

# **GROUND-WATER USE IN THE COASTAL PLAIN OF MARYLAND, 1900-1980**

By Judith C. Wheeler and Franceska D. Wilde

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DEPARTMENT OF THE INTERIOR  
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## CONVERSION FACTORS AND ABBREVIATIONS

For the convenience of readers who may prefer to use metric (International System) units rather than the inch-pound units used in this report, values may be converted by using the following factors:

<u>Multiply inch-pound unit</u>	<u>By</u>	<u>To obtain metric unit</u>
foot (ft)	0.3048	meter (m)
gallon (gal)	3.785	liter (L)
gallon per day (gal/d)	3.785	liter per day (L/d)
million gallons (Mgal)	3,785	cubic meters (m <sup>3</sup> )
million gallons per day (Mgal/d)	3,785	cubic meters per day(m <sup>3</sup> /d)
million gallons per year(Mgal/yr)	3,785	cubic meters per year (m <sup>3</sup> /yr)
mile (mi)	1.609	kilometer (km)
acre	0.4047	hectare

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# GROUND-WATER USE IN THE COASTAL PLAIN OF MARYLAND, 1900 - 1980

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by Judith C. Wheeler and Franceska D. Wilde

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## ABSTRACT

Historically, ground water has been the major source of supply for most users in the Coastal Plain of Maryland. This report presents ground-water withdrawal data from 1900 through 1980 for 16 counties and Baltimore City, that lie either partially or totally within the Coastal Plain physiographic province. These data were collected as part of the U.S. Geological Survey's Regional Aquifer Systems Analysis (RASA) study.

The data are discussed briefly and presented in graphs, tables, and maps. Five water-use categories that comprise the major demands on ground-water supplies are identified: domestic, military, public and private water suppliers, industrial (including commercial), and irrigation. Withdrawal data were obtained or estimated from diverse sources, including Maryland Water Resources Administration files, State and county reports and communication with public officials and individual owners. Aquifer designations of the source of the pumpage were determined by consulting published and unpublished geologic reports and were correlated with the 10-layer aquifer system established for the RASA study computer model.

The results of this research show that ground-water withdrawals increased from approximately 25 million gallons per day (Mgal/d) in 1900 to nearly 136 Mgal/d in 1980. Anne Arundel and Baltimore Counties and Baltimore City had the greatest withdrawals, more than 5 Mgal/d, for most of the 80-year period.

Domestic and industrial/commercial uses comprised the largest withdrawals from 1900 through 1965. For most of the next 15 years, to 1980, water suppliers constituted the greatest demand on ground-water supplies. Large withdrawals for irrigation in the Coastal Plain began in the late 1950's and were primarily centered in Caroline, Dorchester, Queen Annes, and Wicomico Counties.

The surficial aquifer was the most heavily used source of ground water for domestic use; however, it also provided adequate quantities to a few large users (those withdrawing 0.01 Mgal/d or more). The deeper Patapsco and Patuxent aquifers supplied the most water to large users during the 80-year period, mainly for industrial/commercial use.

## INTRODUCTION

The U.S. Geological Survey has conducted Regional Aquifer Systems Analysis (RASA) studies throughout the nation. One of these RASA studies analyzed the northern Atlantic Coastal Plain aquifer system, which encompasses a six-state area stretching from Long Island to North Carolina. The RASA study included development of a digital model to simulate the properties of the Coastal Plain aquifer system and the effect

of pumpage on that system. The data presented here were collected as part of the RASA study, and were used for the calibration and verification of the model.

This report is designed to provide public officials and interested persons a compendium of historical ground-water-use data for the Coastal Plain of Maryland. It was prepared in cooperation with the

Maryland Geological Survey and the Maryland Water Resources Administration. Financial support was provided by the Maryland Geological Survey and the

RASA and National Water Use Data programs of the U.S. Geological Survey.

## PURPOSE AND SCOPE

This report presents ground-water withdrawal data for the 16 counties and part of Baltimore City that lie within the Coastal Plain physiographic province (fig. 1). The data are summarized for each county and Baltimore City, as well as for the Coastal Plain region as a

whole, and are presented in graphs, tables, and maps. Ground-water withdrawal data have been categorized by water user, aquifer used, and quantity withdrawn. The compiled data span the period 1900 through 1980.

## DATA COLLECTION AND ESTIMATION OF WATER USE

The categories of water use discussed in this report are:

1. *Domestic*.--Includes self-supplied individual houses and general farm use, such as livestock watering.

2. *Military*.--Includes Federal military institutions and installations only.

3. *Water suppliers*.--Includes municipality, county and town systems, hospitals, institutions, schools, trailer parks, and private water companies.

4. *Industrial/commercial*.--Includes manufacturing industries, utilities (including electric power), fish hatcheries, laundries, theaters, hotels, motels, government-operated research centers, restaurants, and mining (coal, quarry, sand, and gravel) operations.

5. *Irrigation*.--Includes water used for farmland, nursery crops, and golf courses.

Although this report presents withdrawal data beginning with 1900, few records of actual pumpage were available for individual users prior to the 1960's. Withdrawals between 1900 and 1969 were averaged for each decade in million gallons per day (Mgal/d). Many of these earlier data were estimated based on current withdrawals, population trends, written and oral communication with water users, and amounts given in various reports for a particular time span or year. Most of the graphs for individual counties begin with 1950; however, if enough substantial earlier records were available, graphs were plotted to include these data.

Much of the withdrawal information for large users (those who individually withdraw 0.01 Mgal/d or more) was obtained from the Maryland Water Resources Administration. This agency requires users of 0.01 Mgal/d or more to report monthly pumpage. These data were then tabulated and stored on computer tapes beginning with the earliest known pumpage. Programs were designed to generate graphs and tables from these

tapes for this report. Other sources of water-use data include Maryland Geological Survey Bulletins and Reports of Investigations, Basic Data Reports, county water and sewerage plans, and miscellaneous county reports.

Domestic water use was estimated by taking the total county population (Maryland Dept. of State Planning, 1981) for each year selected and subtracting the estimated population served by municipalities and private water companies (Maryland Dept. of State Planning, 1981, and Maryland Dept. of Natural Resources, 1983). The difference was then multiplied by 75 gallons per person per day (U.S. Environmental Protection Agency, 1973). The determination of water quantities used for irrigation was based on the estimated number of acres irrigated by ground water (U.S. Dept. of Commerce, 1961, 1967, 1972, 1977, and 1981a; and Carr, 1975, 1977, and 1980) and an assumed average application rate of 0.6 ft of water per year (Herring, 1983). Irrigation data for counties withdrawing an average of less than 0.1 Mgal/d for this use over the 80-year period were not included in this report.

Pumpage sites were located on county maps using the Maryland Grid Coordinate System method. In this system, a point is designated by actual distances in feet from two imaginary lines--one running east and west, and the other north and south through a point of origin. The origin of the Maryland Grid Coordinate System is fixed at a point southwest of the State, so that all coordinates are to the east and north of it. The coordinates of this point are N O (zero) E O (zero). For mapping purposes, horizontal and vertical grid lines were established from this point at intervals of 50,000 ft east and north of the origin (Maryland Department of State Planning, 1978).

Aquifer designations were assigned by consulting published and unpublished geologic logs and maps, State and county reports, and correlating depth of screened intervals of wells with the isopach maps constructed by RASA hydrogeologists.

## FORMAT

The water-use data presented here are described in individual sections for each county and Baltimore City, preceded by a section for the entire Coastal Plain. The data are depicted in graphs, tables, and maps.

Ground-water appropriation permit numbers given in the tables are issued by the Maryland Water Resources Administration and are presented here for the convenience of any further detailed research.

## LOCATION AND EXTENT OF STUDY AREA

This report presents data on ground-water use for the part of Maryland that lies within the Coastal Plain physiographic province (fig. 1A). The Coastal Plain province of Maryland covers an area of 8,240 square miles, or approximately one-half of the total area of the State (Knopf, 1929).

The study area is bounded on the east by Delaware and the Atlantic Ocean; on the south by the Potomac River, the Chesapeake Bay, and Virginia; on the west by the Potomac River; and to the west and north by the Fall Line (the contact between the Coastal Plain and Piedmont physiographic provinces). It is widely dissected by the Chesapeake Bay.

Eighteen Maryland counties lie entirely or partially within the Coastal Plain province: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Howard, Kent, Montgomery, Prince Georges, Queen Annes, St. Marys, Somerset, Talbot, Wicomico, and Worcester Counties. The six counties that lie partially within the Coastal Plain include most of Prince Georges County, nearly half of Cecil County, approximately one-fifth of Baltimore and Harford Counties, and less than one-eighth of Howard and Montgomery Counties. About half of Baltimore City lies in the Coastal Plain. Ground-water use in the Coastal Plain of Howard and Montgomery Counties was not significant enough for the period of study to include in this report.

## HYDROGEOLOGIC SETTING

This discussion presents a brief background of the hydrogeology relevant to the material covered in this report. However, for an in-depth treatment that defines and interprets the hydrogeology of the study area, the reader is referred to a publication prepared as part of the RASA study entitled Hydrogeologic Framework of the Coastal Plain in Maryland, Delaware, and the District of Columbia (D. Vroblecky and W. Fleck, U.S. Geological Survey, written commun., 1987).

Maryland covers an area of diverse geology that is divided into five physiographic provinces (regions of distinctive geomorphology) (fig. 1A). The study area comprises the southeastern physiographic province, known as the Coastal Plain province (fig. 1B). In Maryland, the Coastal Plain province is bounded on the west by its contact with the crystalline rocks of the Piedmont province. The zone of this contact is characterized by numerous waterfalls, and thus is commonly known as the Fall Line.

The Coastal Plain is underlain by a wedge-shaped sequence of stratified sediments that dip gently to the southeast and range in thickness from zero at the Fall Line to nearly 8,000 ft at Ocean City, Maryland (fig. 2). This body of mostly unconsolidated gravel, sand, silt, and clay comprises a sequence of stratigraphic units

that includes Quaternary deposits at the top of the geologic section, underlain by deposits of Tertiary and Cretaceous age, respectively. The bottommost strata are Lower Cretaceous deposits that lie unconformably on an older complex of basement rocks, which are of Jurassic (?) to Precambrian age (table 1).

As part of the RASA study, the sequence of deposits were divided into 10 regional hydrogeologic units. Each of these units comprise an aquifer, that is, a geologic formation, group of formations or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs (Lohman and others, 1972). Each aquifer is characterized by distinctive hydrogeologic properties and separated by confining units or strata of very low hydraulic conductivity relative to that of the aquifer. The topmost aquifers differ hydrologically from deeper aquifers in that they are not overlain by a confining unit. As a consequence of being unconfined, fluid pressure at the water-table surface is exactly equal to that of the atmosphere. Unconfined aquifers are also called surficial aquifers or water-table aquifers. The term "surficial aquifer" is used in this report, although commonly used local designations are also noted. In the confined aquifers, water is stored under artesian conditions (hydrostatic pressure is greater than atmospheric pressure). Although the water level in a well fully penetrat-

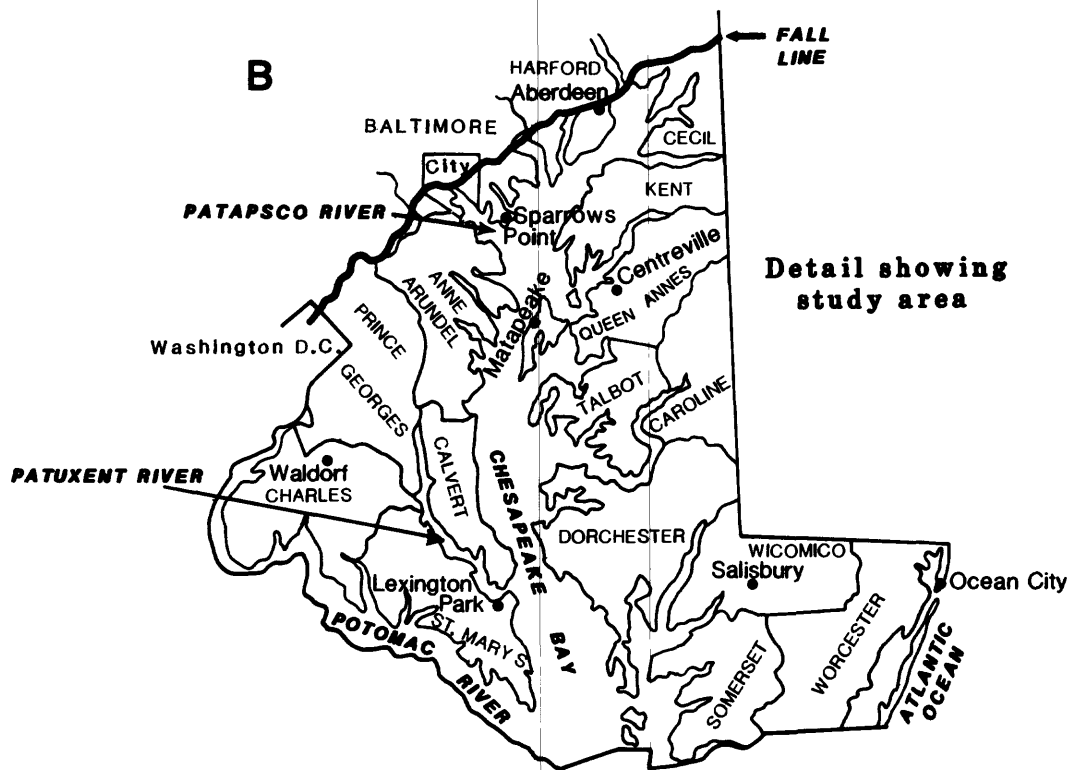
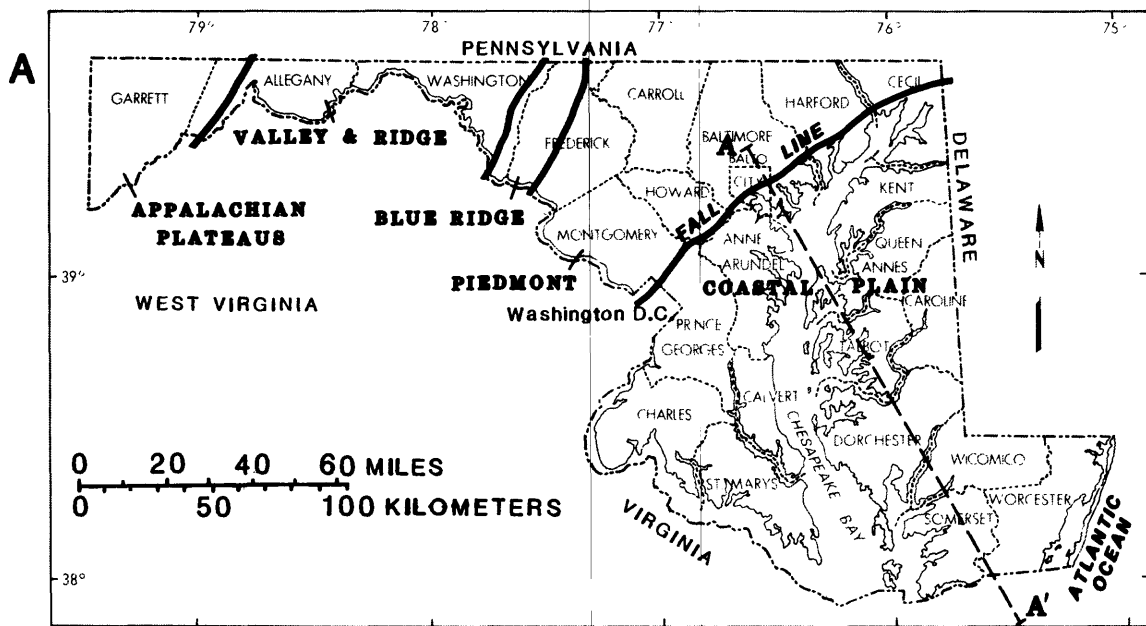
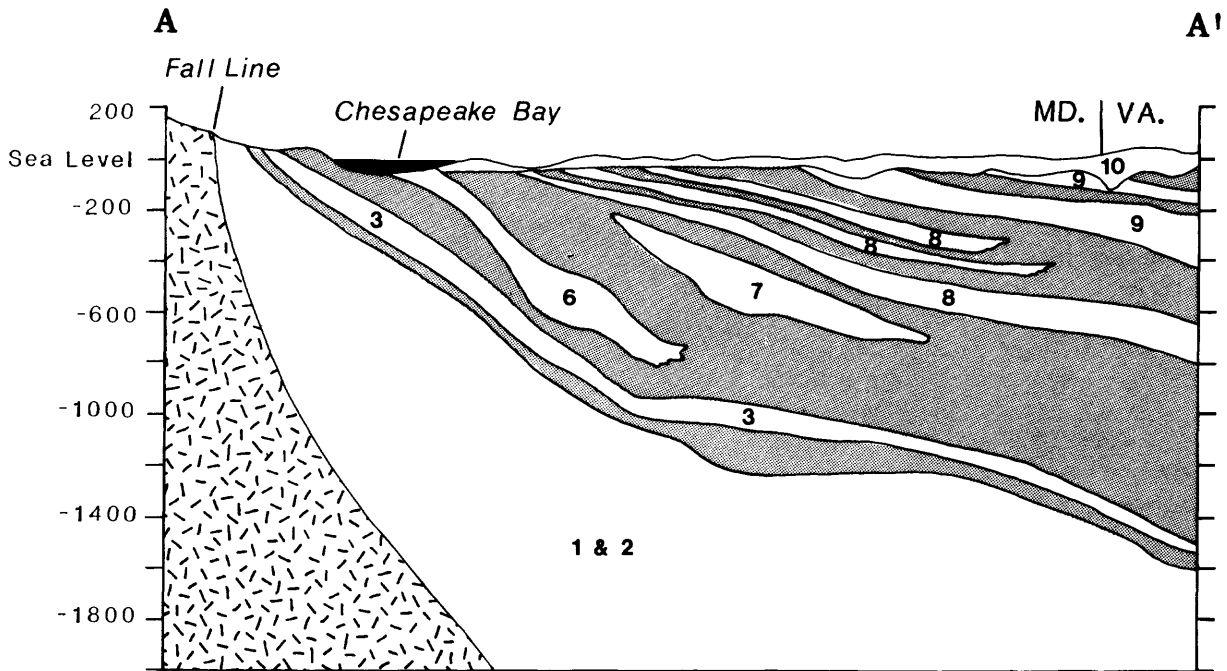


Figure 1.--Location and extent of the Coastal Plain in Maryland.  
 A. Boundaries of physiographic provinces.  
 B. Location and extent of study area.





Modified from Cushing, Kantrowitz,  
and Taylor, 1973

0 20 MILES

Horizontal scale

Vertical exaggeration x 167



EXPLANATION	
RASA LAYER	AQUIFER
10	Surficial
9	Upper Chesapeake
8	Lower Chesapeake
7	Piney Point
6	Aquia
3	Magothy
2	Patapsco
1	Patuxent
	Confining unit
	Basement rocks (Piedmont complex)
(Layers 4 and 5 not present)	

Figure 2.--Hydrogeologic section A-A' through the study area.

ing a confined aquifer will rise above the aquifer surface at the point of penetration, water levels in wells that penetrate a surficial aquifer close to the water table define the top of the saturated zone.

Figure 2 is a hydrogeologic section depicting the stratigraphic relationship between aquifer units. All aquifer units are not regionally extensive; those units important as aquifers in one part of the study area may not be present in another. For example, the aquifer in sediments of Paleocene age (table 1) is not known to exist north of St. Marys and Somerset Counties and does not appear in the cross section. Consequently, the Aquia aquifer rests directly on the confining unit above the Severn aquifer in most of the study area. (The Severn aquifer is also referred to as the Monmouth aquifer by the Maryland Geological Survey.) Where the aquifer in sediments of Paleocene age does exist, it apparently rests directly on the Magothy Formation, indicating that the Severn and Matawan Formations are missing.

The presence and importance of a given aquifer unit is noted in each county section and in table 1 under the description of hydrologic characteristics. However, the term surficial aquifer is used in this report for four local aquifers commonly referred to as Quaternary, Pleistocene, Columbia, and Talbot aquifers (see footnote 2 of table 1). Where appropriate, the local term is identified parenthetically. Local terminology is used in tables and illustrations. Moreover, in this report, the Choptank aquifer and Raritan aquifer (obsolete usage) are referred to as the lower Chesapeake aquifer and Patapsco aquifer, respectively. Sediments formerly included in the Raritan Formation are now assigned to the upper part of the underlying Patapsco Formation (C. Davidson, U.S. Geological Survey, written commun., 1987). The correlation of stratigraphic divisions formally recognized by the U.S. Geological Survey to local aquifers as well as to regional hydrogeologic units used in the RASA study model are given in table 1.

#### ACKNOWLEDGMENTS

Numerous Federal, State, and county agencies, private corporations, and businesses furnished water-use data for this report. Personnel of the Maryland

Water Resources Administration provided valuable assistance with the interpretation and verification of pumpage reports submitted to the agency.

### **GROUND-WATER USE IN THE COASTAL PLAIN OF MARYLAND**

Historically, ground water has been the major source for domestic, military, water supplier, industrial/commercial, and irrigation uses in the Coastal Plain of Maryland. Ground-water withdrawals by use from 1900 through 1980 are shown in figure 3. In 1900, the amount of ground water withdrawn was approximately 25 Mgal/d compared to withdrawals of nearly 136 Mgal/d in 1980. This represents an increase of 438 percent over the 80-year period.

Since 1900, water use in the Coastal Plain increased in all categories. Estimated domestic water use was about 14.0 Mgal/d in 1900, but increased to about 35.0 Mgal/d in 1980. Water withdrawn for use in military facilities was approximately 1.0 Mgal/d in 1900. Withdrawals increased from about 2 Mgal/d in 1942 to nearly 6.0 Mgal/d in 1970. By 1980, however, military pumpage declined to about 4 Mgal/d. Water withdrawn by water suppliers increased from about 3.0 Mgal/d in 1900 to approximately 56 Mgal/d in 1980, with the largest increases occurring between 1950 and 1980. Withdrawals for the industrial/commercial category were approximately 8.0 Mgal/d in 1900 and increased over the following years to a peak of about 49.0 Mgal/d

in 1942. After 1942, this pumpage began to decline and by the late 1940's, about 31.0 Mgal/d was being withdrawn. In 1950, industrial/commercial pumpage increased again to nearly 39.0 Mgal/d, and, over the next 30 years, showed a gradual decline to about 25.0 Mgal/d in 1980.

Large-scale irrigation is a relatively recent type of water use in the Maryland Coastal Plain. Until the late 1950's, most irrigation was in the central and western counties of the State. However, increased urban development in these counties caused a major shift of vegetable growing and attendant irrigation to the Eastern Shore of Maryland where land was less expensive and growing conditions were more favorable (Brodie and others, 1984). By 1969, 73 percent of the acres irrigated were located on the Eastern Shore, and by 1975 the percentage had increased to 85 percent. Figure 3 shows that, in 1960, approximately 2.0 Mgal/d were withdrawn for irrigation in the Coastal Plain. Use continued to increase so that by 1980, withdrawals were nearly 12.0 Mgal/d. Figure 4 compares percentage of ground-water withdrawals by type of use for the beginning year of each decade from 1900 through 1980.

Table 1.--Stratigraphic correlations of geologic and hydrologic units of the Coastal Plain of Maryland (Modified from Vroblecky and Fleck, U.S. Geological Survey, written commun., 1988)

System	Series	Stratigraphic unit	Aquifer names used Maryland	Regional hydrogeologic unit and base <sup>1</sup> modal layer number	Hydrologic characteristics	Lithology	
Quaternary	Holocene, Pleistocene, and Pliocene	Columbia Group undivided and upland and lowland deposits (Otton, 1955)	Quaternary and Columbia 2/	Surficial or unconfined (water-table) aquifer Layer 10	Unconfined. Saturated thickness: less than 20 ft in northern to 40-140 ft in southeastern Md. An aquifer over most of its outcrop area east of the Chesapeake Bay.	Sand, mostly coarse, moderately sorted with gravel, occasional cobbles and thin silt layers	
Tertiary	Miocene	Chesapeake	Eastover Formation (Ward and Blackwelder 1980)	Upper Chesapeake confining unit	Confining unit. Thickness: 0 to greater than 150 ft.	Sand, interbedded gray to whitish gray, fine to coarse-grained, and dark gray to blue-gray clays and silts.	
				Upper Chesapeake aquifer Layer 9	Multi-aquifer system. Typical thickness ranges are: Pocomoke 0-80 ft; Ocean City, 0-85 ft; Manokin, 0-240 ft.		
				St. Marys Formation	St. Marys confining unit		Confining unit. Thickness: 0 to greater than 200 ft.
				Lower Chesapeake aquifer Layer 8	Multi-aquifer system in most areas east of Chesapeake Bay, but grades to confining units in St. Marys County.		
				Choptank Formation	Lower Chesapeake confining unit		Confining unit. Thickness: 0 to greater than 200 ft.
				Calvert Formation	Lower Chesapeake aquifer		Silty sand to sand, medium to coarse-grained, with some gravel and locally abundant shells; interbedded with gray to bluish-gray sandy silts and clays.
	Oligocene	Zocene	Old 3/ (?) Church Formation	Piney Point	Piney Point - Nanjemoy aquifer Layer 7	Aquifer in Calvert and St. Marys Counties and in much of the central areas east of Chesapeake Bay. Thickness: 0 to about 270 ft.	Sand, grayish-green to grayish-white; medium to coarse-grained, glauconitic calcite cemented layers and shell debris. Coarsens upward from basal silts.
	Paleocene	Paleocene	Pamunkey	Marlboro 3/ Clay	Nanjemoy-Marlboro confining unit	Confining unit. Thickness: 0 to greater than 700 ft.	Clay, silty, reddish brown to pink or gray, micaceous.
					Aquia aquifer Layer 6	Aquifer in southern Maryland. Down-dip facies change makes unit function as a confining unit in Worcester and parts of Somerset and Wicomico Counties. Southeast of Cambridge, thickness ranges from 0 to 250 ft.	
					Brightseat aquifer Layer 3 1/2	Confining unit. Thickness: 0 to greater than 80 ft.	
		Paleocene	Grop	Brightseat Formation (Bennett and Collins, 1952)	Paleocene	Brightseat aquifer Layer 3 1/2	The Brightseat is used as an aquifer in Crisfield (60 ft) and Lexington Park (160 ft), but is not known to exist north of St. Marys and Somerset Counties.
					Lower Brightseat confining unit	Confining unit. Thickness: 0 to greater than 200 ft.	
Cretaceous	Upper Cretaceous	Severn 2/ Formation	Hornmouth	Seyvern aquifer Layer 5	Functions as a poor aquifer, primarily in Kent and Queen Annes Counties, and as confining unit in most other places. Thickness is less than 80 ft, but is up to 150 ft thick in Kent County.	Sand, fine to coarse-grained, silty or clayey, reddish brown, glauconitic. Localized occurrences of poorly sorted, coarse-grained sand.	
				Severn confining unit	Confining unit. Thickness: 0 to greater than 80 ft.		
				Metawan aquifer Layer 4	Probably functions as a confining unit in most areas, except for Talbot County where thickness averages less than 50 ft.		
	Lower Cretaceous	Potomac	Patuxent 2/ Formation	Patuxent	Patuxent aquifer Layer 2	Aquifer is typically 50-100 ft but up to 200 ft in Annapolis; contains leaky or laterally discontinuous confining units in some places.	Sand, fine, to medium grained, interbedded with variegated silt to clay, abrupt lateral and vertical changes in lithology.
					Patuxent confining unit	Confining unit. Thickness: 0 to greater than 400 ft.	
					Patuxent aquifer Layer 1	Multi-aquifer system. Aquifer pinches out at the Fall Line and thickens down-dip towards the southeast to at least 350 ft in Queen Annes County.	
	Lower Cretaceous	Grop	Arundel Formation	Arundel	Potomac confining unit	Confining unit. Thickness: 0 to greater than 650 ft.	Clays, thick, variegated, dense with increasing interbedded sand lenses down-dip of out-crop.
					Patuxent aquifer Layer 1	Multi-aquifer system. Aquifer pinches out at the Fall Line and thickens down-dip towards the southeast to at least 350 ft in Queen Annes County.	
Jurassic (?) to Precambrian		Basement rocks	Basement rocks	Basement rocks	Confining unit. Thickness unknown.	Schist, phyllites, granites, gneisses and gabbros.	

<sup>1</sup>/Regional Aquifer systems Analysis (RASA) study.

<sup>2</sup>/The term Columbia Group is in common use as convenient nomenclature that includes the following formations: Pamlico, Talbot, Wicomico, Sunderland, Kent Island Formations, Parsonsburg Sand, Sinspuxent, Ironshire, Omer Formations, Walston Silt, Beaverdam Sand, Bryn Mawr Gravel, Pensauken, Bescon Hill, and Brandywine Formations.

<sup>3</sup>/Ward, 1985.

<sup>4</sup>/Vroblecky and Fleck, (U.S. Geological Survey, written commun., 1988).

<sup>5</sup>/Hansen and Wilson, 1984.

<sup>6</sup>/Also known as the Hornmouth Formation in Maryland.

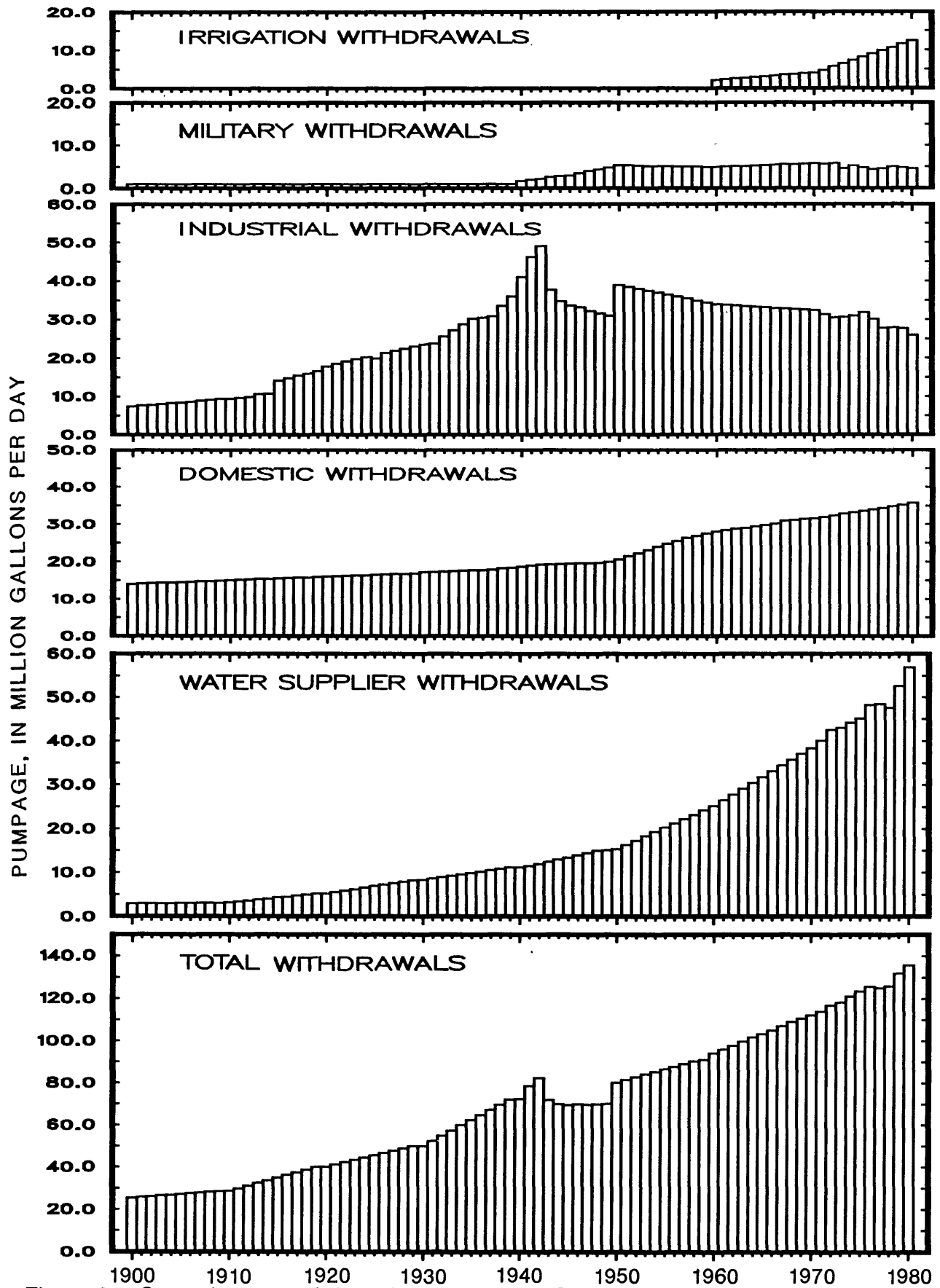


Figure 3.-- Ground-water withdrawals by use in the Coastal Plain province of Maryland from 1900 through 1980.

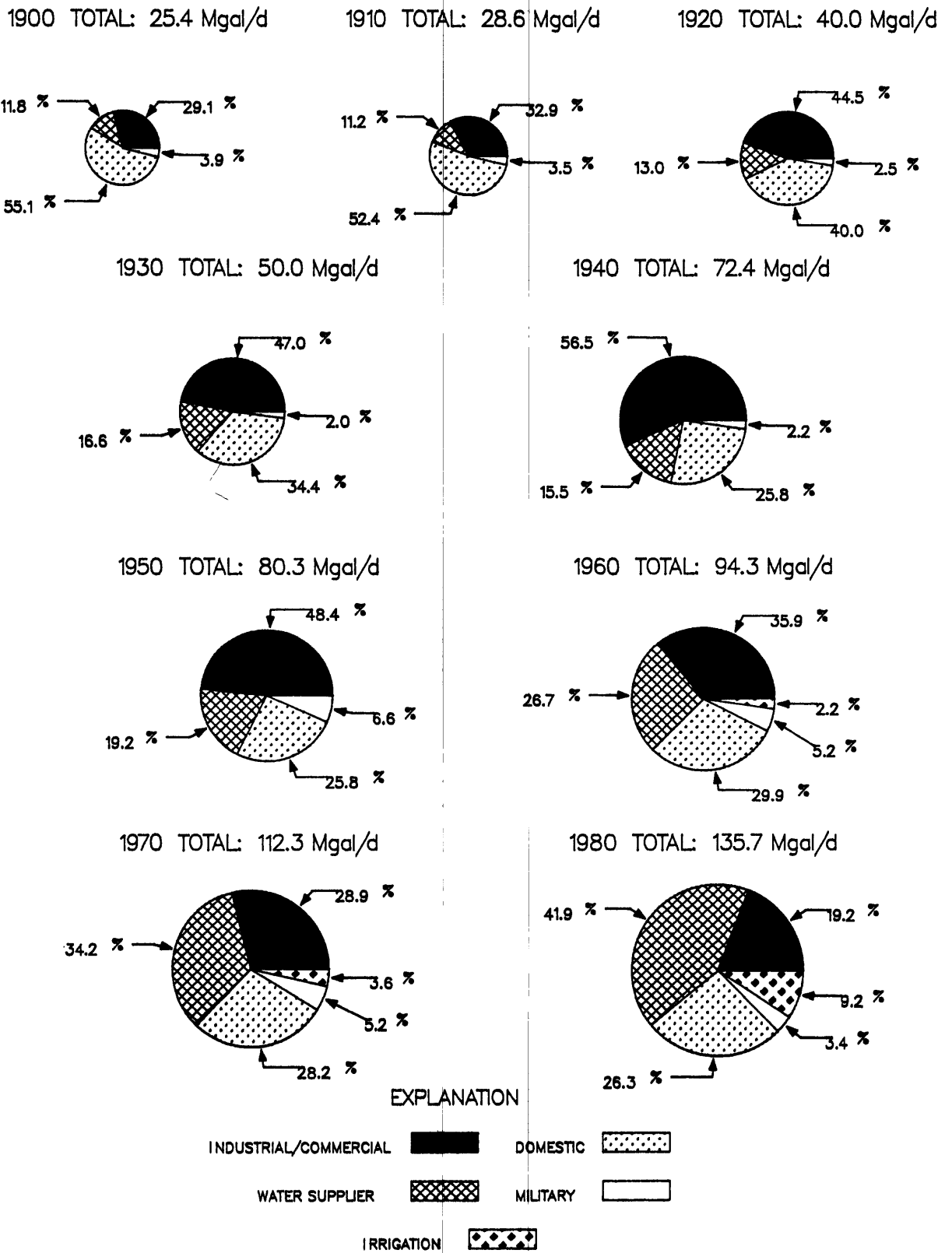


Figure 4.--Ground-water use in the Maryland Coastal Plain and percentage for each type of use, for decade years 1900 through 1980.

In 1900, much of the ground-water withdrawals in the Coastal Plain came from the surficial aquifer. This aquifer continued to supply not only the water needs of domestic use, but also the large quantities needed by several industries and water suppliers. In areas where the surficial aquifers were not available or suitable for use by large users, deeper aquifers were utilized including, in descending order, the Pocomoke and Manokin

aquifers (equivalent to the upper Chesapeake aquifer), lower Chesapeake, Piney Point, Aquia, Severn, and Magothy aquifers, and the Patapsco and Patuxent aquifers in the Potomac Group undivided.

Large ground-water withdrawals from the principal aquifers of the Coastal Plain of Maryland from 1900 through 1980 are shown in figure 5.

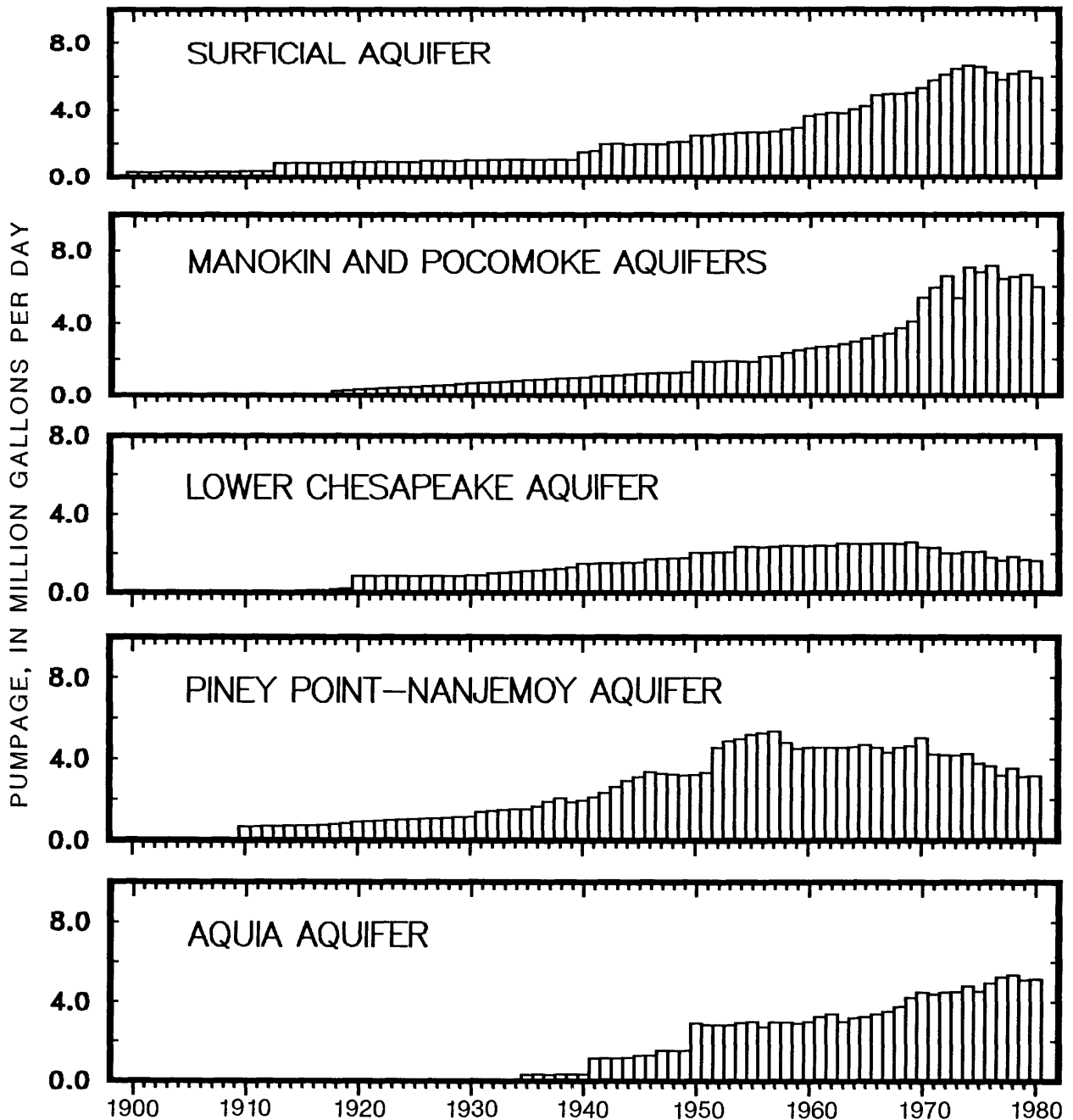


Figure 5.--Large ground-water withdrawals by aquifers in the Maryland Coastal Plain from 1900 through 1980.

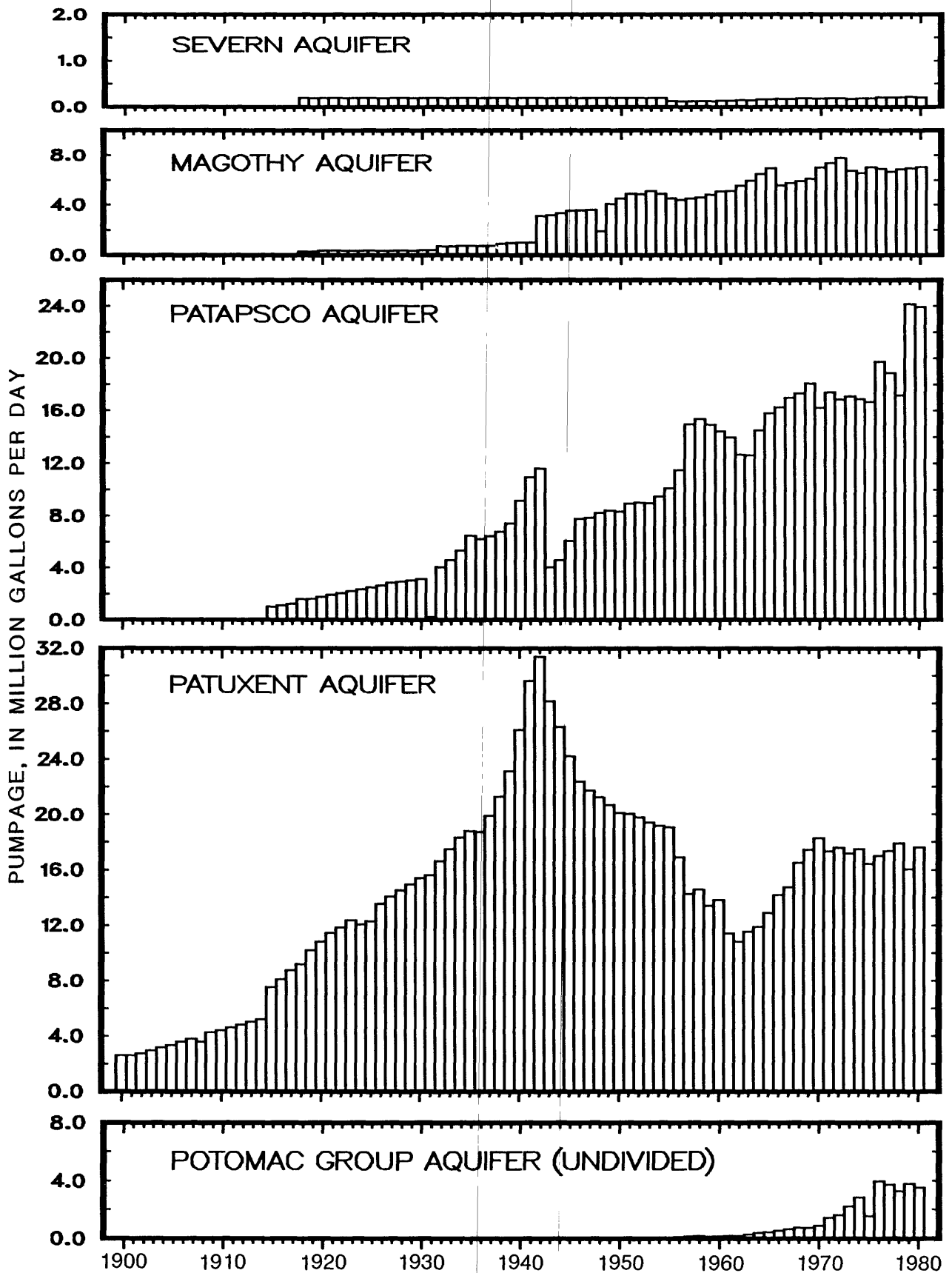


Figure 5.--Large ground-water withdrawals by aquifers in the Maryland Coastal Plain from 1900 through 1980 --Continued.

## ANNE ARUNDEL COUNTY

Ground-water use in Anne Arundel County from 1940 through 1980 is shown in figure 6. In 1940, the amount of ground water withdrawn was approximately 7.5 Mgal/d compared to withdrawals of nearly 41.0 Mgal/d in 1980. This represents an increase of more than 400 percent in the four decades.

Since 1940, water use in Anne Arundel County has increased in all categories. Figure 6 indicates that in 1940 the largest use of ground water in the county was domestic, with withdrawals of about 3.8 Mgal/d. By 1980, this use increased to approximately 9.1 Mgal/d. Withdrawals for military use were about 1.0 Mgal/d in 1940 and increased to about 2.4 Mgal/d in 1980. Water suppliers withdrew about 2.7 Mgal/d in 1940 and continued to increase withdrawals through 1980 to nearly 25.0 Mgal/d, becoming the largest users of ground water in the county. Industrial/commercial use was less than 0.05 Mgal/d in 1940, but increased to about 4.5 Mgal/d by 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, the source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of total amount of ground water withdrawn for domestic, military, water suppliers, and industrial/commercial users for 1940, 1950, 1960, 1970, and 1980 are shown in figure 7. The figure indicates a decline in the percentage for domestic use from about 50 percent in 1940 to 22 percent in 1980, and an increase in the percentage of use by water suppliers from 35.8 percent in 1940 to 61 percent in 1980. This is explained for the most part, by the increase in the percentage of the population served by central water-supply systems, either public or private, rather than by individual wells. The percentage of use for the military dropped from 13 percent in 1940 to 8 percent in 1960, and remained about the same for 1970 and 1980. The percentage for industrial/commercial use remained relatively constant for each of the years shown.

