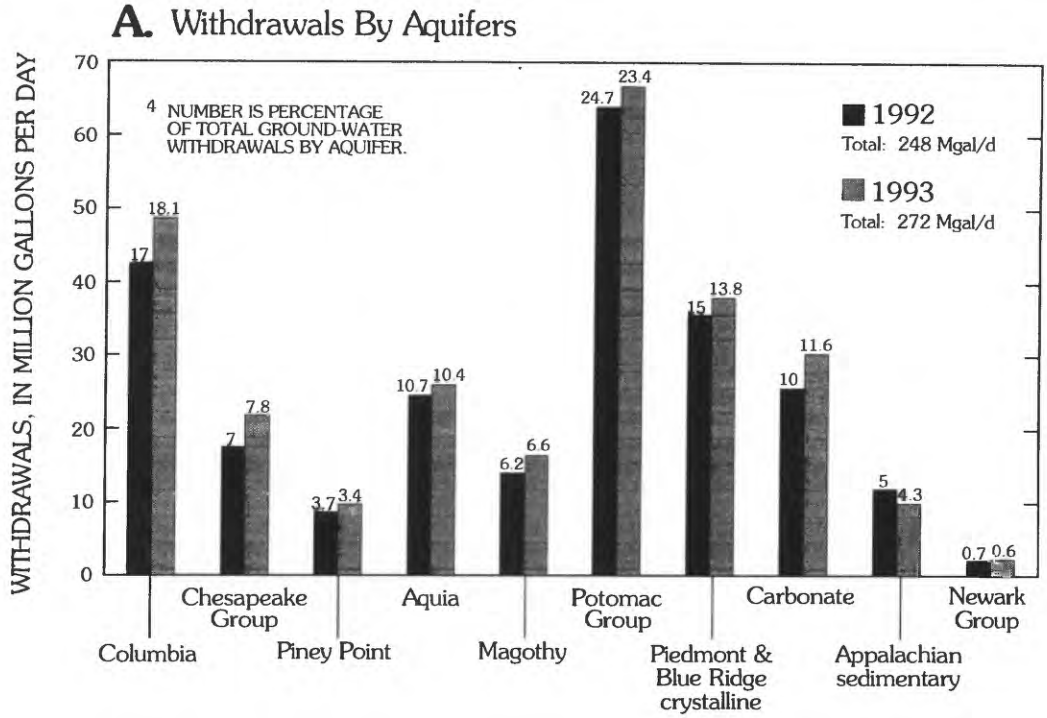
Most public suppliers that rely on ground-water sources are in the eastern and southern parts of Maryland. In counties east of Chesapeake Bay, all public suppliers rely on ground water. The largest ground-water withdrawals for public supply, however, are in Anne Arundel County. During 1992, about 27.8 Mgal/d was withdrawn by public suppliers in the county compared to 28.5 Mgal/d during 1993.

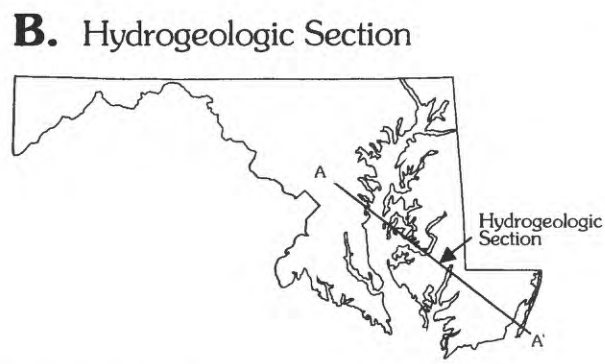
Domestic

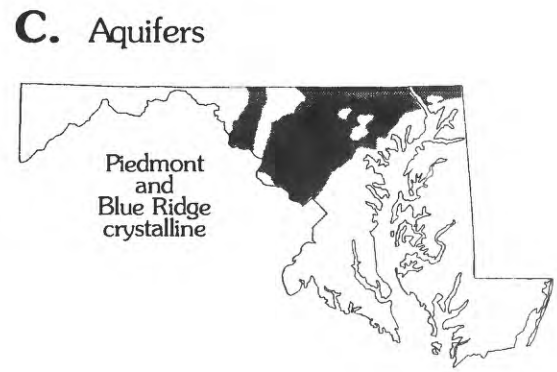
Domestic users in Maryland receive water from public-supply systems and from self-supplied sources (tables 5a and 5b). During 1992, total use (withdrawals plus deliveries) was 478 Mgal/d, of which 407 Mgal/d was delivered by public suppliers. Seventeen percent of the total population (848,000 people) withdrew about 70.4 Mgal/d from privately owned wells (self-supplied). Domestic water use increased during 1993 to 491 Mgal/d, of which 419 Mgal/d was delivered by public suppliers. As in 1992, 17 percent of the total population (857,000 people) withdrew about 71.6 Mgal/d from self-supplied sources. All self-supplied water withdrawn for domestic use was assumed to be from ground water.

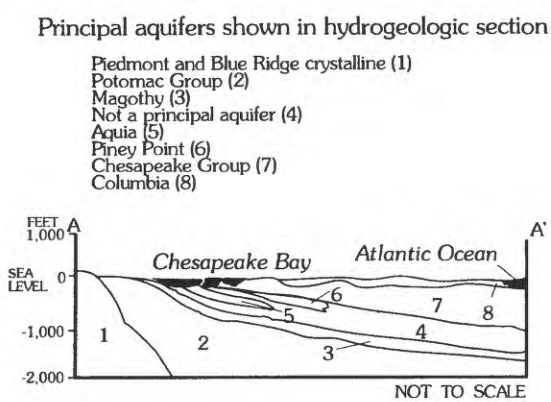
Commercial

Commercial users, including educational institutions and military installations, receive water from public-supply systems and from privately owned wells. Total commercial use during 1992 was 112 Mgal/d (table 6a), of which about 88 Mgal/d (79 percent) was provided by public suppliers and about 23.8 Mgal/d (21 percent) was self-supplied. During 1993, total commercial use increased to 114 Mgal/d (table 6b), of which about 89.3 Mgal/d (78 percent) was provided by public suppliers and about 24.8 Mgal/d (22 percent) was self-supplied.









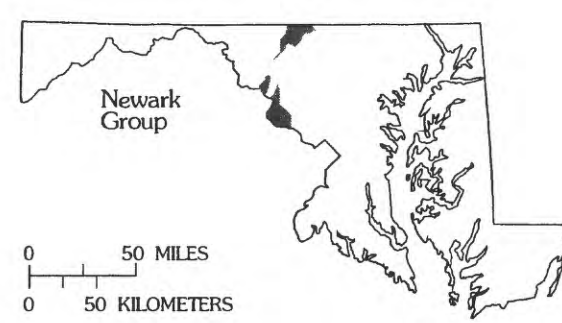


Figure 6. Ground-water withdrawals in Maryland, by principal aquifers, 1992-93. **A.** Withdrawals by aquifer. **B.** Trace of generalized hydrogeologic section (A-A'). **C.** Geographic distribution of use for principal aquifers. (Sources: A. Data compiled from Maryland Water Management Administration and U.S. Geological Survey files; B. U.S. Geological Survey; C. Modified from U.S. Geological Survey, 1990.)