### Major Aquifers

Many domestic withdrawals in Anne Arundel County were from shallow wells (from about 15 to 50 ft deep) tapping the surficial aquifer. Deeper aquifers, including the Aquia, Magothy, Patapsco, and Patuxent, were more widely used by large users. Large user withdrawals by aquifer from 1940 to 1980 are shown in figure 8.

Pumpage from the Aquia aquifer remained relatively constant at about 0.03 Mgal/d from 1940 through 1954, then steadily increased to about 0.3 Mgal/d in 1980. From 1940 to the early 1950's, the Magothy aquifer was the major source of water in the county. For most of the 40 years shown, withdrawals from the Magothy were between 2.0 and 4.0 Mgal/d. Withdrawals from the Patapsco were about 1.1 Mgal/d in 1940; by the mid-1960's, withdrawals were close to 10.0 Mgal/d. Pumpage from the Patapsco aquifer continued to increase, and by 1980, approximately 20.0 Mgal/d were withdrawn. Pumpage from the Patuxent aquifer began in 1951 at about 0.03 Mgal/d and increased significantly the following years. By 1980, nearly 6.0 Mgal/d were pumped from the Patuxent aquifer.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Anne Arundel County for 1940, 1950, 1960, 1970, and 1980 are shown in figure 9. Table 2 presents water-use data for the large users located within particular grid blocks for the year indicated on the map.

In 1940, the areas of heaviest pumpage were located for the most part, in the east-central portion of the county, mainly around the Annapolis area. Comparison of the maps shows a substantial increase in large user withdrawals in northern and southern Anne Arundel County from 1940 to 1980.

The locations of withdrawals from individual aquifers supplying the large users in Anne Arundel County (described in table 2 and fig. 9) are shown in figure 10. In 1940, 1950, 1960, and 1970, the Aquia aquifer supplied most of the water in the southern part of the county. By 1980, the Magothy aquifer was supplying some of the water to large users in the south-western section. The Magothy, however, was more extensively used in the central part of the county during the period of record shown in figure 10.

The Patapsco aquifer was used mostly in the northern part of the county; the number of large users relying on it increased between 1940 and 1980. Withdrawals from the Patuxent aquifer were very limited in 1950. By 1960, however, use of the aquifer extended to a few scattered areas in the northern and north-central part of the county and continued to increase through 1980.



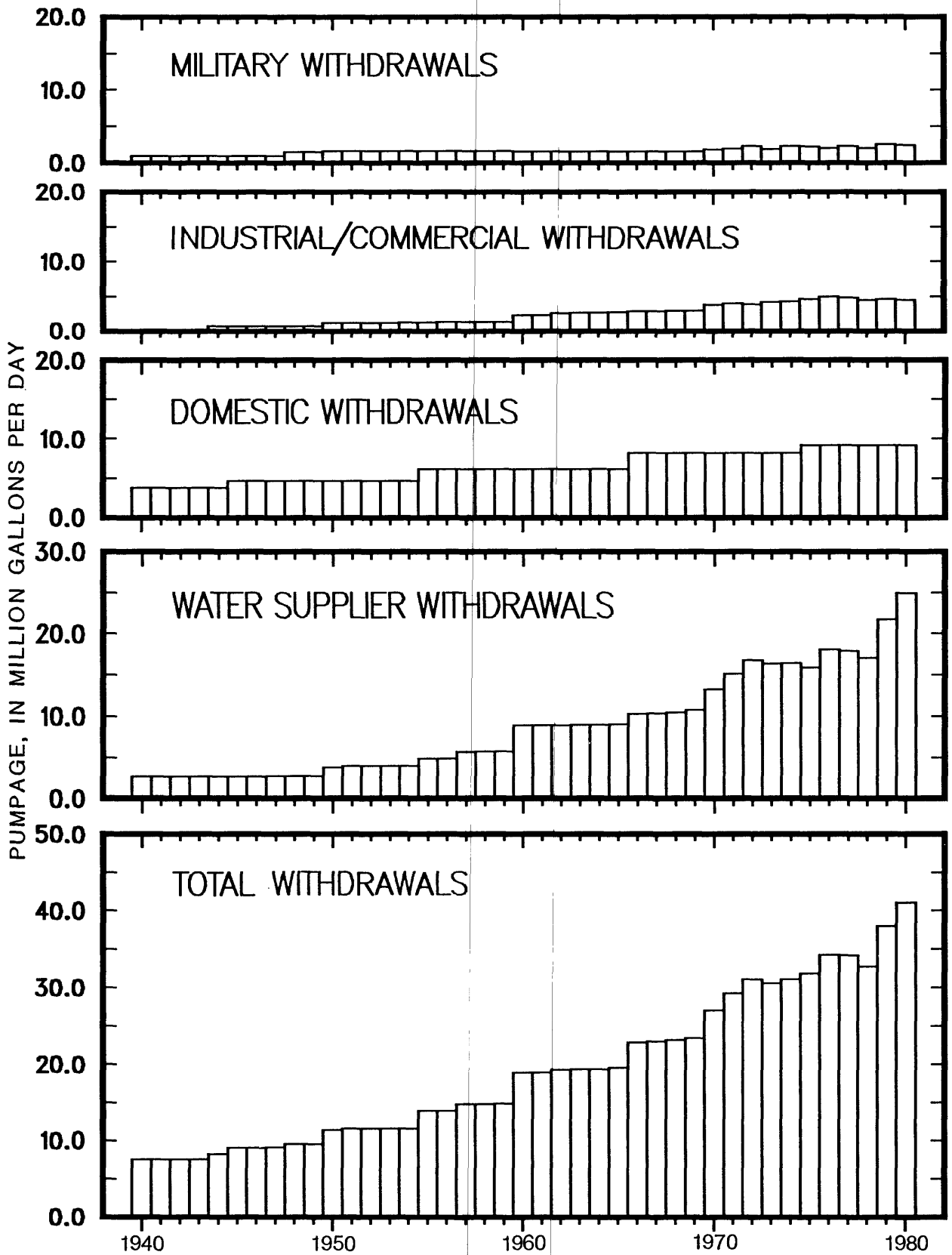
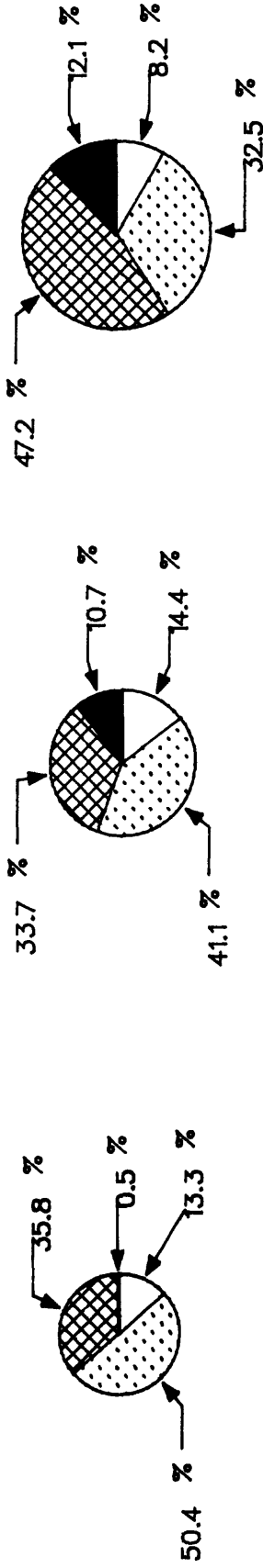
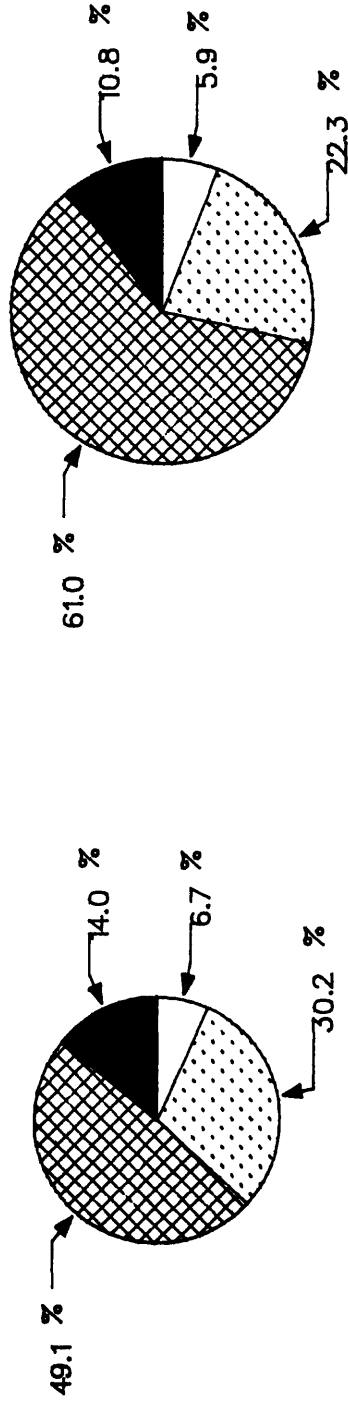


Figure 6.--Ground-water withdrawals by use in Anne Arundel County from 1940 through 1980.

1940 TOTAL: 7.5 Mgal/d      1950 TOTAL: 11.4 Mgal/d      1960 TOTAL: 18.9 Mgal/d



1970 TOTAL: 27.2 Mgal/d      1980 TOTAL: 41.1 Mgal/d



EXPLANATION



Figure 7.--Ground-water use in Anne Arundel County and percentage for each type of use, for 1940, 1950, 1960, 1970, and 1980.

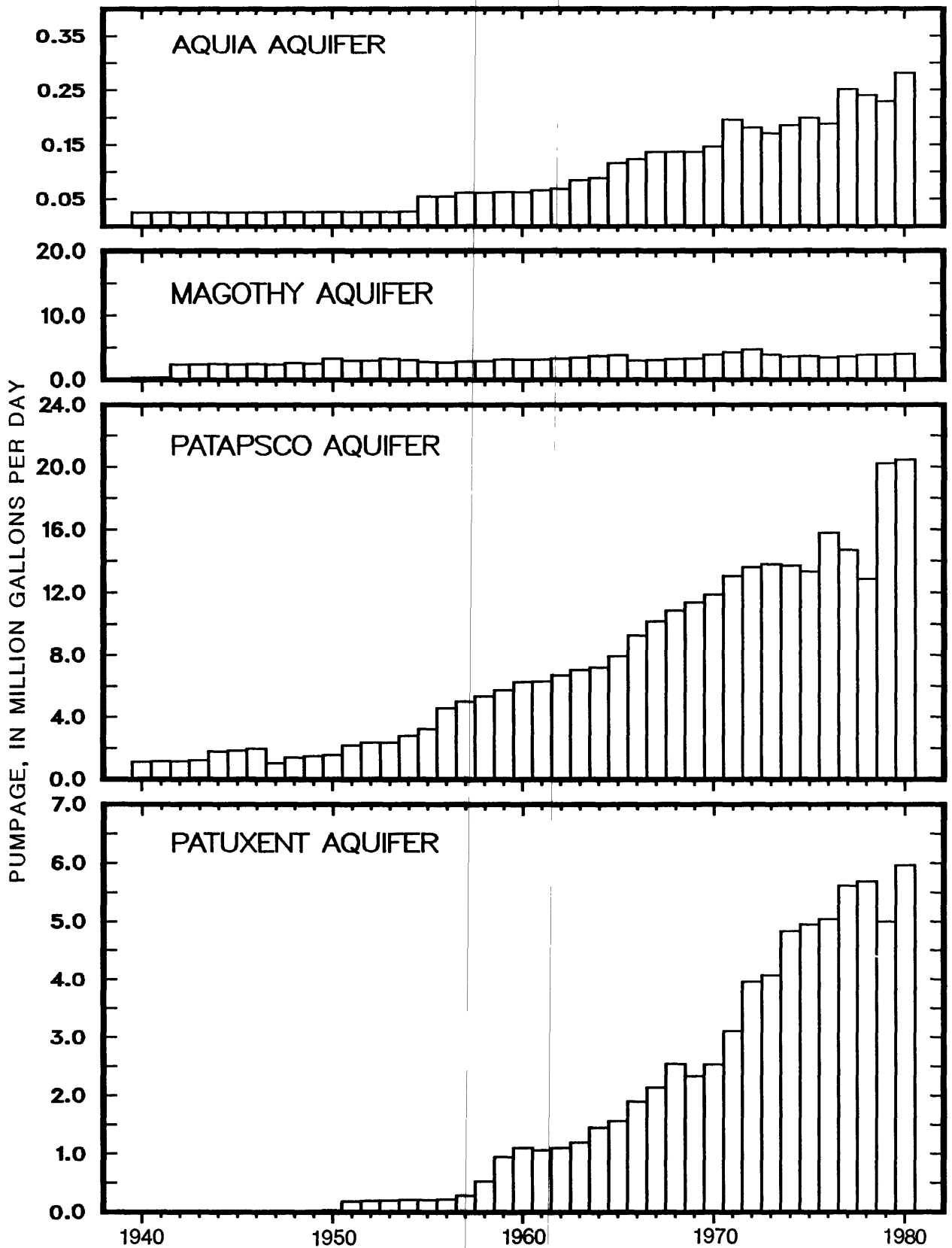


Figure 8.--Large ground-water withdrawals by aquifer in Anne Arundel County from 1940 through 1980.

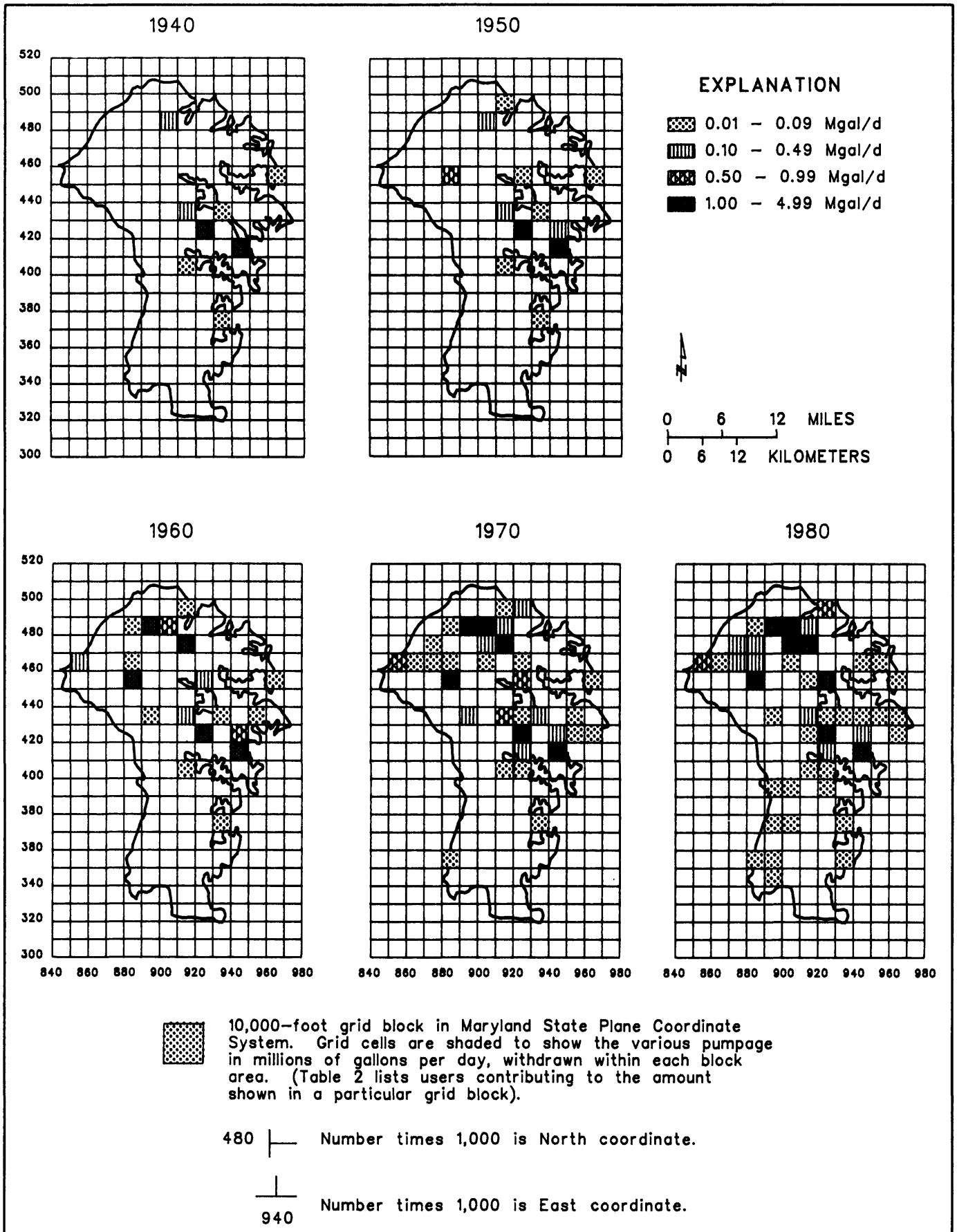


Figure 9.--Locations of large ground-water withdrawals in Anne Arundel County for 1940, 1950, 1960, 1970, and 1980.

Table 2.--Large ground-water users in Anne Arundel County in 1940, 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1940	N370 E930	Woodfield Fish and Oyster Company	0.03	Aquia
	N400 E910	Sylvan Shores	.01	Quaternary
	N410 E940	U.S. Naval Academy	1.00	Patapsco
	N420 E920	Annapolis, City of	2.50	Magothy
	N430 E910	Crownsville State Hospital	.36	Magothy
	N430 E930	Pines-On-Severn	.01	Magothy
	N450 E960	Gibson Island	.05	Patapsco
	N480 E900	Sawmill Creek, Anne Arundel County, Department of Utilities	.16	Patapsco
1950	N370 E930	Woodfield Fish and Oyster Company	0.03	Aquia
	N400 E910	Sylvan Shores	.03	Quaternary
	N410 E940	U.S. Naval Academy	1.00	Patapsco
	N420 E920	Annapolis, City of	2.60	Magothy
	N420 E940	U.S. Naval Ship Research and Development Center	.15	Magothy
			.31	Patapsco
	N430 E910	Crownsville State Hospital	.36	Magothy
	N430 E930	Pines-On-Severn	.02	Magothy
	N450 E880	Nevamar Corporation	.88	Patapsco
	N450 E920	Severna Park, Anne Arundel County, Department of Utilities	.04	Patapsco
	N450 E960	Gibson Island	.07	Patapsco
	N480 E900	Sawmill Creek, Anne Arundel County, Department of Utilities	.27	Patapsco
	N490 E910	USS Agricultural Chemical Company	.03	Patuxent
1960	N370 E930	Woodfield fish and Oyster Company	0.03	Aquia
	N400 E910	Sylvan Shores	.04	Magothy
	N410 E940	U.S. Naval Academy	1.20	Patapsco
	N420 E920	Annapolis, City of	2.50	Magothy
	N420 E940	U.S. Naval Ship Research and Development Center	.19	Magothy
			.41	Patapsco
	N430 E890	Crofton, Anne Arundel County, Department of Utilities	.07	Patuxent
	N430 E910	Crownsville State Hospital	.37	Magothy
	N430 E930	Pines-On-Severn	.03	Magothy
	N430 E950	Howard Johnson's Restaurant	.03	Aquia
	N450 E880	Nevamar Corporation	1.40	Patapsco
	N450 E920	Severna Park, Anne Arundel County, Department of Utilities	.36	Patapsco
	N450 E960	Gibson Island, Anne Arundel County, Department of Utilities	.08	Patapsco
	N460 E850	Maryland City, Anne Arundel County, Department of Utilities	.21	Patuxent
	N460 E880	Cedarhurst Water Company	.02	Patapsco
	N470 E910	Harundale, Anne Arundel County, Department of Utilities	1.30	Patapsco
	N480 E880	Chesapeake Mobile Court	.01	Patapsco
	N480 E890	Dorsey Road, Anne Arundel County, Department of Utilities	.73	Patapsco
			.79	Patuxent
	N480 E900	Sawmill Creek, Anne Arundel County, Department of Utilities	.82	Patapsco
N490 E910	USS Agricultural Chemical Company	.04	Patuxent	
1970	N350 E880	Wayson's Mobile Court	0.04	Aquia
	N370 E930	Woodfield Fish and Oyster Company	.04	Aquia
	N400 E910	Sylvan Shores	.04	Magothy
	N400 E920	Southdown Shores Water Works	.02	Aquia
	N410 E920	Broad Creek Wells, Anne Arundel County, Department of Utilities	.10	Patapsco
	N410 E940	U.S. Naval Academy	1.28	Patapsco
	N420 E920	Annapolis, City of	1.00	Patapsco
			2.80	Magothy
	N420 E940	U.S. Naval Ship Research and Development Center	.18	Magothy
			.32	Patapsco
	N420 E950	U.S. Naval Academy Golf Course	.01	Patapsco
	N420 E980	Westinghouse Electric	.06	Patapsco
	N430 E890	Herald Harbor, Anne Arundel County, Department of Utilities	.12	Patapsco
			.36	Patuxent
				Patuxent

Table 2.--Large ground-water users in Anne Arundel County in 1940, 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System--Continued.

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer	
(1970-Con't)	N430 E910	Crownsville State Hospital	0.52	Magothy	
	N430 E920	Sherwood Forest Water Service	.07	Magothy	
	N430 E930	Pines-On-Severn, Anne Arundel County, Department of Utilities	.20	Magothy	
		Epping Forest Water Works	.03	Magothy	
	N430 E950	Howard Johnson's Restaurant	.04	Aquia	
	N450 E880	Severn Mobile Home Court	.02	Patapsco	
		Nevamar Corporation	2.40	Patapsco	
	N450 E920	Severna Park, Anne Arundel County, Department of Utilities	.76	Patapsco	
	N450 E960	Gibson Island, Anne Arundel County, Department of Utilities	.08	Patapsco	
	N460 E850	Maryland City, Anne Arundel County, Department of Utilities	.51	Patuxent	
		Laurel Race Track	.06	Patuxent	
		Holiday Inn Laurel	.01	Patuxent	
	N460 E860	Colony Seven Motor Inn	.03	Patuxent	
	N460 E870	Fort George Meade, U.S. Army	.04	Patuxent	
	N460 E880	Cedarhurst Water Company	.02	Patapsco	
	N460 E900	Transit Truck Stop	.02	Patapsco	
	N460 E920	Pasadena Water Company	.04	Patapsco	
	N470 E870	Holiday Mobile Estates	.04	Patuxent	
	N470 E900	Crain Highway, Anne Arundel County, Department of Utilities	.03	Patapsco	
		Elvaton, Anne Arundel County, Department of Utilities	.14	Patapsco	
	N470 E910	Harundale, Anne Arundel County, Department of Utilities	1.50	Patapsco	
	N480 E 880	Parkway Industrial, Anne Arundel County, Department of Utilities	.04	Patuxent	
		Koppers Company	.01	Patapsco	
		Koppers Company	.02	Patuxent	
		Chesapeake Mobile Court	.02	Patapsco	
	N480 E890	Dorsey Road, Anne Arundel County, Department of Utilities	1.50	Patapsco	
		Department of Utilities	.98	Patuxent	
	N480 E900	Two Guys Department Store	.20	Patapsco	
		Sawmill Creek, Anne Arundel County, Department of Utilities	1.40	Patapsco	
		Phillips Drive, Anne Arundel County, Department of Utilities	.43	Patapsco	
	N480 E910	Glendale, Anne Arundel County, Department of Utilities	.41	Patapsco	
	N490 E910	USS Agricultural Chemical Company	.04	Patuxent	
	N490 E920	Chemetals	.40	Patuxent	
	1980	N340 E890	Lyons Creek Mobile Homes	0.04	Magothy
			do.	.04	Aquia
		N350 E880	Wayson's Mobile Court	.05	Aquia
		N350 E890	Boones Mobile Estates	.02	Magothy
		N350 E930	Broadwater Waste Plant, Anne Arundel County, Department of Utilities	.01	Aquia
		N370 E890	Maryland Manor Homes	.07	Magothy
		N370 E900	Southern Senior High School	.03	Magothy
		N370 E930	Woodfield Fish and Oyster Company	.04	Aquia
		N390 E890	Sands Road Joint Venture	.05	Aquia
		N390 E900	Homestead Gardens	.01	Aquia
N390 E920		Central Avenue School, Anne Arundel County, Department of Utilities	.03	Magothy	
N400 E910		Sylvan Shores	.04	Magothy	
		Riva Development	.03	Magothy	
		Annapolis Landing Water Treatment Plant	.03	Magothy	
N400 E920		Southdown Shores Water Works	.03	Aquia	
N410 E920		Broad Creek wells, Anne Arundel County Department of Utilities	.38	Patapsco	
N410 E940		U.S. Naval Academy	1.60	Patapsco	
N420 E910		Summer Hill Incorporated	.01	Magothy	

Table 2.--Large ground-water users in Anne Arundel County in 1940, 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System--Continued.

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
(1980--Con't.)	N420 E920	Annapolis, City of	1.40	Patapsco
		do.	3.30	Magothy
	N420 E940	U.S. Naval Ship Research and Development Center	.14	Magothy
			.31	Patapsco
	N420 E960	Westinghouse Electric	.02	Patapsco
	N430 E890	Herald Harbor, Anne Arundel County Department of Utilities	.07	Patapsco
		Crofton, Anne Arundel County, Department of Utilities	1.30	Patuxent
	N430 E910	Crownsville State Hospital	.18	Magothy
	N430 E920	Sherwood Forest Water Service	.06	Magothy
	N430 E930	Epping Forest Water Works	.03	Magothy
	N430 E940	Whispering Woods	.04	Patapsco
		Annapolis Terrace Motel	.01	Aquia
	N430 E950	Howard Johnson's Restaurant	.04	Aquia
	N430 E960	Sandy Point State Park	.01	Magothy
		Revell Square Water Corporation	.02	Patapsco
	N450 E880	Severn Mobile Home Court	.02	Patapsco
		Nevamar Corporation	1.70	Patapsco
		do.	.70	Patuxent
	N450 E910	Chartwell Golf and Country Club	.01	Patapsco
	N450 E920	Severna Park, Anne Arundel County, Department of Utilities	4.18	Patapsco
	N450 E960	Gibson Island, Anne Arundel County, Department of Utilities	.10	Patapsco
	N460 E850	Maryland City, Anne Arundel County, Department of Utilities	.56	Patuxent
		Laurel Race Track	.07	Patuxent
	N460 E860	Colony Seven Motor Inn	.03	Patuxent
	N460 E870	Fort George Meade, U.S. Army	.36	Patuxent
	N460 E880	Severn Water Company	.40	Patapsco
	N460 E900	Transit Truck Stop	.02	Patapsco
	N460 E940	Lake Shore Complex	.04	Magothy
	N460 E950	Bodkin Elementary School	.01	Patapsco
	N470 E870	Provinces Water Company	.29	Patuxent
		Parkway Manor/Econo Lodge	.01	Patuxent
		Holiday Mobile Estates	.05	Patuxent
	N470 E880	Meade Village, Anne Arundel County, Department of Utilities	.11	Patapsco
		MacMillan Bloedel Pkg. Ltd.	.01	Patapsco
		Free State Management, Lake Village	.14	Patapsco
	N470 E900	Quarterfield Road, Anne Arundel County Department of Utilities	.73	Patapsco
		Crain Highway, Anne Arundel County, Department of Utilities	.41	Patapsco
		Elvaton, Anne Arundel County, Department of Utilities	.76	Patapsco
	N470 E910	Harundale, Anne Arundel County, Department of Utilities	1.80	Patapsco
	N480 E880	Robin Hood Dell Trailer Park	.01	Patuxent
		Chesapeake Mobile Court	.04	Patapsco
	N480 E900	Dorsey Road, Anne Arundel County, Department of Utilities	3.06	Patapsco
			1.80	Patuxent
	N480 E900	Sawmill Creek, Anne Arundel County, Rol-Park Trailer Park	1.80	Patapsco
			.02	Patapsco
		Phillips Drive, Anne Arundel County, Department of Utilities	.66	Patapsco
		Thelma Avenue, Anne Arundel County, Department of Utilities	.21	Patapsco
	N480 E910	Glendale, Anne Arundel County, Department of Utilities	.46	Patapsco
	N490 E920	Chemicals	.78	Patuxent

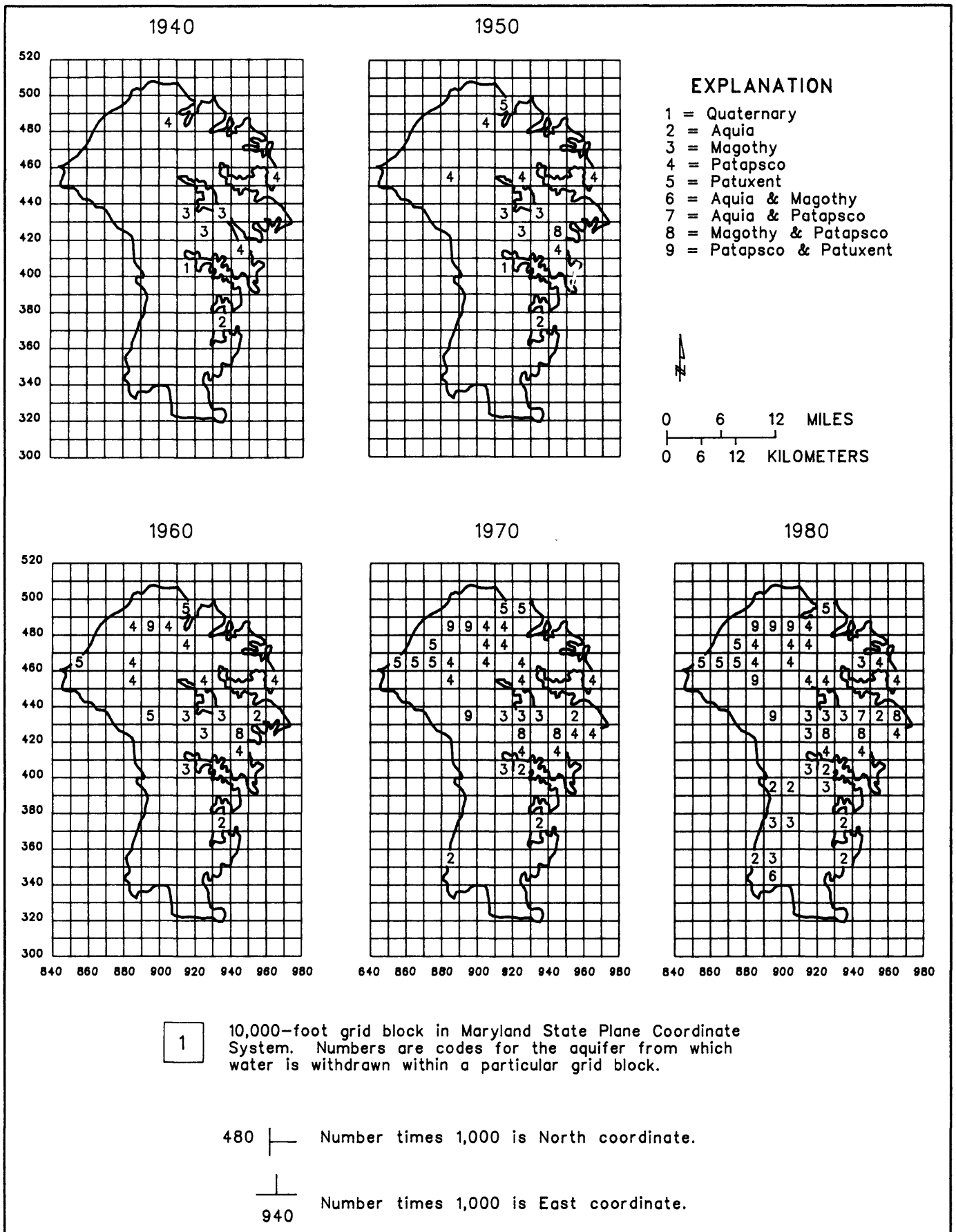


Figure 10.--Locations of large ground-water withdrawals by aquifers in Anne Arundel County for 1940, 1950, 1960, 1970, and 1980.



## BALTIMORE CITY

Approximately one-half of Baltimore City lies in the Coastal Plain province. The first ground-water supplies in the Coastal Plain area of Baltimore City may have been developed as early as the 1600's (Bennett and Meyer, 1952). Most of the water was derived from shallow wells (from about 15 to 45 ft deep). As the population grew and demands for water increased, the city turned to surface water to meet public supply needs. By 1855, ground water was used very little, if at all, for public supply (Baltimore City Department of Public Works, 1970). By 1900, all large ground-water withdrawals in the Coastal Plain area of the city were by industries (see appendix).

Ground-water use by these industries from 1900 through 1980 is shown in figure 11. In 1900, the amount of ground water withdrawn was approximately 7.4 Mgal/d. Pumpage increased the following years to a peak of nearly 25.1 Mgal/d in 1942. However, in the years that followed, withdrawals declined until about 1960. Pumpage afterward remained relatively uniform, comprising approximately 3.3 Mgal/d in 1980, which is about 4.1 Mgal/d less than it was in 1900. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

### Major Aquifers

In the Coastal Plain area of Baltimore City, the Patapsco aquifer was used extensively during the early development of the Baltimore industrial area (prior to 1900). However, in many parts of the industrial dis-

tricts of the city, saltwater intrusion from the Patapsco River contaminated the water and pumping from that aquifer was largely discontinued (Bennett and Meyer, 1952). Nevertheless, the Patapsco aquifer was used from the mid-1930's through the mid-1950's (fig. 12).

The Patuxent aquifer was the most important water-bearing formation used in the Coastal Plain area of Baltimore City. In 1900, approximately 7.4 Mgal/d were withdrawn. By 1942, pumpage from the aquifer peaked at nearly 24.0 Mgal/d. Withdrawals then declined to about 3.2 Mgal/d in 1961 and remained relatively constant through 1980.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in the Coastal Plain portion of Baltimore City for 1930, 1940, 1950, 1960, 1970, and 1980 are shown in figure 13. Table 3 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. Areal distribution of large withdrawals remained about the same for all the years shown. However, fewer points of pumpage were noted in 1970 and 1980 than for the previous years presented.

The locations of withdrawal from individual aquifers supplying the large users in the Coastal Plain area of Baltimore City (described in table 3 and fig. 13) are shown in figure 14. Withdrawals from the Patapsco aquifer were limited to the southwestern part of the city. The Patuxent aquifer was the principal aquifer used for the years shown. It served the entire Coastal Plain portion of Baltimore City, although its use declined from 1960 to 1980.

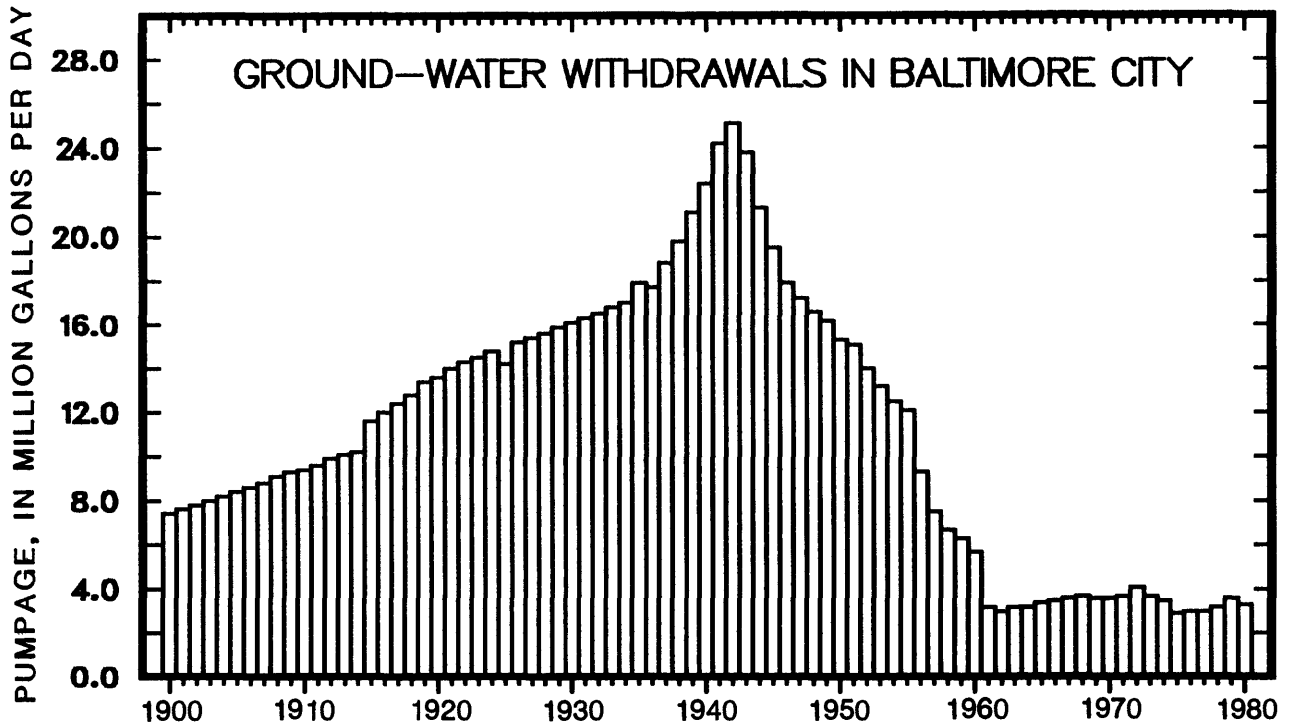


Figure 11.--Ground-water withdrawals in the Coastal Plain area of Baltimore City from 1900 through 1980.

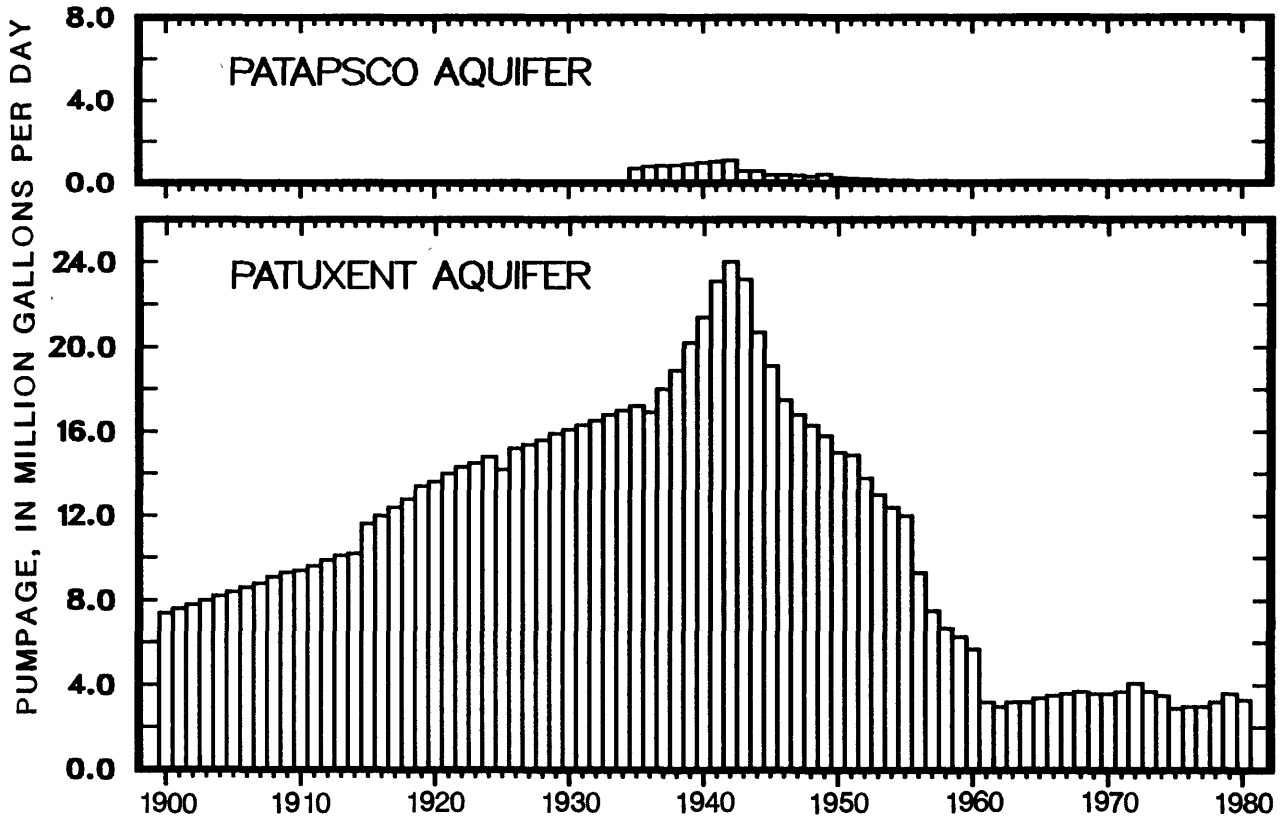


Figure 12.-- Large ground-water withdrawals by aquifers in the Coastal Plain area of Baltimore City from 1900 through 1980.

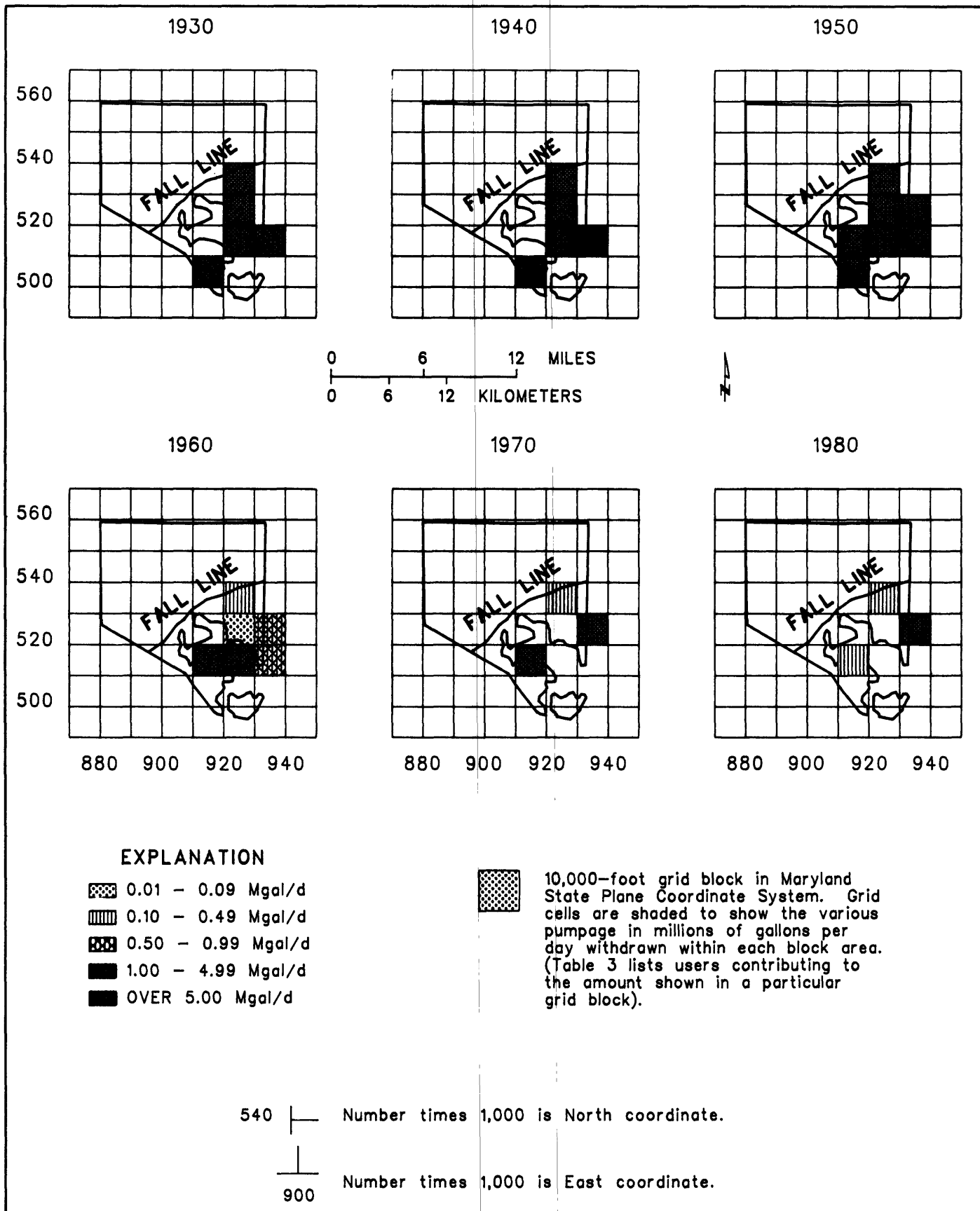


Figure 13.-- Locations of large ground-water withdrawals in the Coastal Plain area of Baltimore City for 1930, 1940, 1950, 1960, 1970, and 1980.