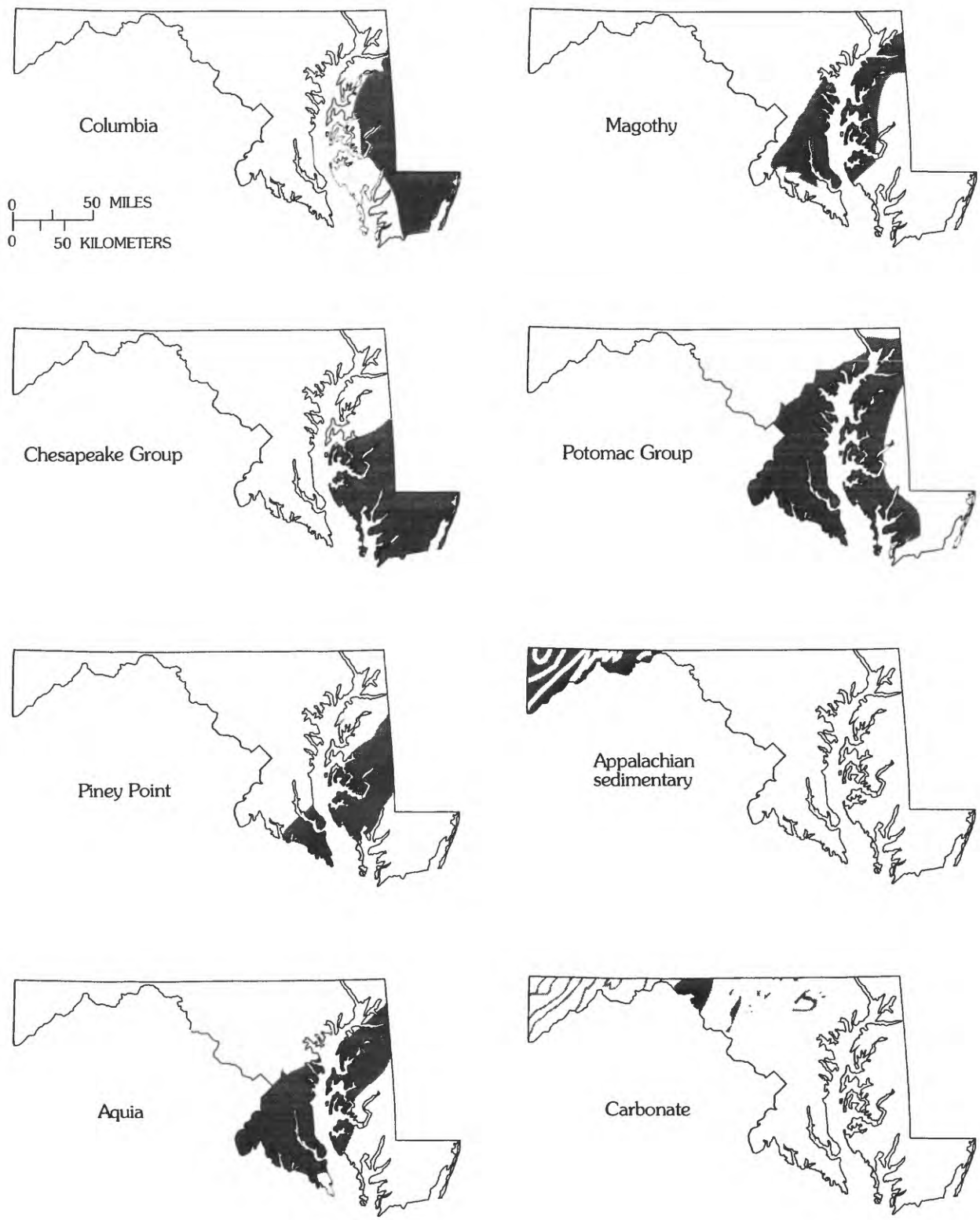


Figure 6. **C.** Geographic distribution of use for principal aquifers. --Continued

Table 2.--Population and water use in Maryland, 1992-93

[Population data rounded to three significant figures and may not add to totals because of independent rounding. Percentages rounded to two significant figures]

	1992	1993
Total population:	4,870,000	4,940,000
Population served by public-supply systems	4,020,000	4,080,000
Percentage of population served	83	83
Population served by self-supplied systems	848,000	857,000
Percentage of population self-supplied	17	17
Surface-water supply:		
Percentage of total population served by surface water	69	69
Number served by public-supply systems	3,380,000	3,430,000
Percentage of total population	69	69
Number served by self-supplied systems	0	0
Percentage of total population	0	0
Ground-water supply:		
Percentage of total population served by ground water	31	31
Number served by public-supply systems	641,000	650,000
Percentage of total population	13	13
Number served by self-supplied systems	848,000	857,000
Percentage of total population	17	17

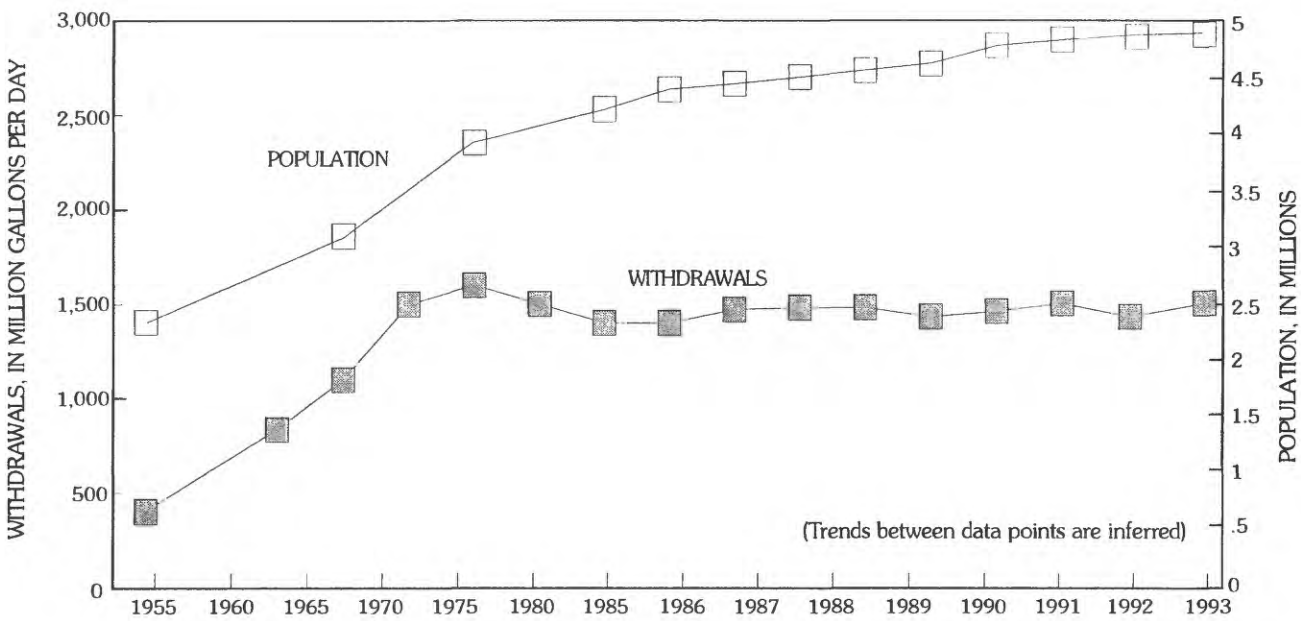


Figure 7. Population and freshwater withdrawals in Maryland, 1955-93.
(Sources: MacKichan, 1951; MacKichan and Kammerer, 1957; MacKichan and Kammerer, 1961; Murray, 1968; Murray and Reeves, 1972; Murray and Reeves, 1977; Solley and others, 1983; Solley and others, 1988; Solley and others, 1993; Maryland Water Management Administration water-use data base; and data compiled from the Maryland Department of State Planning.)

Industrial

Maryland is located within a regional manufacturing belt that extends along the eastern seaboard of the United States. Heavy and light industries are important to the State's economy. Heavy industries include steel, chemical and allied products, shipbuilding, petroleum refining, and truck assembly. Prominent light industries include food processing, printing, publishing, and clothing manufacturing. Water used by industries is from self-supplied and public-supply systems. Major water uses include washing and separation, cooling of industrial machinery, refrigeration, boiler make-up, product manufacturing, and dust control.

During 1992, about 120 Mgal/d of freshwater was used by industries in Maryland (table 7a). Of that amount, 71.5 Mgal/d or 60 percent was self-supplied and 48.4 Mgal/d (40 percent) was provided by public suppliers. Industries used less water during 1993, about 118 Mgal/d (table 7b), of which 69.3 Mgal/d (59 percent) was self-supplied and 49.1 Mgal/d (41 percent) was provided by public suppliers. Industries also used 275 Mgal/d during 1992 and 266 Mgal/d during 1993 of brackish or saline surface water.

Industries in Allegany County had the largest fresh surface-water withdrawals during both years (47.6 Mgal/d in 1992 and 45.01 Mgal/d in 1993). Baltimore County had the largest saline surface-water withdrawals--267.57 Mgal/d (1992) and 258.19 Mgal/d (1993), as well as the largest reclaimed wastewater use for the period. About 62.5 Mgal/d of reclaimed wastewater was used during 1992 (62 Mgal/d during 1993) in steel production primarily for two purposes. The first is noncontact cooling-- that is, the water is used for heat exchange such as in the cooling of machinery or furnace structures. The second is contact cooling and cleaning of steel in the production process. Some reclaimed wastewater is also treated then recycled. The largest ground-water withdrawals for industrial use for both years were in Baltimore City with 5.10 Mgal/d in 1992 and 5.49 Mgal/d in 1993.

Mining

Mining is a major economic activity in Maryland. The mineral resources extracted are those primarily used for building materials and fuels and include stone, sand, gravel, and bituminous coal. Water withdrawn in mining operations is primarily used for dewatering and washing. During 1992, 26.1 Mgal/d of freshwater was withdrawn for mining purposes (table 8a). Of that amount, 6.4 Mgal/d was from surface-water sources and 19.7 Mgal/d was from ground-water sources. An additional 1.03 Mgal/d of brackish or saline surface water was withdrawn, of which about 1.01 Mgal/d was for dredging operations. Total freshwater withdrawals for mining during 1993 were 33.5 Mgal/d (table 8b). Of that amount, 8.68 Mgal/d was from surface-water sources and 24.8 Mgal/d was from ground-water sources. Brackish or saline surface-water withdrawals decreased 66 percent in 1993 to 0.35 Mgal/d due mainly to reduced dredging operations.

Thermoelectric Power

Fourteen thermoelectric powerplants operate in Maryland; 13 are fossil-fueled and 1 is nuclear-fueled. The demand for electricity and consequently, the amount of water used by powerplants, is influenced by various economic, demographic and technological factors such as appliance holdings, weather, household size, income, and the price of electricity. In general, electricity demand is expected to increase in Maryland (Maryland Power Plant Research Program, 1993).