Table 3.--Large ground-water users in the Coastal Plain area of Baltimore City in 1930, 1940, 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1930	N500 E910	Curtis Bay District	2.70	Patuxent
	N510 E920	Fairfield District	3.80	Patuxent
	N510 E930	Dundalk District	3.80	Patuxent
	N520 E920	Harbor District	.27	Quaternary
		do.	1.70	Patuxent
		Canton District	2.20	Patuxent
	N530 E920	Highlandtown District	1.50	Patuxent
1940	N500 E910	Curtis Bay District	3.10	Patuxent
		do.	.99	Patapsco
	N510 E920	Fairfield District	4.90	Patuxent
	N510 E930	Dundalk District	6.60	Patuxent
	N520 E920	Harbor District	.27	Quaternary
		do.	2.30	Patuxent
		Canton District	2.10	Patuxent
	N530 E920	Schluderberg-Kurdle, Incorporated	.82	Patuxent
		Paul Jones Company	.12	Patuxent
		Monarch Rubber	.02	Patuxent
		Crown Cork & Seal	1.10	Patuxent
1950	N500 E910	Curtis Bay District	0.83	Patuxent
		do.	.26	Patapsco
	N510 E910	F.M.C. Corporation	1.60	Patuxent
	N510 E920	Fairfield District	3.30	Patuxent
	N510 E930	Dundalk District	3.70	Patuxent
	N520 E920	Harbor District	.08	Quaternary
		do.	1.70	Patuxent
		Canton District	.42	Patuxent
	N520 E930	Federal Yeast Corporation	1.00	Patuxent
	N530 E920	Schluderberg-Kurdle, Incorporated	.79	Patuxent
		Paul Jones Company	.11	Patuxent
		Monarch Rubber Company	.06	Patuxent
	Crown Cork & Seal	1.50	Patuxent	
1960	N510 E910	F.M.C. Corporation	1.90	Patuxent
	N510 E920	Fairfield District	1.80	Patuxent
	N510 E930	Dundalk District	.90	Patuxent
	N520 E920	Canton District	.08	Patuxent
	N520 E930	Federal Yeast Corporation	.65	Patuxent
	N530 E920	Schluderberg-Kurdle, Incorporated	.41	Patuxent
	1970	N510 E910	F.M.C. Corporation	2.00
N520 E930		Federal Yeast Corporation	1.40	Patuxent
N530 E920		Schluderberg-Kurdle, Incorporated	.16	Patuxent
		Hood Vinegar Company	.07	Patuxent
1980	N510 E910	F.M.C. Corporation	0.42	Patuxent
	N520 E930	Federal Yeast Corporation	2.60	Patuxent
	N530 E920	Schluderberg-Kurdle, Incorporated	.23	Patuxent
		Hood Vinegar Company	.08	Patuxent

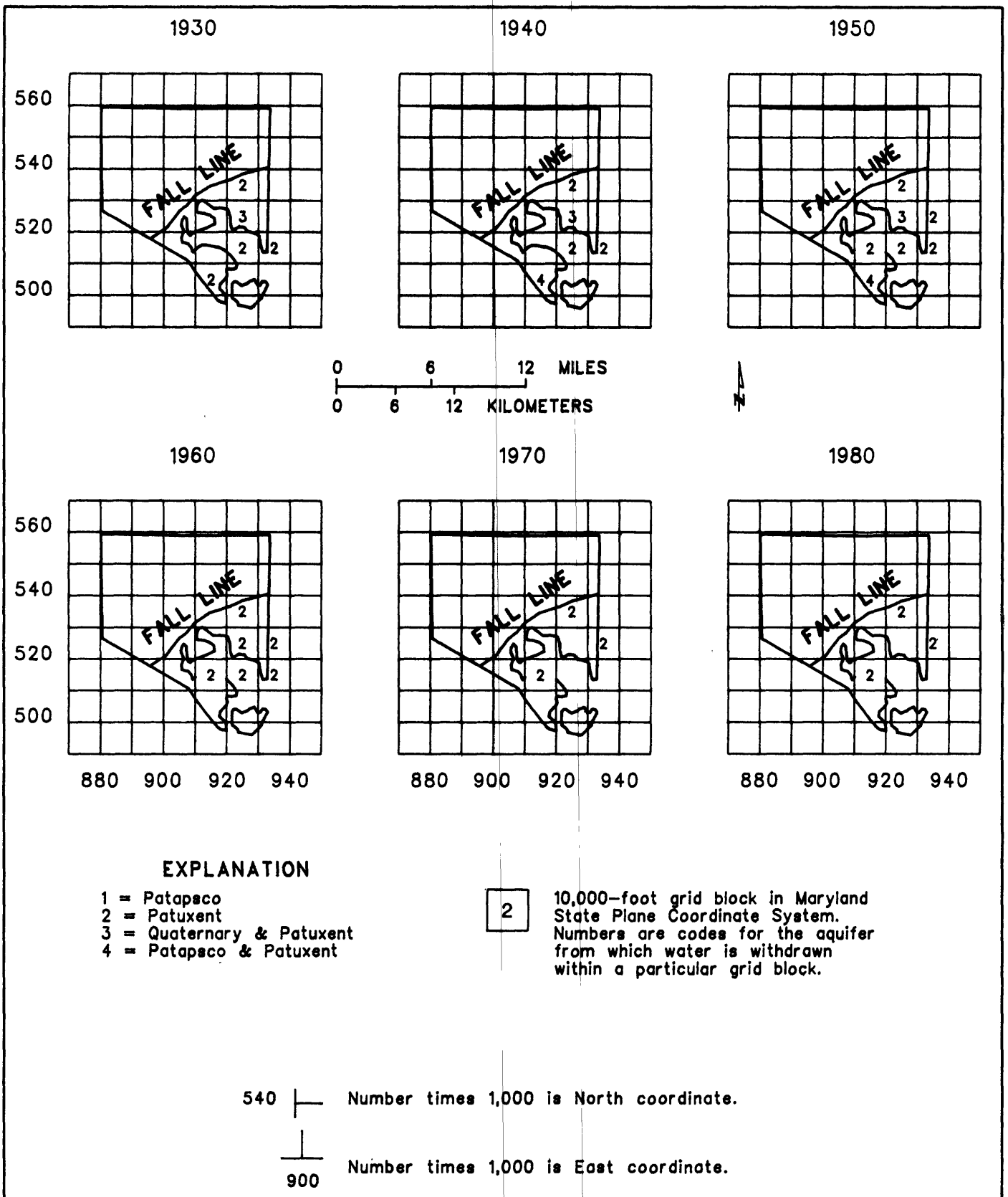


Figure 14.--Locations of large ground-water withdrawals by aquifer in the Coastal Plain area of Baltimore City for 1930, 1940, 1950, 1960, 1970, and 1980.

## BALTIMORE COUNTY

About one-fifth of Baltimore County lies within the Maryland Coastal Plain. Since the early development of this area, ground water has been a source of water supply for many users (Bennett and Meyer, 1952). Much of the early withdrawals were from shallow wells (from about 15 to 80 ft deep) tapping the surficial aquifer. However, as a result of years of heavy pumping, some portions of this aquifer became contaminated with saline water from adjacent estuaries (Bennett and Meyer, 1952). Over time, increasing public-water supply demands were met by extending Baltimore City waterlines farther into the county (Baltimore County Department of Public Works, 1970); however, many large ground-water users, primarily industries, continued to rely on deeper aquifers, including the Patapsco and Patuxent, to meet their needs.

Ground-water use in the Coastal Plain part of the county from 1930 through 1980 is shown in figure 15. In 1930, the amount of ground water withdrawn was approximately 6.3 Mgal/d. Withdrawals increased to a peak of nearly 23.0 Mgal/d in 1942, then declined during the next 2 years to approximately 12.4 Mgal/d in 1944. Although pumpage increased again several times (17.2 in 1958 and 14.2 in 1969), the general trend was downward, and by 1980 withdrawals were about 6.2 Mgal/d. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, the average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic and industrial uses for 1930, 1940, 1950, 1960, 1970, and 1980 are shown in figure 16. Nearly all ground water withdrawn was for industrial use.

### Major Aquifers

The surficial (Quaternary), Patapsco, and Patuxent were the most heavily used aquifers in the Coastal Plain area of Baltimore County from 1930 through 1980 (fig. 17). Use of the surficial aquifer began in 1942 (0.5 Mgal/d) and withdrawals remained relatively the same through 1980.

Use of the Patapsco aquifer was extensive, although, in some areas, heavy pumping caused saltwater intrusion from the Patapsco River which contaminated the aquifer (Bennett and Meyer, 1952). In 1930, pumpage was about 2.8 Mgal/d and increased to nearly 10.0 Mgal/d in 1942. Withdrawals then declined markedly (to approximately 2.8 Mgal/d in 1943). By 1946, pumpage from the Patapsco increased again to nearly 6.0 Mgal/d. Over the next 10 years, pumpage remained at approximately this amount; then in 1957, it increased to more than 9.0 Mgal/d. Withdrawals then began a general downward trend; by 1980, pumpage was only about 0.02 Mgal/d.

The Patuxent was the most heavily used aquifer supplying water to large industries in the Coastal Plain portion of the county. In 1930, approximately 3.5 Mgal/d were withdrawn. By 1942, withdrawals had increased to more than 12.0 Mgal/d. Although withdrawals declined through the early 1960's, they did reach nearly 10.0 Mgal/d in 1970 before declining again to about 5.4 Mgal/d in 1980.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in the Coastal Plain area of Baltimore County for 1930, 1940, 1950, 1960, 1970, and 1980 are shown in figure 18. Table 4 presents water-use data for the large users located within particular grid blocks for the year indicated on the map.

As shown in figure 18, the areas of heaviest pumpage in 1930 were confined to two locations, with the greatest amount being withdrawn at the steel plant at Sparrows Point. There was little change in the distribution pattern for the following years shown, except for an increase in the number of pumpage sites, especially during 1970 and 1980.

The locations of withdrawals from individual aquifers supplying the large users in Baltimore County (described in table 4 and fig. 18) are shown in figure 19. The use of the Patapsco aquifer was limited to the Sparrows Point area. The Patuxent aquifer was the predominant source of ground water for all of the years shown. Its use was greatest in the heavily industrial section of the county--the area bordering the eastern side of Baltimore City, particularly at Sparrows Point.

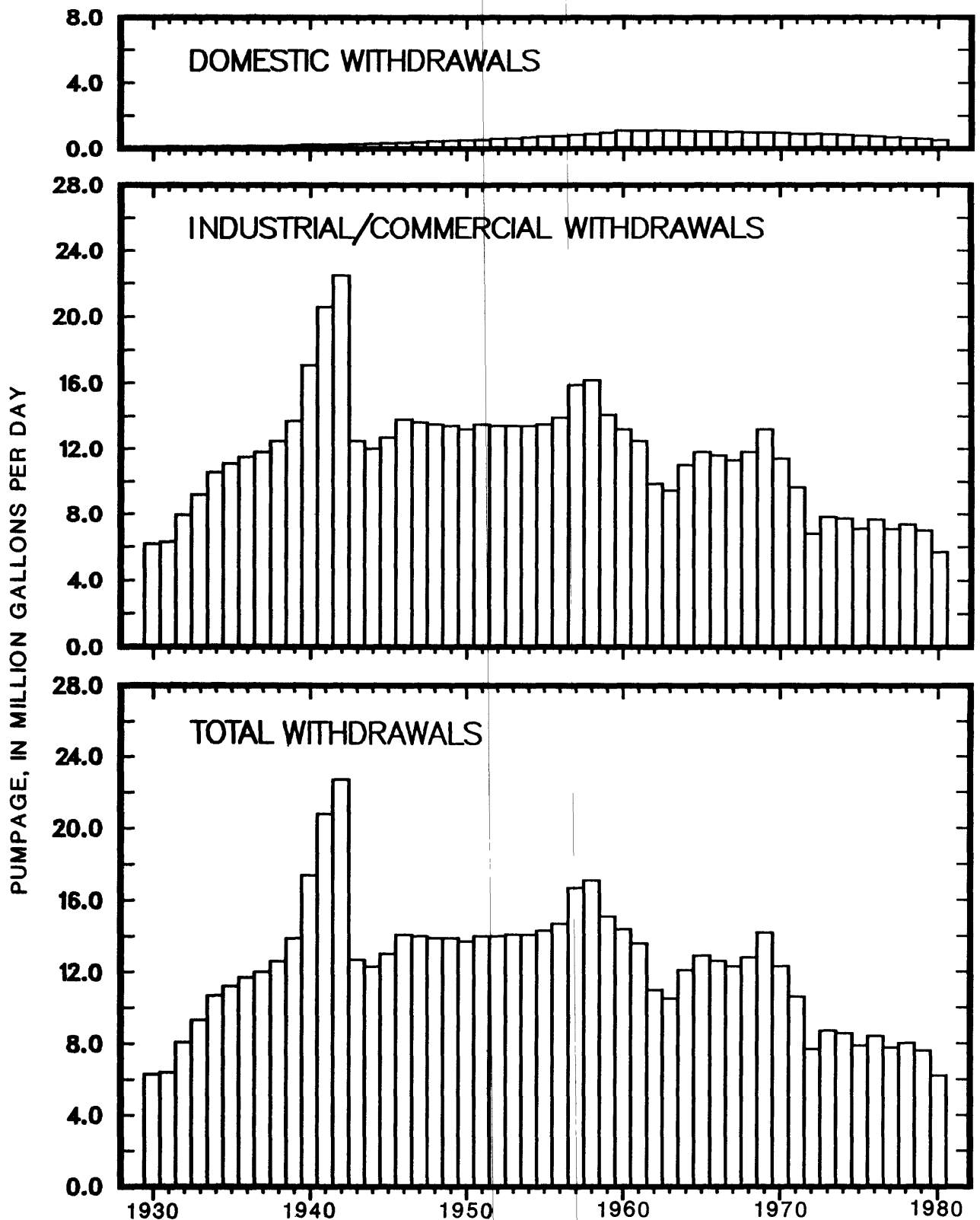


Figure 15.-- Ground-water withdrawals by use in the Coastal Plain area of Baltimore County from 1930 through 1980.

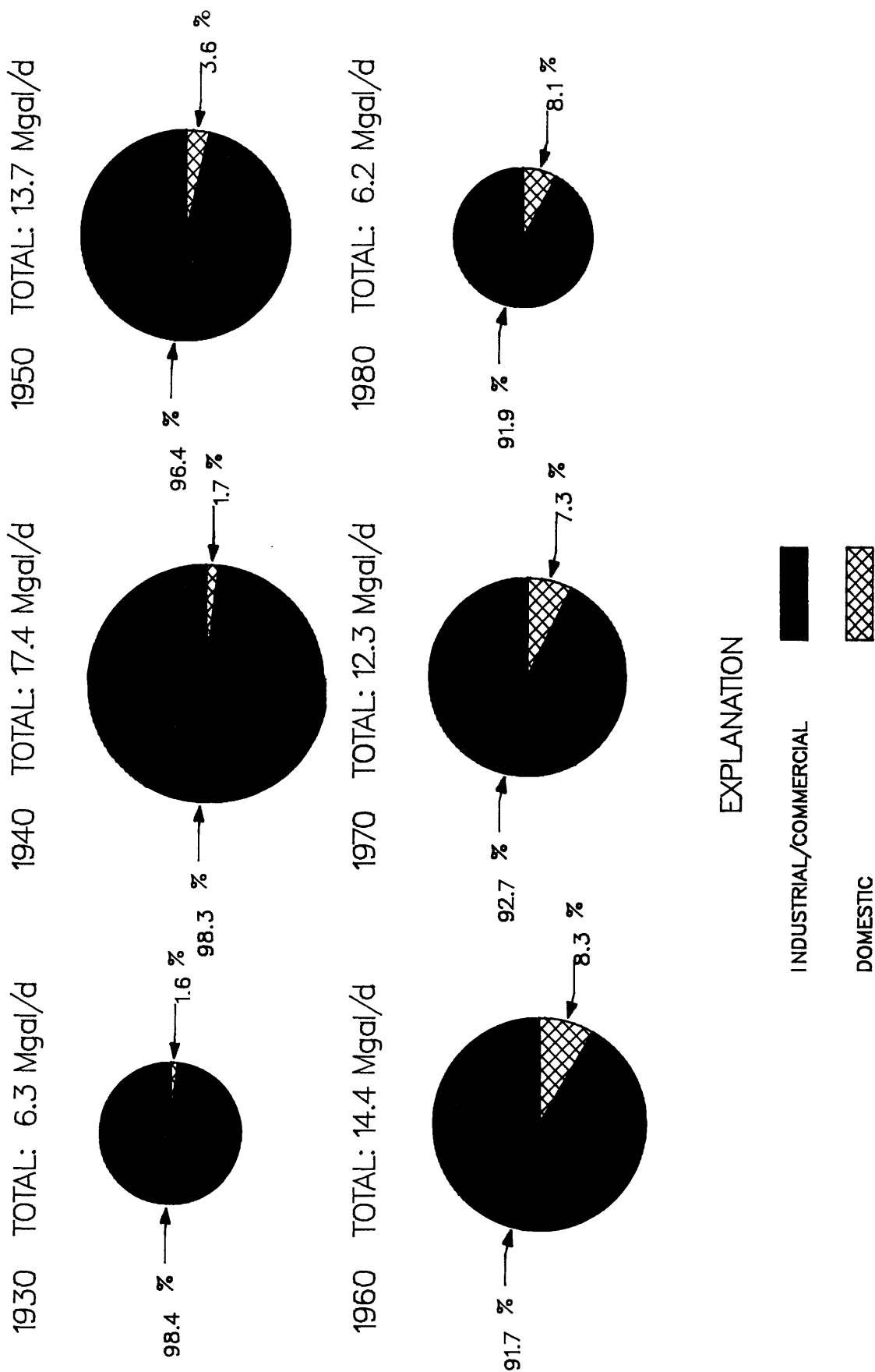


Figure 16.--Ground-water use in the Coastal Plain area of Baltimore County and percentage for each type of use, for 1930, 1940, 1950, 1960, 1970, and 1980.



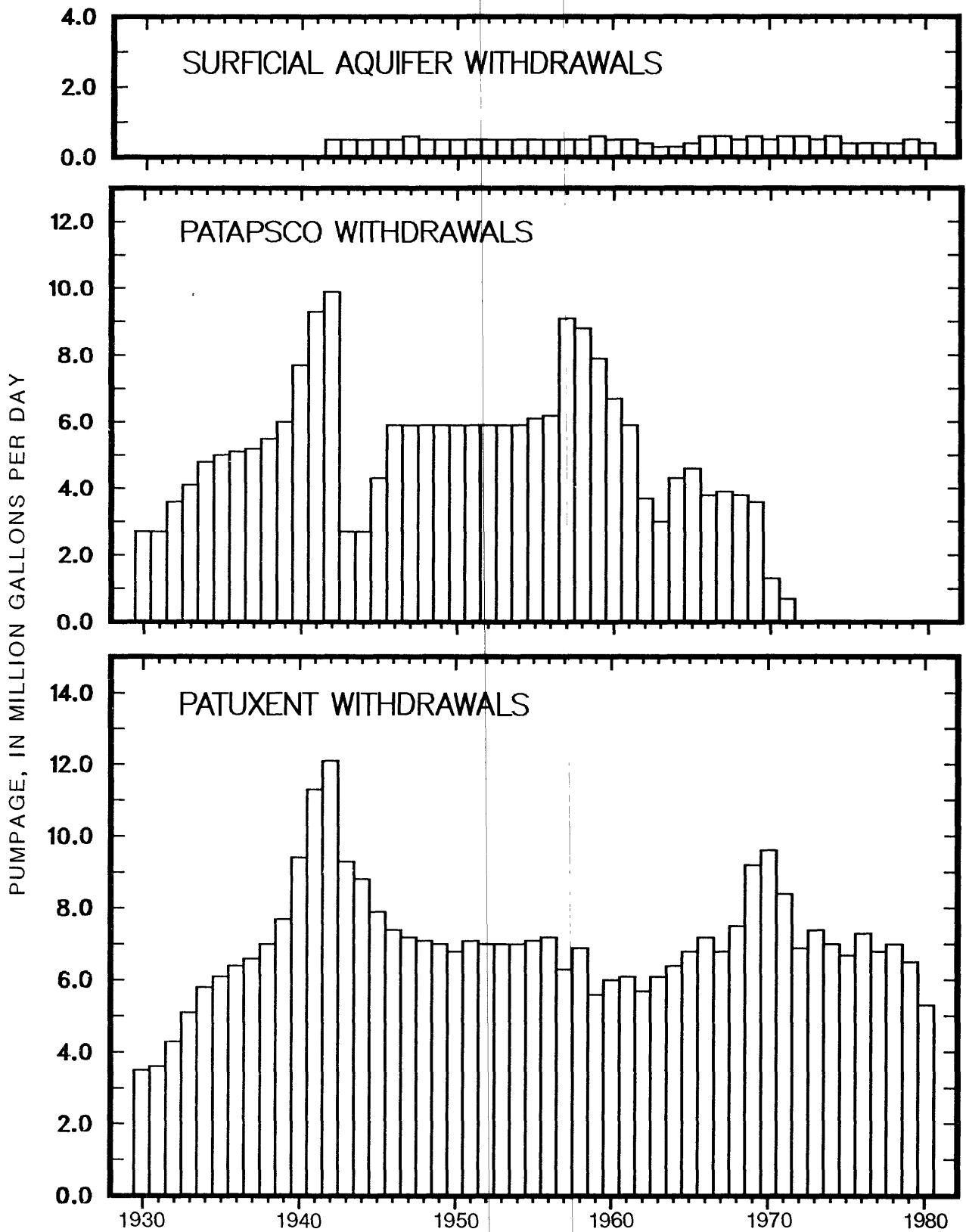


Figure 17.-- Large ground-water withdrawals by aquifers in the Coastal Plain area of Baltimore County from 1930 through 1980.

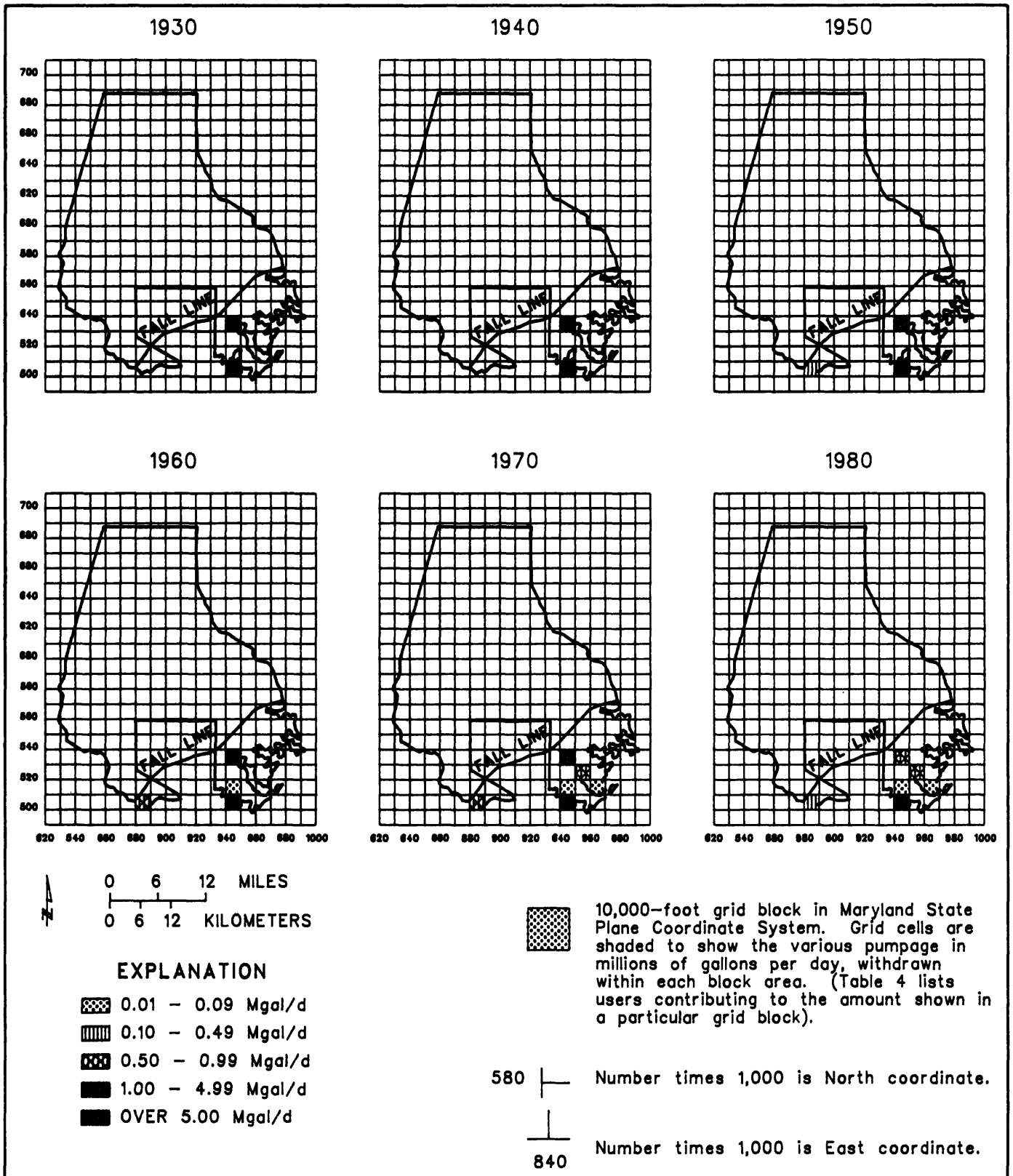


Figure 18.--Locations of large ground-water withdrawals in the Coastal Plain area of Baltimore County for 1930, 1940, 1950, 1960, 1970, and 1980.

Table 4.--Large ground-water users in the Coastal Plain area of Baltimore County in 1930, 1940, 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1930	N500 E940	Bethlehem Steel Corp. (Sparrows Point)	2.70	Patuxent
		do.	2.70	Patapsco
	N530 E940	Eastern Stainless Steel Corporation	.82	Patuxent
1940	N500 E940	Bethlehem Steel Corp. (Sparrows Point)	7.70	Patuxent
		do.	7.70	Patapsco
	N530 E940	Eastern Stainless Steel Corporation	1.80	Patuxent
1950	N500 E880	Jos. E. Seagram & Sons (Calvert Distillery)	0.47	Quaternary
	N500 E940	Bethlehem Steel Corp. (Sparrows Point)	5.50	Patuxent
		do.	5.90	Patapsco
	N530 E940	Eastern Stainless Steel Corporation	1.40	Patuxent
1960	N500 E880	Jos. E. Seagram & Sons (Calvert Distillery)	0.54	Quaternary
	N500 E940	Bethlehem Steel Corp. (Sparrows Point)	4.90	Patuxent
		do.	6.70	Patapsco
	N510 E940	Joseph S. Merritt, Incorporated	.01	Patapsco
	N530 E940	Eastern Stainless Steel Corporation	1.10	Patuxent
1970	N500 E880	Jos. E. Seagram & Sons (Calvert Distillery)	0.53	Quaternary
	N500 E940	Bethlehem Steel Corp. (Sparrows Point)	7.80	Patuxent
		do.	1.20	Patapsco
	N510 E940	Joseph S. Merritt, Incorporated	.02	Patapsco
	N510 E960	Rocky Point Golf Course	.02	Patuxent
	N520 E950	American Yeast Corporation	.70	Patuxent
	N530 E940	Eastern Stainless steel Corporation	1.10	Patuxent
1980	N500 E880	Jos. E. Seagram & Sons (Calvert Distillery)	0.42	Quaternary
	N500 E940	Bethlehem Steel Corp. (Sparrows Point)	3.60	Patuxent
	N510 E940	Joseph S. Merritt, Incorporated	.02	Patapsco
	N510 E960	Rocky Point Golf Course	.04	Patuxent
	N520 E950	American Yeast Corporation	.70	Patuxent
		N530 E940	Eastern Stainless Steel Corporation	.96

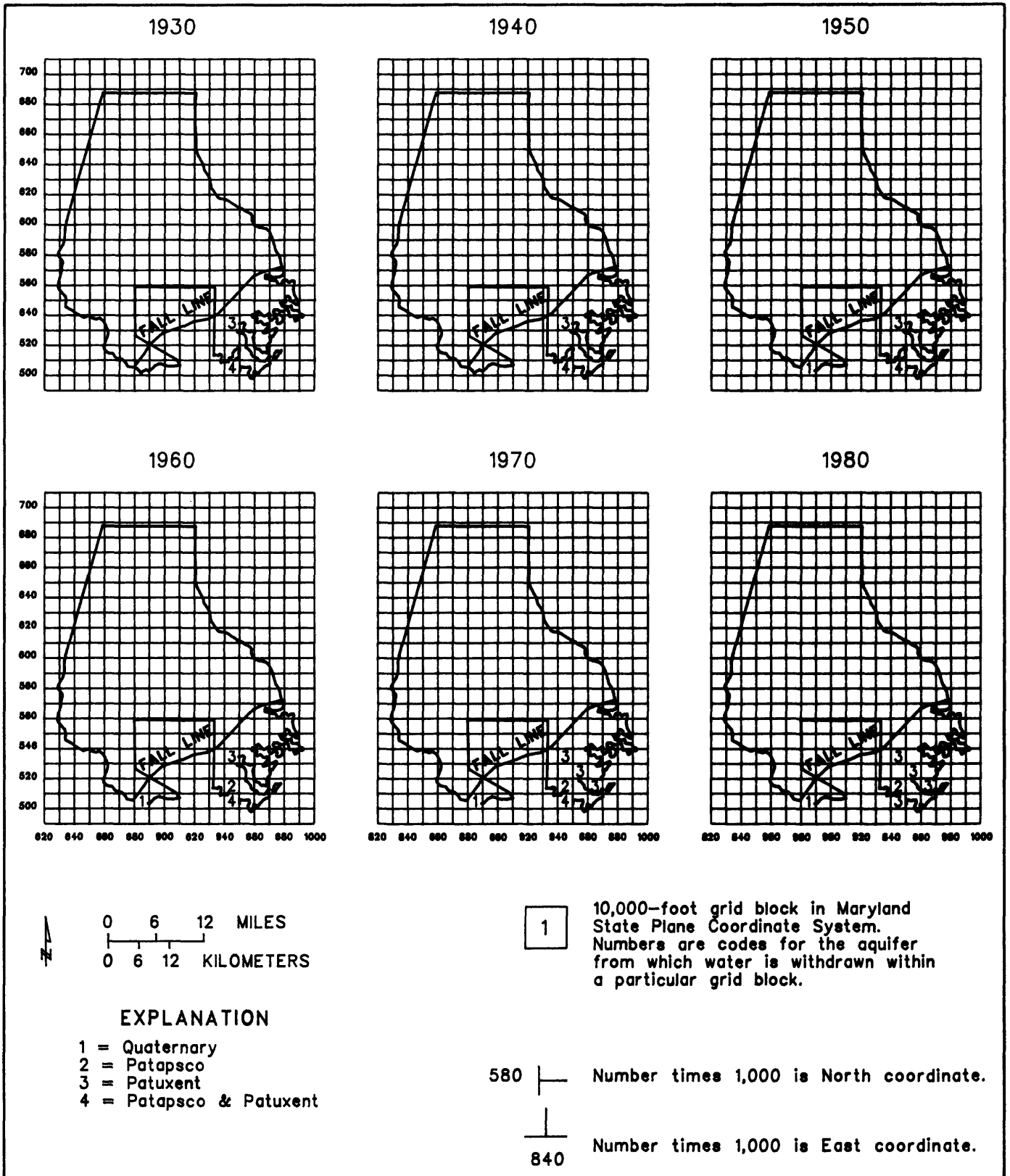


Figure 19.--Locations of large ground-water withdrawals by aquifers in the Coastal Plain area of Baltimore County for 1930, 1940, 1950, 1960, 1970, and 1980.

## CALVERT COUNTY

Ground-water use in Calvert County from 1940 through 1980 is shown in figure 20. In 1940, the amount of ground water withdrawn was approximately 0.8 Mgal/d compared to withdrawals of about 2.8 Mgal/d in 1980. This represents an increase of 250 percent for the four decades. The figure also indicates that for most of the period, the largest withdrawals of ground water were for domestic use. Military use was greatest during the period 1941 (0.8 Mgal/d) through 1949 (0.6 Mgal/d). By 1980, however, military withdrawals had declined to about 0.1 Mgal/d. Large withdrawals for industrial/commercial use began about 1970 and increased from about 0.1 Mgal/d in 1971 to nearly 0.3 Mgal/d in 1979, before declining to about 0.1 Mgal/d in 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, military, water supplier, and industrial/commercial uses for 1950, 1960, 1970, and 1980 are shown in figure 21. Domestic use comprised a significant portion of the total pumpage for all the years shown. Military use accounted for 42 percent of total ground water withdrawn in 1950, but by 1980 the percentage had dropped to only 4.6 percent. Withdrawals for industrial/commercial use began in the early 1970's and, by 1980, comprised about 5 percent of the total.

### Major Aquifers

Many domestic withdrawals in Calvert County were from shallow wells (from about 15 to 45 ft deep) tapping the surficial aquifer. Deeper aquifers, including the Piney Point, Aquia, and Magothy, were more widely used by large users. Large user withdrawals by aquifer from 1940 through 1980 are shown in figure 22.

Pumpage from the Piney Point began in 1947, with users withdrawing less than 0.01 Mgal/d. However, during the following years, withdrawals increased and by 1980 were about 0.17 Mgal/d. Large withdrawals from the Aquia aquifer, the greatest supplier of ground water in the county, began in 1941 and averaged about 0.80 Mgal/d through 1950, declining to just more than 0.2 Mgal/d in 1960. By 1980, however, withdrawals had increased again to about 0.6 Mgal/d. The Magothy aquifer was not used as a source of water supply by large users until 1971. Withdrawals at that time were about 0.04 Mgal/d and increased to more than 0.10 Mgal/d by 1980.

### Locations of Large Ground-Water Withdrawals

The locations of large ground-water withdrawals in Calvert County for 1950, 1960, 1970, and 1980 are shown in figure 23. Table 5 presents water-use data for the large users located within a particular grid block for the year indicated on the map. In 1950, heaviest pumpage by large users was located in the northeastern and extreme southern parts of the county. The maps for 1960 and 1970 show several new locations of large withdrawals, particularly in the central and southeastern areas. By 1980, the distribution was widely scattered throughout the county.

The locations of withdrawals from the aquifers supplying large users in Calvert County (described in table 5 and fig. 23) are shown in figure 24. Use of the Piney Point aquifer by large users began in the 1950's and was located mainly in the east-central and southeastern parts of the county. The Aquia was the only aquifer that supplied large users in 1950. Increased use of the aquifer as a source for large quantities of water is shown on the maps for 1960, 1970, and 1980. The Magothy was the deepest aquifer used as of 1980, and withdrawals from it remained solely in the northernmost part of the county.

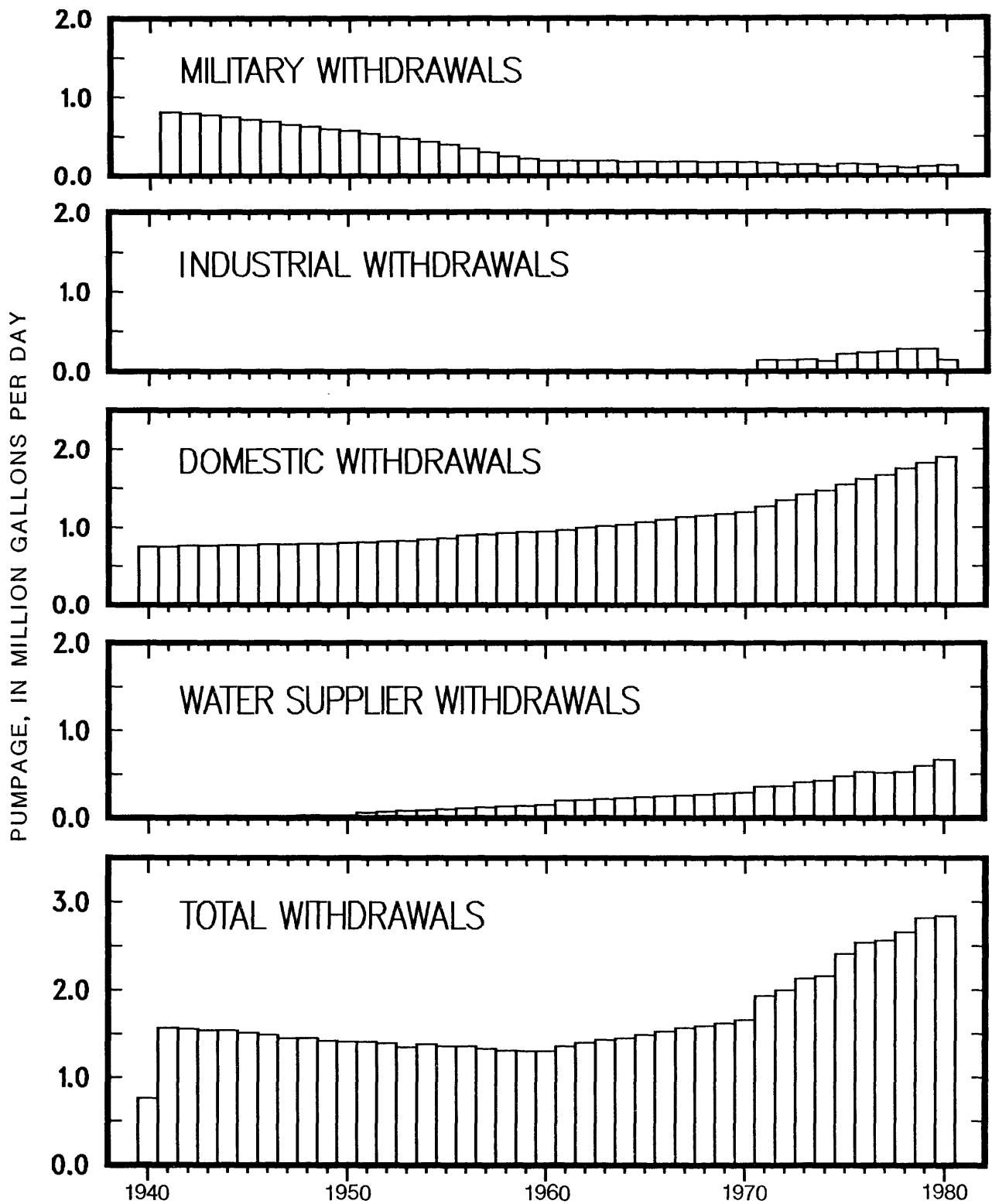
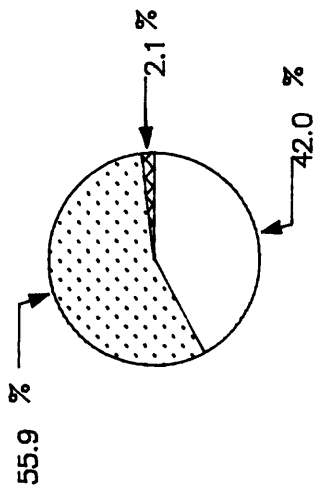
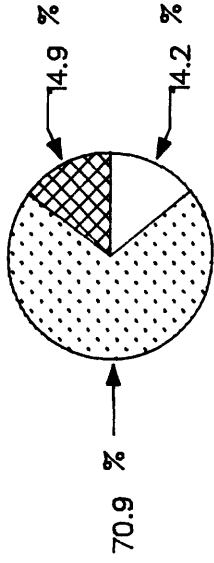


Figure 20.-- Ground-water withdrawals by use in Calvert County from 1940 through 1980.

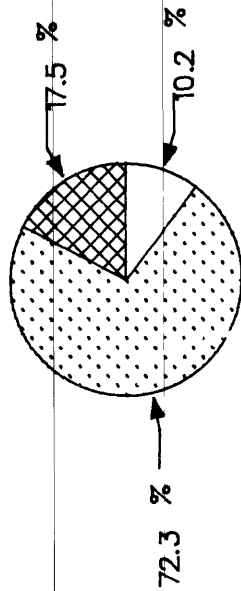
1950 TOTAL: 1.4 Mgal/d



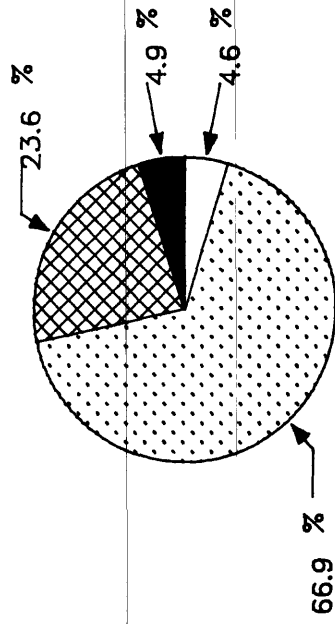
1960 TOTAL: 1.3 Mgal/d



1970 TOTAL: 1.7 Mgal/d



1980 TOTAL: 2.8 Mgal/d



EXPLANATION

- INDUSTRIAL/COMMERCIAL [Solid Black Box]
- DOMESTIC [Dotted Box]
- WATER SUPPLIER [Cross-hatched Box]
- MILITARY [White Box]

Figure 21.--Ground-water use in Calvert County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

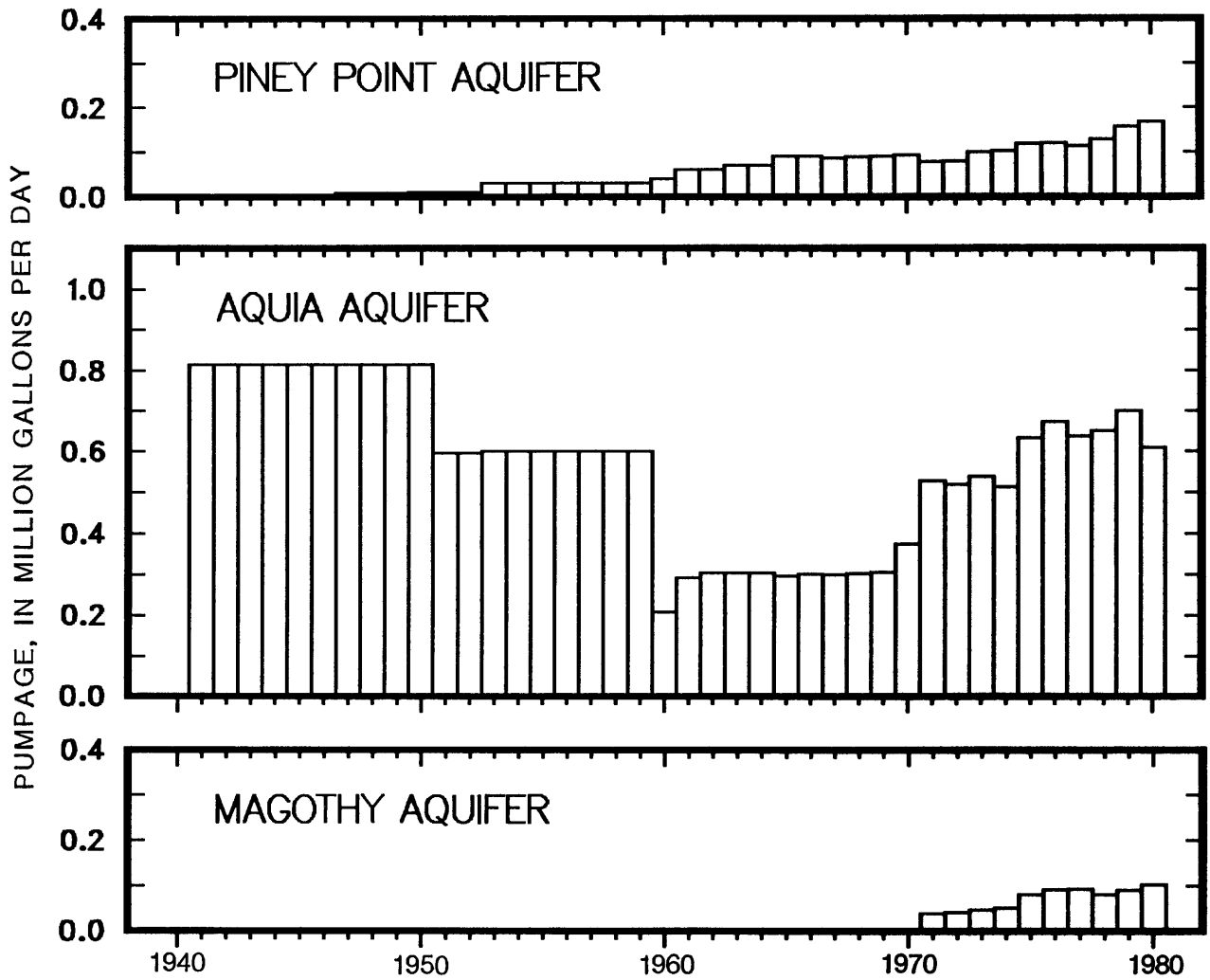
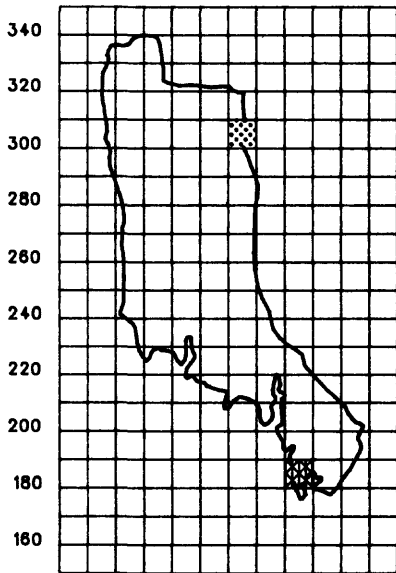





Figure 22.--Large ground-water withdrawals by aquifers in Calvert County from 1940 through 1980.



1950

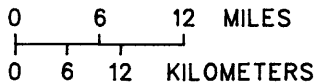


**EXPLANATION**

-  0.01 - 0.09 Mgal/d
-  0.10 - 0.49 Mgal/d
-  0.50 - 0.99 Mgal/d



10,000 foot grid block in Maryland State Plane Coordinate System. Grid cells are shaded in millions of gallons per day withdrawn within each block area. (Table 5 lists users contributing to the amount shown in a particular grid block).

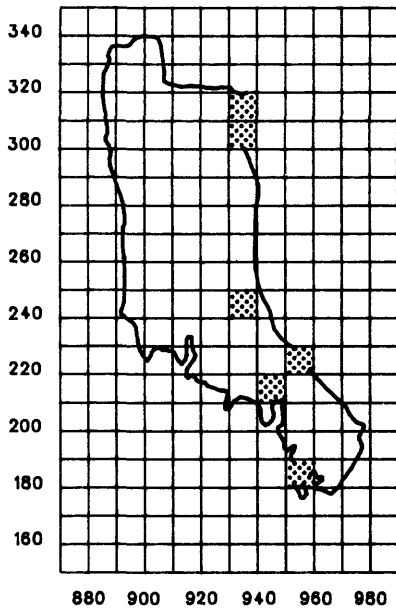


380 | Number times 1,000 is North coordinate.

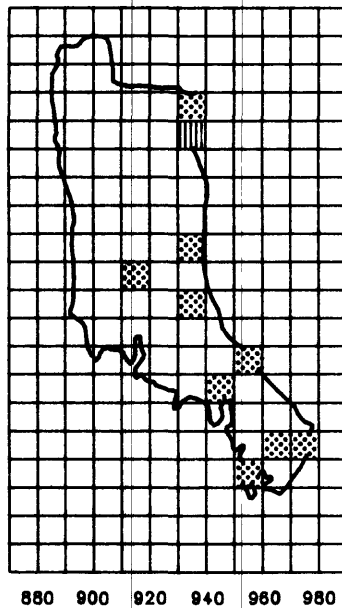


Number times 1,000 is East coordinate.

1960



1970



1980

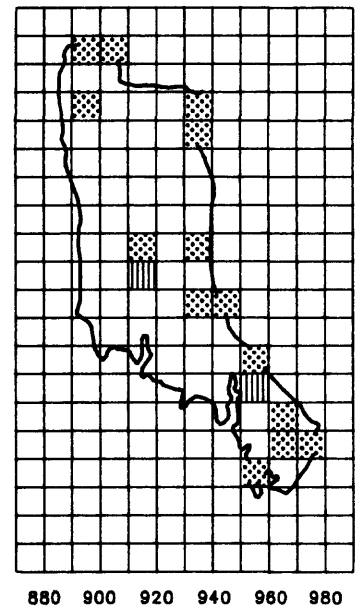


Figure 23.--Locations of large ground-water withdrawals in Calvert County for 1950, 1960, 1970, and 1980.

Table 5.--Large ground-water users in Calvert County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer	
1950	N180 E950	U.S. Navy, Solomons	0.75	Aquia	
	N300 E930	U.S. Navy, Randle Cliffs	.06	Aquia	
1980	N180 E950	U.S. Navy, Solomons	0.09	Aquia	
	N210 E940	White Sands Corporation	.01	Piney Point	
	N220 E950	Long Beach Water, Calvert water system	.02	Aquia	
	N240 E930	Scientist Cliffs Service Company	.02	Piney Point	
	N300 E930	U.S. Navy, Randle Cliffs	.06	Aquia	
	N310 E930	Chesapeake Beach water system	.01	Aquia	
1970	N180 E950	U.S. Navy, Solomons	0.08	Aquia	
	N190 E960	Chesapeake Ranch Water Company	.02	Piney Point	
	N190 E970	do.	.03	Aquia	
	N210 E940	White Sands Corporation	.01	Piney Point	
	N220 E950	Long Beach Water, Calvert water system	.02	Aquia	
		do.	.03	Piney Point	
	N240 E930	Scientist Cliffs Service Company	.02	Piney Point	
	N250 E910	Prince Frederick water system	.09	Aquia	
	N260 E930	A.I.Cassell Utility Corporation	.01	Aquia	
	N300 E930	U.S. Navy, Randle Cliffs	.10	Aquia	
	N310 E930	Chesapeake Beach water system	.03	Aquia	
	1980	N180 E950	U.S. Navy, Solomons	0.09	Aquia
		N190 E960	Chesapeake Ranch Water Company	.03	Piney Point
N190 E970		do.	.09	Aquia	
N200 E960		Columbia Lng. Corporation	.01	Aquia	
N210 E950		Baltimore Gas and Electric, Calvert Cliffs	.12	Aquia	
N220 E950		Long Beach Water, Calvert water system	.02	Aquia	
		do.	.06	Piney Point	
N240 E930		Scientist Cliffs Service Company	.03	Piney Point	
		do.	.01	Aquia	
N240 E940		Kenwood Beach, Calvert water system	.02	Piney Point	
N250 E910		Prince Frederick water system	.10	Aquia	
N260 E910		Calvert Memorial Hospital	.03	Aquia	
N260 E930		Dares Beach Water Company	.03	Piney Point	
		A. I. Cassell Utility Corporation	.04	Aquia	
N300 E930		U.S. Navy, Randle Cliffs	.04	Aquia	
N310 E890		Northern Middle High School	.02	Magothy	
N310 E930		Chesapeake Beach water system	.05	Aquia	
N330 E890		Shores of Calvert	.04	Magothy	
N330 E900	Cavalier Country	.05	Magothy		

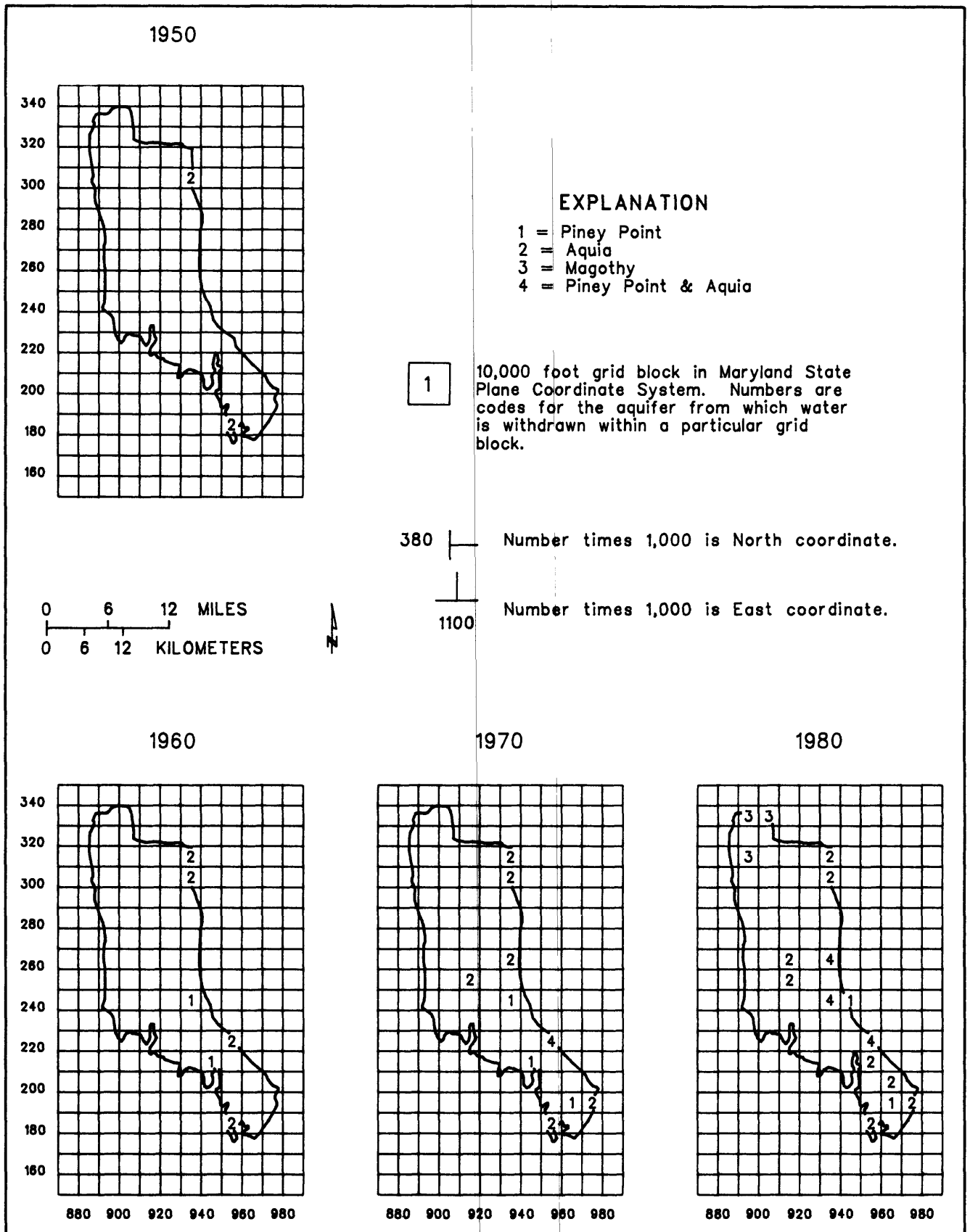


Figure 24.--Locations of large ground-water withdrawals by aquifers in Calvert County for 1950, 1960, 1970, and 1980.

## CAROLINE COUNTY

Ground-water use in Caroline County from 1950 through 1980 is shown in figure 25. In 1950, the amount of ground water withdrawn was approximately 3.3 Mgal/d compared to withdrawals of nearly 7.1 Mgal/d in 1980. This represents an increase of 116 percent for the three decades. During that time, the amount of water withdrawn for domestic and water supplier uses remained relatively constant. However, a decline is indicated in the amount of water withdrawn for industrial/commercial use (from about 1.7 Mgal/d in 1950 to 0.4 Mgal/d in 1980). This decline is due largely to the closing of several canneries in the early 1970's (see appendix). An increase in the amount of ground water used for irrigation (from about 0.06 Mgal/d in 1954 to more than 3.5 Mgal/d in 1980) is also shown. The use of ground water for irrigation by large users in the county began in the mid-1950's. Although there have been no precise measurements of the amounts of water withdrawn by individual irrigators, methods of collecting and reporting these data have improved since that time; however, the most reliable data are from 1970 to 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation uses for 1950, 1960, 1970, and 1980 are shown in figure 26. It is interesting to note that in 1950, industrial/commercial use comprised about 50 percent of the total ground water withdrawn; in 1980, however, this category of use dropped to only 6 percent. Withdrawals for water supplier and domestic use remained fairly constant for the 4 years shown. Irrigation use increased from about 6 percent in 1960 to 50 percent in 1980.

### Major Aquifers

The surficial (Quaternary and Columbia), lower Chesapeake, and Piney Point aquifers were most heavi-

ly pumped by large users from 1950 through 1980 in Caroline County (fig. 27). Withdrawals from the surficial aquifer were less than 0.1 Mgal/d from 1950 through 1975, increasing to about 0.5 Mgal/d in 1976. In 1980, pumpage from these aquifers reached about 0.6 Mgal/d.

The lower Chesapeake aquifer in the lower Chesapeake Group includes several water-bearing units which were used extensively in the county. These include the Frederica (and equivalent Choptank), Federalburg, and Cheswold aquifers. As figure 27 shows, this group of aquifers supplied the greatest amount of water to large users. In 1969, withdrawals peaked at approximately 2.0 Mgal/d. However, beginning in 1970, use of the aquifers declined primarily due to the closing of several canneries which pumped water from these sands (see appendix). By 1980, withdrawals had been reduced to about 0.8 Mgal/d. Pumpage from the Piney Point increased gradually from about 0.3 Mgal/d in 1950 to just more than 0.5 Mgal/d in 1980.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Caroline County for 1950, 1960, 1970, and 1980 are shown in figure 28. Table 6 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. The figure shows that the locations of large withdrawals did not change or increase significantly for any of the years presented.

The locations of withdrawals from individual aquifers supplying the large users in Caroline County (described in table 6 and fig. 28) are shown in figure 29. Withdrawals from the surficial aquifer remained solely in the southernmost part of the county. The use of the water-bearing units of the lower Chesapeake Group was distributed throughout the county. Use of the Piney Point aquifer was limited to the central and north-central part of the county in 1950, but extended to the south-central part in 1960, 1970, and 1980.

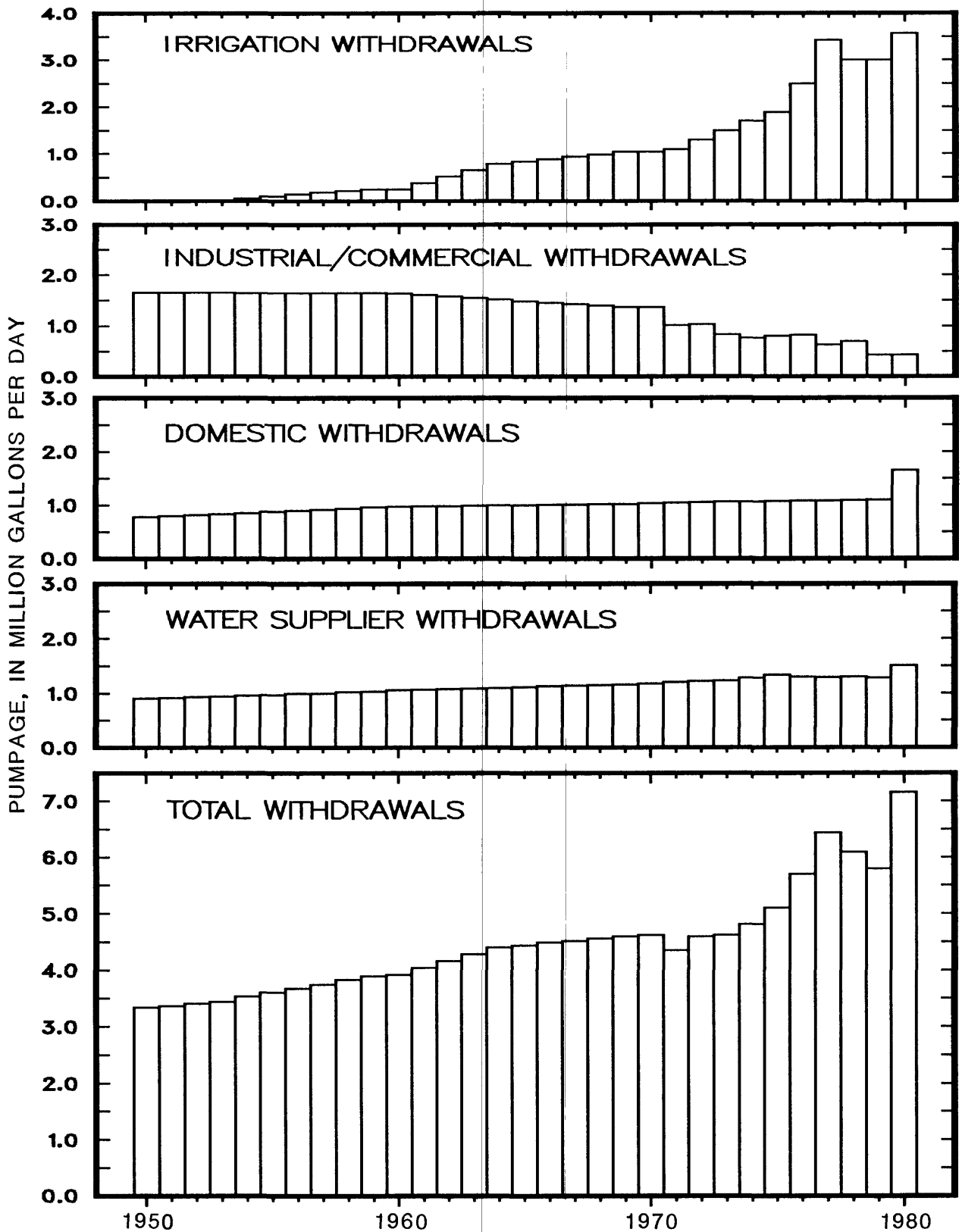
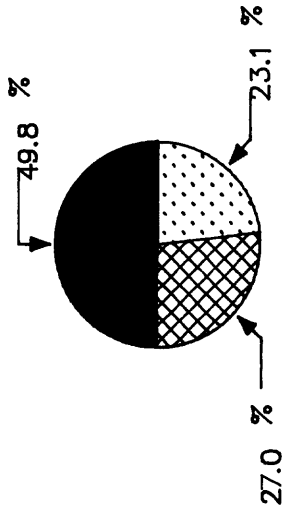
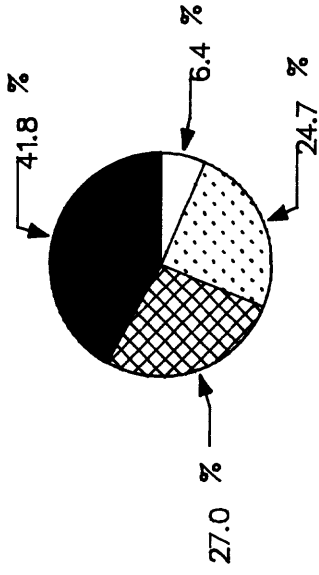


Figure 25.--Ground-water withdrawals by use in Caroline County from 1950 through 1980.

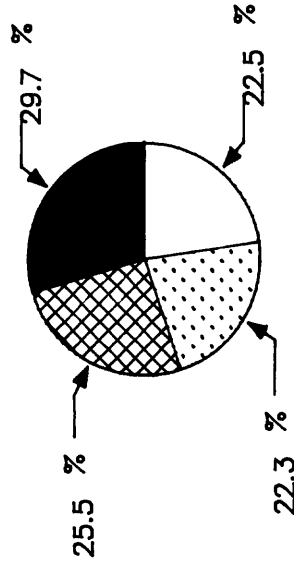
1950 TOTAL: 3.3 Mgal/d



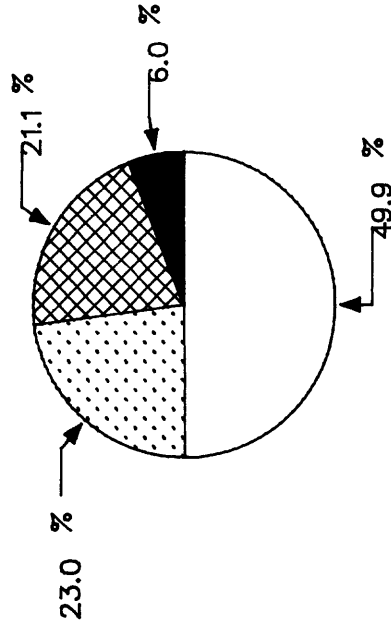
1960 TOTAL: 3.9 Mgal/d



1970 TOTAL: 4.6 Mgal/d



1980 TOTAL: 7.1 Mgal/d



EXPLANATION

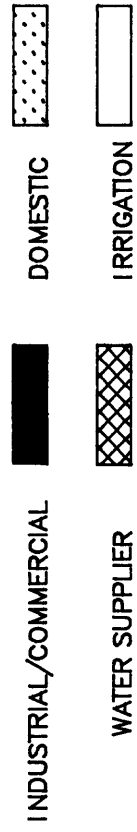


Figure 26.--Ground-water use in Caroline County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

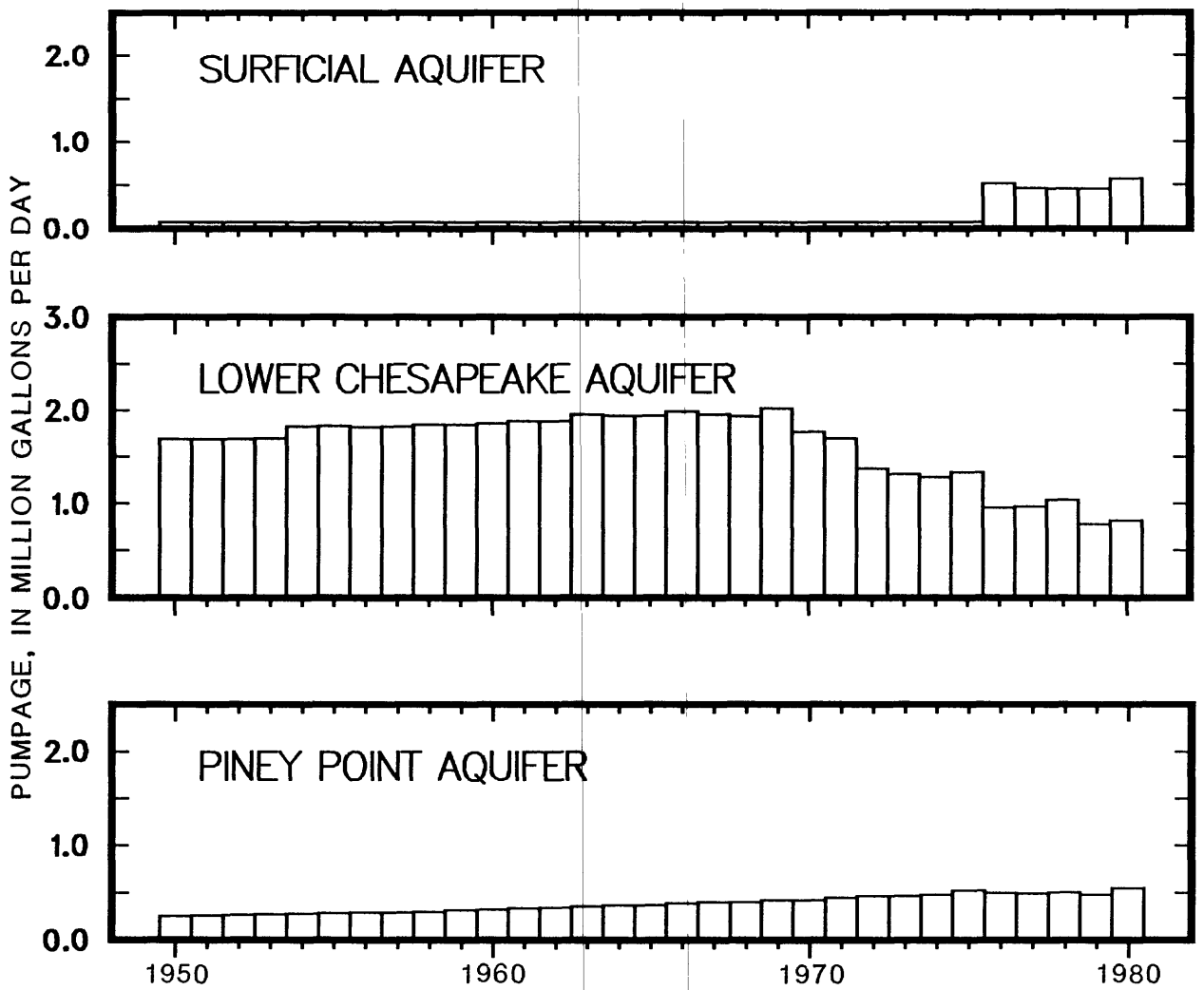
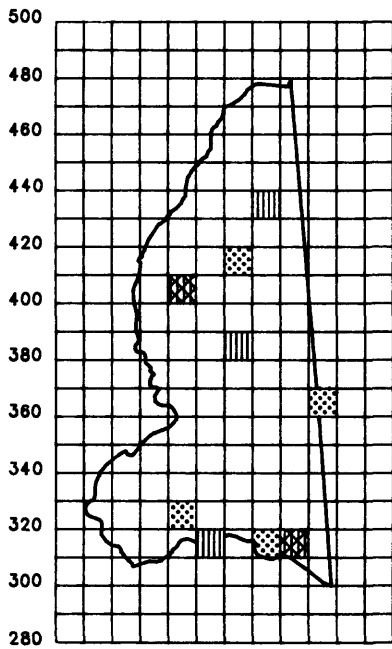






Figure 27.--Large ground-water withdrawals by aquifers in Caroline County from 1950 through 1980.

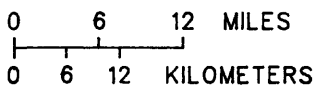
1950



**EXPLANATION**

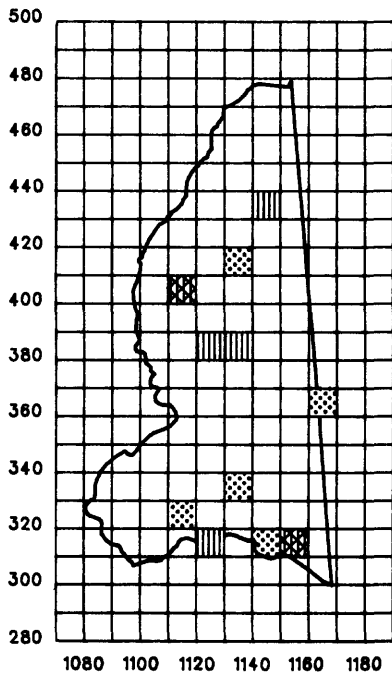
-  0.01 - 0.09 Mgal/d
-  0.10 - 0.49 Mgal/d
-  0.50 - 0.99 Mgal/d

 10,000-foot grid block in Maryland State Plane Coordinate System. Grid cells are shaded in millions of gallons per day withdrawn within each block area. (Table 6 lists users contributing to the amount shown in a particular grid block).

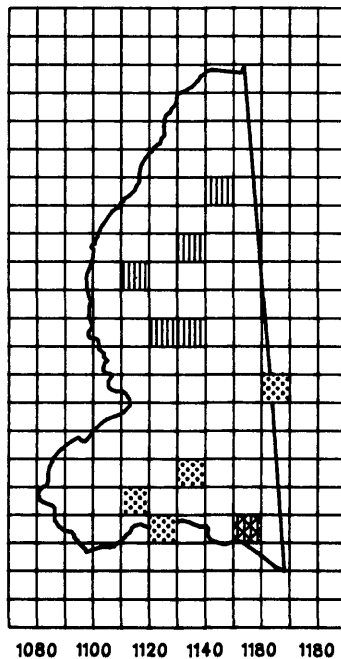


380 | Number times 1,000 is North coordinate.  
 |  
 1100 | Number times 1,000 is East coordinate.

1960



1970



1980

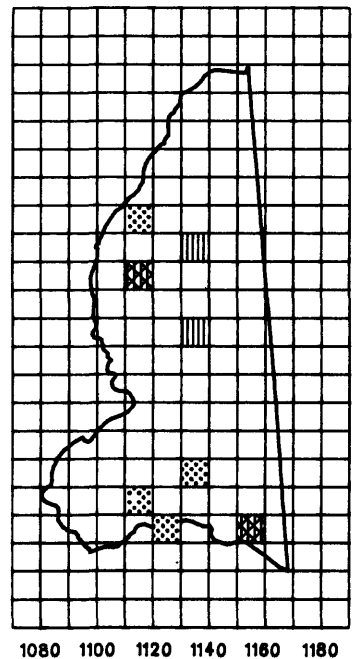


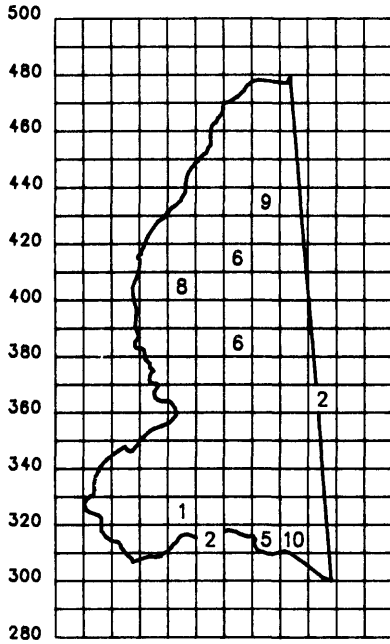
Figure 28.--Locations of large ground-water withdrawals in Caroline County for 1950, 1960, 1970, and 1980.



Table 6.--Large ground-water users in Caroline County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N310 E1120	John N. Wright, Jr.	0.11	Federalsburg
	N310 E1140	John N. Wright, Jr., Incorporated	.03	Calvert
	N310 E1150	Wheatley Canning Company	.15	Calvert
		Federalsburg, Town of	.48	Federalsburg
		Maryland Plastics	.09	Calvert
	N320 E1110	Preston, Town of	.07	Pleistocene
	N360 E1160	Nuttle Canning Company	.04	Federalsburg
	N380 E1130	Denton, Town of	.18	Piney Point
	N400 E1110	Ridgely, Town of	.05	Frederica
		Saulsbury Brothers, Incorporated	.50	Quaternary
	N410 E1130	Greensboro, Town of	.07	Piney Point
	N430 E1140	T. Noble Jarrell Canning company	.14	Quaternary
		Cooklyn Dairies	.09	Choptank
1960	N310 E1120	John N. Wright, Jr.	0.11	Federalsburg
	N310 E1140	John N. Wright, Jr., Incorporated	.03	Calvert
	N310 E1150	Wheatley Canning Company	.15	Calvert
		Federalsburg, town of	.49	Federalsburg
		Maryland Plastics	.09	Calvert
	N320 E1110	Preston, Town of	.07	Pleistocene
	N330 E1130	Northern and Denton High Schools	.01	Piney Point
	N360 E1160	Nuttle Canning Company	.04	Federalsburg
	N380 E1120	Wilson Laurel Farms, Incorporated	.12	Choptank
	N380 E1130	Denton, Town of	.21	Piney Point
	N400 E1110	Ridgely, Town of	.09	Frederica
		Saulsbury Brothers, Incorporated	.50	Quaternary
	N410 E1130	Greensboro, Town of	.10	Piney Point
N430 E1140	T. Noble Jarrell Canning Company	.14	Quaternary	
	Cooklyn Dairies	.09	Choptank	
1970	N310 E1120	John N. Wright, Jr.	0.08	Federalsburg
	N310 E1150	Wheatley Canning Company	.15	Calvert
		Federalsburg, Town of	.52	Federalsburg
		Maryland Plastics	.09	Calvert
	N320 E1110	Preston, Town of	.07	Pleistocene
	N330 E1130	Northern and Denton High Schools	.02	Cheswold
		do.	.01	Piney Point
	N360 E1160	Nuttle Canning Company	.04	Federalsburg
	N380 E1120	Wilson Laurel Farms, Incorporated	.12	Choptank
	N380 E1130	Denton, Town of	.26	Piney Point
	N400 E1110	Ridgely, Town of	.14	Frederica
		Saulsbury Brothers, Incorporated	.22	Quaternary
		Grasonville Fisheries, Incorporated	.11	Frederica
N410 E1130	Greensboro, town of	.15	Piney Point	
N430 E1140	T. Noble Jarrell Canning Company	.14	Quaternary	
	David M. King Canning Company	.04	Quaternary	
	Cooklyn Dairies	.09	Choptank	
1980	N310 E1120	John N. Wright, Jr.	0.06	Federalsburg
	N310 E1150	Federalsburg, Town of	.17	Federalsburg
		do.	.50	Columbia
	N320 E1110	Preston, Town of	.07	Pleistocene
	N330 E1130	Northern and Denton High Schools	.02	Cheswold
		do.	.02	Piney Point
	N380 E1130	Denton, Town of	.36	Piney Point
	N400 E1110	Ridgely, Town of	.19	Frederica
		Saulsbury Brothers, Incorporated	.24	Quaternary
		Grasonville Fisheries, Incorporated	.13	Frederica
N410 E1130	Greensboro, Town of	.17	Piney Point	
N420 E1110	The Benedictine School	.02	Frederica	

1950



EXPLANATION

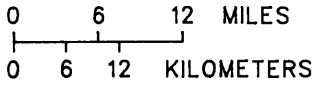
- 1 = Pleistocene
- 2 = Federalsburg
- 3 = Frederica
- 4 = Choptank
- 5 = Calvert
- 6 = Piney Point
- 7 = Federalsburg & Columbia
- 8 = Quaternary & Frederica
- 9 = Quaternary & Choptank
- 10 = Calvert & Federalsburg
- 11 = Cheswold & Piney Point



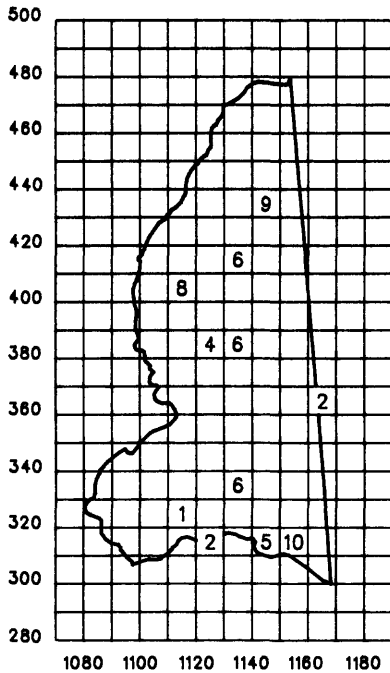
10,000-foot grid block in Maryland State Plane Coordinate System. Numbers are codes for the aquifer from which water is withdrawn within a particular grid block.

380 | Number times 1,000 is North coordinate.

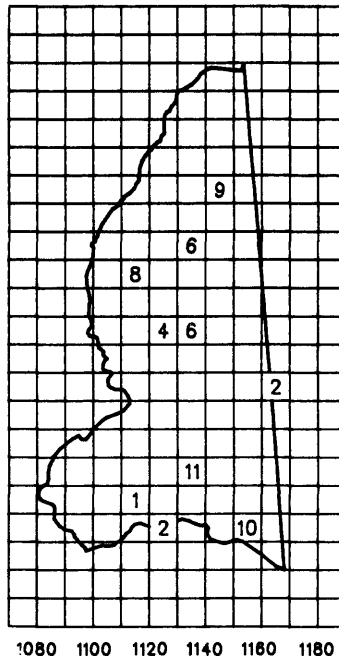
1100 | Number times 1,000 is East coordinate.



1960



1970



1980

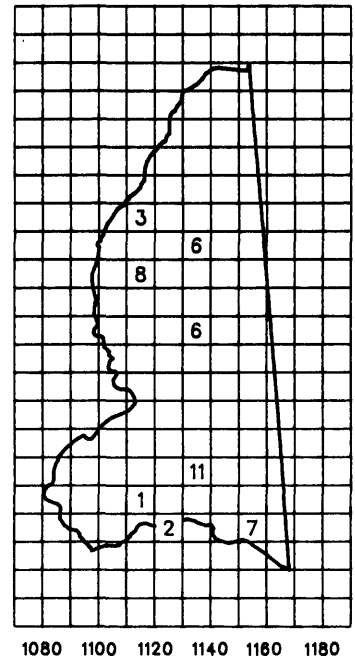


Figure 29.--Locations of large ground-water withdrawals by aquifers in Caroline County for 1950, 1960, 1970, and 1980.

## CECIL COUNTY

About one-half of Cecil County lies within the Coastal Plain. Ground-water use in the Coastal Plain area of Cecil County from 1950 through 1980 is shown in figure 30. In 1950, the amount of ground water withdrawn was approximately 0.7 Mgal/d compared to withdrawals of more than 2.0 Mgal/d in 1980. This represents an increase of 186 percent for the three decades.

Since 1950, water use increased in nearly every category. The largest use of ground water was for domestic use, increasing from about 0.6 Mgal/d in 1950 to nearly 1.3 Mgal/d in 1980. Withdrawals for use by water suppliers showed an increase from about 0.1 Mgal/d in 1950 to nearly 0.6 Mgal/d in 1980; water withdrawn for industrial/commercial use increased from less than 0.01 Mgal/d in 1950 to just more than 0.1 Mgal/d in 1980. Water used for irrigation was estimated from available data and averaged about 0.02 Mgal/d from 1970 to 1980. See appendix for ground-water withdrawal data for each user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation users for 1950, 1960, 1970, and 1980 are shown in figure 31.

### Major Aquifers

Many domestic withdrawals in the Coastal Plain area of Cecil County were from shallow wells (from about 15 to 45 ft deep) tapping the surficial aquifer. Deeper aquifers, including the Magothy and the aquifers of the Potomac Group, were more widely used by large users. Large user withdrawals by aquifer from 1950 through 1980 are shown in figure 32. The use of the Magothy aquifer began about 1968 and, as of 1980, large-user withdrawals were limited to one water sup-

plier (see appendix).

The water-yielding sand and gravel of the Patapsco and Patuxent Formations in the Cretaceous Potomac Group form the Patapsco and Patuxent aquifers (table 1). Where the aquifers are poorly differentiated in Cecil County, they are designated the Potomac aquifers. Figure 32 shows that the Potomac aquifers were the most important source of ground water for large users in the Coastal Plain part of the county, with withdrawals increasing from about 0.12 Mgal/d in 1950 to nearly 0.7 Mgal/d in 1980.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in the Coastal Plain area of Cecil County for 1950, 1960, 1970, and 1980 are shown in figure 33. Table 7 presents water-use data for the large users located within particular grid blocks for the year indicated on the map.

In 1950, the areas of greatest pumpage were located near the Fall Line and in the south-central part of the county. The successive maps show the increase of the areal distribution of large pumpage, and that by 1980, withdrawals were fairly evenly scattered throughout the Coastal Plain portion of the county.

The locations of withdrawals from individual aquifers supplying the large users in the Coastal Plain area of Cecil County (described in table 7 and fig. 33) are shown in figure 34. The Magothy aquifer was not used as a source of water for large users until after 1960 (see appendix). Its use remained limited to a water supplier located in the southern part of the county. The Potomac aquifers were the principal sources of ground water for large users as shown on each of the maps. A comparison of the maps for 1950 and 1980 shows that the areal distribution of use of the Potomac aquifers increased significantly.

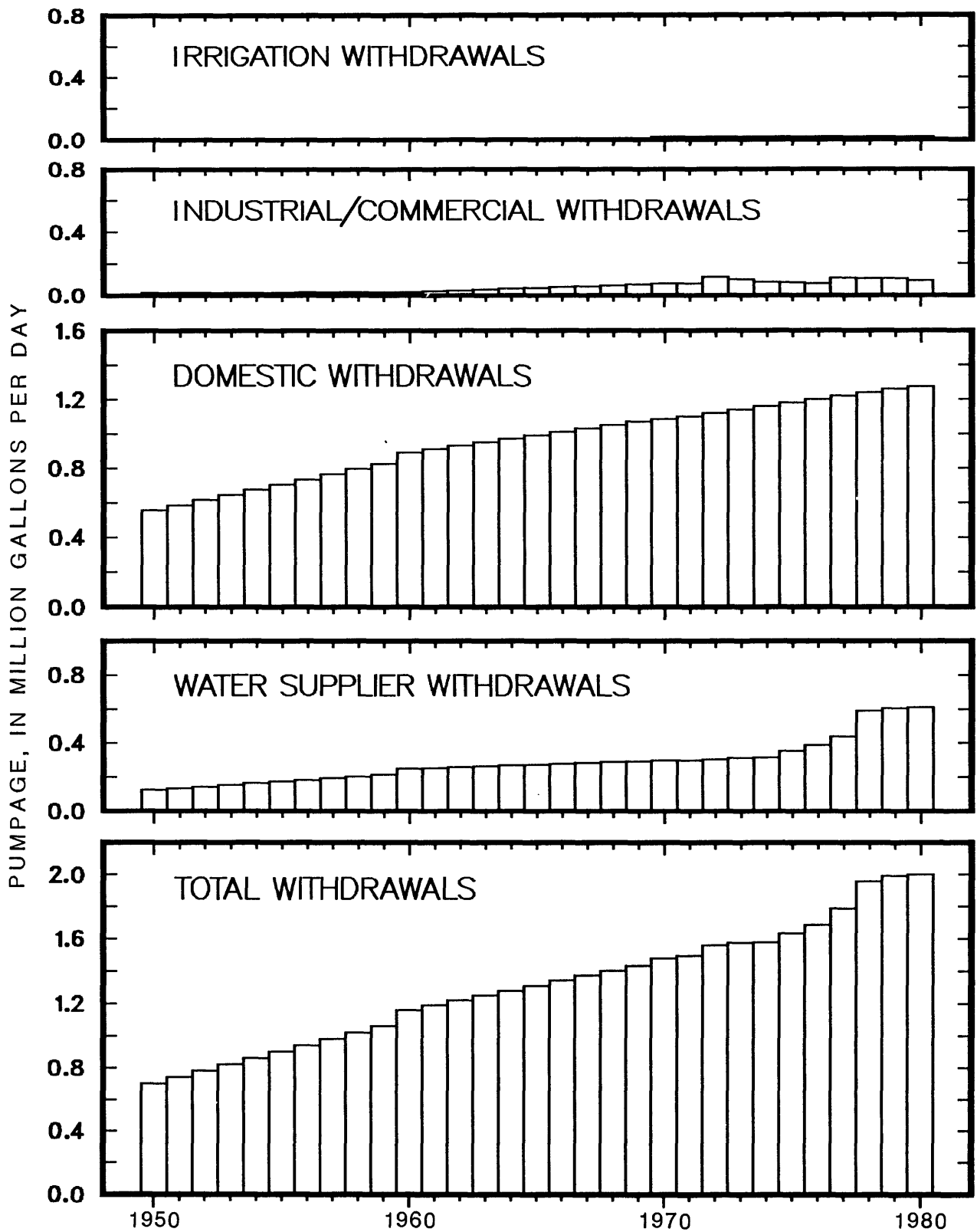
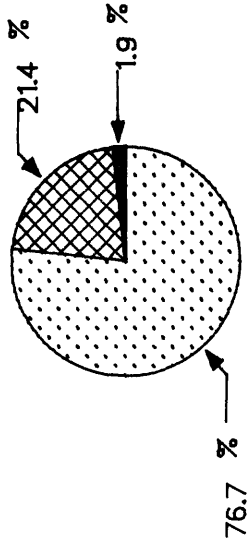
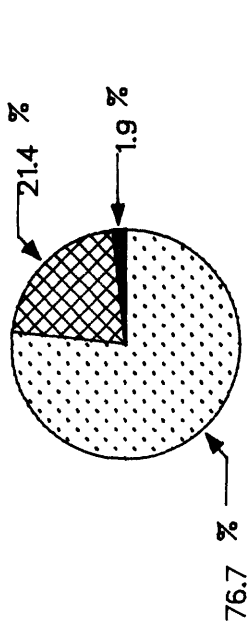


Figure 30.-- Ground-water withdrawals by use in the Coastal Plain area of Cecil County from 1950 through 1980.

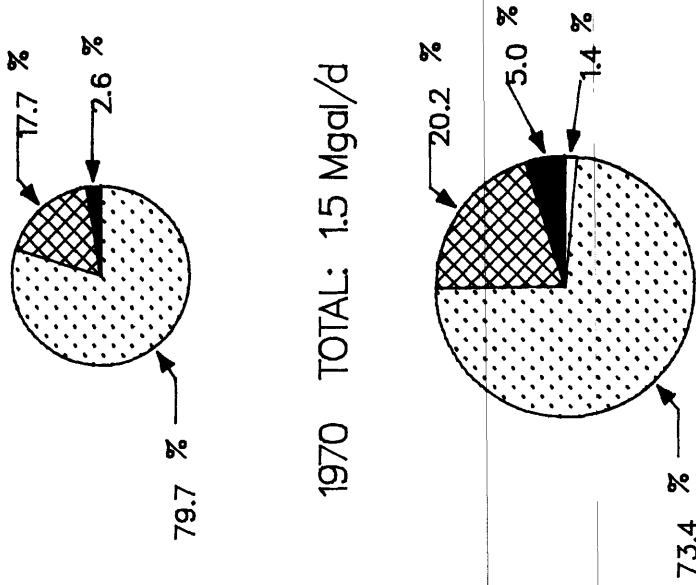
1950 TOTAL: 0.70 Mgal/d



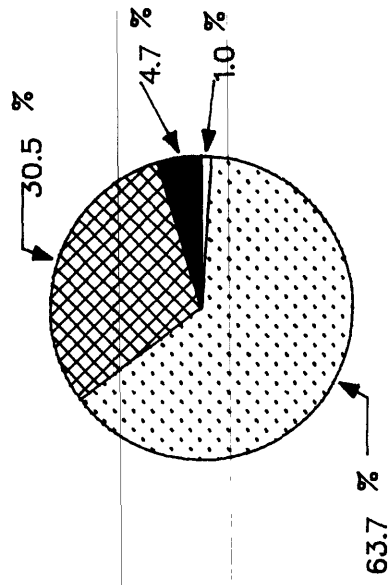
1960 TOTAL: 1.2 Mgal/d



1970 TOTAL: 1.5 Mgal/d



1980 TOTAL: 2.0 Mgal/d



EXPLANATION

- INDUSTRIAL/COMMERCIAL [Solid black box]
- DOMESTIC [Dotted box]
- WATER SUPPLIER [Cross-hatched box]
- IRRIGATION [White box]

Figure 31.--Ground-water use in the Coastal Plain area of Cecil County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

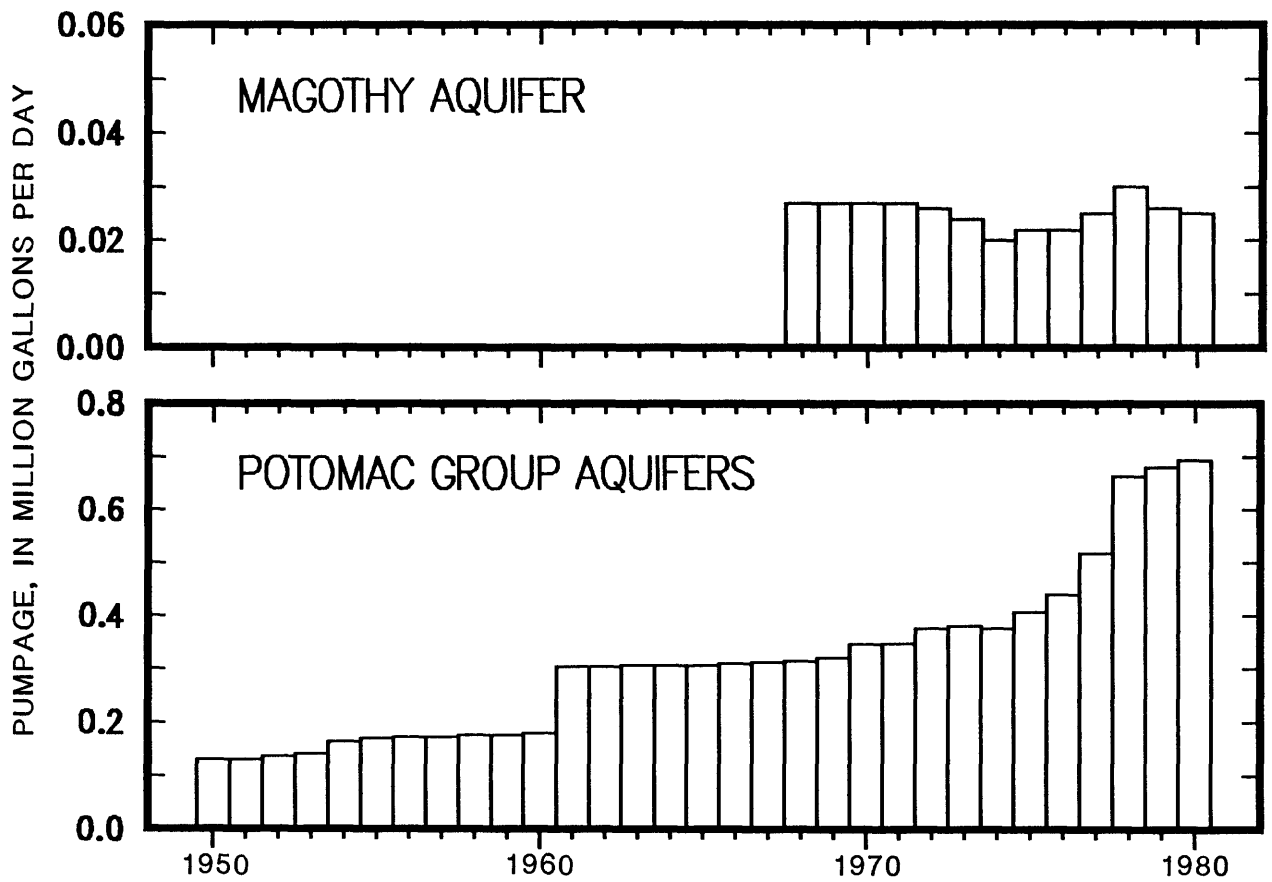


Figure 32.-- Large ground-water withdrawals by aquifers in the Coastal Plain area of Cecil County from 1950 through 1980.