Freshwater use by powerplants during 1992 was 362 Mgal/d, of which about 360 Mgal/d was from surface-water sources and 1.58 Mgal/d was from ground-water sources (table 9a). In addition, 5,350 Mgal/d of saline surface water was used by the powerplants for cooling condensers, of which more than 98 percent was returned to the water source. During 1993, thermoelectric powerplants used about 360 Mgal/d of freshwater, of which about 359 Mgal/d was from surface-water sources and 1.64 Mgal/d was from ground-water sources (table 9b). Larger quantities of saline surface water (5,840 Mgal/d) were used for cooling condensers during 1993 than in 1992.

Hydroelectric Power

Water used for the generation of electricity by hydroelectric powerplants is discussed here but the quantities of water used are not included in the freshwater totals because this use is considered an "instream" water use--that is, water use takes place within the stream channel at the dam where turbine generators are driven by the falling water. Twelve plants are currently producing or are licensed to produce hydroelectric power in Maryland (Weisberg and Rose, 1985, p. 1), the largest of which is in Harford County.

During 1992, about 24,900 Mgal/d of freshwater passed through these plants for the production of electricity (table 10a); during 1993, the amount increased to 26,000 Mgal/d (table 10b). Although the amount of water diverted through some plants is considerable, **consumptive use** is negligible, because water is not withdrawn from the stream or incorporated into a product. Any consumption is by **evaporation** during the generation process and from storage reservoirs and this quantity is unknown.

Livestock

During 1992 and 1993, an estimated 11.3 Mgal/d of freshwater was used for livestock activities, mainly livestock watering and feedlot and dairy operations; 3.48 Mgal/d was from surface-water sources and 7.79 Mgal/d was from ground-water sources (table 11). The major types of livestock raised in Maryland are poultry, cattle, dairy cows, hogs, and sheep. The four counties (Dorchester, Somerset, Wicomico, and Worcester) of the lower Eastern Shore account for about 33 percent of total agricultural revenue in the State, because this area is one of the Nation's leading producers of broiler chickens (Maryland Department of Agriculture, 1994, p. 48).

Irrigation

The amount of water used for irrigation can vary greatly by year and among users during a particular year. In addition to differences in soils and rainfall distribution, other factors including type of crop or turf grown, timing and length of planting and growing seasons, and watering schedule affect the amount of water used for irrigation (Brodie and others, 1984, p. 7).

Freshwater use for irrigating farm crops; commercial, municipal, and institutional lawns and parks; golf courses; and nursery plants was about 47.6 Mgal/d during 1992 (table 12a). Of this amount, 37.9 Mgal/d was used for irrigating crops including corn, soybeans, tobacco, grains, tomatoes, and melons. In addition, 3.78 Mgal/d of brackish surface water was used for farm irrigation. Brackish water is too saline to be potable, but is less saline than seawater--that is, total dissolved solids (TDS) concentrations range from about 1,000 to 20,000 mg/L; the TDS concentrations in seawater are about 35,000 mg/L (Drever, 1982, p. 12).

About 69,600 acres of cropland in Maryland were irrigated during 1992, of which about 63,500 acres or 91 percent were in the eight counties east of Chesapeake Bay (fig. 1). During 1992, about 15.1 Mgal/d of fresh surface water was used to irrigate about 25,200 acres and 22.8 Mgal/d of ground water was used to irrigate about 38,100 acres.

During 1993, total freshwater used for irrigation increased to 69.4 Mgal/d (table 12b), of which 58.2 Mgal/d was used for irrigating farm crops. More land (71,500) was irrigated during 1993 than during 1992. About 22.9 Mgal/d of fresh surface water was used to irrigate about 25,700 acres and 35.2 Mgal/d of fresh ground water was used to irrigate about 39,500 acres. In addition, about 5.66 Mgal/d of brackish surface water was used for irrigating crops.

The county with the largest total irrigated acreage in the State was Caroline County--about 19,100 acres during both 1992 and 1993. The largest freshwater withdrawals for irrigation were in Dorchester County, with 10.28 Mgal/d during 1992 and 15.32 Mgal/d during 1993.

Aquaculture

Aquaculture, also known as fish farming or fish culture, is the controlled production of finfish, shellfish, and aquatic plants in fresh and saline water (Maryland Department of Agriculture, 1990). In Maryland, aquaculture includes production of ornamental fish, oysters, soft-shell crabs, crawfish, hybrid striped bass, catfish, tilapia, trout, aquatic plants, and other aquatic species such as perch and sturgeon.

During 1992, about 24 Mgal/d of freshwater was withdrawn for aquaculture in the State, of which 19.3 Mgal/d was from surface-water sources and 4.68 Mgal/d was from ground-water sources (table 13a). In addition, 12.9 Mgal/d of saline surface water was used for this purpose. Freshwater withdrawals for aquaculture increased during 1993 to 25.1 Mgal/d, of which 19.6 Mgal/d was from surface-water sources and 5.49 Mgal/d was from ground-water sources (table 13b). Use of saline surface water decreased slightly during 1993 to 12.5 Mgal/d.

SUMMARY

During 1992, about 1,430 Mgal/d of freshwater was withdrawn from surface-water and ground-water sources in Maryland, compared to about 1,480 Mgal/d withdrawn during 1993. About 1,190 Mgal/d (83 percent) during 1992 and 1,240 Mgal/d (84 percent) during 1993 were used in the State. About 236 Mgal/d (17 percent) during 1992 and 243 Mgal/d (16 percent) during 1993 were transferred to surrounding States and the District of Columbia for water supply. About 6.09 Mgal/d of freshwater during 1992 and 6.34 Mgal/d during 1993 were imported from bordering States for use in Maryland.

Over 80 percent of freshwater withdrawals (1,180 Mgal/d during 1992 and 1,200 Mgal/d during 1993) were from surface-water sources. The largest surface-water withdrawals, more than 100 Mgal/d, were in Montgomery and Baltimore Counties. The reservoirs and rivers in these counties provide water sources for public suppliers that serve the Baltimore City and District of Columbia metropolitan areas. Most fresh surface water (about 825 Mgal/d during 1992 and 825 Mgal/d during 1993 or nearly 70 percent of total surface-water withdrawals) was withdrawn for use from the Potomac drainage basin, whereas most ground water (about 178 Mgal/d during 1992 and 194 Mgal/d during 1993) was withdrawn for use from the Upper Chesapeake drainage basin. The Potomac Group aquifers were the largest source of ground water (25 percent of total ground-water withdrawals during 1992 and 23 percent during 1993).

The population of Maryland served by public water-supply systems increased slightly from 4.02 million during 1992 to 4.08 million during 1993. In addition, during the peak tourist season (from May to September), the Ocean City water-supply system served approximately 280,000 more individuals than the base population of about 15,000. During 1992 and 1993, surface water was used by about 69 percent of the State's population and ground water was used by the remaining 31 percent.

Ten water-use categories represent the major demands on the surface-water and ground-water resources of the State during 1992 and 1993: Public supply, domestic, commercial, industrial, mining, thermoelectric power, hydroelectric power, livestock, irrigation, and aquaculture. Freshwater withdrawals for public supply, self-supplied domestic use, aquaculture, and irrigation increased during 1992 and 1993, whereas withdrawals for commercial, industrial, thermoelectric power, and mining uses decreased.

Public-supply systems withdrew the largest quantity of water in the State with 790 Mgal/d during 1992 and 812 Mgal/d during 1993. This water was delivered for a variety of uses including domestic, commercial, and industrial uses. The largest user of surface water for public supply was Baltimore City. During 1992, about 126 Mgal/d was withdrawn for use by the City compared to about 129 Mgal/d during 1993.

Domestic water use increased from about 478 Mgal/d during 1992 to 491 Mgal/d during 1993.

About 407 Mgal/d during 1992 and 419 Mgal/d during 1993 were received from public suppliers and about 70.4 Mgal/d during 1992 and 71.6 Mgal/d during 1993 were self-supplied. All self-supplied domestic water withdrawals were from ground-water sources.

Total commercial use during 1992 was 112 Mgal/d, of which about 88 Mgal/d was provided by public suppliers and about 23.8 Mgal/d was self-supplied. During 1993, total commercial use increased to 114 Mgal/d, of which about 89.3 Mgal/d was provided by public suppliers and about 24.8 Mgal/d was self-supplied.

Fresh surface-water and ground-water use by industries decreased from 120 Mgal/d during 1992 to 118 Mgal/d during 1993. About 71.5 Mgal/d during 1992 and 69.3 Mgal/d during 1993 were self-supplied. The remaining water used was delivered by public suppliers. Industries also used saline surface water--275 Mgal/d during 1992 and 266 Mgal/d during 1993. About 62.5 Mgal/d of reclaimed wastewater was used for industrial purposes during 1992 (62 Mgal/d during 1993).

Fresh surface-water and ground-water use for mining increased from 26.1 Mgal/d during 1992 to 33.5 Mgal/d during 1993. About 1.03 Mgal/d during 1992 and 0.35 Mgal/d during 1993 of brackish or saline surface water were withdrawn, primarily for dredging operations.

Fresh surface-water and ground-water withdrawals for thermoelectric power decreased from 362 Mgal/d during 1992 to 360 Mgal/d during 1993. Larger quantities of saline surface water were used for cooling purposes during 1993 (5,840 Mgal/d) than during 1992 (5,710 Mgal/d).