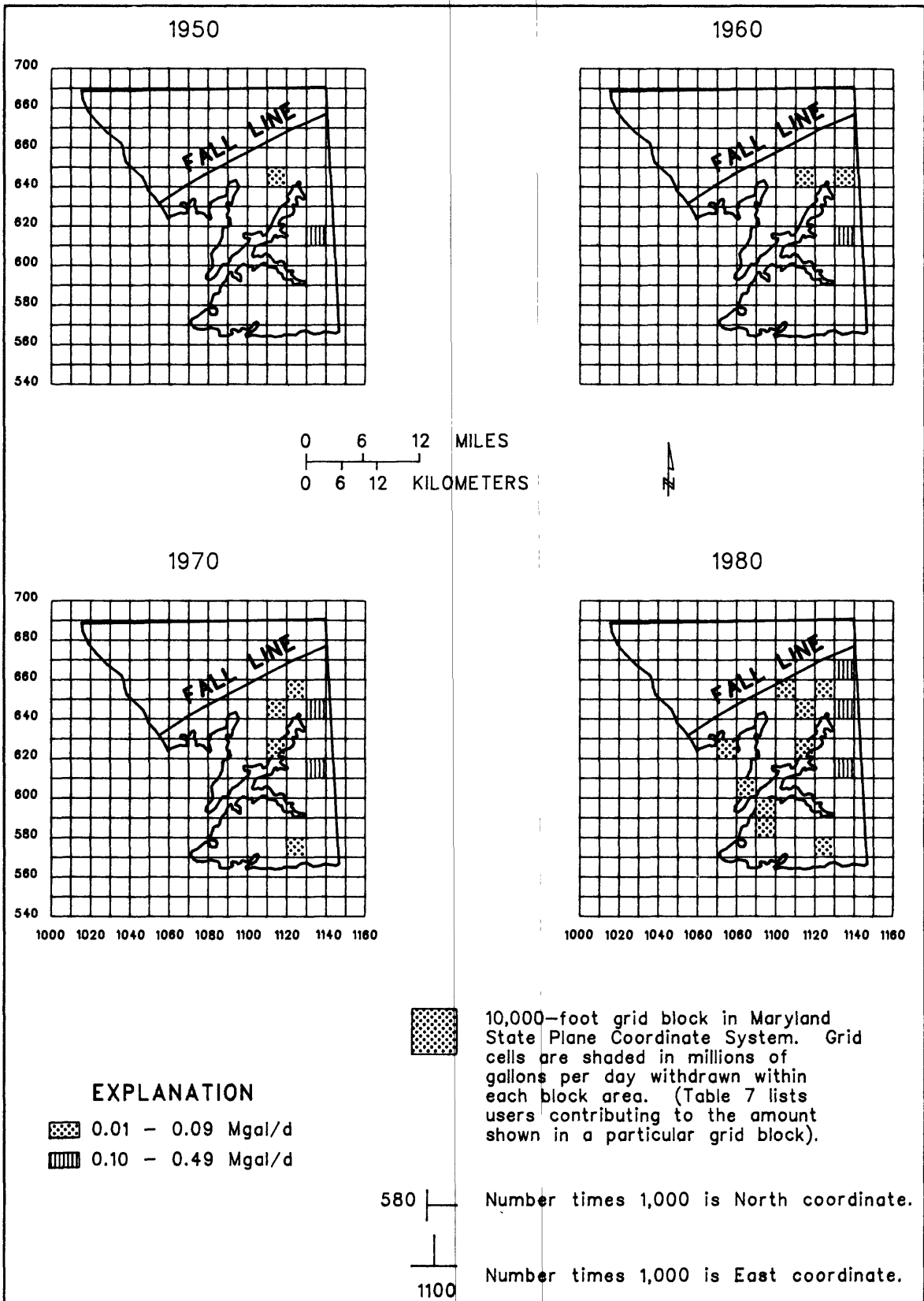


Figure 33.--Locations of large ground-water withdrawals in the Coastal Plain area of Cecil County for 1950, 1960, 1970, and 1980.

Table 7.-- Large ground-water users in the Coastal Plain area of Cecil County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N610 E1130	Chesapeake City	0.12	Potomac Group
	N640 E1110	Thiokol Chemical Company	.02	Potomac Group
1960	N610 E1130	Chesapeake City	0.14	Potomac Group
	N640 E1110	Thiokol Chemical Company	.02	Potomac Group
	N640 E1130	Holly Hall Terrace Utility Corporation	.03	Potomac Group
1970	N570 E1120	Cecilton, Town of	0.03	Magothy
	N610 E1130	Chesapeake City	.15	Potomac Group
	N620 E1110	Pine Hills Subdivision	.01	Potomac Group
	N640 E1110	Thiokol Chemical Company	.04	Potomac Group
	N640 E1130	Holly Hall Terrace Utility Corporation	.11	Potomac Group
	N650 E1120	Pirelli Cable Corporation	.04	Potomac Group
1980	N570 E1120	Cecilton, Town of	0.03	Magothy
	N580 E1090	Crystal Beach	.02	Potomac Group
	N590 E1090	Buttonwood Beach	.03	Potomac Group
	N600 E1080	Elk Neck State Park	.02	Potomac Group
	N610 E1130	Chesapeake City	.17	Potomac Group
	N620 E1070	Carpenters Point water system	.01	Potomac Group
	N620 E1110	Pine Hills Subdivision	.02	Potomac Group
	N640 E1110	Thiokol Chemical Company	.02	Potomac Group
	N640 E1130	Elkton: Holly Hall water system	.21	Potomac Group
	N650 E1100	Town and Country Mobile Home Park	.03	Potomac Group
	N650 E1120	Pirelli Cable Corporation	.04	Potomac Group
	N660 E1130	Meadowview Utilities, Incorporated	.11	Potomac Group



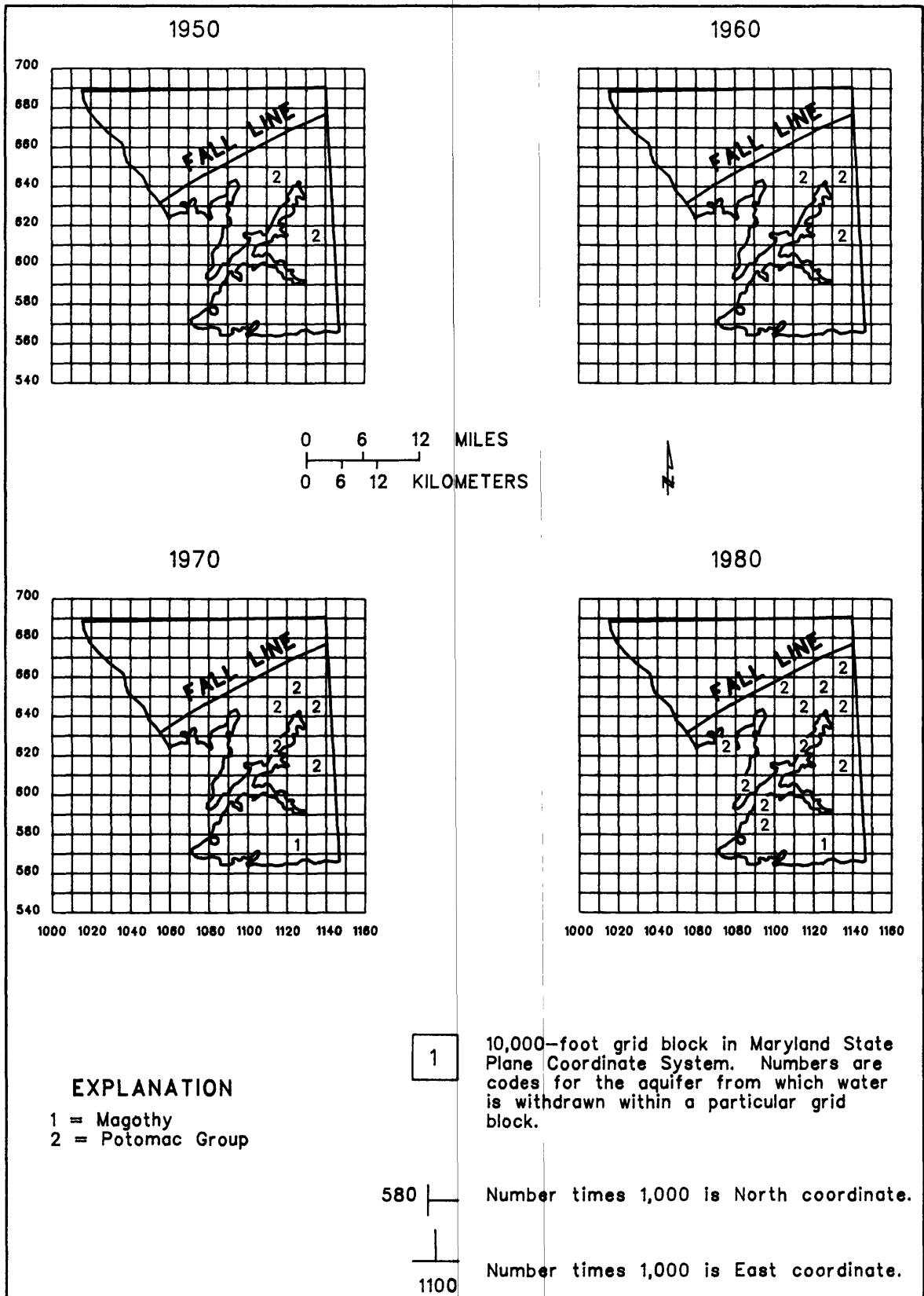


Figure 34.--Locations of large ground-water withdrawals by aquifers in the Coastal Plain area of Cecil County for 1950, 1960, 1970, and 1980.

## CHARLES COUNTY

Ground-water use in Charles County from 1950 through 1980 is shown in figure 35. In 1950, the amount of ground water withdrawn was approximately 2.3 Mgal/d compared to withdrawals of nearly 9.4 Mgal/d in 1980. This represents an increase of 292 percent for the three decades.

Since 1950, water use in the county increased in all categories. The greatest amount of water withdrawn was for domestic use, increasing from about 1.0 Mgal/d in 1950 to 3.7 Mgal/d in 1980. Withdrawals by water suppliers increased from about 0.2 Mgal/d in 1950 to over 3.0 Mgal/d in 1980. The greatest magnitude of these withdrawals occurred from the mid-1960's through 1980. Industrial/commercial pumpage showed a similar trend during the same period, increasing from less than 0.01 Mgal/d in 1950 to nearly 1.4 Mgal/d in 1980; water withdrawn for military use increased from about 1.0 Mgal/d in 1950 to nearly 2.2 Mgal/d in 1970, gradually declining to about 1.0 Mgal/d again in 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began

The percentages of total amount of ground water withdrawn for domestic, military, water supplier, and industrial/commercial uses for 1950, 1960, 1970, and 1980 are shown in figure 36. In 1950, domestic and military usage comprised 90 percent of the total pumpage, with only a small percentage each for water supplier and industrial/commercial uses. By 1960, the trend in water use had started to change. There were decreases in the percentage of water pumped for domestic and military uses and a significant increase in water withdrawn by water suppliers. A small increase in industrial/commercial use also was indicated. This trend continued through 1980. However, the percentage of water withdrawn for domestic use remained relatively the same in 1960, 1970, and 1980.

### Major Aquifers

Many domestic withdrawals in Charles County were from shallow wells (from about 15 to 80 ft deep) tapping the surficial aquifer. Deeper aquifers including the Aquia, Magothy, Patapsco, and Patuxent were more widely used by large users. Large user withdrawals by

aquifer from 1950 through 1980 are shown in figure 37. The Aquia aquifer was not used by large users until about 1970. Although there was an initial increase in its use, since about 1972 through 1980, withdrawals remained between 0.05 Mgal/d and 0.09 Mgal/d. The use of the Magothy aquifer by large users began in 1962 and grew considerably from approximately 0.01 Mgal/d in 1960 to about 2.2 Mgal/d in 1980. Withdrawals from the Patapsco aquifer were about 0.6 Mgal/d in 1950 and gradually increased to about 1.8 Mgal/d in 1969. From 1970 to 1980, greater amounts of water were withdrawn from the Patapsco aquifer with nearly 2.4 Mgal/d pumped in 1980. The Patuxent aquifer provided about 0.3 Mgal/d in 1950. Withdrawals from this aquifer increased through 1971 to nearly 1.0 Mgal/d, then declined to about half that amount (0.5 Mgal/d) in 1973, and remained relatively constant through 1980.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Charles County for 1950, 1960, 1970, and 1980 are shown in figure 38. Table 8 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. For the years shown, the areas of greatest withdrawals were located in the northwestern, central, and north-central part (Waldorf area) of the county.

The withdrawals from individual aquifers supplying the large users in Charles County (described in table 8 and fig. 38) are shown in figure 39. Withdrawals from the Aquia aquifer for 1980 were limited to a single location in the central part of the county. Withdrawals from the Magothy aquifer began in 1960 in the north-central area. Its use by large users grew substantially from that time, although its areal distribution remained the same.

The Patuxent and Patapsco were the principal aquifers supplying large users in 1950. Their distribution of use centered mostly in the northwestern part of the county, with only one site located in the central section. The pattern of use of the aquifers remained essentially the same through 1960 and 1970. However, by 1980, a noticeable increase in the number of withdrawal sites from the Patuxent and Patapsco aquifers was evident, especially in the north-central area of the county.

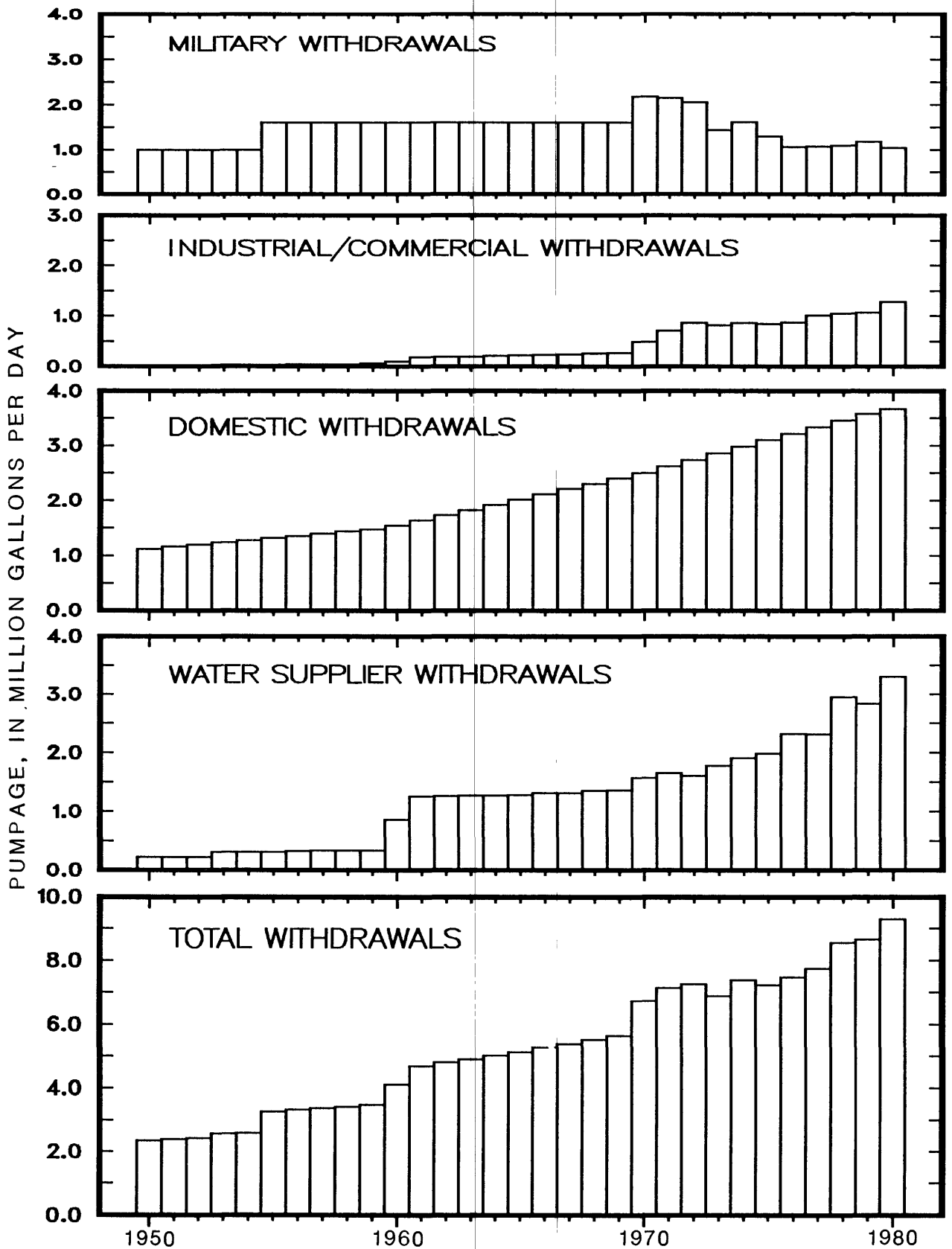
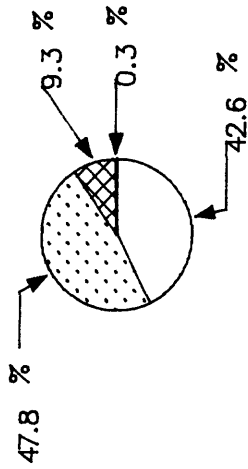
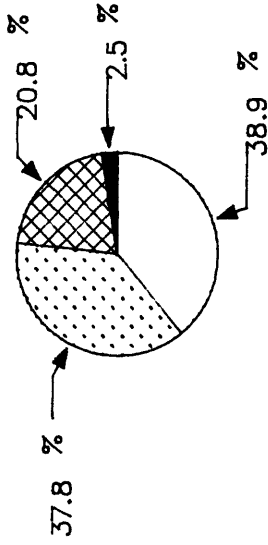


Figure 35.-- Ground-water withdrawals by use in Charles County from 1950 through 1980.

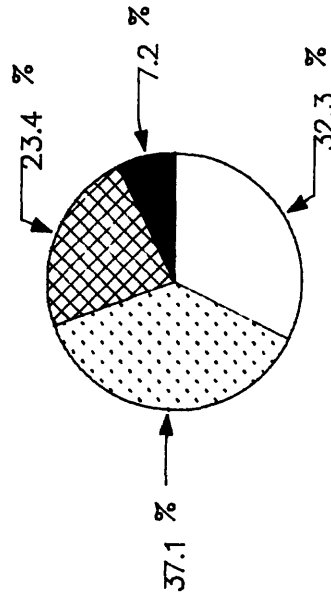
1950 TOTAL: 2.30 Mgal/d



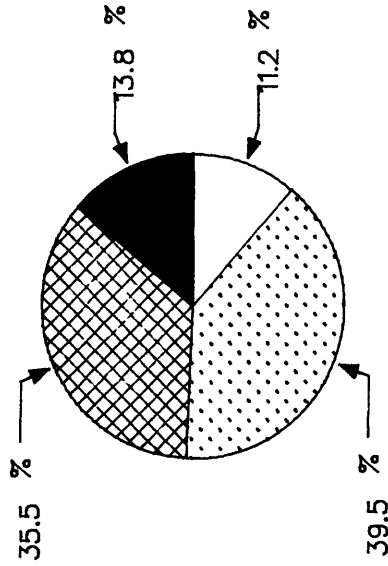
1960 TOTAL: 4.1 Mgal/d



1970 TOTAL: 6.7 Mgal/d



1980 TOTAL: 9.4 Mgal/d



EXPLANATION

- INDUSTRIAL/COMMERCIAL [Solid black box]
- DOMESTIC [Dotted box]
- WATER SUPPLIER [White box]
- MILITARY [Cross-hatched box]

Figure 36.--Ground-water use in Charles County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

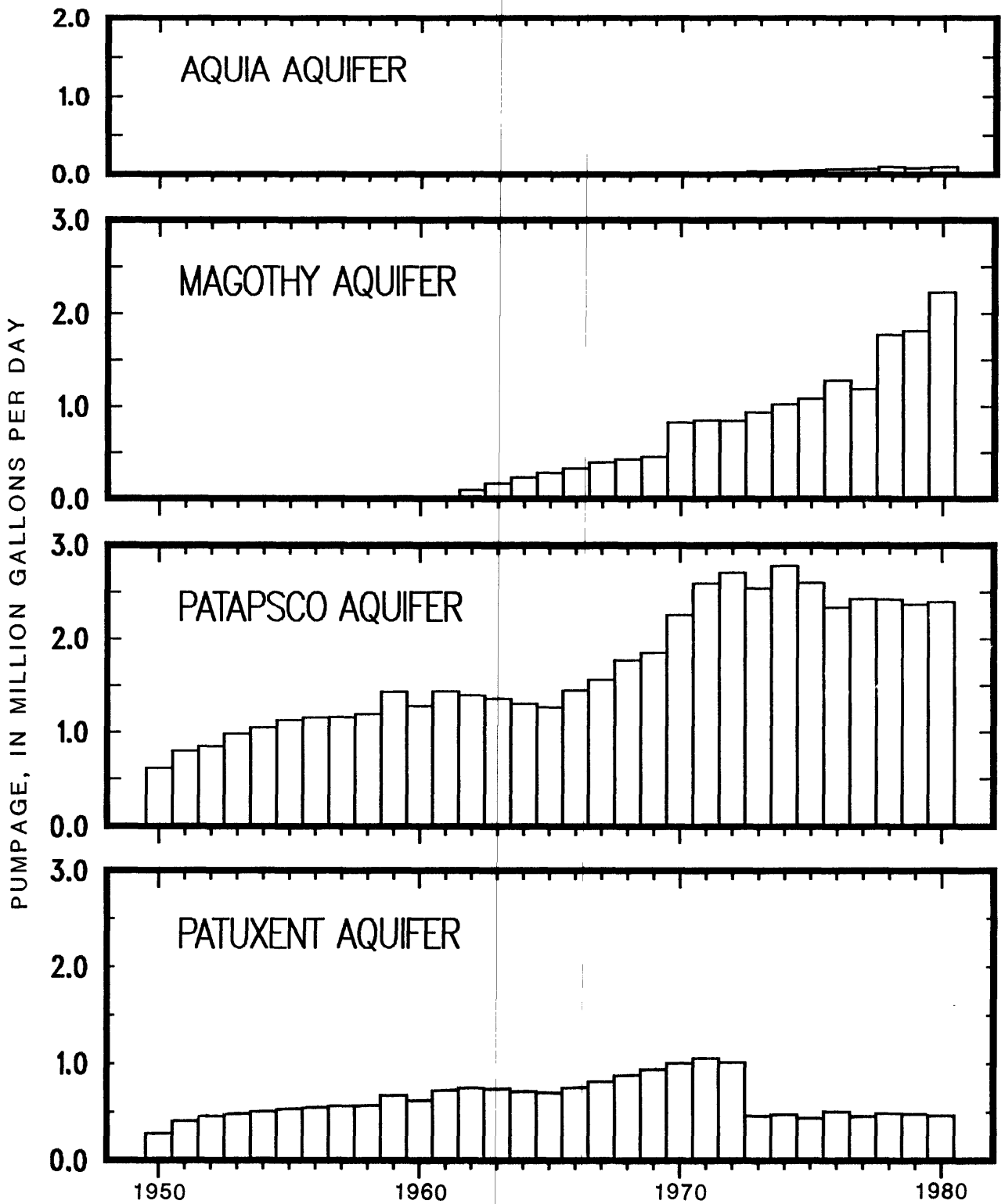


Figure 37.--Large ground-water withdrawals by aquifers in Charles County from 1950 through 1980.

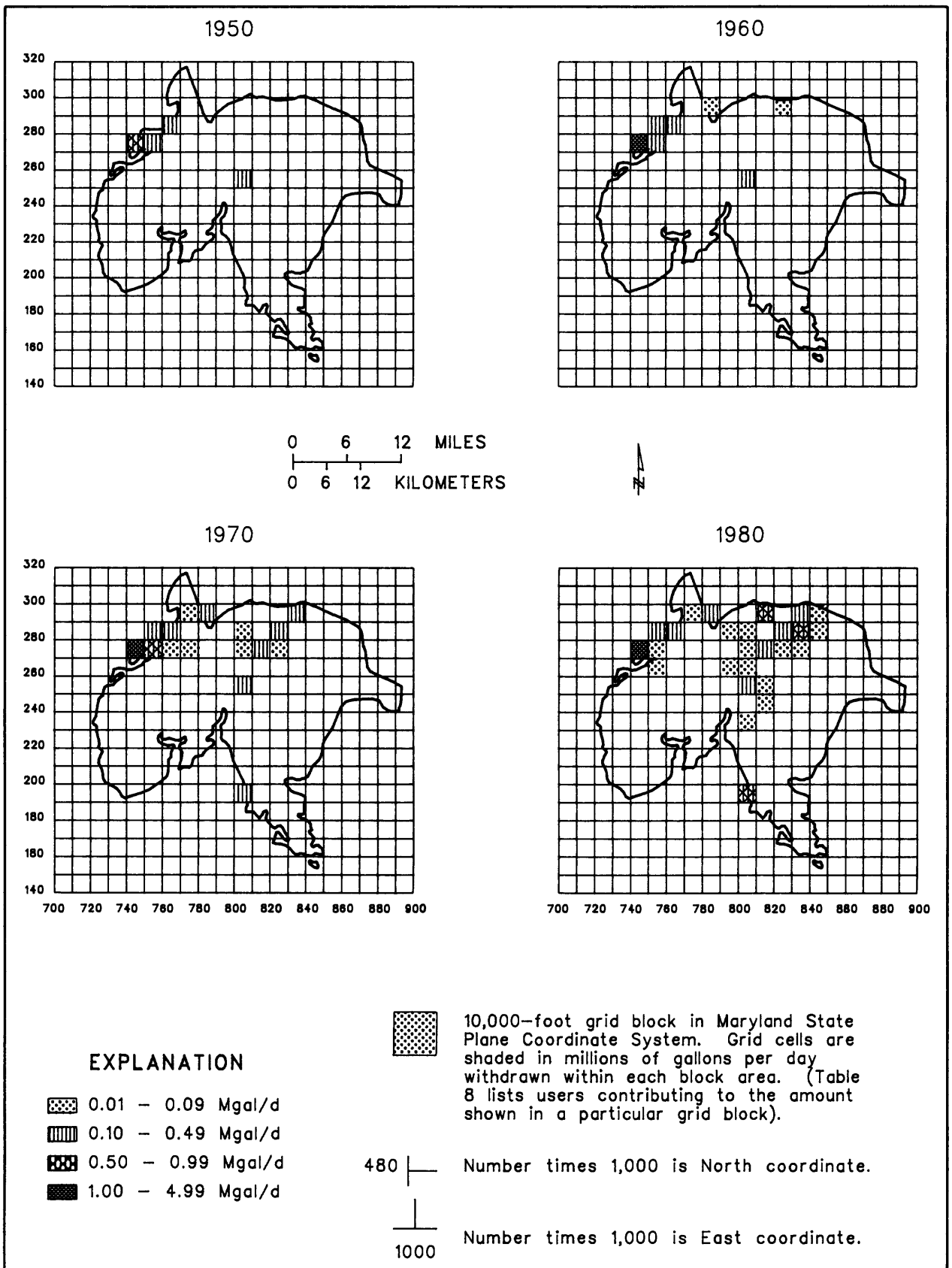


Figure 38.--Locations of large ground-water withdrawals in Charles County for 1950, 1960, 1970, and 1980.

Table 8.--Large ground-water users in Charles County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer	
1950	N250 E800	LaPlata, Town of	0.10	Patapsco	
	N270 E740	U.S. Naval Ordnance Station	.52	Patapsco	
	N270 E750	do.	.22	Patuxent	
	N280 E760	Potomac Heights Home Owners Association	.10	Patuxent	
1960	N250 E800	LaPlata, Town of	0.14	Patapsco	
	N270 E740	U.S. Naval Ordnance Station	1.00	Patapsco	
	N270 E750	do.	.44	Patuxent	
		Woodland Village	.02	Patuxent	
	N280 E750	Indian Head, Town of	.11	Patapsco	
	N280 E760	Potomac Heights Home Owners Association	.10	Patuxent	
	N290 E780	Charles Utilities Commission, Inc.	.04	Patuxent	
	N290 E820	Stardust Motel	.01	Magothy	
1970	N190 E800	PEPCO, Morgantown	0.27	Patapsco	
	N250 E800	LaPlata, Town of	.17	Patapsco	
	N280 E800	Brookwood Utilities	.03	Magothy	
	N270 E740	U.S. Naval Ordnance Station	1.52	Patapsco	
	N270 E750	do.	.65	Patuxent	
		Woodland Village	.02	Patuxent	
	N270 E760	Lackey High School	.01	Patapsco	
	N270 E770	Pomonkey Water Commission, Inc.	.01	Patuxent	
	N270 E800	Oak Hill Estates	.01	Patapsco	
	N270 E810	South well - Waldorf system, Charles County	.21	Magothy	
	N270 E820	White Plains Park	.02	Patapsco	
	N280 E750	Indian Head, Town of	.19	Patapsco	
	N280 E760	Potomac Heights Home Owners Association	.12	Patuxent	
	N280 E820	St. Charles City - Waldorf system, Charles County DFW	.37	Magothy	
	N290 E770	Potomac Utilities Corporation	.03	Patapsco	
	N290 E780	Inman Utilities Company	.01	Patapsco	
		Charles Utilities Commission, Inc.	.11	Patuxent	
	N290 E830	North well - Waldorf system, Charles County, DFW	.21	Magothy	
	1980	N190 E800	PEPCO, Morgantown	0.76	Patapsco
			Clifton on the Potomac wells, Charles County, DFW	.04	Aquia
N230 E800		Bel Alton Estates well, Charles County DFW	.01	Patapsco	
N240 E810		Newtown Estates Water Company, Inc.	.02	Aquia	
		Mariellen Park Water Company	.02	Aquia	
N250 E800		LaPlata, Town of	.01	Aquia	
		do.	.28	Patapsco	
N250 E810		Ellenwood wells, Charles County DFW	.02	Patapsco	
N280 E800		Brookwood Utilities	.04	Magothy	
N260 E750		Du-Mar Estates Water Company	.01	Patuxent	
N260 E790		Charles County Community College	.01	Patapsco	
		McDonough High School	.01	Patapsco	
N260 E800		Carmel Utilities Company	.02	Patapsco	
N270 E740		U.S. Naval Ordnance Station	1.04	Patapsco	
N270 E750		Woodland Village	.03	Patuxent	
N270 E800		Turkey Hill Water Company	.01	Patapsco	
		Oak Hill Estates	.01	Patapsco	
N270 E810		White Plains Water Company	.02	Magothy	
		South well - Waldorf system, Charles County DFW	.27	Magothy	
N270 E820		White Plains Park	.07	Patapsco	
		Fine Hill Estates Water Company	.01	Magothy	
		Cleveland Park well, Charles County DFW	.01	Magothy	
N270 E830		Charles County Gardens Company	.03	Magothy	
		Trimac Water Company, Inc.	.02	Patapsco	
N280 E750		Indian Head, Town of	.10	Patapsco	
		do.	.11	Patuxent	
N280 E760		Potomac Heights Home Owners Association	.14	Patuxent	
N280 E790		Quiet Acres and Billingly Forest	.01	Patuxent	
N280 E820		St. Charles City - Waldorf system, Charles County DFW	.28	Magothy	
N280 E830		J. Hanson School - Waldorf system, Charles County DFW	.65	Magothy	
N280 E840		Beantown Water Association	.01	Magothy	
N290 E770		Potomac Utilities Corporation	.01	Patapsco	
	do.	.05	Patuxent		
N290 E780	Charles Utilities Commission, Inc.	.12	Patuxent		
N290 E810	Berry Road well - Waldorf system, Charles County DFW	.62	Magothy		
N290 E830	North well - Waldorf system, Charles County DFW	.19	Magothy		
N290 E840	Cedarville State Fish Hatchery	.09	Magothy		

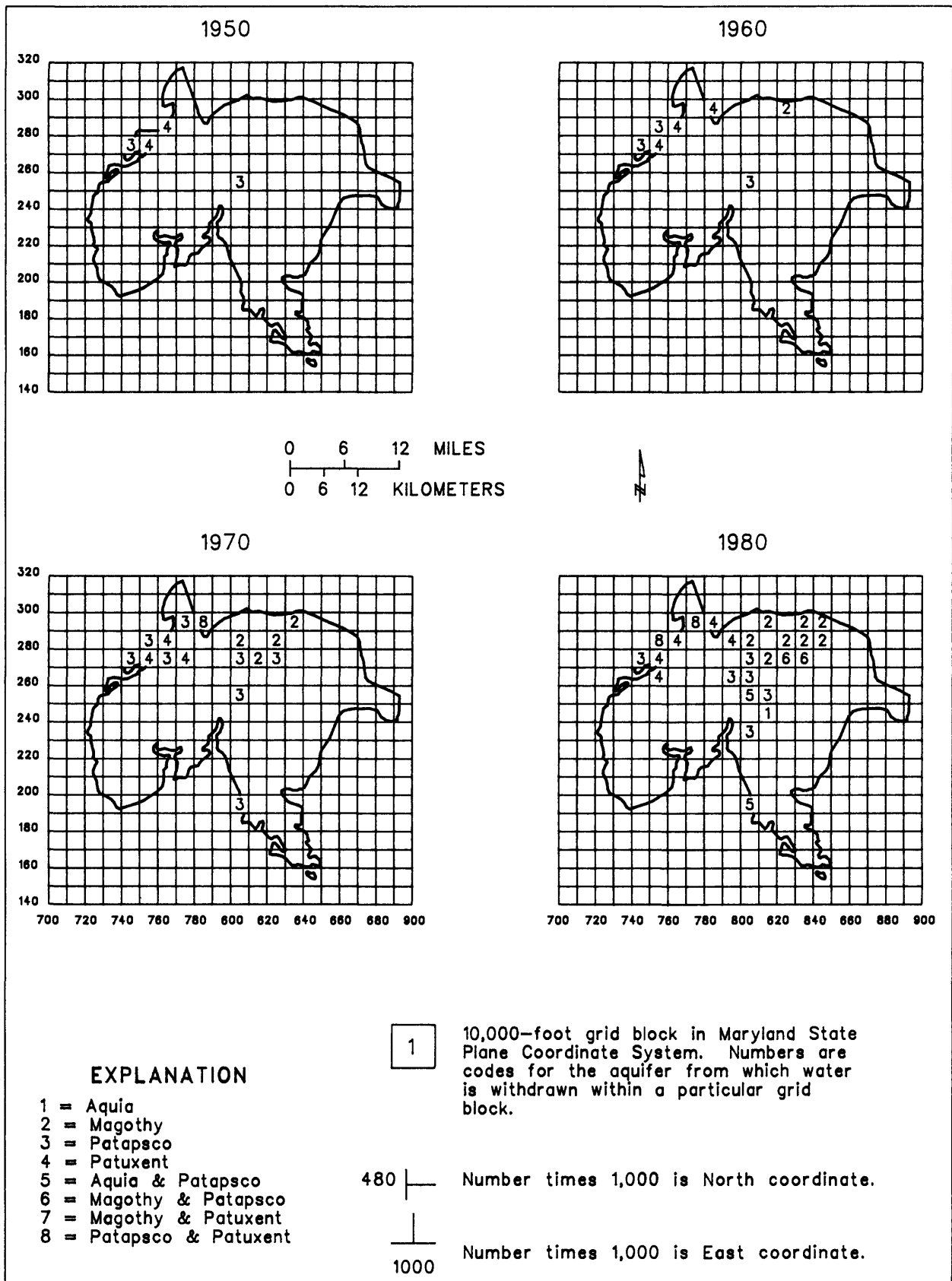


Figure 39.--Locations of large ground-water withdrawals by aquifers in Charles County for 1950, 1960, 1970, and 1980.



## DORCHESTER COUNTY

Ground-water use in Dorchester County from 1950 through 1980 is shown in figure 40. In 1950, the amount of ground water withdrawn was approximately 4.2 Mgal/d compared to withdrawals of nearly 9.2 Mgal/d in 1980. This represents an increase of 119 percent for the three decades.

The largest use of ground water in the county was by water suppliers who withdrew nearly 3.0 Mgal/d in 1950, increasing to about 3.4 Mgal/d in 1980. Irrigation use increased considerably from about 0.6 Mgal/d in 1960 to about 3.4 Mgal/d in 1980. Irrigation was an important water use in the county since about the early 1960's. Although there were no precise measurements of the amounts of water withdrawn by individual irrigators, methods of collecting and reporting these data have improved since the 1960's. The most reliable data were for 1970 to 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation uses for 1950, 1960, 1970, and 1980 are shown in figure 41. It is evident that water suppliers comprised a significant portion of the total pumpage for 1950, 1960, and 1970. The figure also illustrates that the percentage of water used for irrigation has increased considerably, from 9 percent in 1960 to 37 percent in 1980.

### Major Aquifers

The earliest ground-water pumpage in Dorchester County probably came from the surficial (Quaternary) aquifer. Although these shallow sands continued to

supply much of the low-yield water needs, chiefly for domestic use, a few large users were able to withdraw sufficient quantities of water. As the demand for water increased, the use of deeper aquifers, including the lower Chesapeake, Piney Point, Magothy, and Patapsco aquifers, increased. Large-user withdrawals by aquifer from 1950 through 1980 are shown in figure 42.

The Piney Point aquifer served as the major source of water for the 30-year period. In 1950, approximately 2.7 Mgal/d was withdrawn from the aquifer by large users. Pumpage increased to nearly 4.5 Mgal/d in 1956, but then began a declining trend over the next 20 years. By 1980, withdrawals had dropped to just more than 1.8 Mgal/d. For most of the 30 years, withdrawals from the other aquifers remained less than 0.9 Mgal/d (withdrawals from the Patapsco aquifer reached about 1.0 Mgal/d in 1980).

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Dorchester County for 1950, 1960, 1970, and 1980 are shown in figure 43. Table 9 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. In 1950, the areas of heaviest pumpage were located mostly along the northern border of the county. Distribution patterns remained relatively the same for the other years shown, with only a few sites added by 1980.

The locations of withdrawals from individual aquifers supplying the large users in Dorchester County (described in table 9 and fig. 43) are shown in figure 44. The maps indicate little change in development or use of the aquifers in the county, with distribution remaining centered along the northern and eastern borders.

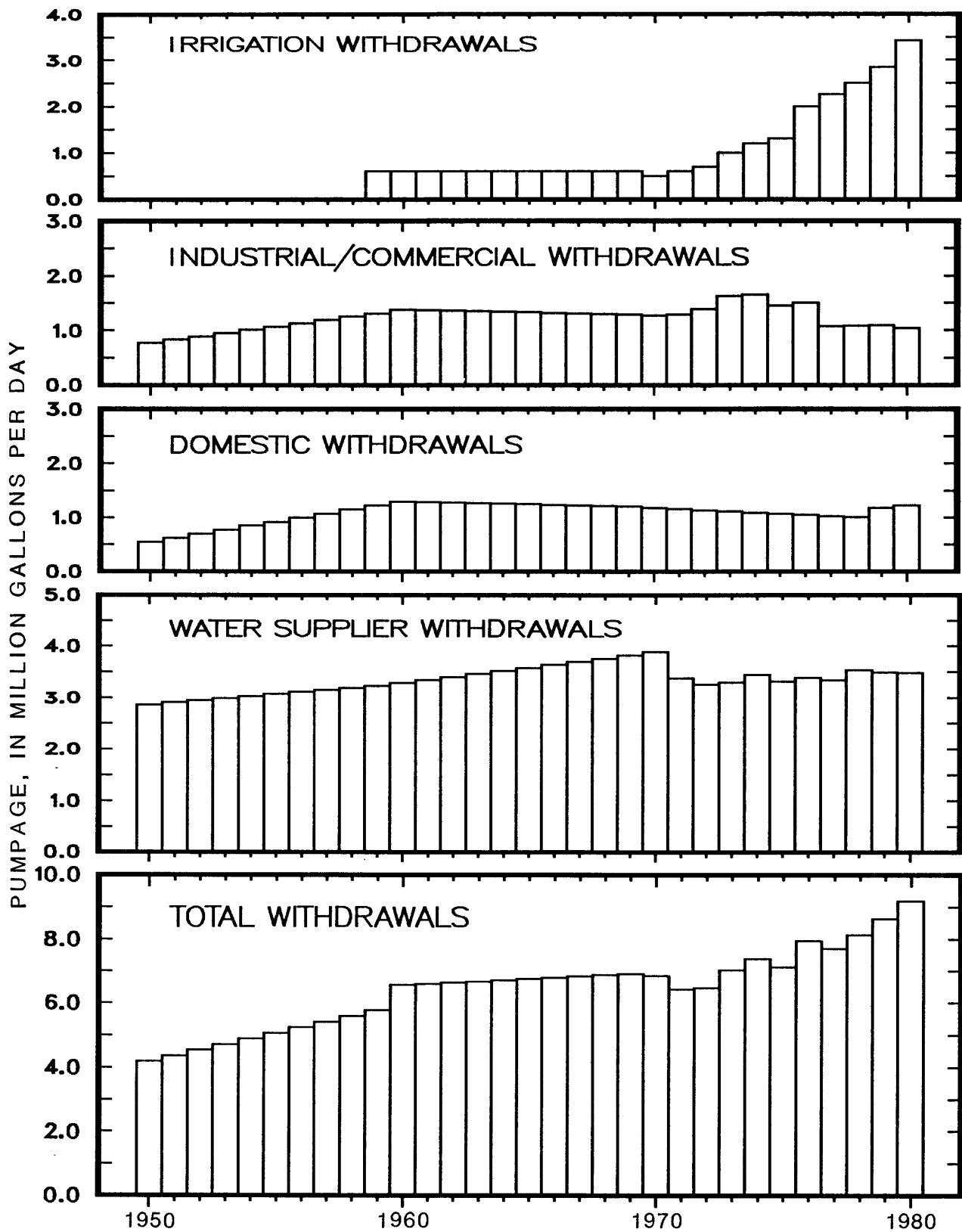
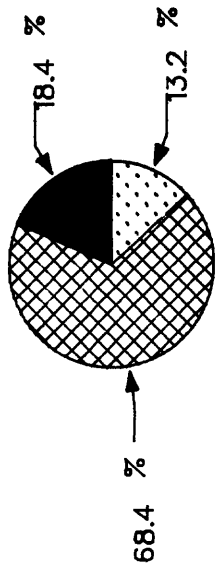
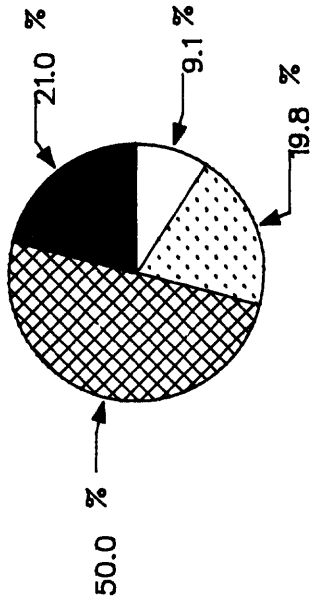


Figure 40.--Ground-water withdrawals by use in Dorchester County from 1950 through 1980.

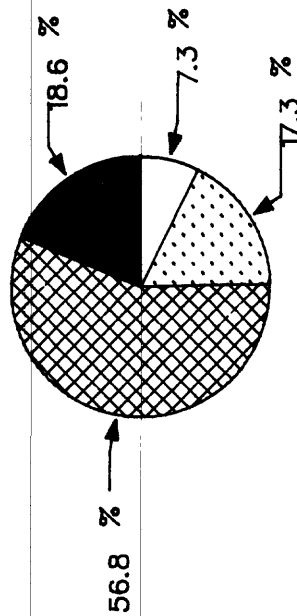
1950 TOTAL: 4.2 Mgal/d



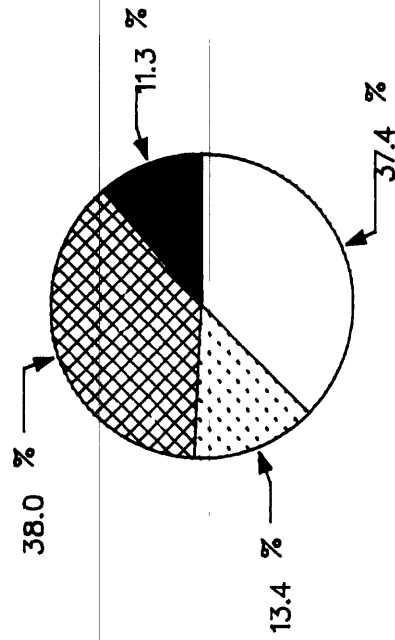
1960 TOTAL: 6.6 Mgal/d



1970 TOTAL: 6.8 Mgal/d



1980 TOTAL: 9.2 Mgal/d



EXPLANATION

- INDUSTRIAL/COMMERCIAL [Solid black box]
- DOMESTIC [Dotted box]
- WATER SUPPLIER [Cross-hatched box]
- IRRIGATION [White box]

Figure 41.--Ground-water use in Dorchester County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

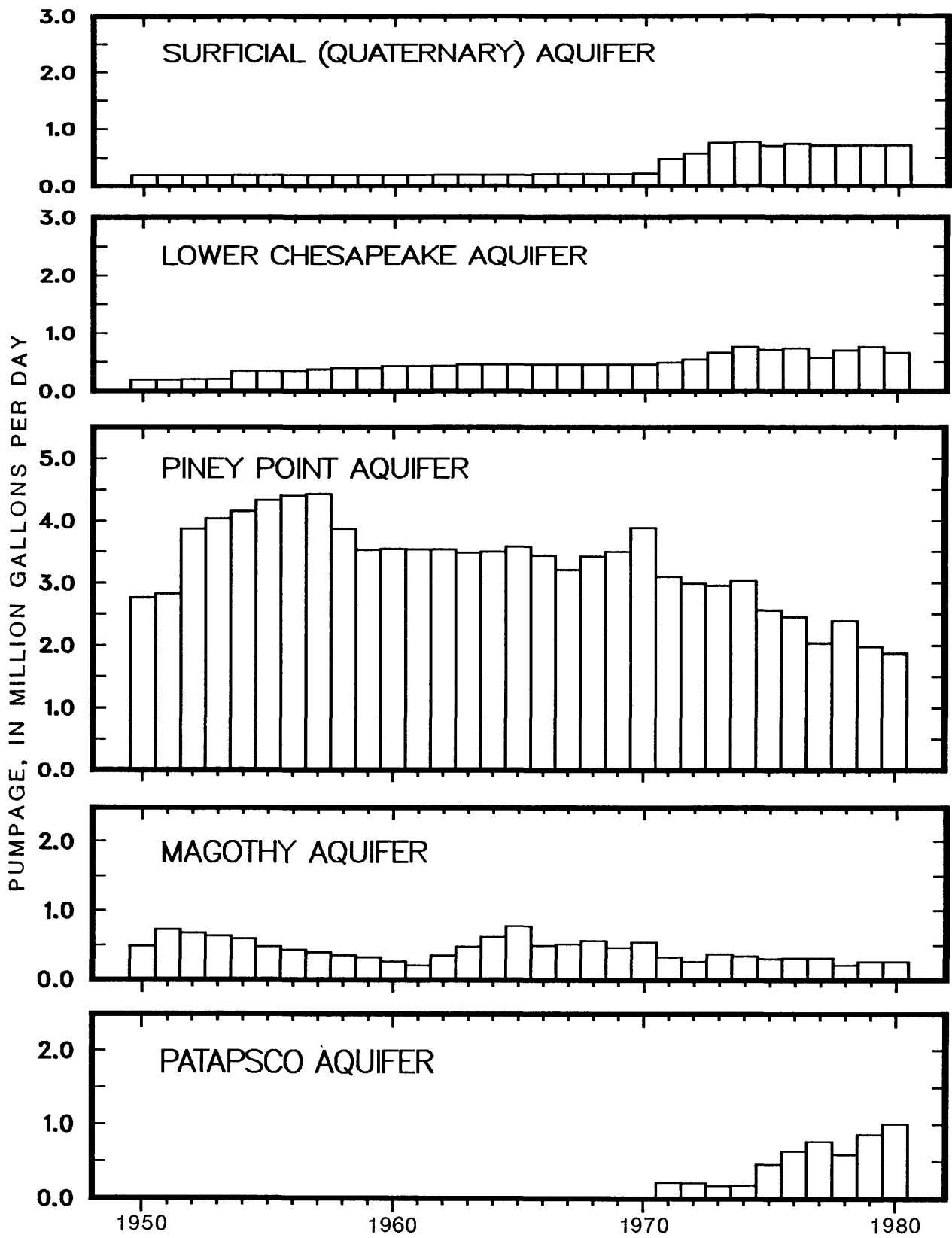


Figure 42.--Large ground-water withdrawals by aquifers in Dorchester County from 1950 through 1980.