Fresh surface-water use for hydroelectric power increased from 24,900 Mgal/d during 1992 to 26,100 Mgal/d during 1993. Although the amount of water diverted through some powerplants was considerable, the amount consumed was negligible.

Fresh surface-water and ground-water use for livestock was about 11.3 Mgal/d during each year of the 2-year period. About 3.48 Mgal/d was from surface-water sources and 7.79 Mgal/d was from ground-water sources.

Fresh surface-water and ground-water use for irrigation increased from 47.6 Mgal/d during 1992 to 69.4 Mgal/d during 1993. Most of the water (37.9 Mgal/d during 1992 and 58.2 Mgal/d during 1993) was used for irrigating farm crops.

Fresh surface-water and ground-water withdrawals for aquaculture increased from 24 Mgal/d during 1992 to 25.1 Mgal/d during 1993. Saline surface-water withdrawals for aquaculture decreased from 12.9 Mgal/d during 1992 to 12.5 Mgal/d during 1993.

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APPENDIX

WATER-WITHDRAWAL AND USE DATA FOR MARYLAND, 1992-93

Table 3a.--Total water withdrawals (excluding hydroelectric power) in Maryland, by county, 1992

[State totals rounded to three significant figures. (Sources: Withdrawals, data compiled from Maryland Water Management Administration and U.S. Geological Survey site-specific data bases, and the University of Maryland Cooperative Extension Service; Population projections, data compiled from Maryland Office of Planning, 1994)]

County or city	Population, in thousands	Water withdrawals, in million gallons per day									
		Source									
		Surface water			Ground water				Total excluding reclaimed wastewater		
		Fresh	Saline	Total	Fresh	Saline	Total	Reclaimed wastewater	Fresh	Saline	Total
Allegany	75.05	48.35	0.00	48.35	1.75	0.00	1.75	0.00	50.10	0.00	50.10
Anne Arundel	436.16	4.16	682.52	686.68	44.27	.00	44.27	.00	48.43	682.52	730.95
Baltimore	697.09	263.94	644.47	908.41	11.23	.00	11.23	62.50	275.17	644.47	919.64
Calvert	55.26	.34	2,812.35	2,812.69	5.51	.00	5.51	.00	5.85	2,812.35	2,818.20
Caroline	27.55	4.37	.00	4.37	10.07	.00	10.07	.00	14.44	.00	14.44
Carroll	131.30	4.34	.00	4.34	10.82	.00	10.82	.04	15.16	.00	15.16
Cecil	74.12	3.43	.00	3.43	6.32	.00	6.32	.00	9.75	.00	9.75
Charles	107.61	.60	818.71	819.31	11.56	.00	11.56	.00	12.16	818.71	830.87
Dorchester	30.32	2.62	1.05	3.67	13.92	.00	13.92	.00	16.54	1.05	17.59
Frederick	158.44	26.93	.00	26.93	17.71	.00	17.71	.00	44.64	.00	44.64
Garrett	28.50	10.24	.00	10.24	10.71	.00	10.71	.00	20.95	.00	20.95
Harford	188.36	9.35	.00	9.35	11.96	.00	11.96	.00	21.31	.00	21.31
Howard	197.97	.60	.00	.60	2.90	.00	2.90	.00	3.50	.00	3.50
Kent	17.91	.75	.00	.75	5.58	.00	5.58	.00	6.33	.00	6.33
Montgomery	770.22	689.51	.00	689.51	4.48	.00	4.48	.00	693.99	.00	693.99
Prince Georges	741.24	50.53	589.50	640.03	6.76	.00	6.76	.00	57.29	589.50	646.79
Queen Annes	35.98	3.05	.00	3.05	8.47	.00	8.47	.00	11.52	.00	11.52
St. Marys	78.32	.75	.00	.75	8.53	.00	8.53	.00	9.28	.00	9.28
Somerset	24.04	.21	.96	1.17	4.72	.00	4.72	.00	4.93	.96	5.89
Talbot	31.13	.68	.01	.69	5.82	.00	5.82	.00	6.50	.01	6.51
Washington	122.28	51.30	.00	51.30	10.42	.00	10.42	.00	61.72	.00	61.72
Wicomico	75.89	.77	.00	.77	16.94	.00	16.94	.00	17.71	.00	17.71
Worcester	36.44	1.08	.00	1.08	12.72	.00	12.72	.00	13.80	.00	13.80
Baltimore City	730.04	.02	79.00	79.02	5.32	.00	5.32	.00	5.34	79.00	84.34
State Total	4,870	1,180	5,630	6,810	248	0.00	248	62.5	1,430	5,630	7,060

Table 3b.--Total water withdrawals (excluding hydroelectric power) in Maryland, by county, 1993

[State totals rounded to three significant figures. (Sources: Withdrawals, data compiled from Maryland Water Management Administration and U.S. Geological Survey site-specific data bases, and the University of Maryland Cooperative Extension Service; Population projections, data compiled from Maryland Office of Planning, 1994)]

		Water withdrawals, in million gallons per day									
		Source									
		Surface water			Ground water				Total excluding reclaimed wastewater		
County or city	Population, in thousands	Fresh	Saline	Total	Fresh	Saline	Total	Reclaimed wastewater	Fresh	Saline	Total
Allegany	75.16	45.73	0.00	45.73	1.74	0.00	1.74	0.00	47.47	0.00	47.47
Anne Arundel	439.52	4.37	888.25	892.62	45.48	.00	45.48	.00	49.85	888.25	938.10
Baltimore	698.53	272.48	705.16	977.64	11.56	.00	11.56	62.00	284.04	705.16	989.20
Calvert	58.47	.48	2,950.76	2,951.24	6.15	.00	6.15	.00	6.63	2,950.76	2,957.39
Caroline	28.03	6.36	.00	6.36	12.70	.00	12.70	.00	19.06	.00	19.06
Carroll	130.11	4.75	.00	4.75	11.04	.00	11.04	.04	15.79	.00	15.79
Cecil	74.86	3.52	.00	3.52	6.60	.00	6.60	.00	10.12	.00	10.12
Charles	111.38	.85	964.56	966.49	12.20	.00	12.20	.00	13.05	965.64	978.69
Dorchester	30.57	3.46	1.07	4.53	18.46	.00	18.46	.00	21.92	1.07	22.99
Frederick	166.76	30.93	.00	30.93	23.55	.00	23.55	.00	54.48	.00	54.48
Garrett	28.66	9.53	.00	9.53	10.22	.00	10.22	.00	19.75	.00	19.75
Harford	198.31	10.99	.00	10.99	11.88	.00	11.88	.00	22.87	.00	22.87
Howard	204.25	.74	.00	.74	2.92	.00	2.92	.00	3.66	.00	3.66
Kent	18.12	.63	.00	.63	7.05	.00	7.05	.00	7.68	.00	7.68
Montgomery	776.81	698.70	.00	698.70	4.54	.00	4.54	.00	703.24	.00	703.24
Prince Georges	755.33	59.95	498.20	558.15	6.71	.00	6.71	.00	66.66	498.20	564.86
Queen Annes	36.62	4.64	.00	4.64	9.76	.00	9.76	.00	14.40	.00	14.40
St. Marys	81.09	.93	.00	.93	9.05	.00	9.05	.00	9.98	.00	9.98
Somerset	24.19	.30	.96	1.26	5.31	.00	5.31	.00	5.61	.96	6.57
Talbot	31.48	1.01	.01	1.02	6.27	.00	6.27	.00	7.28	.01	7.29
Washington	124.76	41.28	.00	41.28	11.14	.00	11.14	.00	27.22	.00	52.42
Wicomico	76.78	1.65	.00	1.65	19.00	.00	19.00	.00	20.65	.00	20.65
Worcester	36.63	1.46	.00	1.46	13.34	.00	13.34	.00	14.80	.00	14.80
Baltimore City	728.87	.02	98.64	98.66	5.55	.00	5.55	.00	5.57	98.64	104.21
State Total	4,940	1,200	6,110	7,310	272	0.00	272	62.00	1,480	6,110	7,590

Table 4a.--Public-supply water withdrawals and deliveries in Maryland, by county, 1992

[State totals rounded to three significant figures. (Sources: Withdrawals, data compiled from Maryland Water Management Administration and U.S. Geological Survey site-specific data bases; Population projections, data compiled from Maryland Office of Planning, 1994)]

County or city	Population served, in thousands			Water withdrawals, in million gallons per day			Water deliveries, by type of use, in million gallons per day		
	Source			Source					
	Surface water	Ground water	Total	Surface water	Ground water	Total	Domestic	Commercial	Industrial
Allegany	58.73	2.03	60.76	0.53	0.36	0.89	5.97	0.82	1.39
Anne Arundel	82.87	241.44	324.31	2.36	27.77	30.13	30.96	5.66	1.14
Baltimore	652.41	1.74	654.15	262.48	.08	262.56	64.48	13.82	13.82
Calvert	.00	14.46	14.46	.00	1.46	1.46	1.32	.14	.00
Caroline	.00	9.92	9.92	.00	1.29	1.29	1.16	.07	.06
Carroll	34.93	15.39	50.32	3.17	2.04	5.21	5.34	1.00	.33
Cecil	15.89	16.80	32.69	1.94	1.34	3.28	2.72	.20	.36
Charles	.00	69.84	69.84	.00	6.46	6.46	5.82	.64	.00
Dorchester	.00	18.97	18.97	.00	2.75	2.75	1.65	.41	.69
Frederick	61.97	17.31	79.28	10.85	2.23	13.08	7.90	3.29	1.97
Garrett	3.12	4.38	7.50	2.19	.75	2.94	.83	.11	.09
Harford	68.79	50.72	119.51	5.71	4.84	10.55	8.96	1.27	.32
Howard	168.27	.00	168.27	.00	.00	.00	18.27	3.30	.44
Kent	.00	8.02	8.02	.00	1.21	1.21	.97	.12	.12
Montgomery	732.33	4.00	736.33	363.91	.44	364.35	69.75	20.19	1.83
Prince Georges	692.82	32.00	724.82	48.57	2.71	51.28	73.44	8.54	3.42
Queen Annes	.00	5.76	5.76	.00	.67	.67	.54	.07	.06
St. Marys	.00	28.98	28.98	.00	2.96	2.96	2.68	.28	.00
Somerset	.00	10.10	10.10	.00	1.50	1.50	1.35	.08	.07
Talbot	.00	14.69	14.96	.00	2.23	2.23	1.90	.22	.11
Washington	80.22	8.32	88.54	10.84	1.20	12.04	8.63	1.15	1.72
Wicomico	.00	36.43	36.43	.00	5.90	5.90	4.41	.60	1.15
Worcester	.00	29.30	29.30	.00	7.38	7.38	6.28	.73	.37
Baltimore City	730.04	.00	730.04	.00	.00	.00	82.04	25.24	18.93
State Total	3,380	641	4,020	713	77.6	790	407	88.0	48.4

Table 4b.--Public-supply water withdrawals and deliveries in Maryland, by county, 1993

[State totals rounded to three significant figures. (Sources: Withdrawals, data compiled from Maryland Water Management Administration and U.S. Geological Survey site-specific data bases; Population projections, data compiled from Maryland Office of Planning, 1994)]

County or city	Population served, in thousands			Water withdrawals, in million gallons per day			Water deliveries, by type of use, in million gallons per day		
	Source			Source					
	Surface water	Ground water	Total	Surface water	Ground water	Total	Domestic	Commercial	Industrial
Allegany	58.82	2.03	60.85	0.52	0.34	0.86	6.19	0.85	1.44
Anne Arundel	83.51	241.74	325.25	2.79	28.51	31.30	33.04	6.05	1.21
Baltimore	655.50	1.75	657.25	270.72	.09	270.81	66.98	14.35	14.36
Calvert	.00	14.50	14.50	.00	1.75	1.75	1.57	.18	.00
Caroline	.00	9.92	9.92	.00	1.20	1.20	1.08	.06	.06
Carroll	35.94	17.93	52.87	3.40	1.89	5.29	5.48	1.03	.33
Cecil	15.59	15.54	31.13	2.12	1.37	3.49	2.90	.21	.38
Charles	.00	70.17	70.17	.00	6.67	6.67	6.01	.66	.00
Dorchester	.00	17.95	17.95	.00	2.99	2.99	1.80	.44	.75
Frederick	65.04	18.34	83.38	11.24	2.61	13.85	8.41	3.51	2.10
Garrett	4.80	4.54	9.34	2.19	.87	3.06	.92	.12	.09
Harford	72.38	53.54	125.92	6.12	4.22	10.34	8.79	1.24	.31
Howard	174.67	.00	174.67	.00	.00	.00	18.32	3.31	.44
Kent	.00	8.10	8.10	.00	1.17	1.17	.94	.12	.11
Montgomery	744.18	5.00	749.18	363.78	.42	364.20	65.68	18.76	2.05
Prince Georges	708.66	32.32	740.98	58.02	2.81	60.83	81.18	9.43	3.77
Queen Annes	.00	6.15	6.15	.00	.73	.73	.59	.07	.07
St. Marys	.00	30.00	30.00	.00	3.40	3.40	3.07	.33	.00
Somerset	.00	10.16	10.16	.00	1.55	1.55	1.40	.08	.07
Talbot	.00	15.21	15.21	.00	2.29	2.29	1.95	.23	.11
Washington	81.84	8.48	90.32	10.73	1.26	11.99	8.54	1.14	1.70
Wicomico	.00	36.70	36.70	.00	6.18	6.18	4.54	.63	1.29
Worcester	.00	29.45	29.45	.00	7.66	7.66	6.51	.77	.38
Baltimore City	728.87	.00	728.87	.00	.00	.00	83.60	25.72	19.30
State Total	3,430	650	4,080	732	80.0	812	419	89.3	49.1

Table 5a.--Domestic water withdrawals (self-supplied) and deliveries from public suppliers in Maryland, by county, 1992

[State totals rounded to three significant figures. (Sources: Withdrawals, estimated using population projection data compiled from Maryland Office of Planning, 1994, using per capita use of 80 gallons per day; Population projections, data compiled from Maryland Office of Planning, 1994)]

County or city	Self-supplied		Public-supplied		Total
	Population, in thousands	Ground-water withdrawals, in million gallons per day	Population served, in thousands	Water deliveries, in million gallons per day	Withdrawals and deliveries, in million gallons per day
Allegany	14.29	1.15	60.76	5.97	7.12
Anne Arundel	111.85	9.71	324.31	30.96	40.67
Baltimore	42.94	3.47	654.15	64.48	67.95
Calvert	40.80	3.36	14.46	1.32	4.68
Caroline	17.63	1.46	9.92	1.16	2.62
Carroll	80.98	6.53	50.32	5.34	11.87
Cecil	41.43	3.34	32.69	2.72	6.06
Charles	37.77	3.04	69.84	5.82	8.86
Dorchester	11.35	.94	18.97	1.65	2.59
Frederick	79.16	6.40	79.28	7.90	14.30
Garrett	21.00	1.68	7.50	.83	2.51
Harford	68.85	5.59	119.51	8.96	14.55
Howard	29.70	2.42	168.27	18.27	20.69
Kent	9.89	.82	8.02	.97	1.79
Montgomery	33.89	3.02	736.33	69.75	72.77
Prince Georges	16.42	1.34	724.82	73.44	74.48
Queen Annes	30.22	2.45	5.76	.54	2.99
St. Marys	49.34	4.03	28.98	2.68	6.71
Somerset	13.94	1.13	10.10	1.35	2.48
Talbot	16.17	1.42	14.96	1.90	3.32
Washington	33.74	2.72	88.54	8.63	11.35
Wicomico	39.46	3.62	36.43	4.41	8.03
Worcester	7.14	.76	29.30	6.28	7.04
Baltimore City	.00	.00	730.04	82.04	82.04
State Total	848	70.4	4,020	407	478

Table 5b.--Domestic water withdrawals (self-supplied) and deliveries from public suppliers in Maryland, by county, 1993

[State totals rounded to three significant figures. (Sources: Withdrawals, estimated using population projection data compiled from Maryland Office of Planning, 1994, using per capita use of 80 gallons per day; Population projections, data compiled from Maryland Office of Planning, 1994)]

County or city	Self-supplied		Public-supplied		Total
	Population, in thousands	Ground-water withdrawals, in million gallons per day	Population served, in thousands	Water deliveries, in million gallons per day	Withdrawals and deliveries, in million gallons per day
Allegany	14.31	1.15	60.85	6.19	7.34
Anne Arundel	114.27	9.84	325.25	33.04	42.88
Baltimore	41.28	3.48	657.25	66.98	70.46
Calvert	43.97	3.62	14.50	1.57	5.19
Caroline	18.11	1.50	9.92	1.08	2.58
Carroll	77.24	6.23	52.87	5.48	11.71
Cecil	43.73	3.51	31.13	2.90	6.41
Charles	41.21	3.32	70.17	6.01	9.33
Dorchester	12.62	1.06	17.95	1.80	2.86
Frederick	83.38	6.74	83.38	8.41	15.15
Garrett	19.32	1.55	9.34	.92	2.47
Harford	72.39	5.88	125.92	8.79	14.67
Howard	29.38	2.40	174.67	18.32	20.72
Kent	10.02	.83	8.10	.94	1.77
Montgomery	27.63	2.92	749.18	65.68	68.60
Prince Georges	14.35	1.17	740.98	81.18	82.35
Queen Annes	30.47	2.47	6.15	.59	3.06
St Marys	51.09	4.17	30.00	3.07	7.24
Somerset	14.03	1.14	10.16	1.40	2.54
Talbot	16.27	1.43	15.21	1.95	3.38
Washington	34.44	2.77	90.32	8.54	11.31
Wicomico	40.08	3.66	36.70	4.54	8.20
Worcester	7.18	.76	29.45	6.51	7.27
Baltimore City	.00	.00	728.87	83.60	83.60
State Total	857	71.6	4,080	419	491

Table 6a.--Commercial freshwater withdrawals (self-supplied) and deliveries from public suppliers in Maryland, by county, 1992