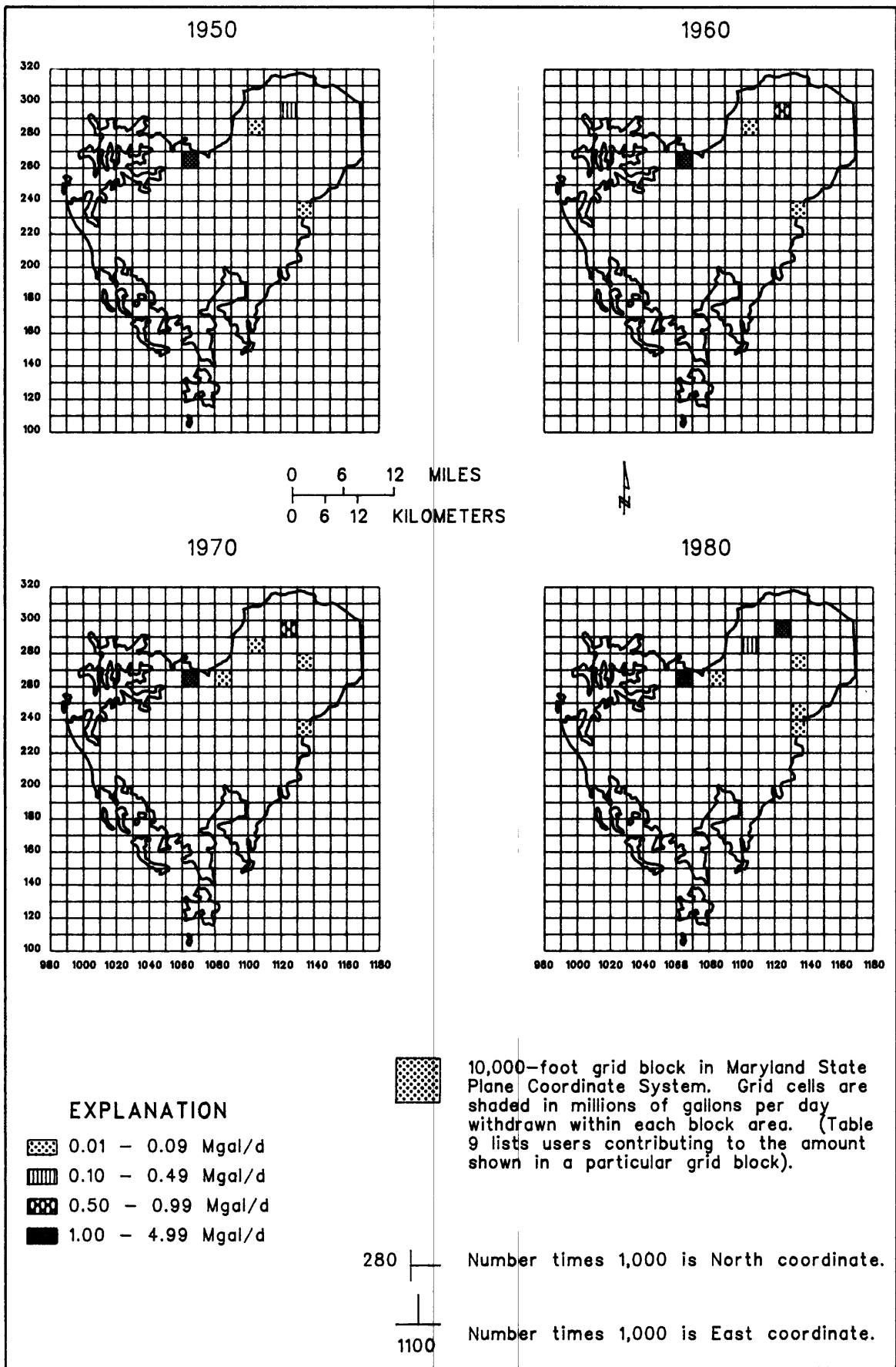


Figure 43.--Locations of large ground-water withdrawals in Dorchester County for 1950, 1960, 1970, and 1980.

Table 9.--Large ground-water users in Dorchester County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N230 E1130	Vienna, Town of	0.05	Calvert
	N260 E1060	East Coast Cold Storage	.22	Piney Point
		Cambridge, City of	2.40	Piney Point
		do.	.41	Magothy
		Crystal Ice & Cold Storage	.08	Piney Point
		do.	.08	Magothy
	N280 E1100	Secretary, Town of	.04	Piney Point
		East New Market, Town of	.03	Calvert
	N290 E1120	Hurlock, Town of	.12	Frederica
		Bloch & Guggenheimer, Inc.	.19	Quaternary
1960	N230 E1130	Vienna, Town of	0.05	Calvert
	N260 E1060	Hanover Brands	.32	Piney Point
		East Coast Cold Storage	.22	Piney Point
		Cambridge, City of	2.50	Piney Point
		do.	.19	Magothy
		Bumble Bee Corporation	.44	Piney Point
		Crystal Ice & Cold Storage	.08	Piney Point
		do.	.08	Magothy
	N280 E1100	Secretary, Town of	.04	Piney Point
		East New Market, Town of	.03	Calvert
	N290 E1120	Hurlock, Town of	.13	Frederica
		ACME Markets, Inc.	.22	Frederica
		Bloch & Guggenheimer, Inc.	.19	Quaternary
	Hurlock Pickling Company	.05	Frederica	
1970	N230 E1130	Vienna, Town of	0.04	Calvert
	N260 E1060	Hanover Brands	.25	Piney Point
		East Coast Cold Storage	.20	Piney Point
		Cambridge, City of	3.16	Piney Point
		do.	.47	Magothy
		Bumble Bee Corporation	.14	Piney Point
		Crystal Ice & Cold Storage	.08	Piney Point
		do.	.08	Magothy
	N260 E1060	Bonnie Brook, Dorchester County	.02	Piney Point
	N270 E1130	Dececco Corporation	.02	Quaternary
	N280 E1100	Secretary, Town of	.03	Piney Point
		East New Market, Town of	.04	Calvert
	N290 E1120	Hurlock, Town of	.13	Frederica
		ACME Markets, Inc.	.25	Frederica
	Bloch & Guggenheimer, Inc.	.19	Quaternary	
	Hurlock Pickling Company	.05	Frederica	
1980	N230 E1130	Vienna, Town of	0.07	Calvert
	N240 E1130	Delmarva Power & Light Company	.03	Quaternary
	N260 E1060	East Coast Cold Storage	.05	Piney Point
		Cambridge, City of	1.00	Patapsco
		do.	1.73	Piney Point
		do.	.26	Magothy
	N260 E1060	Bonnie Brook, Dorchester County	.02	Piney Point
	N270 E1130	Dececco Corporation	.03	Quaternary
	N280 E1100	Secretary, Town of	.08	Piney Point
		East New Market, Town of	.03	Calvert
	N290 E1120	Hurlock, Town of	.29	Frederica
		Country Pride Foods, Inc.	.46	Quaternary
		ACME Markets, Inc.	.26	Frederica
	Bloch & Guggenheimer, Inc.	.19	Quaternary	

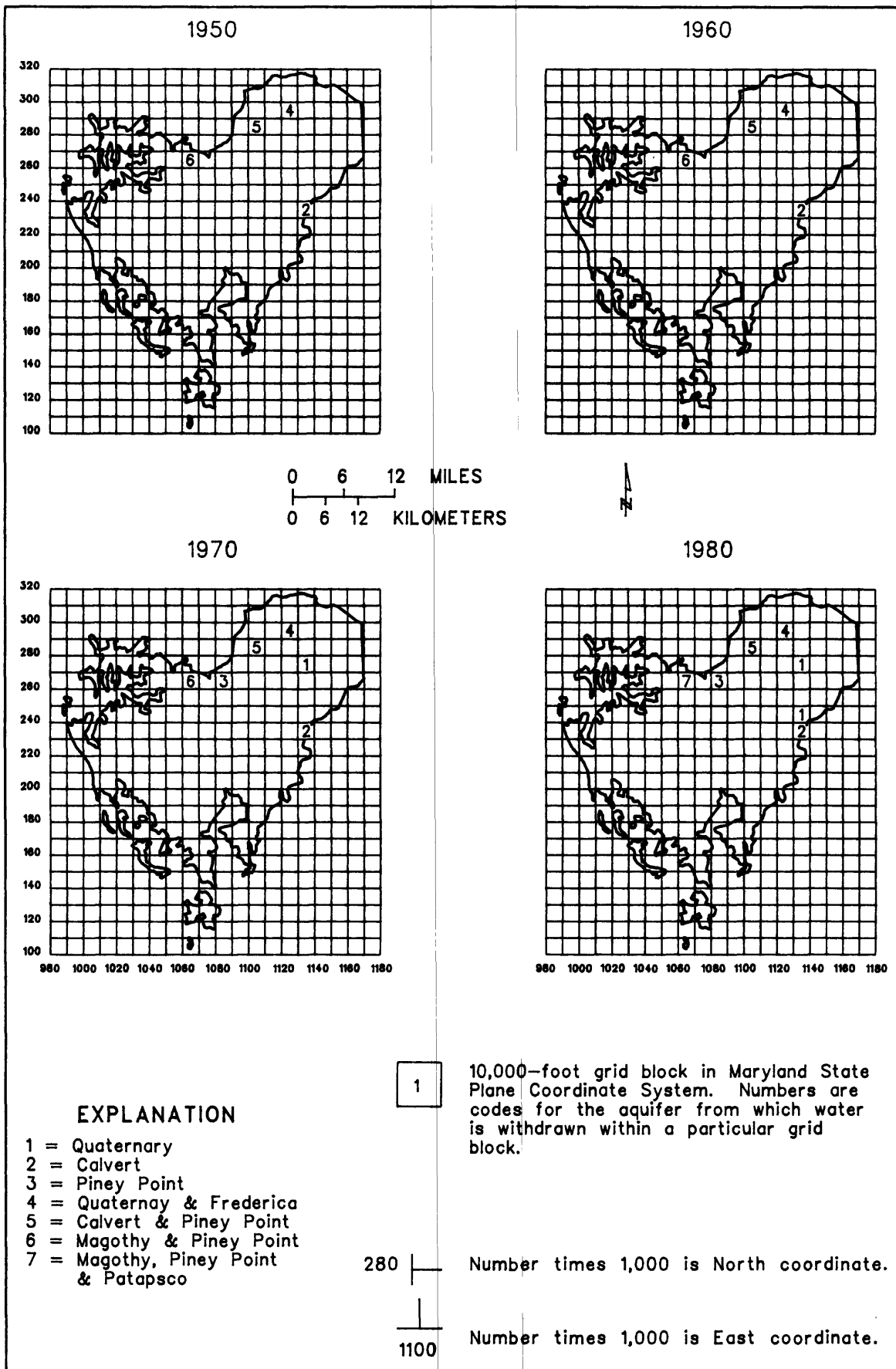


Figure 44.--Locations of large ground-water withdrawals by aquifers in Dorchester County for 1950, 1960, 1970, and 1980.

## HARFORD COUNTY

The Coastal Plain comprises only about one-fifth of Harford County. Ground-water use in the Coastal Plain area of Harford County from 1950 through 1980 is shown in figure 45. In 1950, the amount of ground water withdrawn was approximately 1.1 Mgal/d compared to withdrawals of nearly 6.2 Mgal/d in 1980. This represents an increase of 464 percent for the three decades.

Since 1950, ground-water use increased in all categories except for military, which declined from approximately 0.3 Mgal/d in 1950 to less than 0.05 Mgal/d in 1980. From the mid-1950's, the largest use of ground water was by water suppliers, whose use increased from about 0.3 Mgal/d in 1950 to 4.3 Mgal/d in 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, the average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, military, water supplier, and industrial/commercial uses for 1950, 1960, 1970, and 1980 are shown in figure 46. Military use comprised about 27 percent of the total water withdrawn in 1950, then decreased to only 0.5 percent by 1980. Withdrawals for water suppliers comprised only 26 percent of the total in 1950. However, by 1980, this use comprised 69 percent.

### Major Aquifers

Earliest ground-water withdrawals in the Coastal Plain area of Harford County probably came from the surficial (Quaternary) aquifer, primarily the Talbot Formation of the Columbia Group. These shallow sands continued to supply some low-yield water needs, chiefly for domestic use. A few large users were also able to withdraw sufficient quantities of water from the surficial aquifer. As the demand for water by large users increased, the use of deeper aquifers including those of the Potomac Group increased.

Withdrawals from the surficial (Talbot and Quaternary) and Potomac aquifers from 1950 through 1980 are shown in figure 47. From 1950 through 1959, withdrawals from the surficial aquifer averaged about 0.7 Mgal/d. In 1960, pumpage from these aquifers increased to 1.4 Mgal/d, primarily due to increases in withdrawals by the town of Aberdeen (see appendix). By 1980, pumpage had declined to about 1.2 Mgal/d.

Withdrawals from the Potomac aquifers began in 1954 at less than 0.1 Mgal/d and increased to almost 4.0 Mgal/d in 1976. The drop in pumpage in 1975 and the rise in 1976 are probably due to variations in withdrawals by the Harford County Department of Public Works (see appendix). By 1980, withdrawals were about 3.4 Mgal/d.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in the Coastal Plain area of Harford County for 1950, 1960, 1970, and 1980 are shown in figure 48. Table 10 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. In 1950, the areas of greatest pumpage were located along the Fall Line. Although the number of sites of large withdrawals increased, there was little change in the distribution pattern shown on the maps for 1960, 1970, and 1980.

The locations of withdrawals from individual aquifers supplying the large users in the Coastal Plain area of Harford County (described in table 10 and fig. 48) are shown in figure 49. The distribution of use of the surficial aquifer remained virtually the same for the years shown. Use of the Potomac aquifers did not begin until 1954 (fig. 47) and was limited to areas in the county along the Fall Line.



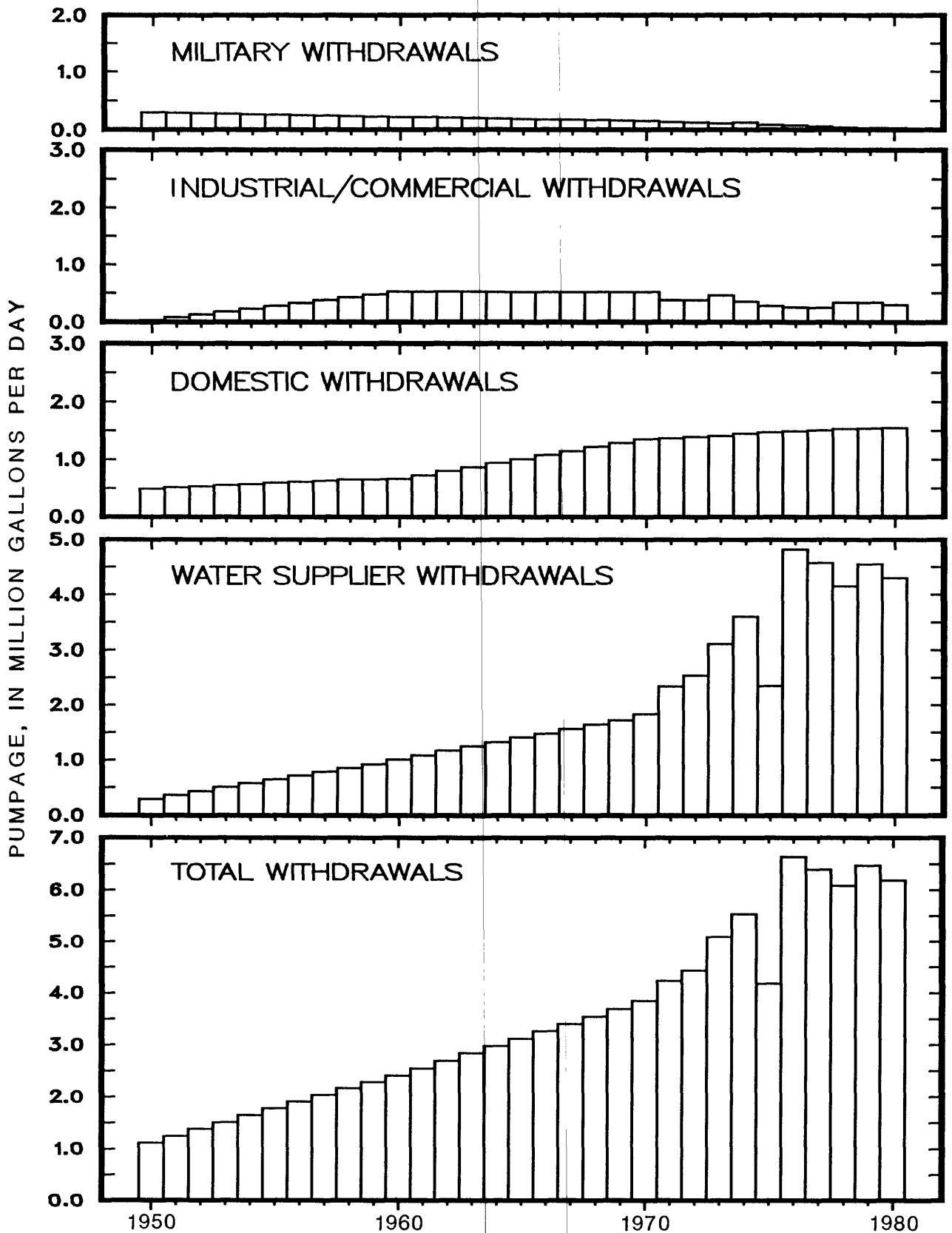
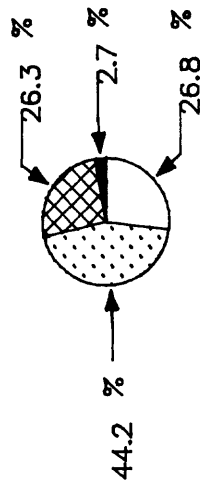
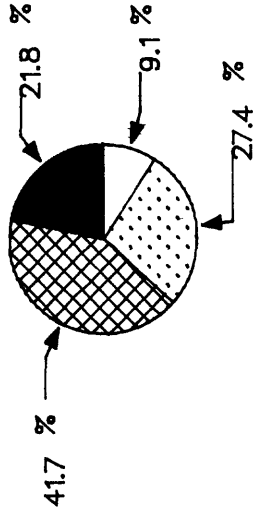


Figure 45.--Ground-water withdrawals by use in the Coastal Plain area of Harford County from 1950 through 1980.

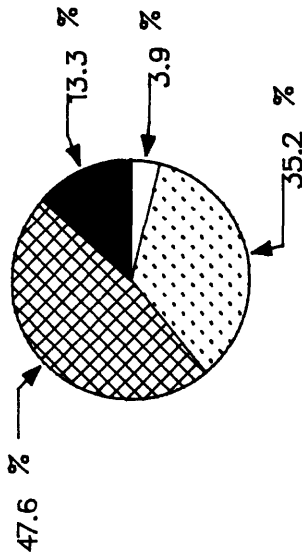
1950 TOTAL: 1.1 Mgal/d



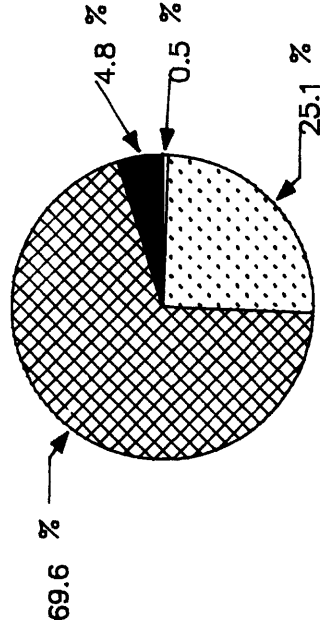
1960 TOTAL: 2.4 Mgal/d



1970 TOTAL: 3.9 Mgal/d



1980 TOTAL: 6.2 Mgal/d



EXPLANATION



Figure 46.--Ground-water use in the Coastal Plain area of Harford County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

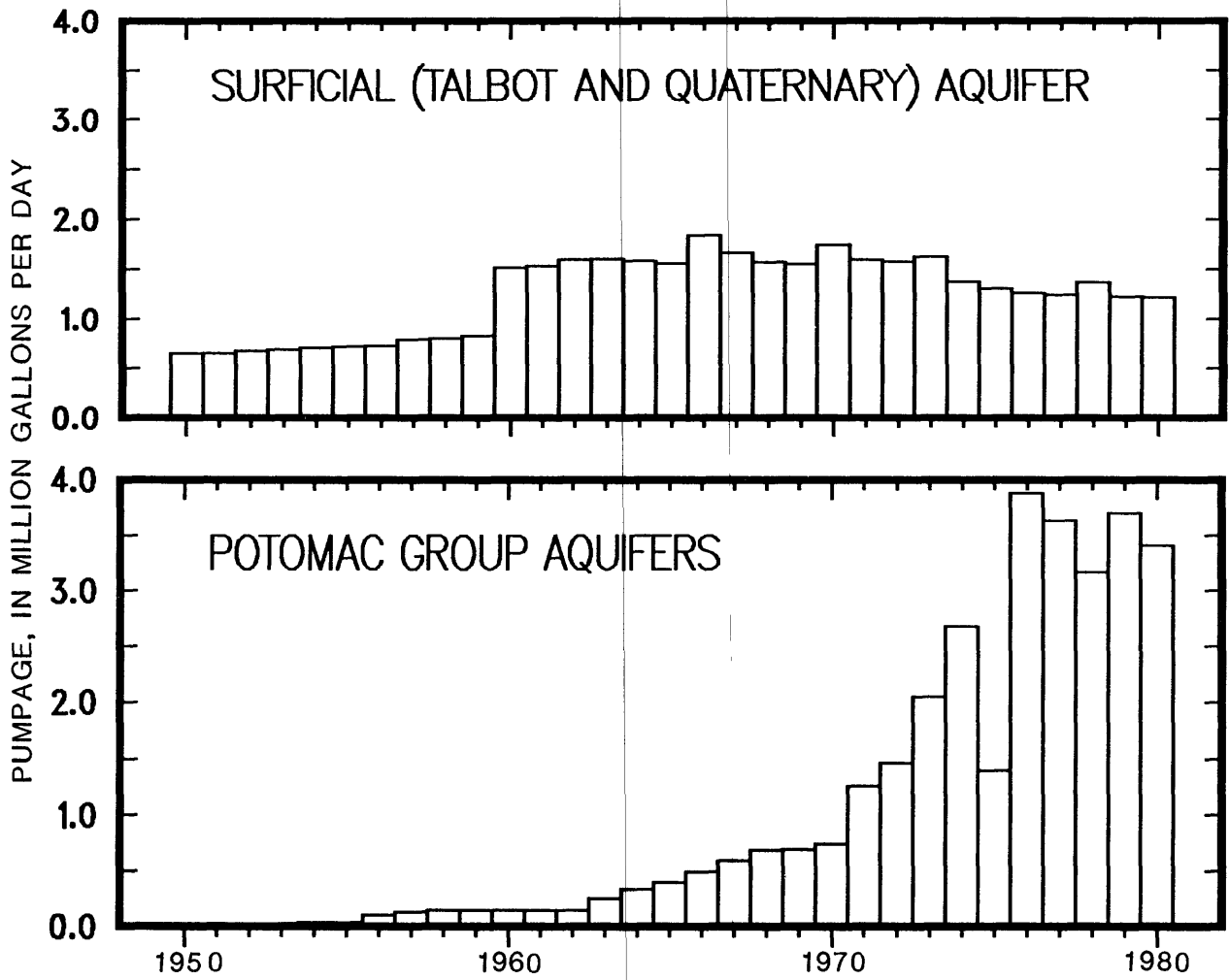


Figure 47.--Large ground-water withdrawals by aquifers in the Coastal Plain area of Harford County from 1950 through 1980.

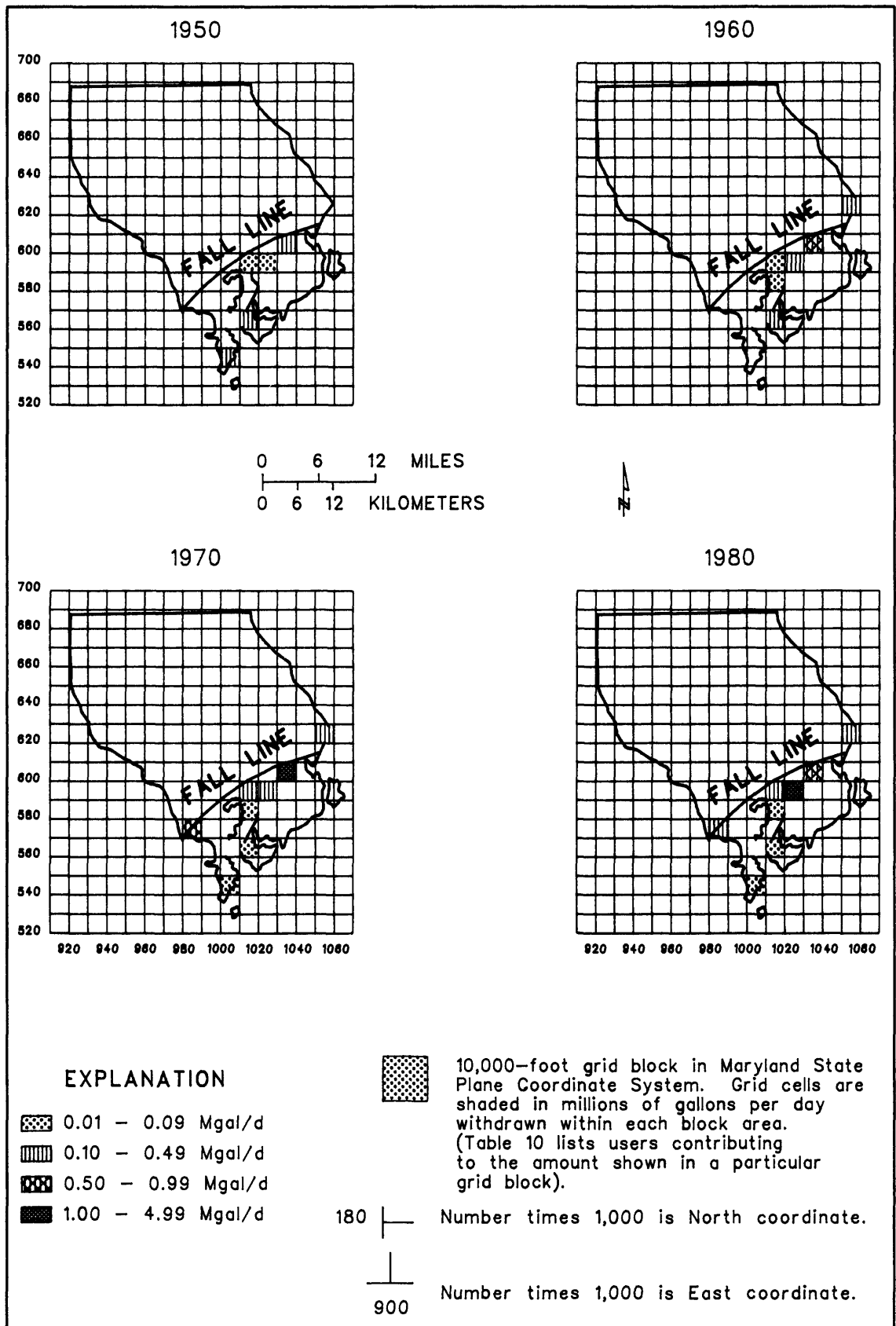


Figure 48.--Locations of large ground-water withdrawals in the Coastal Plain area of Harford County for 1950, 1960, 1970, and 1980.

Table 10.--Large ground-water users in the Coastal Plain area of Harford County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N540 E1000	Aberdeen Proving Ground (Edgewood wells)	0.16	Talbot
	N560 E1010	Aberdeen Proving Ground (Aberdeen wells)	.14	Talbot
	N590 E1010	Bata Shoe Company, Inc.	.02	Talbot
	N590 E1020	F.O. Mitchell & Bros. Canning Inc.	.04	Talbot
	N600 E1030	Aberdeen, Town of	.29	Quaternary
1960	N540 E1000	Aberdeen Proving Ground, (Edgewood wells)	0.15	Talbot
	N560 E1010	Aberdeen Proving Ground, (Aberdeen wells)	.13	Talbot
	N580 E1010	Willoughby Beach Water Company	.04	Potomac Group
	N590 E1010	Bata Shoe Company, Inc.	.04	Talbot
	N590 E1020	Interpace Corporation	.11	Potomac Group
	N590 E1020	F.O. Mitchell & Bros. Canning Inc.	.04	Talbot
	N600 E1030	Aberdeen, Town of	.97	Quaternary
	N620 E1050	J.M. Huber Corporation	.20	Talbot
1970	N540 E1000	Aberdeen Proving Ground, (Edgewood wells)	0.08	Talbot
	N560 E1010	Aberdeen Proving Ground, (Aberdeen wells)	.07	Talbot
	N570 E980	Joppatowne Utilities	.54	Potomac Group
	N580 E1010	Willoughby Beach Water Company	.04	Potomac Group
	N590 E1010	Long Bar Harbor, Harford Co. Metro. Comm.	.05	Potomac Group
	N590 E1020	Bata Shoe Company, Inc.	.05	Talbot
	N590 E1020	Interpace Corporation	.12	Potomac Group
	N590 E1020	F.O. Mitchell & Bros. Canning Inc.	.02	Talbot
	N600 E1030	Aberdeen, Town of	1.20	Quaternary
	N620 E1050	J.M. Huber Corporation	.33	Talbot
1980	N540 E1000	Aberdeen Proving Ground, (Edgewood wells)	0.02	Talbot
	N560 E1010	Aberdeen Proving Ground, (Aberdeen wells)	.02	Talbot
	N570 E980	Joppatowne Utilities	.26	Potomac Group
	N580 E1010	Willoughby Beach Water Company	.04	Potomac Group
	N590 E1010	Long Bar Harbor, Harford Co., Metro. Comm.	.11	Potomac Group
	N590 E1020	Bata Shoe Company, Inc.	.02	Talbot
	N590 E1020	Short Lane, Harford Co., Metro. Comm.	1.78	Potomac Group
	N590 E1020	Perryman, Harford Co. Dept. of Public Works	1.13	Potomac Group
	N590 E1020	Interpace Corporation	.10	Potomac Group
	N600 E1030	Aberdeen, Town of	.98	Quaternary
	N620 E1050	J.M. Huber Corporation	.18	Talbot

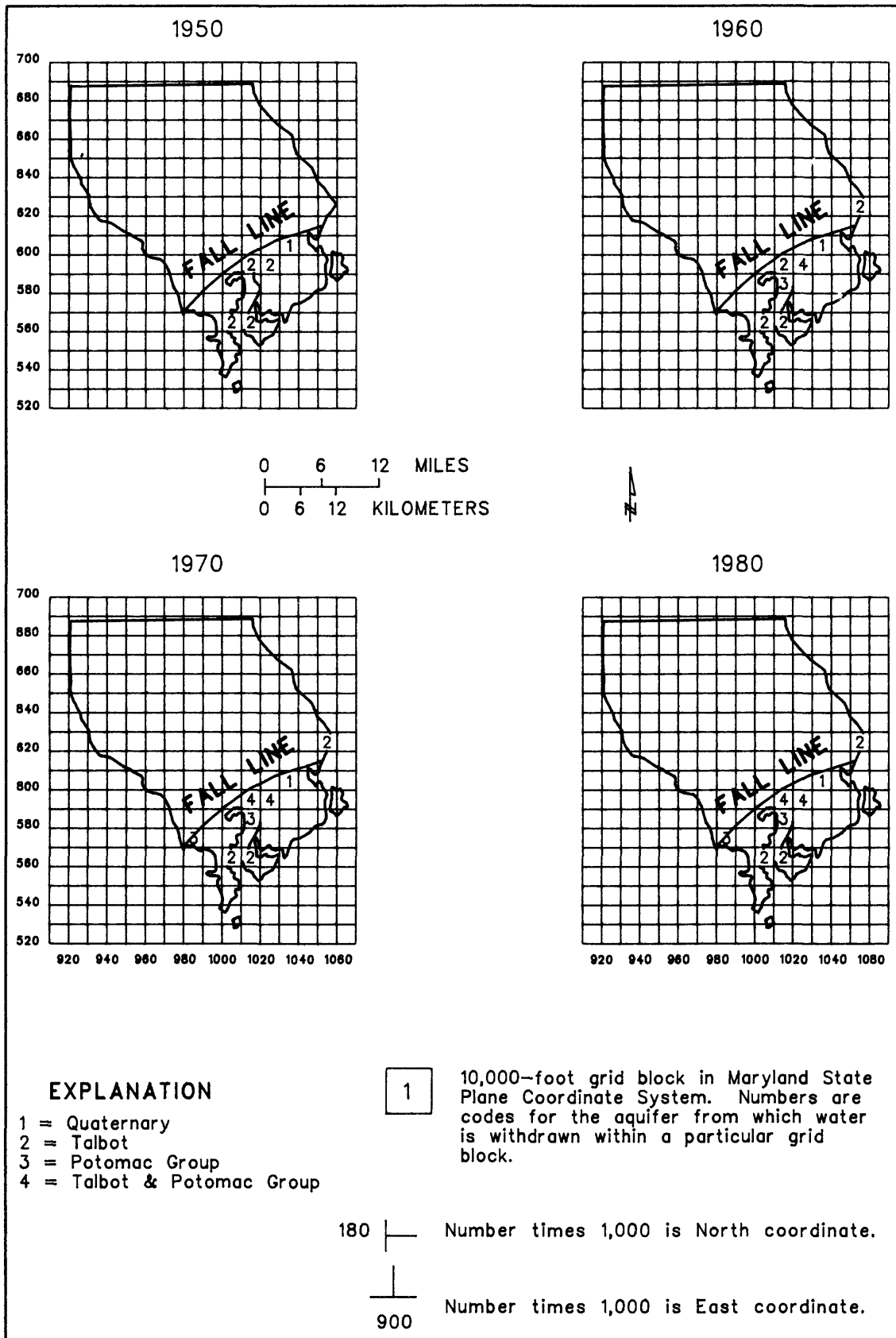


Figure 49.--Locations of large ground-water withdrawals by aquifers in the Coastal Plain area of Harford County for 1950, 1960, 1970, and 1980.

## KENT COUNTY

Ground-water use in Kent County from 1950 through 1980 is shown in figure 50. In 1950, the amount of ground water withdrawn was approximately 1.4 Mgal/d compared to withdrawals of nearly 3.5 Mgal/d in 1980. This represents an increase of 150 percent for the three decades.

Since 1950, water use in Kent County has increased in nearly all categories. Figure 50 shows that during the early 1950's, the largest use of ground water was domestic (approximately 0.7 Mgal/d). Withdrawals for this use remained relatively the same until 1980. Pumpage by water suppliers also remained about the same (0.4 Mgal/d) to 1970. However, increases in withdrawals for this use occurred over the next 10 years, and, by 1980, about 0.8 Mgal/d was being pumped.

From the mid-1950's until 1971, the largest withdrawals were for industrial/commercial use. Following the closing of several canneries and processing plants during the early 1970's, however, withdrawals declined from about 1.0 Mgal/d in 1963 to about 0.6 Mgal/d in 1980.

Water withdrawn for irrigation was greatest during the period 1964 (0.3 Mgal/d) to 1980 (1.1 Mgal/d). Although there have been no precise measurements of the amounts of water withdrawn by individual irrigators, methods of collecting and reporting these data have improved since the early 1950's. However, the most reliable data are from 1970 to 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation uses are shown in figure 51. In 1950, 50 percent of the total water pumped was for domestic use. However, this percentage dropped the following years to about 28 percent by 1980. The percentage of water used for irrigation, on the other hand, increased from 10 percent in 1960 to about 31 percent in 1980.

### Major Aquifers

Many domestic withdrawals in Kent County were from shallow wells (from about 15 to 45 ft deep) tapping the surficial aquifer. Deeper aquifers including the

Aquia, Severn, Magothy, and Patapsco were more widely used by large users. Large user withdrawals by aquifer from 1950 through 1980 are shown in figure 52.

The Aquia aquifer was a major source of water for large users for the 30 years shown. The amount of its use remained relatively the same during the decade 1950 to 1960 (around 0.4 Mgal/d), then increased in 1960 to about 0.7 Mgal/d, and continued to increase through 1980 to about 1.1 Mgal/d. Withdrawals from the Severn aquifer were less than 0.01 Mgal/d until 1978; from then to 1980, pumpage averaged about 0.01 Mgal/d.

Use of the Magothy aquifer stayed virtually the same from 1950 through 1970 (at approximately 0.3 Mgal/d), when its use declined. From 1971 through 1980, withdrawals averaged about 0.15 Mgal/d.

Pumpage from the Patapsco aquifer was relatively constant (approximately 0.1 Mgal/d) for most of the 30-year period. However, withdrawals did increase to nearly 0.2 Mgal/d during the last few years of record.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Kent County for 1950, 1960, 1970, and 1980 are shown in figure 53. Table 11 presents water-use data for the large users located within particular grid blocks for the year indicated on the map.

In 1950, the locations of large withdrawals were near the northern border of the county, along the southwestern border near the Chesapeake Bay, and along the east-central border. This distribution pattern remained relatively the same until 1970. However, the maps for 1970 and 1980 show increases in withdrawal sites in the central part of the county.

The locations of withdrawals from individual aquifers supplying the large users in Kent County (described in table 11 and fig. 53) are shown in figure 54. For the 4 years shown, the Aquia aquifer was used primarily in the central and southern parts of the county. Large withdrawals from the Severn aquifer appear only on the map for 1980, and at a single location in the central part of the county. The Magothy aquifer had the widest distribution of use, whereas the Patapsco aquifer was used in only one location in the southwestern part of the county.

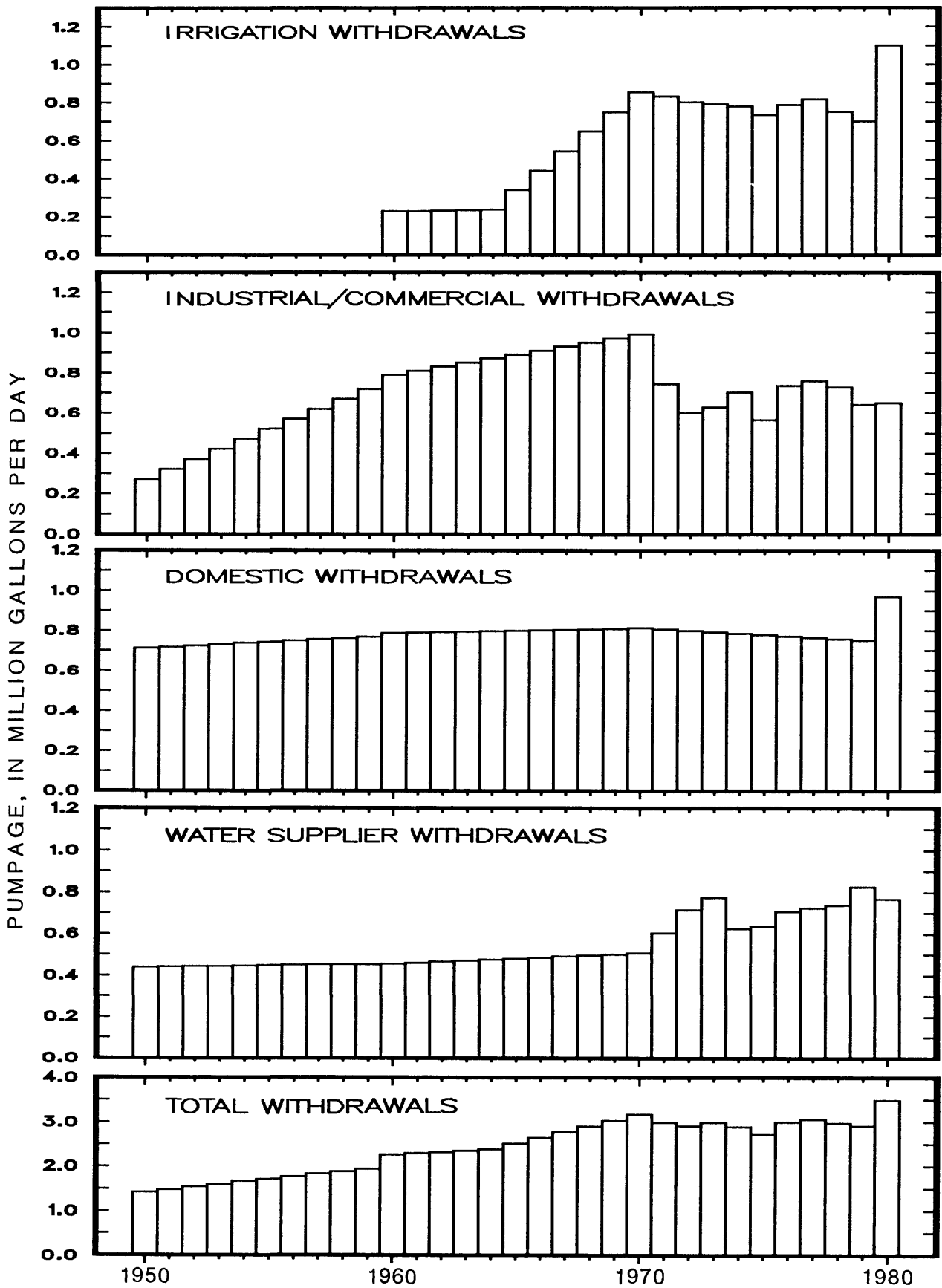
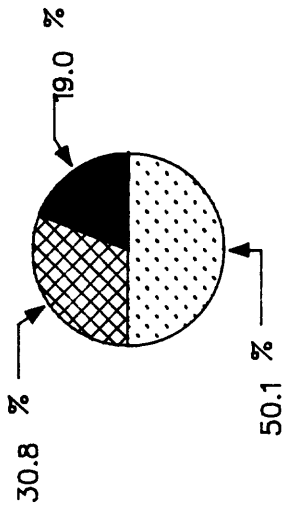


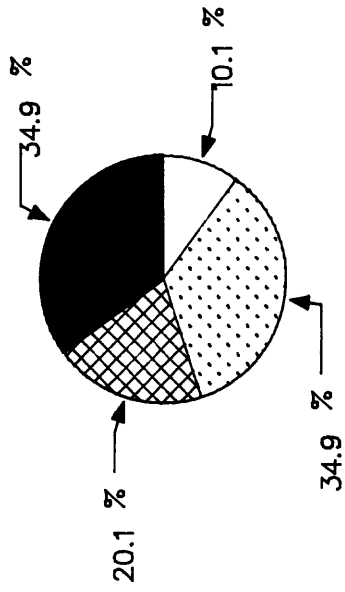
Figure 50.--Ground-water withdrawals by use in Kent County from 1950 through 1980.



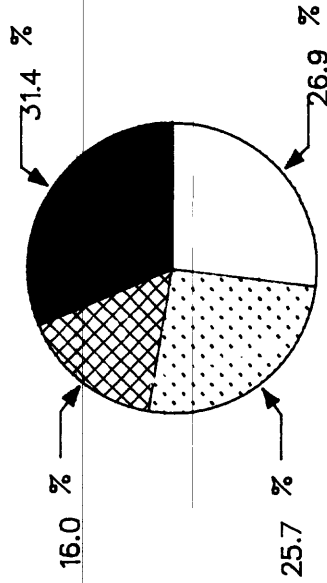
1950 TOTAL: 1.4 Mgal/d



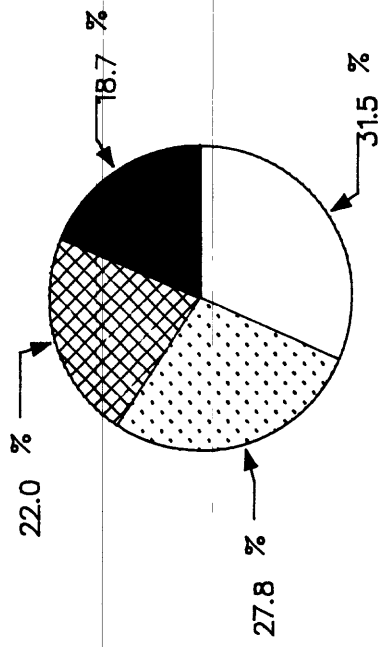
1960 TOTAL: 2.3 Mgal/d



1970 TOTAL: 3.2 Mgal/d



1980 TOTAL: 3.5 Mgal/d



EXPLANATION

- INDUSTRIAL/COMMERCIAL [Solid Black Box]
- DOMESTIC [Dotted Box]
- IRRIGATION [White Box]
- WATER SUPPLIER [Cross-hatched Box]

Figure 51.---Ground-water use in Kent County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

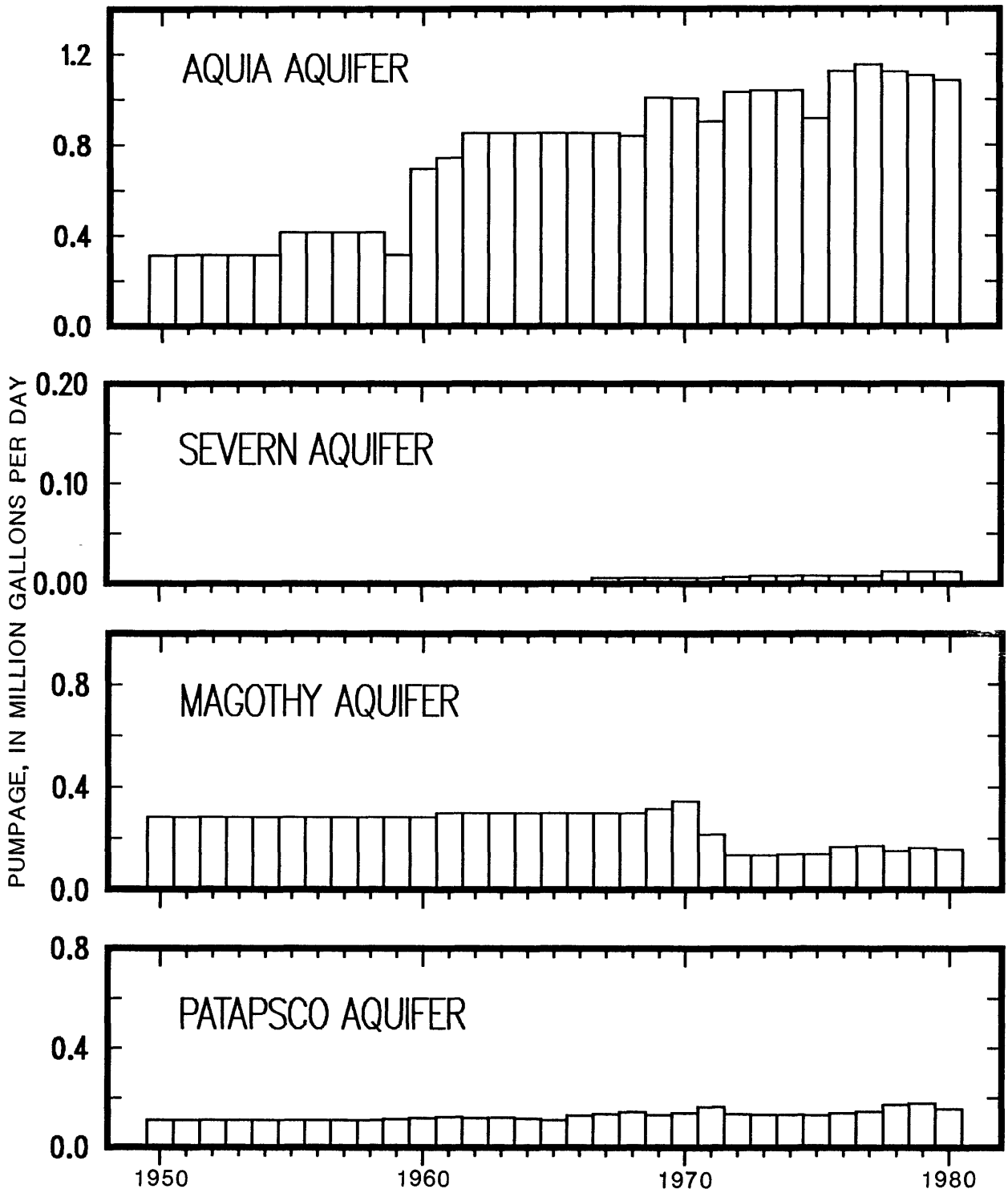


Figure 52.--Large ground-water withdrawals by aquifers in Kent County from 1950 through 1980.