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Self-supplied			Public-supplied	Total
	Water withdrawals, in million gallons per day				
	Source				
	Surface water	Ground water	Total	Water deliveries, in million gallons per day	Withdrawals and deliveries, in million gallons per day
Allegany	0.04	0.15	0.19	0.82	1.01
Anne Arundel	.08	4.07	4.15	5.66	9.81
Baltimore	.05	.68	.73	13.82	14.55
Calvert	.01	.39	.40	.14	.54
Caroline	.00	.18	.18	.07	.25
Carroll	.45	.36	.81	1.00	1.81
Cecil	.37	.56	.93	.20	1.13
Charles	.00	1.38	1.38	.64	2.02
Dorchester	.01	.25	.26	.41	.67
Frederick	.04	.58	.62	3.29	3.91
Garrett	3.54	.71	4.25	.11	4.36
Harford	2.80	.49	3.29	1.27	4.56
Howard	.04	.28	.32	3.30	3.62
Kent	.00	.15	.15	.12	.27
Montgomery	.01	.46	.47	20.19	20.66
Prince Georges	.12	1.35	1.47	8.54	10.01
Queen Annes	.01	.58	.59	.07	.66
St. Marys	.01	1.38	1.39	.28	1.67
Somerset	.00	.46	.46	.08	.54
Talbot	.00	.37	.37	.22	.59
Washington	.10	.23	.33	1.15	1.48
Wicomico	.00	.52	.52	.60	1.12
Worcester	.00	.49	.49	.73	1.22
Baltimore City	.01	.03	.04	27.04	25.28
State Total	7.69	16.1	23.8	88.0	112

Table 6b.--Commercial freshwater withdrawals (self-supplied) and deliveries from public suppliers in Maryland, by county, 1993

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Self-supplied			Public-supplied	Total
	Water withdrawals, in million gallons per day				
	Source				
	Surface water	Ground water	Total	Water deliveries, in million gallons per day	Withdrawals and deliveries, in million gallons per day
Allegany	0.02	0.16	0.18	0.85	1.03
Anne Arundel	.00	4.05	4.05	6.05	10.10
Baltimore	.05	.69	.74	14.36	15.10
Calvert	.00	.43	.43	.18	.61
Caroline	.00	.17	.17	.06	.23
Carroll	.49	.37	.86	1.03	1.89
Cecil	.42	.58	1.00	.21	1.21
Charles	.00	1.42	1.42	.66	2.08
Dorchester	.01	.31	.32	.44	.76
Frederick	.05	.53	.58	3.51	4.09
Garrett	3.52	.70	4.22	.12	4.34
Harford	3.74	.47	4.21	1.24	5.45
Howard	.06	.28	.34	3.31	3.65
Kent	.00	.16	.16	.12	.28
Montgomery	.01	.44	.45	18.76	19.21
Prince Georges	.11	1.31	1.42	9.43	10.85
Queen Annes	.01	.56	.57	.07	.64
St. Marys	.01	1.30	1.31	.33	1.64
Somerset	.00	.63	.63	.08	.71
Talbot	.00	.36	.36	.23	.59
Washington	.10	.23	.33	1.14	1.47
Wicomico	.00	.52	.52	.63	1.15
Worcester	.00	.49	.49	.77	1.26
Baltimore City	.01	.00	.00	25.72	25.77
State Total	8.61	16.2	24.8	89.3	114

Table 7a.--Industrial water withdrawals (self-supplied) and deliveries from public suppliers in Maryland, by county, 1992

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Self-supplied withdrawals, in million gallons per day								Public-supplied deliveries of freshwater, in million gallons per day	Total withdrawals and deliveries of freshwater, in million gallons per day
	Source									
	Surface water		Ground water		Reclaimed wastewater	Total, excluding reclaimed wastewater				
	Fresh	Saline	Fresh	Saline		Fresh	Saline	Total		
Allegany	47.60	0.00	0.04	0.00	0.00	47.64	0.00	47.64	1.39	49.03
Anne Arundel	.02	.01	2.28	.00	.00	2.3	.01	2.31	1.14	3.44
Baltimore	.00	267.57	2.86	.00	62.50	2.86	267.57	270.43	13.82	16.68
Calvert	.00	.00	.02	.00	.00	.02	.00	.02	.00	.02
Caroline	.00	.00	.60	.00	.00	.60	.00	.60	.06	.66
Carroll	.00	.00	.12	.00	.04	.12	.00	.12	.33	.45
Cecil	.01	.00	.07	.00	.00	.08	.00	.08	.36	.44
Charles	.00	.00	.02	.00	.00	.02	.00	.02	.00	.02
Dorchester	.06	.00	.94	.00	.00	1.00	.00	1.00	.69	1.69
Frederick	.00	.00	2.41	.00	.00	2.41	.00	2.41	1.97	4.38
Garrett	.00	.00	.06	.00	.00	.06	.00	.06	.09	.15
Harford	.02	.00	.39	.00	.00	.41	.00	.41	.32	.73
Howard	.25	.00	.03	.00	.00	.28	.00	.28	.44	.72
Kent	.00	.00	.44	.00	.00	.44	.00	.44	.12	.56
Montgomery	.00	.00	.05	.00	.00	.05	.00	.05	1.83	1.88
Prince Georges	.00	.00	.02	.00	.00	.02	.00	.02	3.42	3.44
Queen Annes	.00	.00	.30	.00	.00	.30	.00	.30	.06	.36
St. Marys	.01	.00	.02	.00	.00	.03	.00	.03	.00	.03
Somerset	.00	.96	.08	.00	.00	.08	.96	1.04	.07	.15
Talbot	.00	.00	.70	.00	.00	.70	.00	.70	.11	.81
Washington	2.17	.00	.16	.00	.00	2.33	.00	2.33	1.72	4.05
Wicomico	.00	.00	2.69	.00	.00	2.69	.00	2.69	1.15	3.84
Worcester	.00	.00	1.94	.00	.00	1.94	.00	1.94	.37	2.31
Baltimore City	.00	6.12	5.10	.00	.00	5.10	6.12	11.22	18.93	24.03
State Total	50.1	275	21.3	0.00	62.5	71.5	275	346	48.4	120

Table 7b.--Industrial water withdrawals (self-supplied) and deliveries from public suppliers in Maryland, by county, 1993

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Self-supplied withdrawals, in million gallons per day								Public-supplied deliveries of freshwater, in million gallons per day	Total withdrawals and deliveries of freshwater, in million gallons per day
	Source									
	Surface water		Ground water			Total, excluding reclaimed wastewater				
	Fresh	Saline	Fresh	Saline	Reclaimed wastewater	Fresh	Saline	Total		
Allegany	45.01	0.00	0.04	0.00	0.00	45.05	0.00	45.05	1.44	46.49
Anne Arundel	.03	.01	2.57	.00	.00	2.60	.01	2.61	1.21	3.81
Baltimore	.00	258.19	3.23	.00	62.00	3.23	258.19	261.42	14.35	17.58
Calvert	.00	.00	.02	.00	.00	.02	.00	.02	.00	.02
Caroline	.00	.00	.56	.00	.00	.56	.00	.56	.06	.62
Carroll	.00	.00	.12	.00	.04	.12	.00	.12	.33	.45
Cecil	.01	.00	.06	.00	.00	.07	.00	.07	.38	.45
Charles	.00	.00	.02	.00	.00	.02	.00	.02	.00	.02
Dorchester	.06	.00	.86	.00	.00	.92	.00	.92	.75	1.67
Frederick	.08	.00	2.23	.00	.00	2.23	.00	2.23	2.10	4.33
Garrett	.00	.00	.10	.00	.00	.10	.00	.10	.09	.19
Harford	.02	.00	.45	.00	.00	.47	.00	.47	.31	.78
Howard	.31	.00	.03	.00	.00	.34	.00	.34	.44	.78
Kent	.00	.00	.51	.00	.00	.51	.00	.51	.11	.62
Montgomery	.00	.00	.05	.00	.00	.05	.00	.05	.85	.90
Prince Georges	.00	.00	.02	.00	.00	.02	.00	.02	3.77	3.79
Queen Annes	.00	.00	.29	.00	.00	.29	.00	.29	.07	.36
St. Marys	.01	.00	.02	.00	.00	.03	.00	.03	.00	.03
Somerset	.00	.96	.08	.00	.00	.08	.96	1.04	.07	.15
Talbot	.00	.00	.86	.00	.00	.86	.00	.86	.11	.97
Washington	2.17	.00	.24	.00	.00	.24	.00	.24	1.70	1.94
Wicomico	.00	.00	1.89	.00	.00	1.89	.00	1.89	1.29	3.18
Worcester	.00	.00	1.98	.00	.00	1.98	.00	1.98	.38	2.36
Baltimore City	.00	6.76	5.49	.00	.00	5.49	6.76	12.25	19.30	24.79
State Total	47.6	266	21.7	0.00	62.0	69.3	266	335	49.1	118

Table 8a.--Mining water withdrawals in Maryland, by county, 1992

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Water withdrawals, in million gallons per day								
	Source								
	Surface water			Ground water			Total		
	Fresh	Saline	Total	Fresh	Saline	Total	Fresh	Saline	Total
Allegany	0.02	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.02
Anne Arundel	.84	.00	.84	.05	.00	.05	.89	.00	.89
Baltimore	.15	1.01	1.16	3.76	.00	3.76	3.91	1.01	4.92
Calvert	.00	.00	.00	.00	.00	.00	.00	.00	.00
Caroline	.01	.00	.01	.03	.00	.03	.04	.00	.04
Carroll	.00	.00	.00	1.18	.00	1.18	1.18	.00	1.18
Cecil	.64	.00	.64	.27	.00	.27	.91	.00	.91
Charles	.09		.09	.01	.00	.01	.10	.13	.10
Dorchester	.85	.00	.85	.01	.00	.01	.86	.00	.86
Frederick	.04	.00	.04	4.74	.00	4.74	4.78	.00	4.78
Garrett	2.01	.00	2.01	7.29	.00	7.29	9.30	.00	9.30
Harford	.06	.00	.06	.29	.00	.29	.35	.00	.35
Howard	.00	.00	.00	.00	.00	.00	.00	.00	.00
Kent	.00	.00	.00	.00	.00	.00	.00	.00	.00
Montgomery	.00	.00	.00	.03	.00	.03	.03	.00	.03
Prince Georges	1.36	.00	1.36	.35	.00	.35	1.71	.00	1.71
Queen Annes	.00	.00	.00	.01	.00	.01	.01	.00	.01
St. Marys	.29	.00	.29	.02	.00	.02	.31	.00	.31
Somerset	.00	.00	.00	.01	.00	.01	.01	.00	.01
Talbot	.00	.01	.01	.02	.00	.02	.02	.01	.03
Washington	.01	.00	.01	1.22	.00	1.22	1.23	.00	1.23
Wicomico	.01	.00	.03	.00	.00	.00	.03	.00	.03
Worcester	.00	.00	.00	.18	.00	.18	.18	.00	.18
Baltimore City	.00	.01	.01	.19	.00	.19	.19	.01	.20
State Total	6.40	1.03	7.43	19.7	0.00	19.7	26.01	1.03	27.1

Table 8b.--Mining water withdrawals in Maryland, by county, 1993

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Water withdrawals, in million gallons per day								
	Source								
	Surface water			Ground water			Total		
	Fresh	Saline	Total	Fresh	Saline	Total	Fresh	Saline	Total
Allegany	0.02	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.02
Anne Arundel	.74	.00	.74	.06	.00	.06	.80	.00	.80
Baltimore	.20	.33	.53	3.64	.00	3.64	3.84	.33	4.17
Calvert	.00	.00	.00	.00	.00	.00	.00	.00	.00
Caroline	.00	.00	.00	.03	.00	.03	.04	.00	.04
Carroll	.00	.00	.00	1.84	.00	1.84	1.84	.00	1.84
Cecil	.33	.00	.33	.32	.00	.32	.65	.00	.65
Charles	.10	.08	.10	.02	.00	.02	.12	.00	.12
Dorchester	.85	.00	.85	.01	.00	.01	.86	.00	.86
Frederick	3.34	.00	3.34	9.86	.00	9.86	13.20	.00	13.20
Garrett	1.04	.00	1.04	6.76	.00	6.76	7.80	.00	7.80
Harford	.19	.00	.19	.46	.00	.46	.65	.00	.65
Howard	.00	.00	.00	.00	.00	.00	.00	.00	.00
Kent	.00	.00	.00	.00	.00	.00	.00	.00	.00
Montgomery	.20	.00	.20	.03	.00	.03	.23	.00	.23
Prince Georges	1.29	.00	1.29	.37	.00	.37	1.66	.00	1.66
Queen Annes	.00	.00	.00	.01	.00	.01	.01	.00	.01
St. Marys	.28	.00	.28	.02	.00	.02	.30	.00	.30
Somerset	.00	.00	.00	.01	.00	.01	.01	.00	.01
Talbot	.01	.01	.02	.02	.00	.02	.03	.01	.04
Washington	.06	.00	.06	1.18	.00	1.18	1.24	.00	1.24
Wicomico	.02	.00	.02	.00	.00	.00	.02	.00	.02
Worcester	.00	.00	.00	.12	.00	.12	.12	.00	.12
Baltimore City	.00	.01	.01	.02	.00	.02	.02	.01	.03
State Total	8.68	0.35	9.03	24.8	0.00	24.8	33.5	0.35	33.8

Table 9a.--Thermoelectric-power water withdrawals in Maryland, by county, 1992

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Water withdrawals, in million gallons per day				
	Source				
	Surface Water			Fresh ground water	Total freshwater withdrawals
	Fresh	Saline	Total		
Allegany	0.00	0.00	0.00	0.00	0.00
Anne Arundel	.00	682.51	682.51	.00	.00
Baltimore	.00	375.89	375.89	.00	.00
Calvert	.00	2,812.35	2,812.35	.15	.15
Caroline	.00	.00	.00	.00	.00
Carroll	.00	.00	.00	.00	.00
Cecil	.00	.00	.00	.00	.00
Charles	.00	818.71	818.71	.58	.58
Dorchester	.00	1.05	1.05	.04	.04
Frederick	.00	.00	.00	.00	.00
Garrett	.00	.00	.00	.00	.00
Harford	.00	.00	.00	.00	.00
Howard	.00	.00	.00	.00	.00
Kent	.00	.00	.00	.00	.00
Montgomery	324.88	.00	324.88	.03	324.91
Prince Georges	.00	589.50	589.50	.78	.78
Queen Annes	.00	.00	.00	.00	.00
St. Marys	.00	.00	.00	.00	.00
Somerset	.00	.00	.00	.00	.00
Talbot	.00	.00	.00	.00	.00
Washington	35.26	.00	35.26	.00	35.26
Wicomico	.00	.00	.00	.00	.00
Worcester	.00	.00	.00	.00	.00
Baltimore City	.00	72.87	72.87	.00	.00
State Total	360	5,350	5,710	1.58	362

Table 9b.--Thermoelectric-power water withdrawals in Maryland, by county, 1993

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Water withdrawals, in million gallons per day				
	Source				
	Surface Water			Fresh ground water	Total freshwater withdrawals
	Fresh	Saline	Total		
Allegany	0.00	0.00	0.00	0.00	0.00
Anne Arundel	.00	888.24	888.24	.00	.00
Baltimore	.00	446.64	446.64	.00	.00
Calvert	.00	2,950.76	2,950.76	.18	.18
Caroline	.00	.00	.00	.00	.00
Carroll	.00	.00	.00	.00	.00
Cecil	.00	.00	.00	.00	.00
Charles	.00	965.64	965.64	.67	.67
Dorchester	.00	1.07	1.07	.03	.03
Frederick	.00	.00	.00	.00	.00
Garrett	.00	.00	.00	.00	.00
Harford	.00	.00	.00	.00	.00
Howard	.00	.00	.00	.00	.00
Kent	.00	.00	.00	.00	.00
Montgomery	333.52	.00	341.32	.04	333.56
Prince Georges	.00	498.20	498.20	.72	.72
Queen Annes	.00	.00	.00	.00	.00
St. Marys	.00	.00	.00	.00	.00
Somerset	.00	.00	.00	.00	.00
Talbot	.00	.00	.00	.00	.00
Washington	25.20	.00	25.20	.00	25.20
Wicomico	.00	.00	.00	.00	.00
Worcester	.00	.00	.00	.00	.00
Baltimore City	.00	91.87	91.87	.00	.00
State Total	359	5,840	6,200	1.64	360

Table 10a.--Hydroelectric-power water use in Maryland, by county, 1992

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Freshwater use	
	Million gallons per day	Thousand acre-feet per year
Allegany	0.00	0.00
Anne Arundel	0.00	0.00
Baltimore	0.00	0.00
Calvert	0.00	0.00
Caroline	0.00	0.00
Carroll	0.00	0.00
Cecil	7.63	8.55
Charles	0.00	0.00
Dorchester	0.00	0.00
Frederick	0.00	0.00
Garrett	53.87	60.36
Harford	24,245.50	27,168.30
Howard	0.00	0.00
Kent	0.00	0.00
Montgomery	0.00	0.00
Prince Georges	0.00	0.00
Queen Annes	0.00	0.00
St. Marys	0.00	0.00
Somerset	0.00	0.00
Talbot	0.00	0.00
Washington	562.19	629.96
Wicomico	0.00	0.00
Worcester	0.00	0.00
Baltimore City	0.00	0.00
State Total	24,900	27,900

Table 10b.--Hydroelectric-power water use in Maryland, by county, 1993

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Freshwater use	
	Million gallons per day	Thousand acre-feet per year
Allegany	0.00	0.00
Anne Arundel	0.00	0.00
Baltimore	0.00	0.00
Calvert	0.00	0.00
Caroline	0.00	0.00
Carroll	0.00	0.00
Cecil	8.20	9.19
Charles	0.00	0.00
Dorchester	0.00	0.00
Frederick	0.00	0.00
Garrett	74.99	84.03
Harford	25,539.67	28,618.48
Howard	0.00	0.00
Kent	0.00	0.00
Montgomery	0.00	0.00
Prince Georges	0.00	0.00
Queen Annes	0.00	0.00
St. Marys	0.00	0.00
Somerset	0.00	0.00
Talbot	0.00	0.00
Washington	414.72	464.71
Wicomico	0.00	0.00
Worcester	0.00	0.00
Baltimore City	0.00	0.00
State Total	26,000	29,200

Table 11.--Livestock water withdrawals in Maryland, by county, 1992-93

[State totals rounded to three significant figures. Sources: Withdrawals estimated based on data from U.S. Department of Commerce, 1994 and U.S. Environmental Protection Agency, 1973]