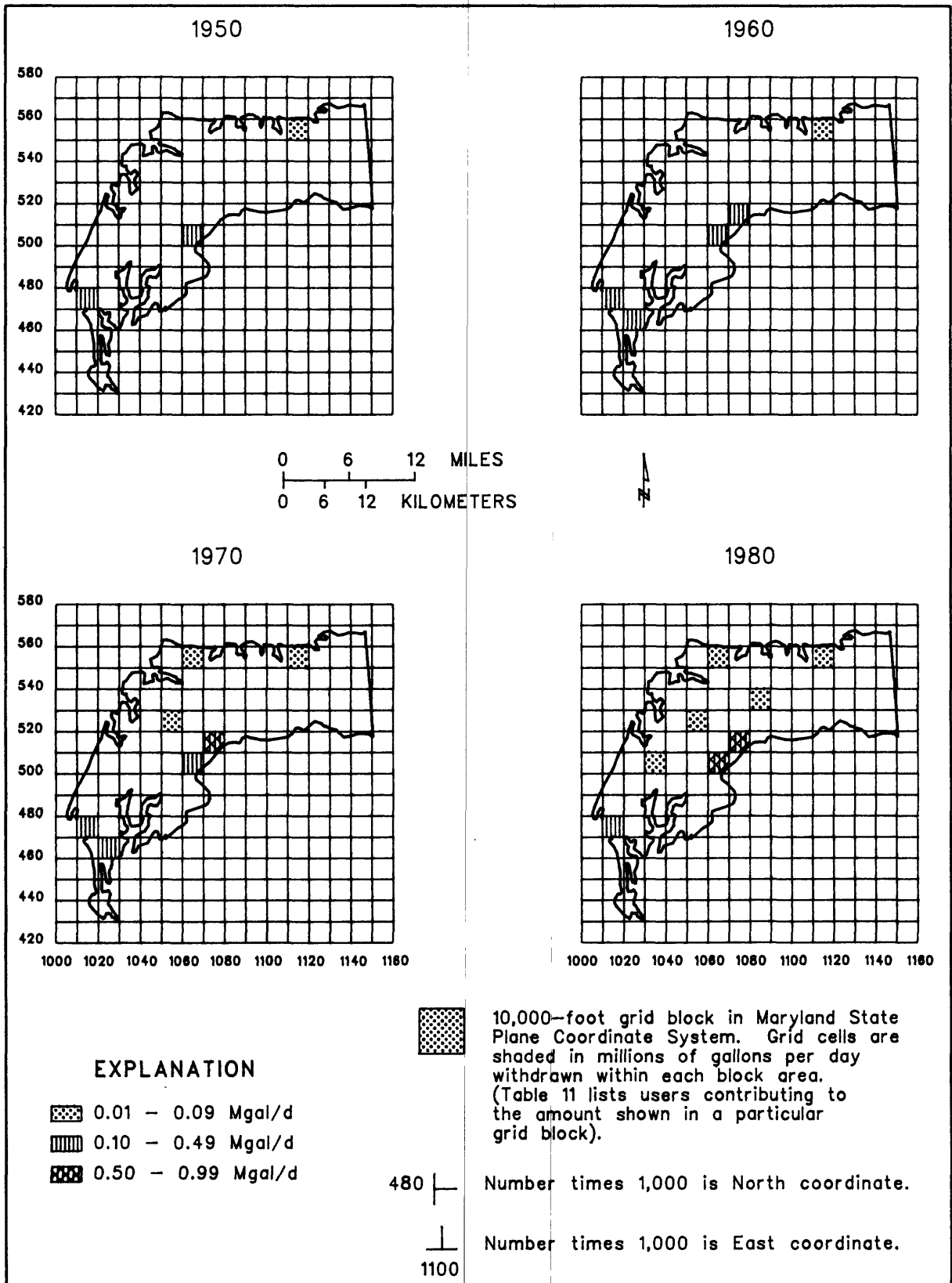


Figure 53.--Locations of large ground-water withdrawals in Kent County for 1950, 1960, 1970, and 1980.

Table 11.--Large ground-water users in Kent County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N470 E1010	Rock Hall, Town of	0.11	Fatapsco
		Kent Packing Company	.15	Magothy
		Ivens & Hudson Oyster Company	.02	Magothy
	N500 E1060	Vita Food Products, Incorporated	.10	Magothy
	N550 E1110	Chestertown Utilities Commission Galena, Town of	.32 .01	Aquia Magothy
1960	N460 E1020	C.H. Ashley & Son Oyster Company	0.16	Aquia
	N470 E1010	Rock Hall, Town of	.12	Fatapsco
		Kent Packing Company	.15	Magothy
		Ivens & Hudson Oyster Company	.02	Magothy
	N500 E1060	Vita Food Products, Incorporated Chestertown Utilities Commission	.10 .32	Magothy Aquia
	N510 E1070	Campbell Soup Company	.22	Aquia
	N550 E1110	Galena, Town of	.01	Magothy
1970	N460 E1020	C.H. Ashley & Son Oyster Company	0.10	Aquia
	N470 E1010	Rock Hall, Town of	.14	Fatapsco
		Kent Packing Company	.15	Magothy
		Ivens & Hudson Oyster Company	.02	Magothy
	N500 E1060	Vita Food Products, Incorporated	.10	Magothy
		Chestertown Utilities Commission	.32	Aquia
	N510 E1070	Campbell Soup Company	.59	Aquia
	N520 E1050	Tenneco Chemicals, Incorporated	.03	Magothy
	N550 E1110	Galena, Town of	.03	Magothy
N560 E1060	Betterton, Town of	.02	Magothy	
1980	N470 E1010	Rock Hall, Town of	0.15	Fatapsco
	N500 E1030	Fairlee District, Kent County Sanitary District	.04	Magothy
		Chestertown Utilities Commission	.50	Aquia
	N510 E1070	Campbell Soup Company	.58	Aquia
	N520 E1050	Tenneco Chemicals, Incorporated	.07	Magothy
	N530 E1080	Kennedyville, Kent County Sanitary District	.01	Severn
		N550 E1110	Galena, Town of	.04
	N560 E1060	Betterton, Town of	.02	Magothy

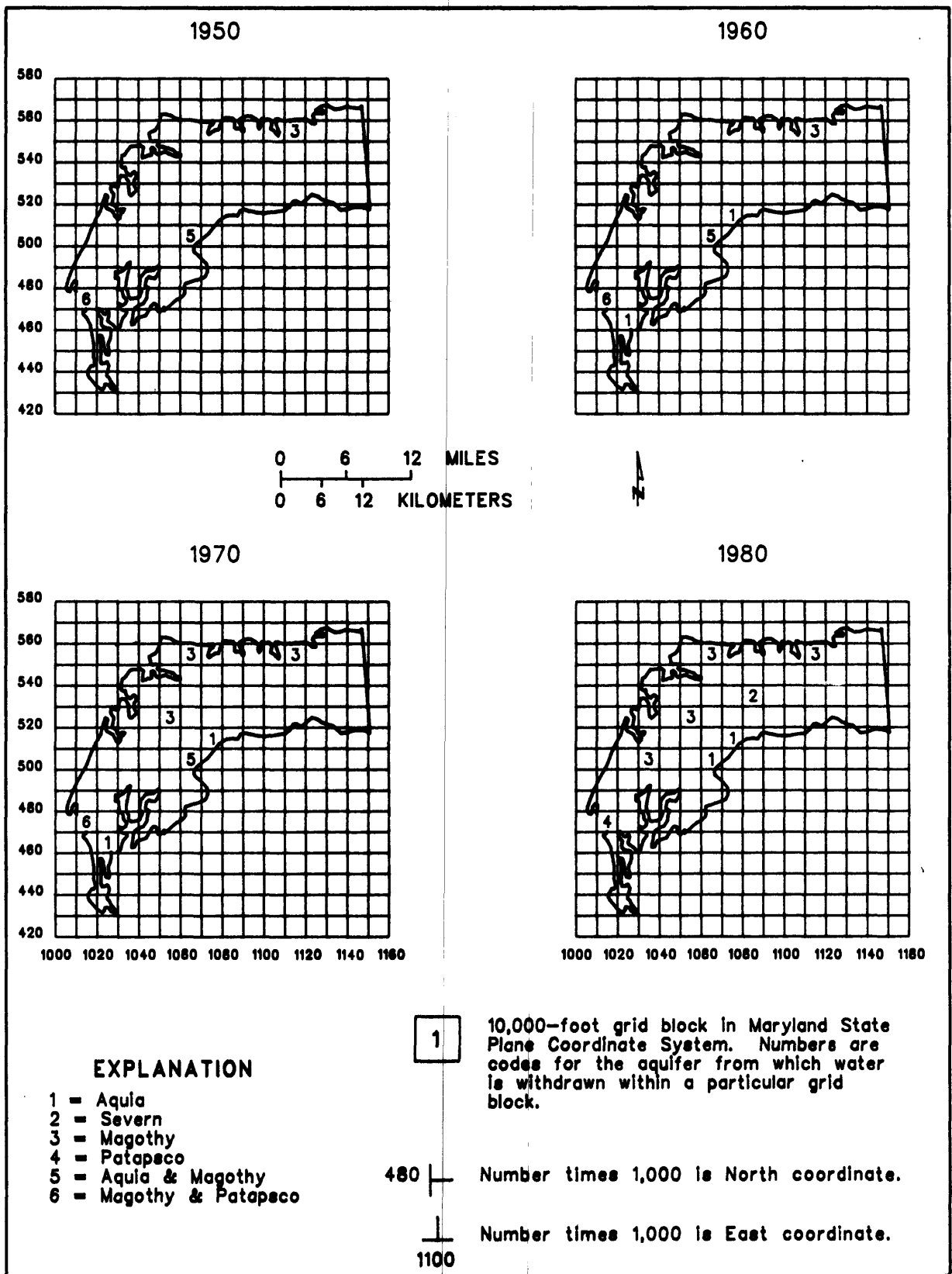


Figure 54.--Locations of large ground-water withdrawals by aquifers in Kent County for 1950, 1960, 1970, and 1980.

## PRINCE GEORGES COUNTY

In the early development of Prince Georges County, ground water supplied most of the needs of the inhabitants. However, as the population grew, particularly around the Washington, D.C. area, and demand for water increased, the Maryland General Assembly in 1918 established the Washington Suburban Sanitary Commission (WSSC) to be responsible for supplying water (surface water from the Potomac and Patapsco Rivers) to the suburban areas of Prince Georges and Montgomery Counties (Mack, 1966). Since that time, WSSC has extended waterlines throughout most of Prince Georges County, which, as of 1980, served about 80 percent of the population. Nevertheless, ground water continued to supply some large users and individual houses and farms. Much of the pumpage for domestic use was from shallow wells (from about 15 to 45 ft deep) tapping the surficial aquifer. Deeper aquifers including the Patuxent, Patapsco, and Magothy were more widely used by large ground-water users.

Ground-water use in the Coastal Plain area of Prince Georges County from 1950 through 1980 is shown in figure 55. In 1950, the amount of ground water withdrawn was approximately 6.0 Mgal/d. By 1970, withdrawals had increased to nearly 10.0 Mgal/d. After that year, pumpage started to decline so that by 1980 it had fallen to about 7.2 Mgal/d, or just more than 1.0 Mgal/d greater than it had been in 1950. A major factor in this decline was the expansion of water service by WSSC to many areas that previously had been supplied by individual wells or by wells of public and private water companies.

Pumpage by water suppliers was about 0.7 Mgal/d in 1950. There was little change in withdrawals until around 1960, at which time a central water supply was put into service at Bowie (see appendix). Pumpage then increased considerably over the next decade so that by 1970, approximately 4.1 Mgal/d was withdrawn by public suppliers, most of which was from the Bowie supply. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, military, water supplier, and industrial/commercial uses for years 1950 to 1980 are shown in figure 56. As shown, domestic use comprised about 74 percent of the total water withdrawn in 1950. By 1980, however, the fraction was only about 35 percent, whereas the percentage for water suppliers

increased from 12 percent in 1950 to 40 percent in 1980.

### Major Aquifers

Many domestic withdrawals in Prince Georges County were from shallow wells (from about 15 to 45 ft deep) tapping the surficial aquifer. Deeper aquifers including the Magothy, Patapsco, and Patuxent were more widely used by large users not supplied by WSSC. Large user withdrawals by aquifer from 1940 through 1980 are shown in figure 57.

Pumpage from the Magothy aquifer showed little change from 1940 to 1959. After that time, withdrawals increased from about 0.5 Mgal/d in 1959 to nearly 1.5 Mgal/d in 1980, with a peak pumpage of about 1.7 Mgal/d in 1976.

Continuous use of the Patapsco aquifer by large users began about 1958. By the early 1970's, pumpage had increased to almost 2 Mgal/d. Withdrawals remained more than 1 Mgal/d through the 1970's. However, in 1980 there was a significant drop in pumpage to about 0.5 Mgal/d. This was due to a decline in pumpage from the Patapsco aquifer at Bowie (see appendix).

Pumpage from the Patuxent aquifer began about 1946 and gradually increased until 1960. From 1960 to 1970, significant increases are shown, especially after 1965. During that year, the city of Bowie began using the Patuxent aquifer.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Prince Georges County for 1950, 1960, 1970, and 1980 are shown in figure 58. Table 12 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. The maps show that the pattern of distribution of pumpage developed around the perimeter areas of the county which are generally not served by WSSC.

The locations of withdrawals from individual aquifers supplying the large users in Prince Georges County (described in table 12 and fig. 58) are shown in figure 59. The Magothy aquifer was used mostly in the south-central to southeastern part of the county. Locations of withdrawals from the Patapsco aquifer were primarily in the Bowie area and the southwestern part of the county. For the most part, the Patuxent aquifer was used in the northern part of the county.

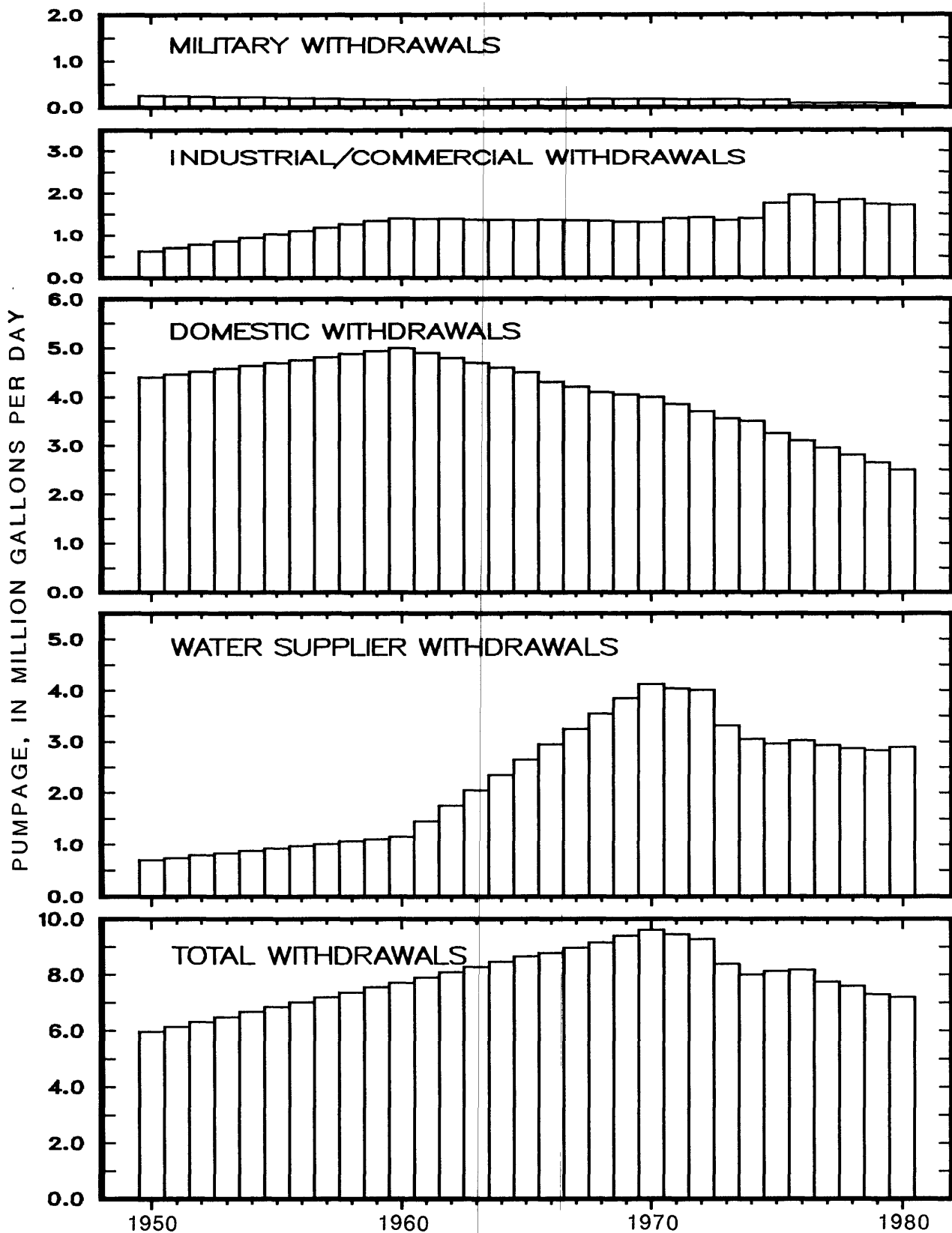


Figure 55.--Ground-water withdrawals by use in the Coastal Plain area of Prince Georges County from 1950 through 1980.

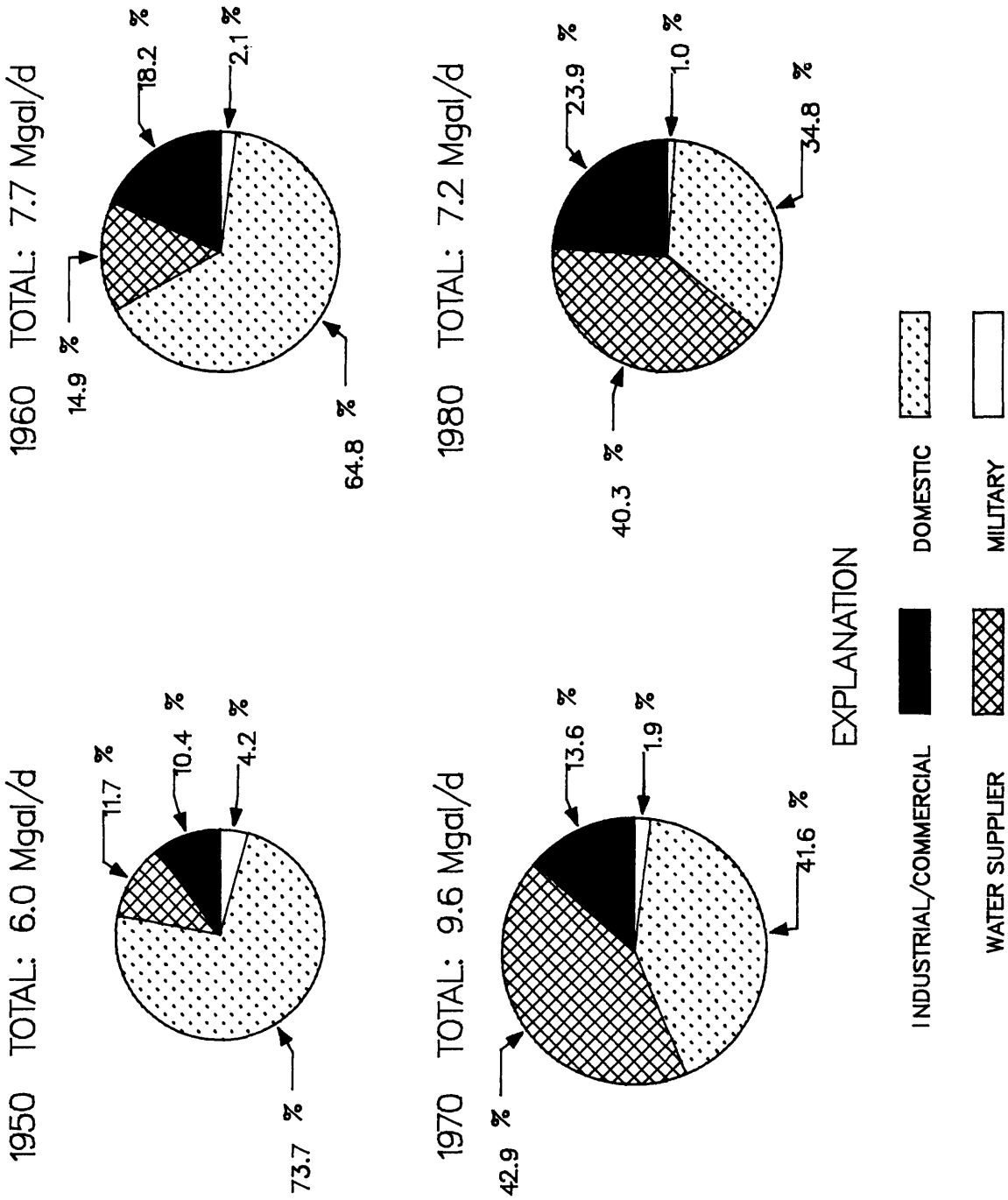


Figure 56.--Ground-water use in the Coastal Plain area of Prince Georges County and percentage for each type of use, for 1950, 1960, 1970, and 1980.



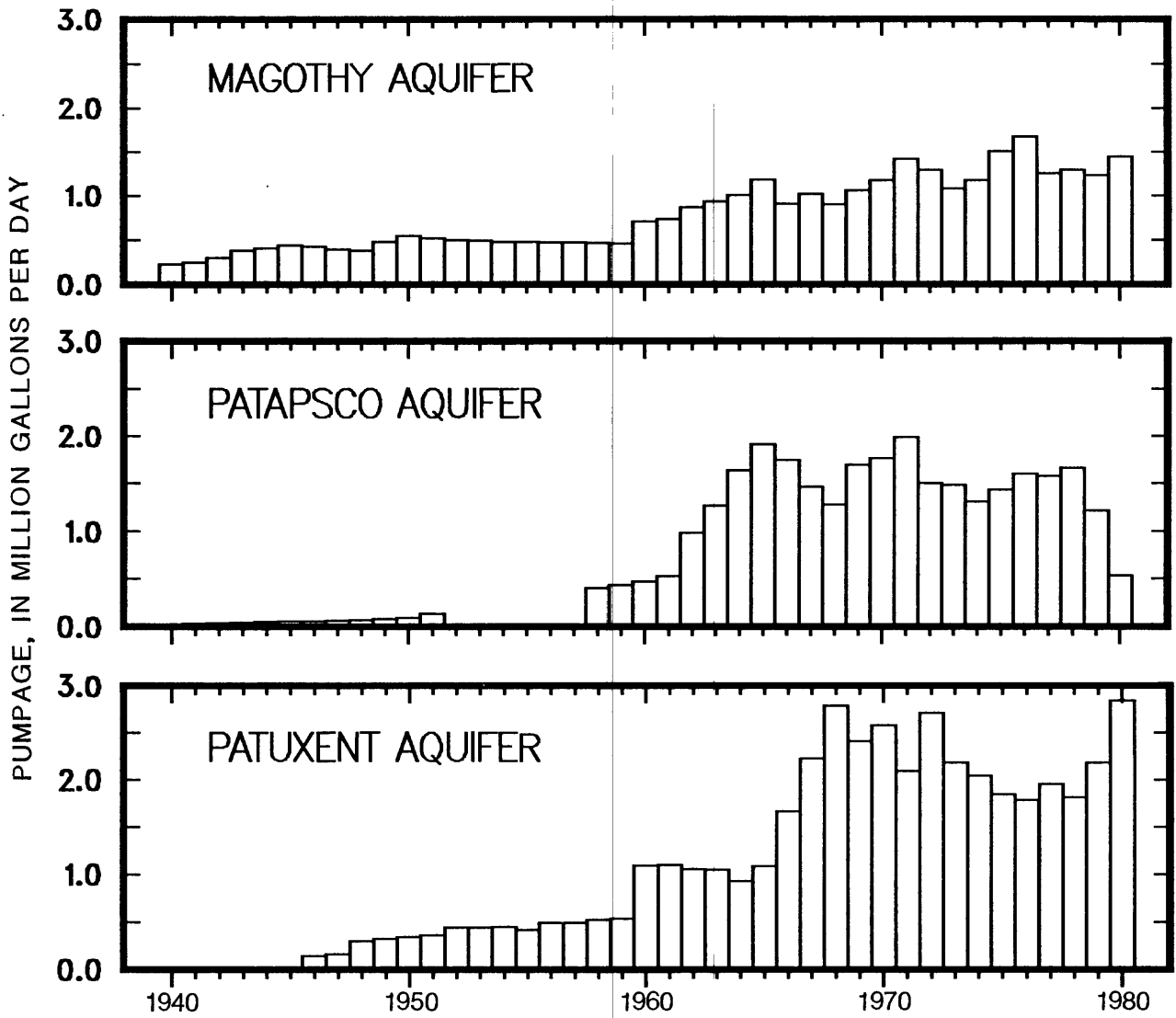


Figure 57.--Large ground-water withdrawals by aquifers in the Coastal Plain area of Prince Georges County from 1940 through 1980.

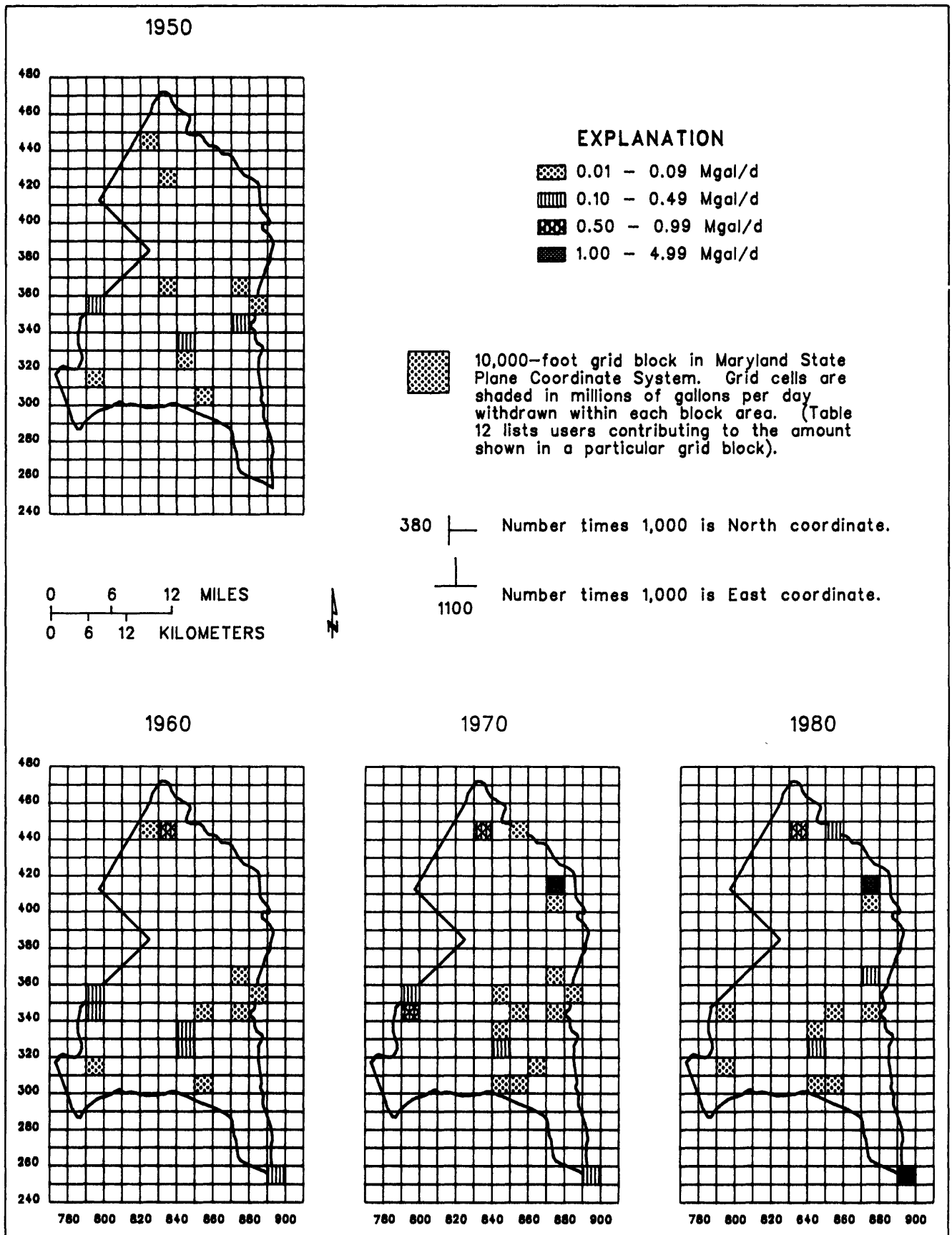


Figure 58.--Locations of large ground-water withdrawals in the Coastal Plain area of Prince Georges County for 1950, 1960, 1970, and 1980.

Table 12.--Large ground-water users in the Coastal Plain area of Prince Georges County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer	
1950	N300 E850	Cedarville Park, Incorporated	0.05	Magothy	
	N310 E790	Fort Washington	.01	Patuxent	
		do.	.01	Patapsco	
	N320 E840	Boys' Village	.03	Magothy	
	N330 E840	U.S. Navy, Cheltenham	.32	Magothy	
	N340 E870	Upper Marlboro, WSSC	.12	Magothy	
	N350 E790	Forest Heights, WSSC	.19	Patuxent	
	N350 E880	Willie G. Sauerwein	.01	Magothy	
	N360 E830	Morningside Village	.08	Patapsco	
	N360 E870	Northeast Marlboro Water System	.01	Magothy	
	N420 E830	Greenbelt Consumer Service	.10	Patuxent	
	N440 E820	Mineral Pigments Corporation	.04	Patuxent	
	1960	N250 E890	PEPCO, Chalk Point	0.24	Magothy
		N300 E850	Cedarville Park, Inc.	.06	Magothy
N310 E790		Fort Washington	.03	Patuxent	
		do.	.02	Patapsco	
N320 E840		Boys' Village	.14	Magothy	
N330 E840		U.S. Navy, Cheltenham	.18	Magothy	
N340 E790		Fort Foote, WSSC	.45	Patapsco	
N340 E850		Safeway Stores, Inc.	.01	Magothy	
N340 E870		Upper Marlboro, WSSC	.06	Magothy	
N350 E790		Forest Heights, WSSC	.46	Patuxent	
N350 E880		Willie G. Sauerwein	.01	Magothy	
N360 E870		Northeast Marlboro water system	.01	Magothy	
N440 E820		Mineral Pigments Corporation	.07	Patuxent	
N440 E830		U.S. Dept. of Agriculture, Beltsville	.53	Patuxent	
1970	N250 E890	PEPCO, Chalk Point	0.48	Magothy	
	N300 E840	U.S. Naval Research Laboratory, Brandywine	.03	Patapsco	
	N300 E850	Cedarville Park, Inc.	.06	Magothy	
		BFW Fabrication Company	.01	Magothy	
	N310 E860	U.S. Air Force Country Club	.07	Potomac Group	
	N320 E840	Boys' Village	.11	Magothy	
	N330 E840	U.S. Navy, Cheltenham	.08	Magothy	
	N340 E790	Fort Foote, WSSC	.67	Patapsco	
	N340 E850	Safeway Stores, Inc.	.01	Magothy	
	N340 E870	Upper Marlboro, WSSC	.05	Magothy	
	N350 E790	Forest Heights, WSSC	.47	Patuxent	
	N350 E840	Lone Star Industries, Inc.	.02	Magothy	
	N350 E880	Willie G. Sauerwein	.01	Magothy	
	N360 E870	Northeast Marlboro water system	.01	Magothy	
		First Maryland Utilities, Inc.	.06	Magothy	
	N400 E870	Simpson Land Company, Inc.	.01	Magothy	
	N410 E870	Bowie, City of	1.42	Patuxent	
		do.	.99	Patapsco	
		do.	.27	Magothy	
N440 E830	U.S. Dept. of Agriculture, Beltsville	.70	Patuxent		
N440 E850	Patuxent Wildlife Research Center	.07	Patapsco		
1980	N250 E890	PEPCO, Chalk Point	0.30	Patapsco	
		do.	.78	Magothy	
	N300 E840	U.S. Naval Research Laboratory, at Brandywine	.01	Patapsco	
	N300 E850	Cedarville Park, Inc.	.04	Magothy	
	N310 E790	Calvert Manor Corporation	.02	Patapsco	
	N320 E840	Boys' Village	.11	Magothy	
	N330 E840	U.S. Navy, Cheltenham	.06	Magothy	
	N340 E790	Potomac Vista Corporation	.02	Patapsco	
	N340 E800	Cedar Ridge Company	.02	Patapsco	
	N340 E870	Upper Marlboro, WSSC	.02	Magothy	
	N360 E870	First Maryland Utilities, Inc.	.18	Magothy	
	N400 E870	Simpson Land Company, Inc.	.01	Magothy	
	N410 E870	Bowie, City of	2.08	Patuxent	
		do.	.16	Patapsco	
		do.	.24	Magothy	
	N440 E830	U.S. Dept. of Agriculture, Beltsville	.61	Patuxent	
	N440 E850	Patuxent Wildlife Research Center	.16	Patuxent	

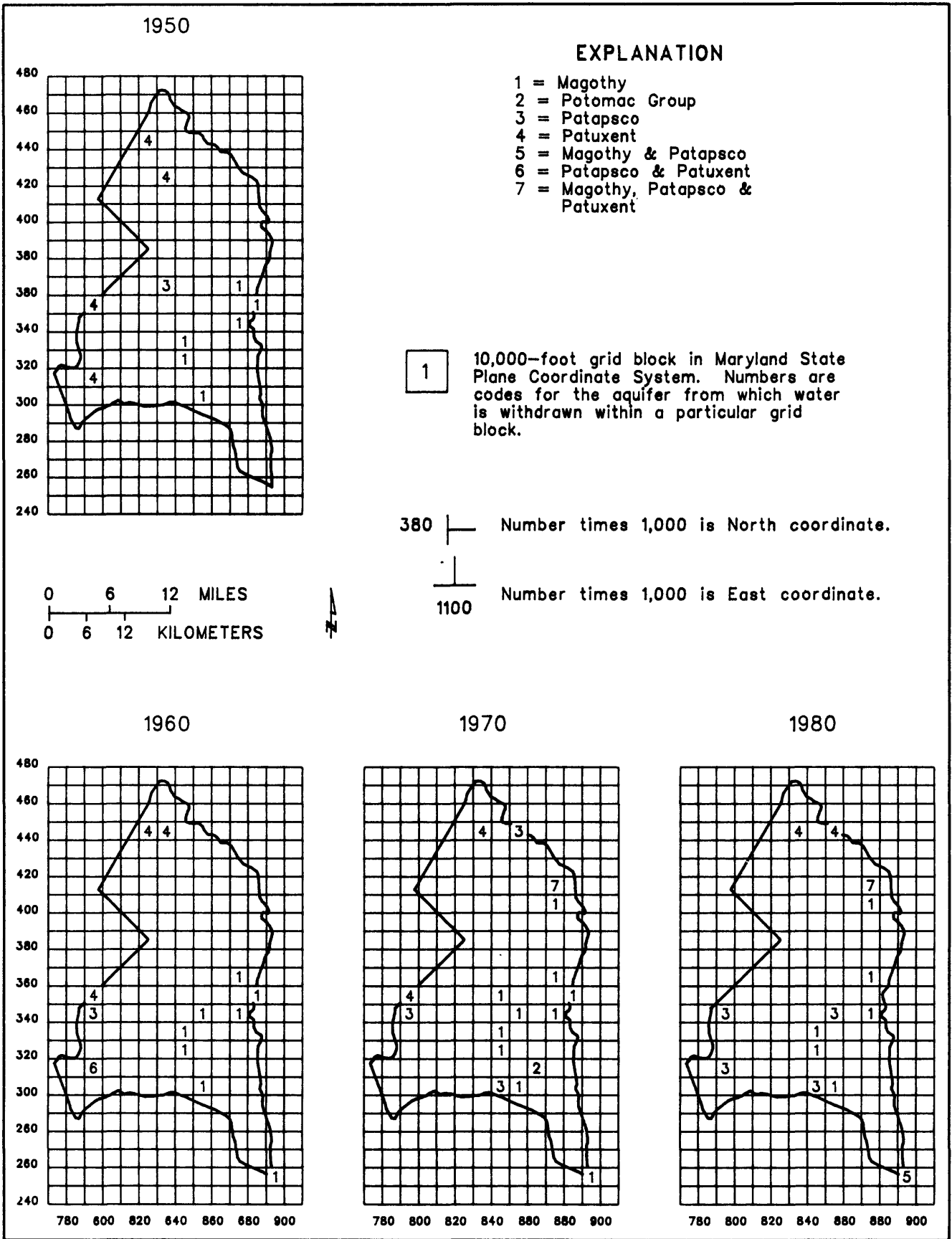


Figure 59.--Locations of large ground-water withdrawals by aquifers in the Coastal Plain area of Prince Georges County for 1950, 1960, 1970, and 1980.

## QUEEN ANNES COUNTY

Ground-water use in Queen Annes County from 1950 through 1980 is shown in figure 60. In 1950, the amount of ground water withdrawn was approximately 1.2 Mgal/d compared to withdrawals of 4.0 Mgal/d in 1980. This represents an increase of 233 percent for the three decades.

Since 1950, ground-water use in the county has increased in all categories. The largest withdrawals were for domestic use. In 1950, about 1.0 Mgal/d was withdrawn compared to nearly 1.77 Mgal/d in 1980. Withdrawals by water suppliers remained fairly constant for most of the 30-year period (approximately 0.3 Mgal/d), with an increase to about 0.4 Mgal/d in 1980. Industrial/commercial water use increased from about 0.06 Mgal/d in 1950 to about 0.5 Mgal/d in 1980.

Water withdrawn for irrigation was the second greatest use, increasing from less than 0.01 Mgal/d in 1950 to about 1.5 Mgal/d in 1980. Although irrigation was an important water use in the county, there were no precise measurements of the amounts of water withdrawn by individual irrigators. Methods of collecting and reporting these data have improved since the early 1950's. The most reliable data are from 1970 to 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation uses are shown in figure 61. Domestic use comprised a significant portion of the total pumpage for 1950, 1960, and 1970. The figure also shows that the percentage of water used for irrigation has increased considerably from 4 percent in 1950 to 37 percent in 1980.

### Major Aquifers

Many domestic withdrawals in Queen Annes County were from shallow wells ( from about 15 to 45 ft deep) tapping the surficial aquifer. Deeper aquifers including the Aquia, Severn, and Magothy were more widely used by large users. Large user withdrawals by aquifer from 1950 through 1980 are shown in figure 62.

From 1900 through 1980, the Aquia Formation was a major source for low- yield water needs for Kent Island and several areas on the mainland of the county. During the 1940's, large users began withdrawing water from the Aquia aquifer. Since that time, it has been the most important source of water for large users in the county (see appendix). In 1950, about 0.05 Mgal/d were withdrawn from the aquifer compared to nearly 0.3 Mgal/d in 1980.

The greatest withdrawals were from the Severn aquifer. It has served as a source of water for the town of Centreville since about 1900 (see appendix). Pumpage steadily increased from about 0.2 Mgal/d in 1900 to 0.3 Mgal/d in 1980. As of 1980, the Centreville water supply was the only large user withdrawing water from the Severn aquifer.

The use of the Magothy Formation as a source of water for large users was limited to the U.S. Army Corps of Engineers' Chesapeake Bay Model facility located at Matapeake on Kent Island. Pumping from the aquifer began in 1976 and increased from 0.05 to 0.07 Mgal/d in 1979. However, withdrawals declined by 1980 to 0.04 Mgal/d.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Queen Annes County for 1950, 1960, 1970, and 1980 are shown in figure 63. Table 13 presents water- use data for the large users located within particular grid blocks for the year indicated on the map. In 1950, the areas of greatest pumpage were located at Centreville and in the south-central part of the county. By 1980, several more large users were withdrawing ground water, mostly in the western and southern parts of the county.

The locations of withdrawals from individual aquifers supplying the large users in Queen Annes County (described in table 13 and fig. 63) are shown in figure 64. The Aquia and Severn aquifers were the principal sources of ground water for large users for the years shown. Withdrawals from both aquifers were located primarily in the central and south-central part of the county. The Magothy aquifer was not used as a source of water until 1976 (see appendix). It was the deepest aquifer used in 1980, and the only withdrawals were from wells located at Matapeake.

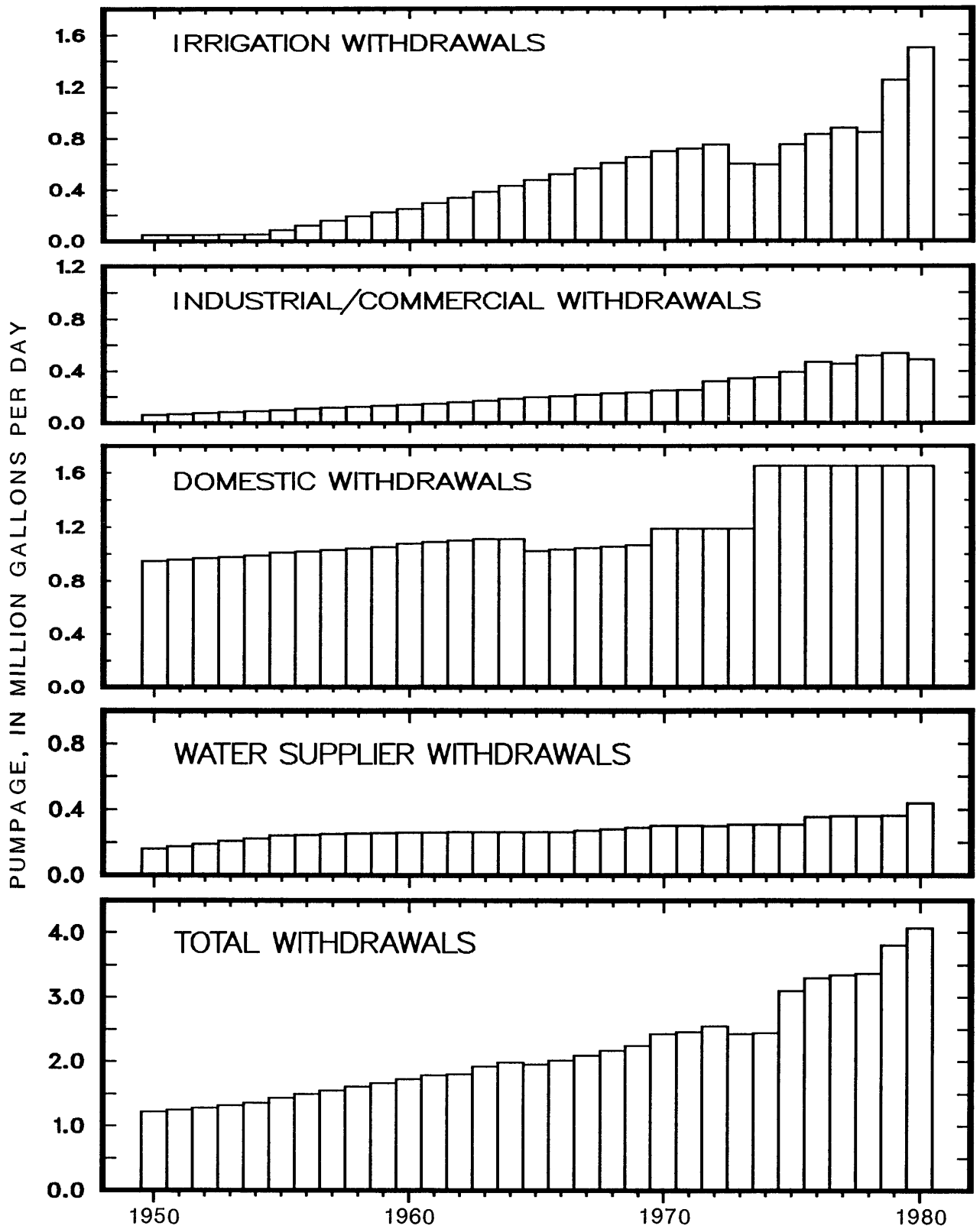
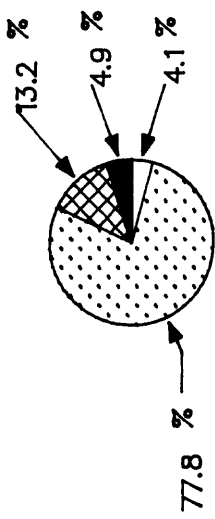
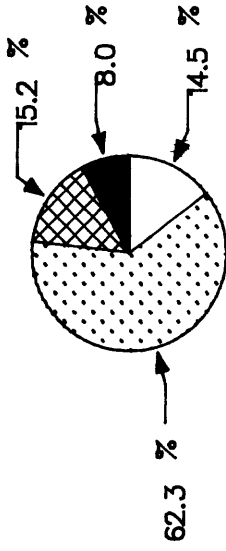


Figure 60.--Ground-water withdrawals by use in Queen Annes County from 1950 through 1980.