County or city	Freshwater withdrawals, in million gallons per day		
	Source		Total
	Surface water	Ground water	
Allegany	0.06	0.03	0.09
Anne Arundel	.04	.01	.05
Baltimore	.16	.12	.28
Calvert	.02	.00	.02
Caroline	.06	.63	.69
Carroll	.41	.42	.83
Cecil	.14	.16	.30
Charles	.04	.02	.06
Dorchester	.01	.37	.38
Frederick	.89	1.24	2.13
Garrett	.28	.21	.49
Harford	.24	.18	.42
Howard	.10	.06	.16
Kent	.09	.20	.29
Montgomery	.14	.09	.23
Prince Georges	.04	.02	.06
Queen Annes	.08	.23	.31
St. Marys	.06	.08	.14
Somerset	.03	.79	.82
Talbot	.03	.16	.19
Washington	.51	.61	1.12
Wicomico	.02	1.20	1.22
Worcester	.03	.96	.99
Baltimore City	.00	.00	.00
State Total	3.48	7.79	11.3

Table 12a.--Irrigation water withdrawals in Maryland, by county, 1992

[State totals rounded to three significant figures. Source: Withdrawals and acreage irrigated estimated based on data from L.E. Carr, Maryland Cooperative Extension Service, oral commun., 1994]

County or city	Irrigated land by type of water, in thousand acres		Water withdrawals, in million gallons per day					
			Surface water		Ground water	Total		
	Fresh	Saline	Fresh	Brackish	Fresh	Fresh	Brackish	Total
Allegany	0.09	0.00	0.09	0.00	0.02	0.11	0.00	0.11
Anne Arundel	.42	.00	.82	.00	.37	1.19	.00	1.19
Baltimore	.95	.02	.90	.01	.21	1.11	.01	1.12
Calvert	.59	.04	.31	.02	.05	.36	.02	.38
Caroline	15.95	3.18	4.30	1.90	5.86	10.16	1.90	12.06
Carroll	.55	.00	.31	.00	.17	.48	.00	.48
Cecil	.52	.00	.33	.00	.58	.91	.00	.91
Charles	.78	.02	.47	.01	.05	.52	.01	.53
Dorchester	17.09	.90	1.69	.54	8.59	10.28	.54	7.86
Frederick	.42	.00	.47	.00	.10	.57	.00	.57
Garrett	.28	.00	.19	.00	.01	.20	.00	.20
Harford	.74	.00	.52	.00	.18	.70	.00	.70
Howard	.16	.00	.21	.00	.11	.32	.00	.32
Kent	2.81	.25	.66	.15	2.76	3.42	.15	3.57
Montgomery	.39	.00	.57	.00	.36	.93	.00	.93
Prince Georges	.36	.00	.44	.00	.19	.63	.00	.63
Queen Annes	8.90	.92	2.96	.55	4.00	6.96	.55	7.51
St. Marys	.65	.20	.38	.12	.04	.42	.12	.54
Somerset	1.52	.06	.18	.04	.75	.93	.04	.97
Talbot	1.86	.00	.65	.00	.92	1.57	.00	1.57
Washington	.32	.00	.17	.00	.06	.23	.00	.23
Wicomico	5.57	.60	.74	.36	2.99	3.73	.36	4.09
Worcester	2.48	.12	.90	.07	1.00	1.90	.07	1.97
Baltimore City	.00	.00	.01	.00	.00	.01	.00	.01
State Total	63.3	6.31	18.3	3.77	29.4	47.6	3.78	51.4

Table 12b.--Irrigation water withdrawals in Maryland, by county, 1993

[State totals rounded to three significant figures. Source: Withdrawals and acreage irrigated estimated based on data from L.E. Carr, Maryland Cooperative Extension Service, oral commun., 1994]

County or city	Irrigated land by type of water, in thousand acres		Water withdrawals, in million gallons per day					
			Surface water		Ground water	Total		
	Fresh	Saline	Fresh	Brackish	Fresh	Fresh	Brackish	Total
Allegany	0.09	0.00	0.09	0.00	0.02	0.11	0.00	0.11
Anne Arundel	.37	.00	.77	.00	.43	1.20	.00	1.20
Baltimore	.95	.02	1.15	.02	.27	1.42	.02	1.44
Calvert	.59	.04	.46	.04	.07	.53	.04	.57
Caroline	15.95	3.18	6.29	2.84	8.59	14.88	2.84	17.72
Carroll	.55	.00	.45	.00	.17	.62	.00	.62
Cecil	.52	.00	.50	.00	.60	1.10	.00	1.10
Charles	.78	.02	.71	.02	.06	.77	.02	.79
Dorchester	17.09	.90	2.53	.81	12.79	15.32	.81	16.13
Frederick	.42	.00	.65	.00	.13	.78	.00	.78
Garrett	.28	.00	.25	.00	.01	.26	.00	.26
Harford	.75	.00	.68	.00	.22	.90	.00	.90
Howard	.16	.00	.27	.00	.15	.42	.00	.42
Kent	2.81	.25	.54	.22	4.18	4.72	.22	4.94
Montgomery	.39	.00	1.05	.00	.55	1.60	.00	1.60
Prince Georges	.26	.00	.49	.00	.28	.77	.00	.77
Queen Annes	8.90	.92	4.55	.83	5.24	9.79	.83	10.62
St. Marys	.65	.20	.57	.18	.06	.63	.18	.81
Somerset	1.52	.06	.27	.05	1.11	1.38	.05	1.43
Talbot	1.86	.00	.97	.00	1.14	2.11	.00	2.11
Washington	.29	.00	.27	.00	.06	.33	.00	.33
Wicomico	7.45	.60	1.61	.54	5.53	7.14	.54	7.68
Worcester	2.48	.12	1.28	.11	1.36	2.64	.11	2.75
Baltimore City	.00	.00	.01	.00	.00	.01	.00	.01
Sate Total	65.1	6.31	26.4	5.66	43.0	69.4	5.66	75.1

Table 13a.--Aquaculture water withdrawals in Maryland, by county, 1992

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Water withdrawals, in million gallons per day				
	Source				
	Surface Water			Fresh ground water	Total freshwater withdrawals
	Fresh	Saline	Total		
Allegany	0.01	0.00	0.01	0.00	0.01
Anne Arundel	.00	.00	.00	.01	.01
Baltimore	.20	3.60	3.80	.05	.25
Calvert	.00	.002	.002	.08	.08
Caroline	.00	.00	.00	.02	.02
Carroll	.00	.00	.00	.00	.00
Cecil	.00	.00	.00	.00	.00
Charles	.00	.00	.00	.00	.00
Dorchester	.00	8.80	8.80	.03	.03
Frederick	14.64	.00	14.64	.01	14.65
Garrett	2.03	.00	2.03	.00	2.03
Harford	.00	.00	.00	.00	.00
Howard	.00	.00	.00	.00	.00
Kent	.00	.00	.00	.00	.00
Montgomery	.00	.00	.00	.00	.00
Prince Georges	.00	.00	.00	.00	.00
Queen Annes	.00	.25	.25	.23	.23
St. Marys	.00	.07	.00	.00	.00
Somerset	.00	.14	.14	.00	.00
Talbot	.00	.00	.00	.00	.00
Washington	2.24	.00	2.24	4.22	6.46
Wicomico	.00	.001	.001	.02	.02
Worcester	.15	.00	.15	.01	.16
Baltimore City	.00	.00	.00	.00	.00
State Total	19.3	12.9	32.2	4.68	24.0

Table 13b.--Aquaculture water withdrawals in Maryland, by county, 1993

[State totals rounded to three significant figures. Source: Data compiled from Maryland Water Management Administration files]

County or city	Water withdrawals, in million gallons per day				
	Source				
	Surface Water			Fresh ground water	Total freshwater withdrawals
	Fresh	Saline	Total		
Allegany	0.01	0.00	0.01	0.00	0.01
Anne Arundel	.00	.00	.00	.01	.01
Baltimore	.00	3.02	3.22	.04	.24
Calvert	.00	.002	.002	.08	.08
Caroline	.00	.00	.00	.02	.02
Carroll	.00	.00	.00	.003	.003
Cecil	.00	.00	.00	.00	.00
Charles	.00	.00	.00	.00	.00
Dorchester	.00	9.08	9.08	.04	.04
Frederick	14.76	.00	14.76	.21	14.97
Garrett	2.25	.00	2.25	.02	2.27
Harford	.003	.00	.003	.00	.003
Howard	.00	.00	.00	.00	.00
Kent	.00	.00	.00	.00	.00
Montgomery	.00	.00	.00	.00	.00
Prince Georges	.00	.00	.00	.01	.01
Queen Annes	.00	.25	.25	.23	.23
St. Marys	.00	.004	.004	.001	.001
Somerset	.00	.14	.14	.00	.00
Talbot	.00	.00	.00	.01	.01
Washington	2.24	.00	2.24	4.79	7.03
Wicomico	.00	.001	.001	.02	.02
Worcester	.15	.00	.15	.01	.16
Baltimore City	.00	.00	.00	.00	.00
State Total	19.6	12.5	32.1	5.49	25.1