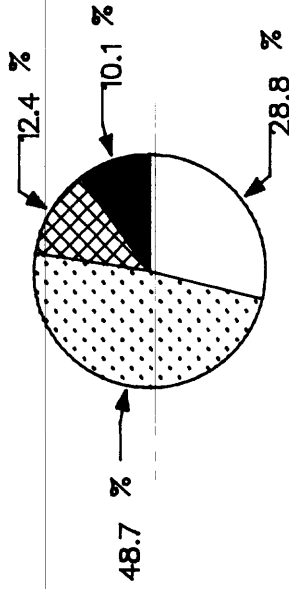
1950 TOTAL: 1.2 Mgal/d



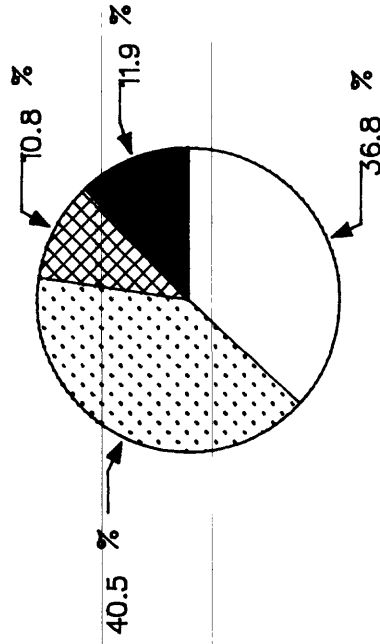
1960 TOTAL: 1.7 Mgal/d



1970 TOTAL: 2.4 Mgal/d



1980 TOTAL: 4.0 Mgal/d



EXPLANATION

- INDUSTRIAL/COMMERCIAL [Solid black box]
- DOMESTIC [Dotted box]
- WATER SUPPLIER [Cross-hatched box]
- IRRIGATION [White box]

Figure 61.--Ground-water use in Queen Annes County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

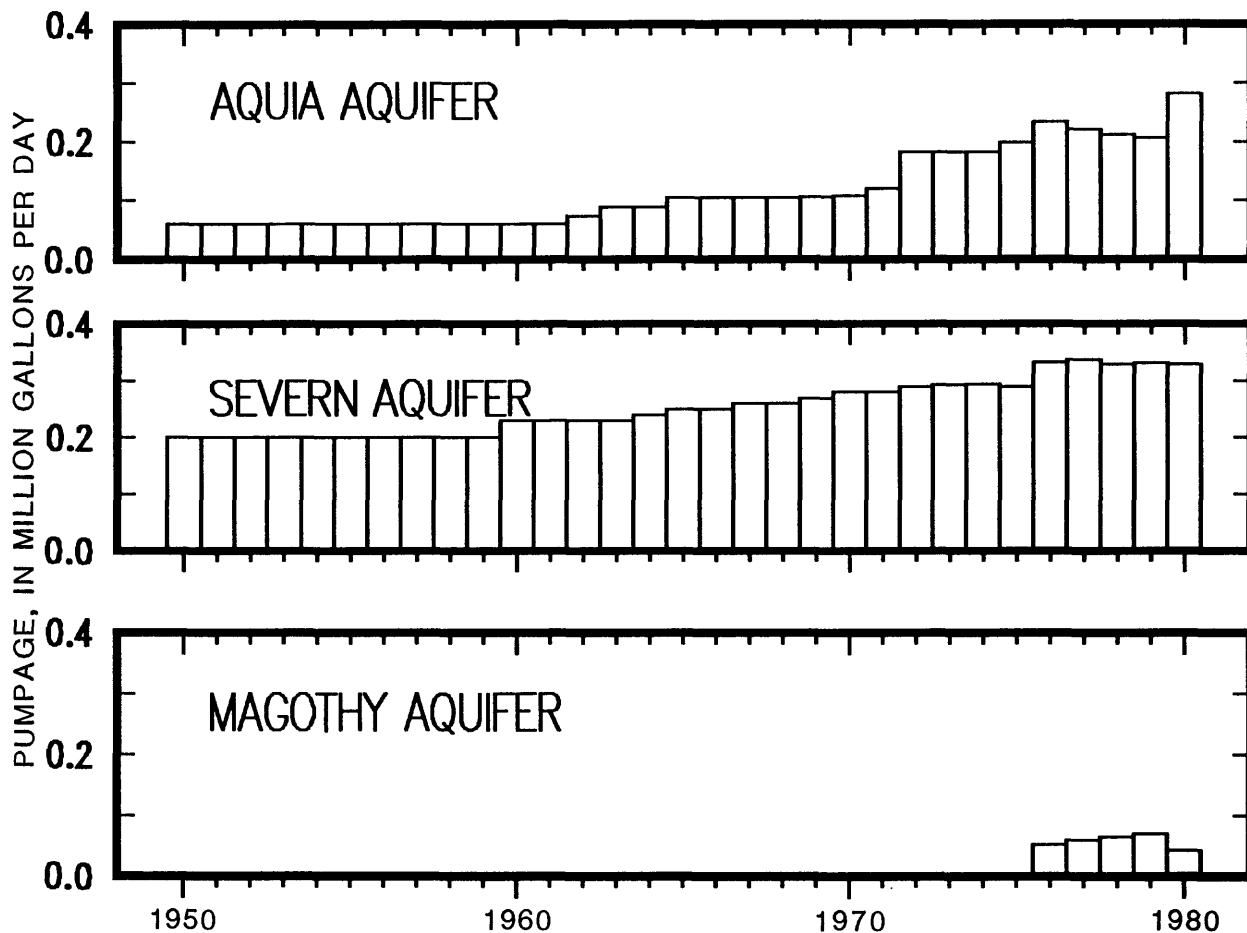


Figure 62.--Large ground-water withdrawals by aquifers in Queen Annes County from 1950 through 1980.



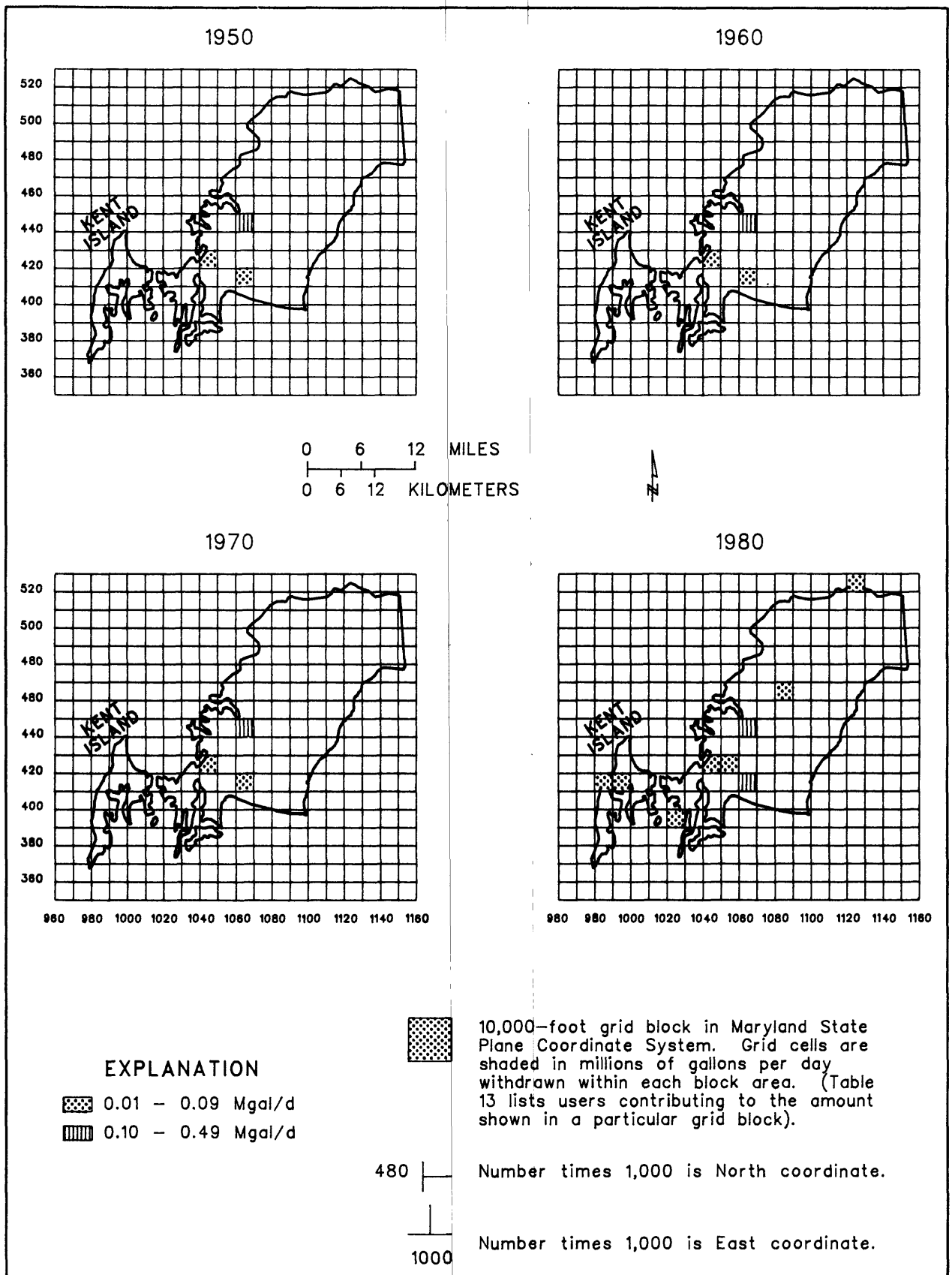


Figure 63.--Locations of large ground-water withdrawals in Queen Annes County for 1950, 1960, 1970, and 1980.

Table 13.--Large ground-water users in Queen Annes County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N410 E1060	S.E.W. Friel Cannery, (Wye Mills Plant)	0.04	Aquia
	N420 E1040	S.E.W. Friel Cannery, (Queenstown Plant)	.02	Aquia
	N440 E1060	Centreville, Town of	.20	Severn
1960	N410 E1060	S.E.W. Friel Cannery, (Wye Mills Plant)	0.03	Aquia
	N420 E1040	S.E.W. Friel Cannery, (Queenstown Plant)	.02	Aquia
	N440 E1060	Centreville, Town of	.13	Severn
		do.	.09	Aquia
1970	N410 E1060	S.E.W. Friel Cannery, (Wye Mills Plant)	0.08	Aquia
	N420 E1040	S.E.W. Friel Cannery, (Queenstown Plant)	.02	Aquia
	N440 E1060	Centreville, Town of	.20	Severn
		do.	.12	Aquia
1980	N390 E1020	Prospect Plantation Golf Course	0.02	Aquia
	N410 E 980	Chesapeake Bay Model Shelter	.04	Magothy
	N410 E 990	Stevens Village Utility Company	.03	Aquia
	N410 E1060	S.E.W. Friel Cannery, (Wye Mills Plant)	.11	Aquia
		N420 E1040	S.E.W. Friel Cannery, (Queenstown Plant)	.03
	do.		.02	Cheswold
	Queenstown, Town of	.04	Aquia	
	N420 E1050	Country Pride Foods (Queenstown)	.02	Aquia
	N440 E1060	Centreville, Town of	.20	Severn
		do.	.13	Aquia
	N460 E1080	Maryland Department of Correction, Eastern Pre-Release Unit	.02	Aquia
	N520 E1120	Millington, Town of (sewage treatment plant)	.01	Aquia

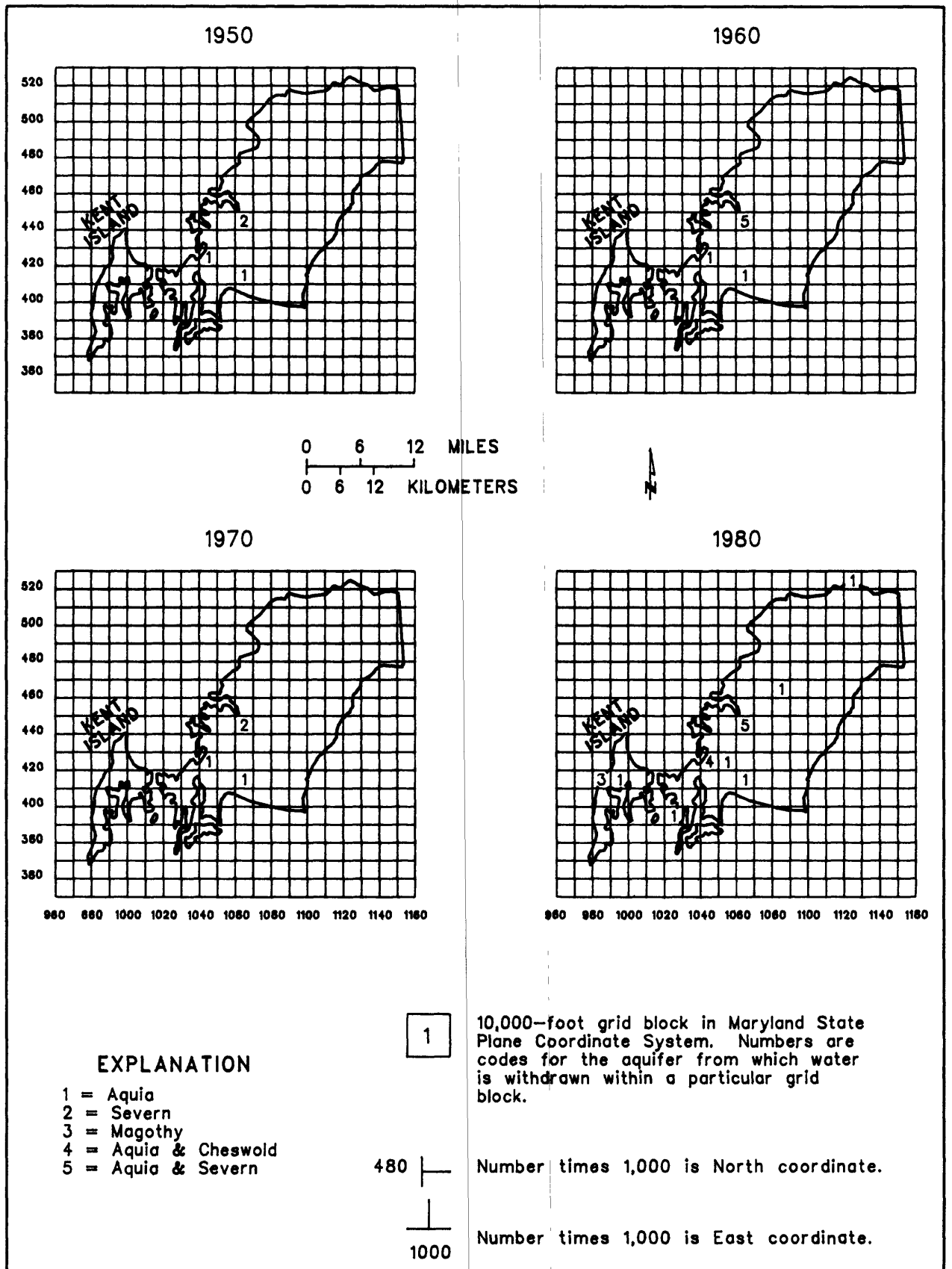


Figure 64.--Locations of large ground-water withdrawals by aquifers in Queen Annes County for 1950, 1960, 1970, and 1980.

## ST. MARYS COUNTY

Ground-water use in St. Marys County from 1950 through 1980 is shown in figure 65. In 1950, the amount of ground water withdrawn was approximately 3.5 Mgal/d compared to withdrawals of about 5.6 Mgal/d in 1980. This represents an increase of 60 percent for the three decades.

Since 1950, water use in St. Marys County increased in all categories except military use. The greatest amounts were withdrawn for domestic use, which increased from about 1.7 Mgal/d in 1950 to 2.8 Mgal/d in 1980. Pumpage by military facilities was about 1.5 Mgal/d in 1950. Withdrawals gradually declined over the next 30 years to 0.9 Mgal/d in 1980. Water suppliers used approximately 0.3 Mgal/d of ground water in 1950. By 1980, these withdrawals had increased to 1.8 Mgal/d. Industrial/commercial use increased from about 0.01 Mgal/d in 1950 to just more than 0.1 Mgal/d in 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, military, water supplier, and industrial/commercial uses are shown in figure 66. Domestic use comprised a significant portion of the total pumpage for all the years shown. Military use accounted for 42 percent of total pumpage in 1950, but by 1980 this percentage had dropped to 16 percent. Industrial use comprised only a very small percentage for the 4 years shown in figure 66 (no more than 2 percent).

### Major Aquifers

Many domestic withdrawals in St. Marys County were from shallow wells (from about 15 to 45 ft deep) tapping the surficial aquifer. Deeper aquifers including the Piney Point and Aquia were more widely used by large users. Large user withdrawals by aquifer from 1950 through 1980 are shown in figure 67.

Withdrawals from the Piney Point aquifer increased from about 0.2 Mgal/d in 1950 to 0.4 Mgal/d in 1980. Extensive use of the Aquia aquifer began in the 1940's when the naval facility was built near Lexington Park. In 1950, approximately 1.7 Mgal/d was withdrawn from the Aquia. Its use increased over the next 30 years, and by 1980 more than 2.3 Mgal/d were being pumped.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in St. Marys County for 1950, 1960, 1970, and 1980 are shown in figure 68. Table 14 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. From 1950 through 1970, the areal distribution of pumpage remained relatively the same, with increases in the number of sites in the Lexington Park area only. By 1980, large ground-water withdrawals were located throughout the county.

The locations of withdrawals from individual aquifers supplying the large users in St. Marys County (described in table 14 and fig. 68) are shown in figure 69. Use of the Piney Point aquifer centered mainly around Lexington Park for the 4 years shown. In 1950, the Aquia aquifer was used primarily in the Lexington Park area. This pattern of distribution showed little change on the map for 1960. However, the maps for 1970 and 1980 show a wider area of use of the Aquia in the county.

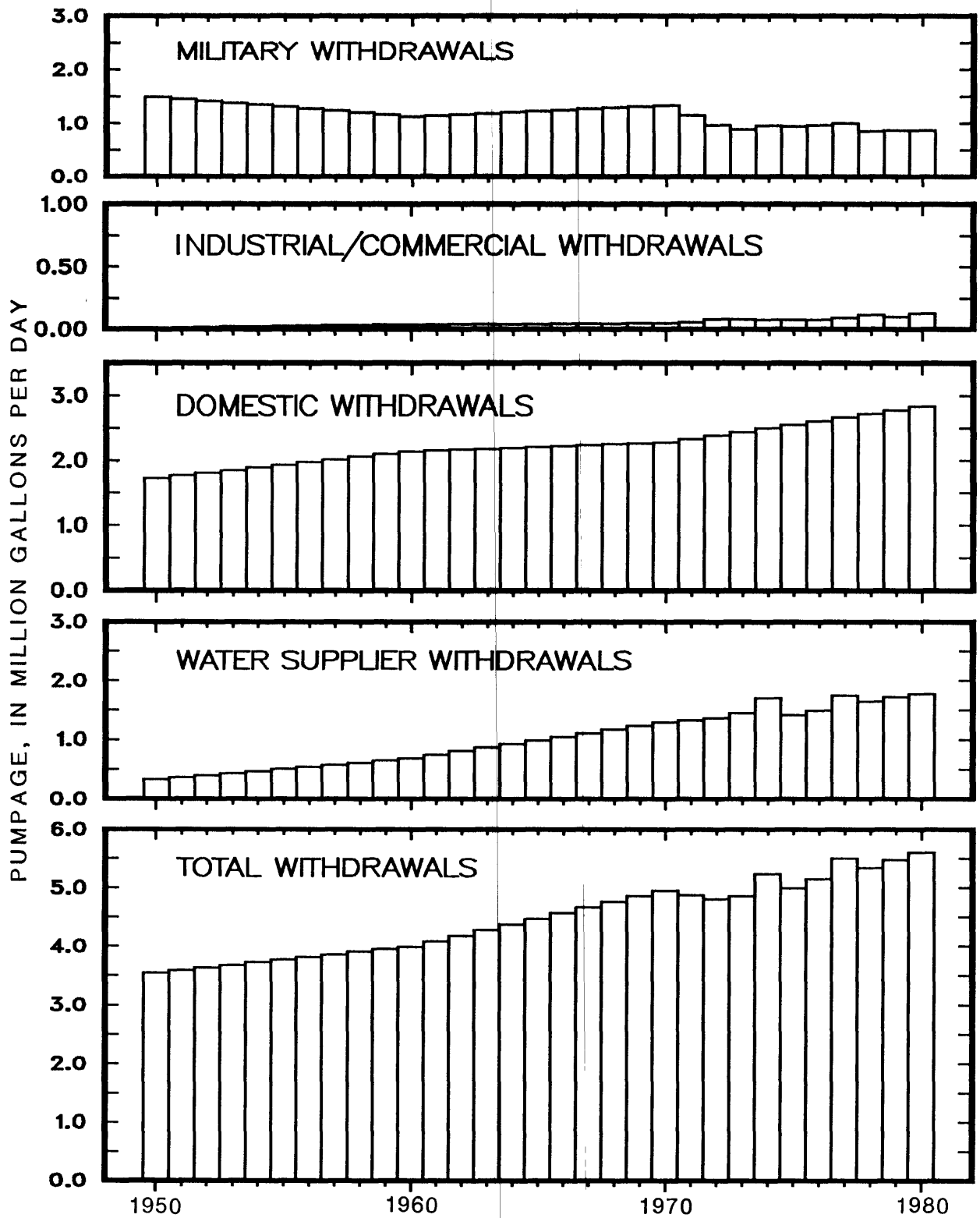
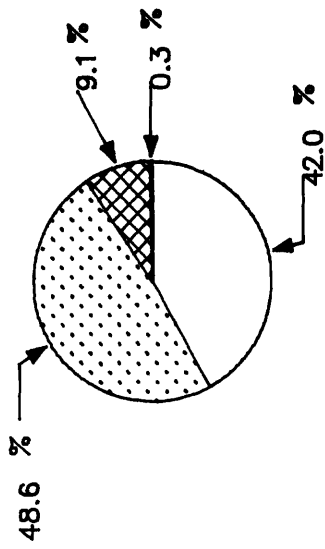
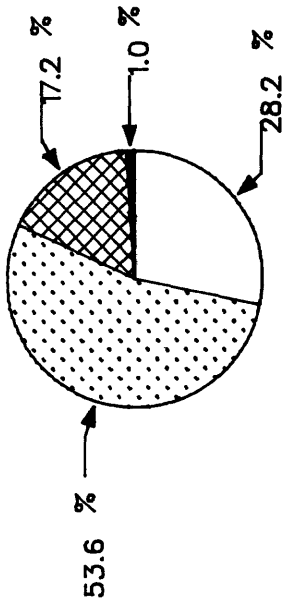


Figure 65.--Ground-water withdrawals by use in St. Marys County from 1950 through 1980.

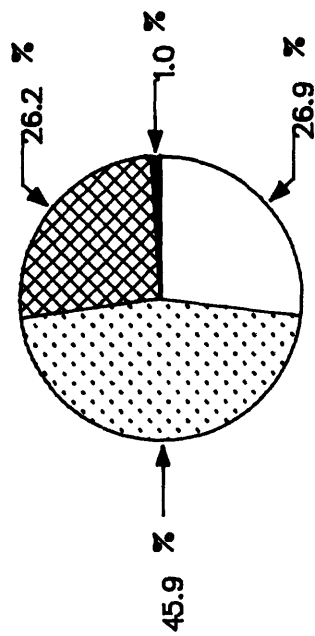
1950 TOTAL: 3.5 Mgal/d



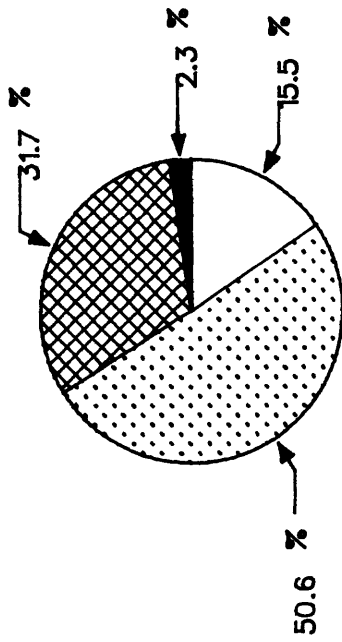
1960 TOTAL: 4.0 Mgal/d



1970 TOTAL: 4.9 Mgal/d



1980 TOTAL: 5.6 Mgal/d



EXPLANATION



Figure 66.--Ground-water use in St. Marys County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

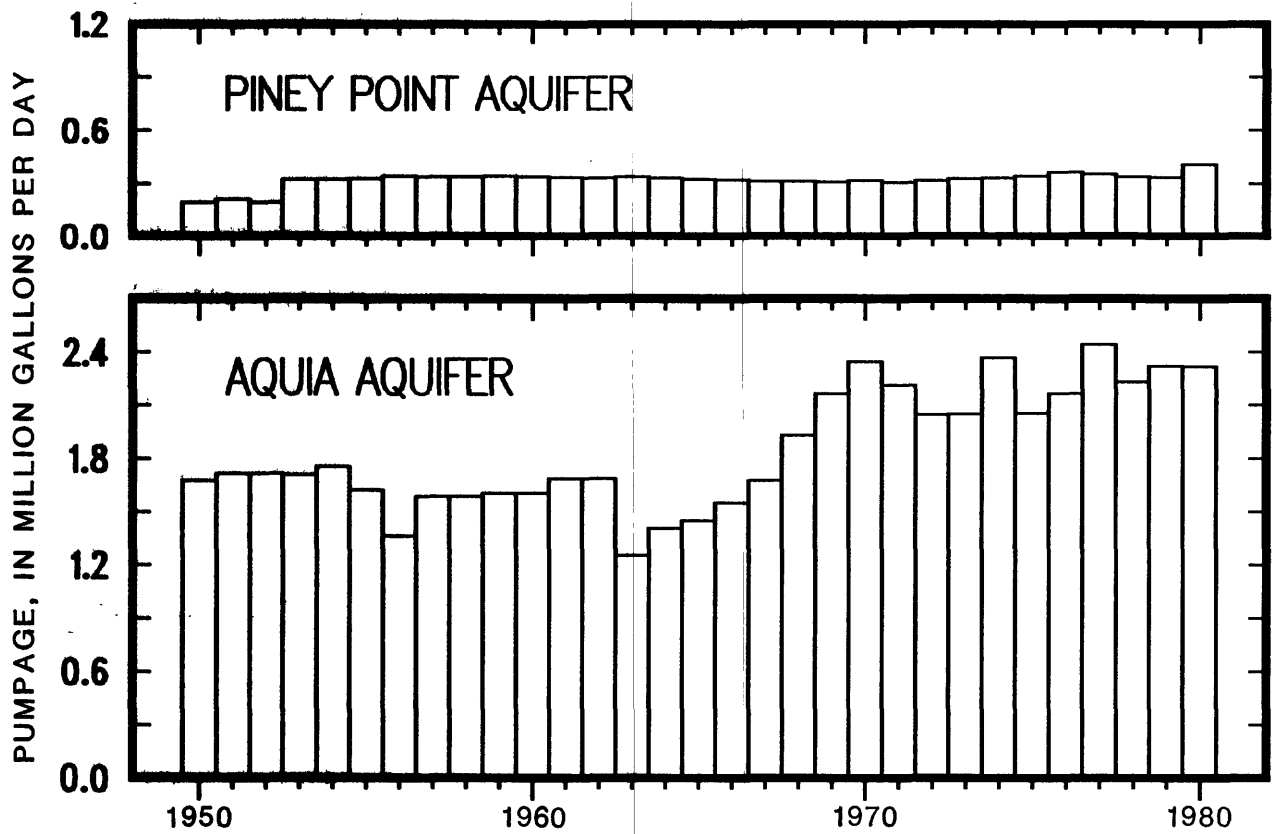


Figure 67.--Large ground-water withdrawals by aquifers in St. Marys County from 1950 through 1980.

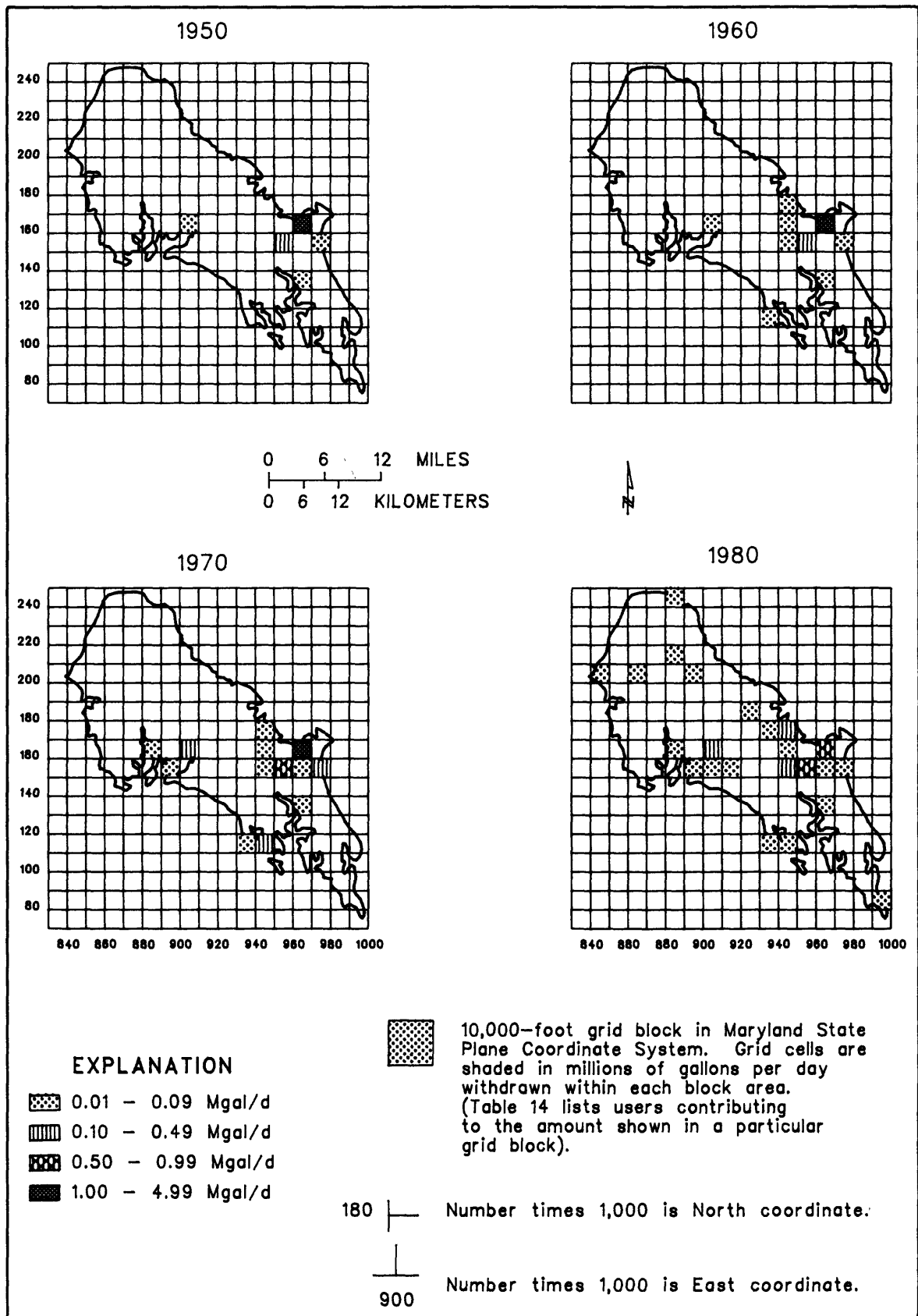


Figure 68.--Locations of large ground-water withdrawals in St. Marys County for 1950, 1960, 1970, and 1980.



Table 14.--Large ground-water users in St. Marys County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N130 E960	St. Marys College	0.02	Aquia
	N150 E950	Lexington Park, St. Marys Metropolitan Commission	.23	Aquia
	N150 E970	Patuxent Naval Air Station do.	.03	Piney Point
			.03	Aquia
	N160 E900	Leonardtown, Town of	.03	Aquia
	N160 E960	Patuxent Naval Air Station do.	1.40	Aquia
			.16	Piney Point
1960	N110 E930	Steuart Petroleum Company	0.02	Aquia
	N130 E960	St. Marys College	.02	Aquia
	N150 E940	James Hill Trailer Park	.05	Piney Point
	N150 E950	Lexington Park, St. Marys Metropolitan Commission	.27	Aquia
	N150 E970	Patuxent Naval Air Station do.	.03	Piney Point
			.03	Aquia
	N160 E900	Leonardtown, Town of	.05	Aquia
	N160 E940	Mayjack, Incorporated	.02	Piney Point
	N160 E960	Patuxent Naval Air Station do.	1.20	Aquia
			.15	Piney Point
	N170 E940	Town Creek Water Company	.08	Piney Point
1970	N110 E930	Steuart Petroleum Company	0.02	Aquia
	N110 E940	Lundeburg School of Seamanship	.10	Aquia
	N130 E960	St. Marys College	.05	Aquia
	N150 E890	Cherry Cove Water Company	.05	Aquia
	N150 E940	James Hill Trailer Park	.05	Piney Point
		Greenview Knolls Water Company	.03	Piney Point
	N150 E950	Lexington Park, St. Marys Metropolitan Commission	.68	Aquia
	N150 E960	Cedar Cove, St. Marys Metropolitan Commission	.05	Aquia
	N150 E970	Patuxent Naval Air Station do.	.05	Piney Point
			.05	Aquia
	N160 E880	St. Clements Shores Water Company	.02	Aquia
	N160 E900	Leonardtown, Town of	.16	Aquia
	N160 E940	Mayjack, Incorporated	.02	Piney Point
	N160 E960	Patuxent Naval Air Station do.	1.16	Aquia
			.08	Piney Point
N170 E940	Town Creek Water Company	.08	Piney Point	
1980	N080 E990	Point Lookout State Park	0.01	Upper Cretaceous
	N110 E930	Steuart Petroleum Company do.	.02	Piney Point
			.02	Aquia
	N110 E940	Lundeburg School of Seamanship	.08	Aquia
	N130 E960	St. Marys College	.06	Aquia
	N150 E890	Cherry Cove Water Company	.06	Aquia
	N150 E900	Green Acres Drive-In, Incorporated	.03	Aquia
	N150 E910	Leonardtown High School	.01	Aquia
	N150 E940	James Hill Trailer Park	.04	Piney Point
		Greenview Knolls Water Company	.07	Piney Point
		Chance Water Company	.01	Piney Point
	N150 E950	Lexington Park, St. Marys Metropolitan Commission	.69	Aquia
	N150 E960	Cedar Cove, St. Marys Metropolitan Commission	.05	Aquia
	N150 E970	Patuxent Naval Air Station do.	.02	Piney Point
			.02	Aquia
	N160 E880	St. Clements Shores Water Company	.03	Aquia
	N160 E900	Leonardtown, Town of	.31	Aquia
	N160 E940	Tubman Douglas, St. Marys Metropolitan Commission	.04	Aquia
	N160 E960	Mayjack, Incorporated	.04	Piney Point
		Patuxent Naval Air Station do.	.77	Aquia
			.06	Piney Point
	N170 E930	Wildewood, St. Marys Metropolitan Commission	.03	Aquia
	N170 E940	Town Creek Water Company	.15	Piney Point
	N180 E920	Fenwick Manor, St. Marys Metropolitan Commission	.02	Aquia
	N200 E840	Southern Maryland Utilities Company	.01	Patapsco
	N200 E860	Country Lakes, St. Marys Metropolitan Commission	.03	Aquia
	N200 E890	King & Kennedy wells, St. Marys Metropolitan Commission	.02	Aquia
N210 E880	Birch Manor, St. Marys Metropolitan Commission	.02	Aquia	
N240 E880	Rolling Acres, St. Marys Metropolitan Commission	.02	Aquia	

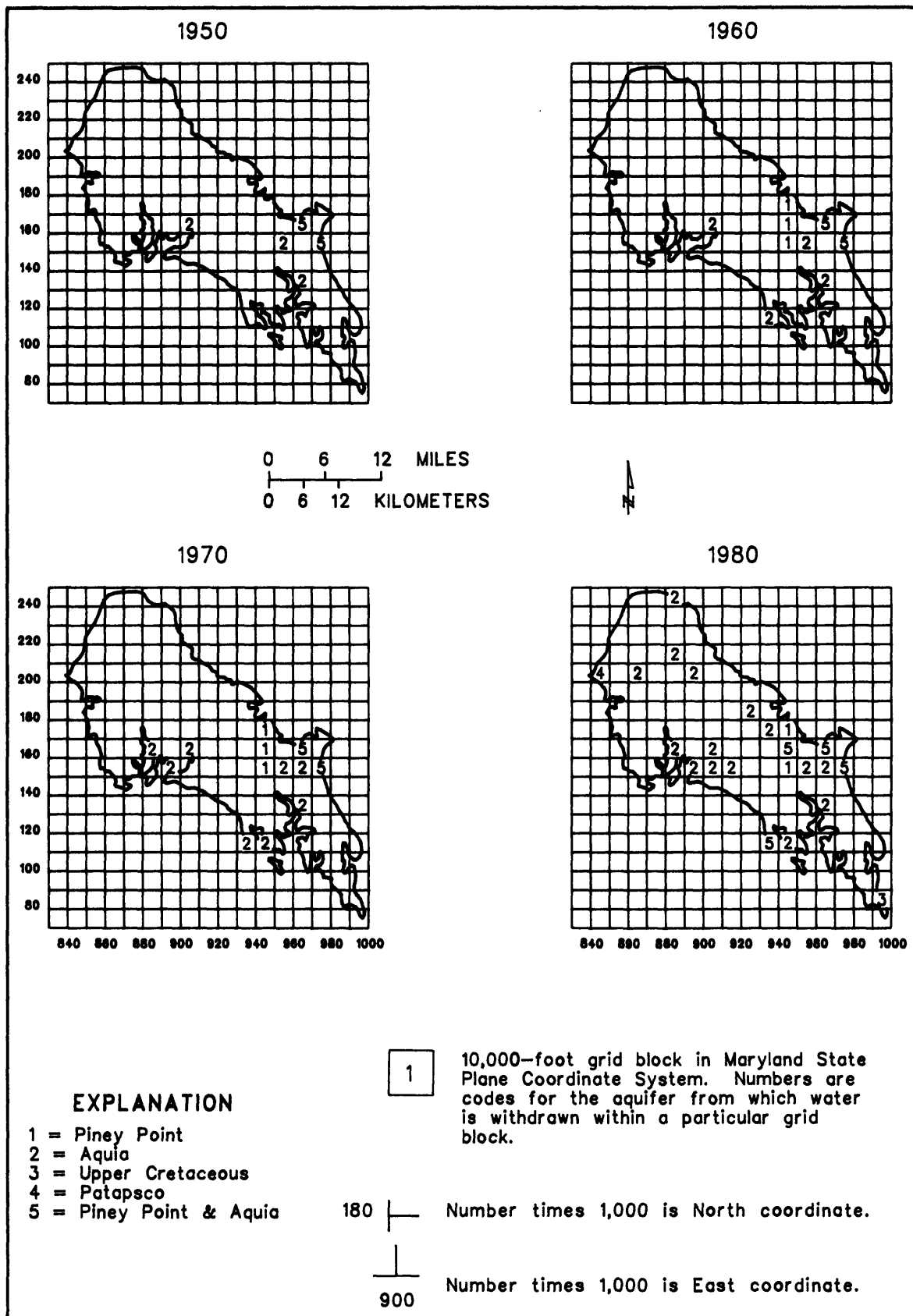


Figure 69.--Locations of large ground-water withdrawals by aquifers in St. Marys County for 1950, 1960, 1970, and 1980.

## SOMERSET COUNTY

Ground-water use in Somerset County from 1950 through 1980 is shown in figure 70. In 1950, the amount of ground water withdrawn was approximately 1.9 Mgal/d compared to withdrawals of nearly 2.6 Mgal/d in 1980. This represents an increase of 37 percent for the three decades.

One of the largest uses of ground water in the county was for domestic purposes. In 1950, domestic pumpage was about 1.1 Mgal/d. However, withdrawals gradually declined over the 30-year period to 0.8 Mgal/d in 1980. Water suppliers used about 0.7 Mgal/d in 1950. These withdrawals increased over the next 24 years to a peak of 1.6 Mgal/d in 1974 before declining to 1.2 Mgal/d in 1980. Water withdrawn for industrial/commercial use was estimated to be less than 0.05 Mgal/d in 1950, but had increased to about 0.3 Mgal/d by 1980.

Large withdrawals of ground water for irrigation in the county began about 1960. Although there have been no precise measurements of amounts of water pumped by individual irrigators, methods of collecting and reporting these data have improved since the early 1960's. The most reliable data are from 1970 to 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation uses are shown in figure 71. In 1950, domestic use comprised the greatest percentage of ground-water use (62 percent). By 1960, however, this use had declined to 40 percent and withdrawals by water suppliers accounted for the largest percentage (46 percent). Between 1970 and 1980, the total amount of water used declined by about 0.3 Mgal/d and water-use percentages remained virtually the same, indicating a similar percentage decline in each water-use category.

### Major Aquifers

The earliest ground-water pumpage in Somerset County probably came from the surficial (Quaternary) aquifer. Although this aquifer continued to supply much of the low-yield water needs, chiefly for domestic use, a few large users also were able to withdraw sufficient quantities of water from the surficial aquifer. As the demand for water increased, the use of deeper

aquifers including the Manokin and Pocomoke (in the upper Chesapeake Group), Magothy, and the Patapsco increased (fig. 72).

From 1952, when large users began withdrawing water from the surficial aquifer, until 1962, pumpage was relatively constant at 0.04 Mgal/d. From 1962 through 1965, withdrawals increased to about 0.14 Mgal/d, before declining again to 0.04 Mgal/d in 1966. Withdrawals remained steady through 1975 when pumpage from the surficial aquifer ceased (see appendix).

Pumpage from the Manokin and Pocomoke aquifers remained relatively unchanged from 1950 through 1965. After 1965, withdrawals increased to about 0.5 Mgal/d in 1970 and remained about the same through 1980.

Pumpage from the Magothy and Patapsco aquifers stayed about the same from 1950 through 1953. Beginning in 1954, withdrawals increased from both aquifers. This trend continued until 1965 when the rate of pumpage leveled off. Pumpage increased again in the 1970's, peaking at nearly 0.5 Mgal/d for the Magothy in 1972 and reaching nearly 1.0 Mgal/d from the Patapsco in 1978.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Somerset County for 1950, 1960, 1970, and 1980 are shown in figure 73. Table 15 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. In 1950, pumpage was limited to the north-central and southwestern sections of the county and this areal distribution remained relatively unchanged through 1960. Between 1970 and 1980, withdrawals increased on the eastern and western boundaries of the county.

The locations of withdrawals from individual aquifers supplying the large users in Somerset County (described in table 15 and fig. 73) are shown in figure 74. Withdrawals from the Manokin and Pocomoke aquifers were confined to the north-central part of the county in 1950 and 1960, but increased along the eastern boundary by 1970 and 1980. Pumpage from the Magothy and Patapsco aquifers was primarily limited to a location in the southwestern corner of the county for all 4 years shown, except for a site on the western boundary which used the Patapsco aquifer in 1980.

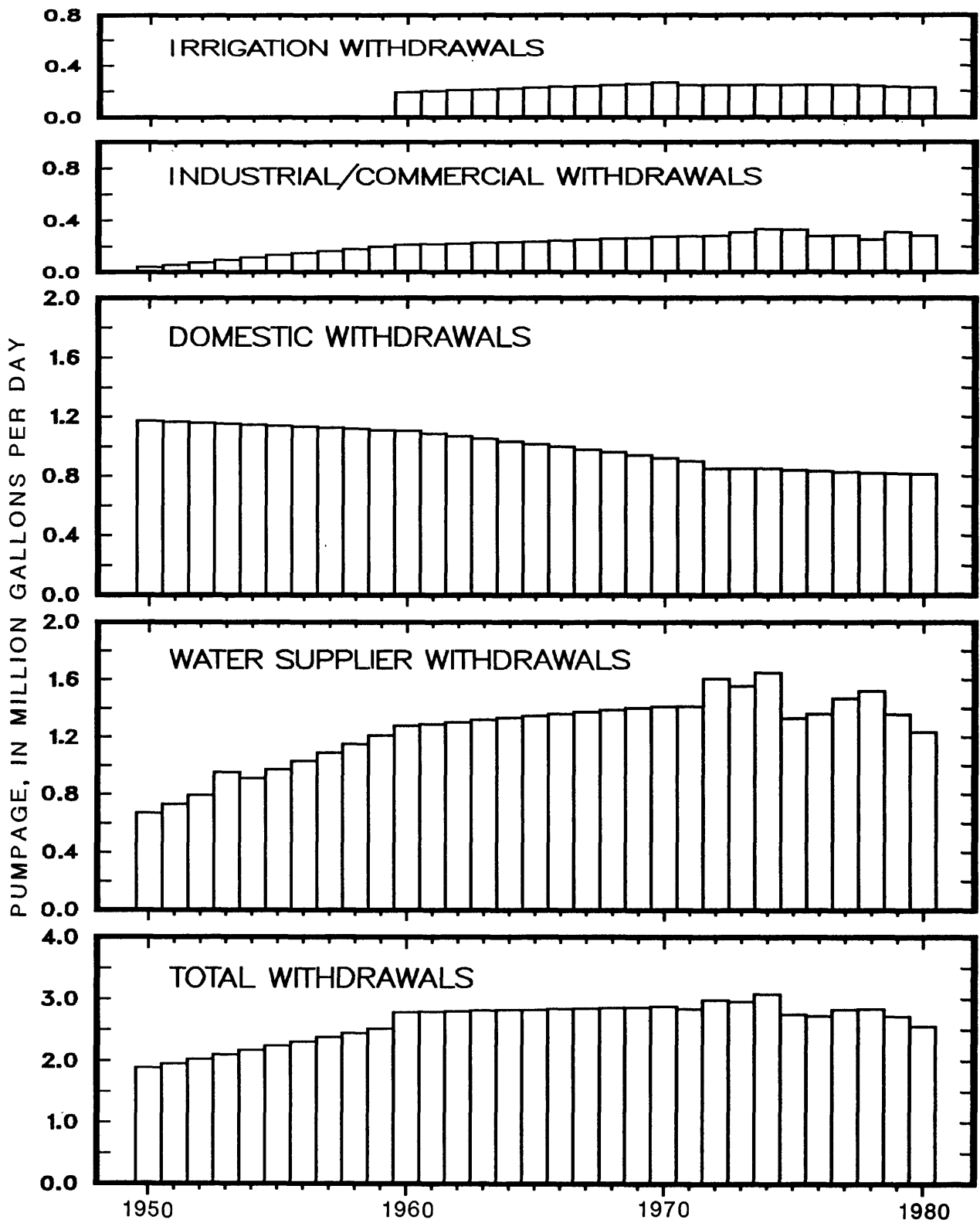


Figure 70.--Ground-water withdrawals by use in Somerset County from 1950 through 1980.

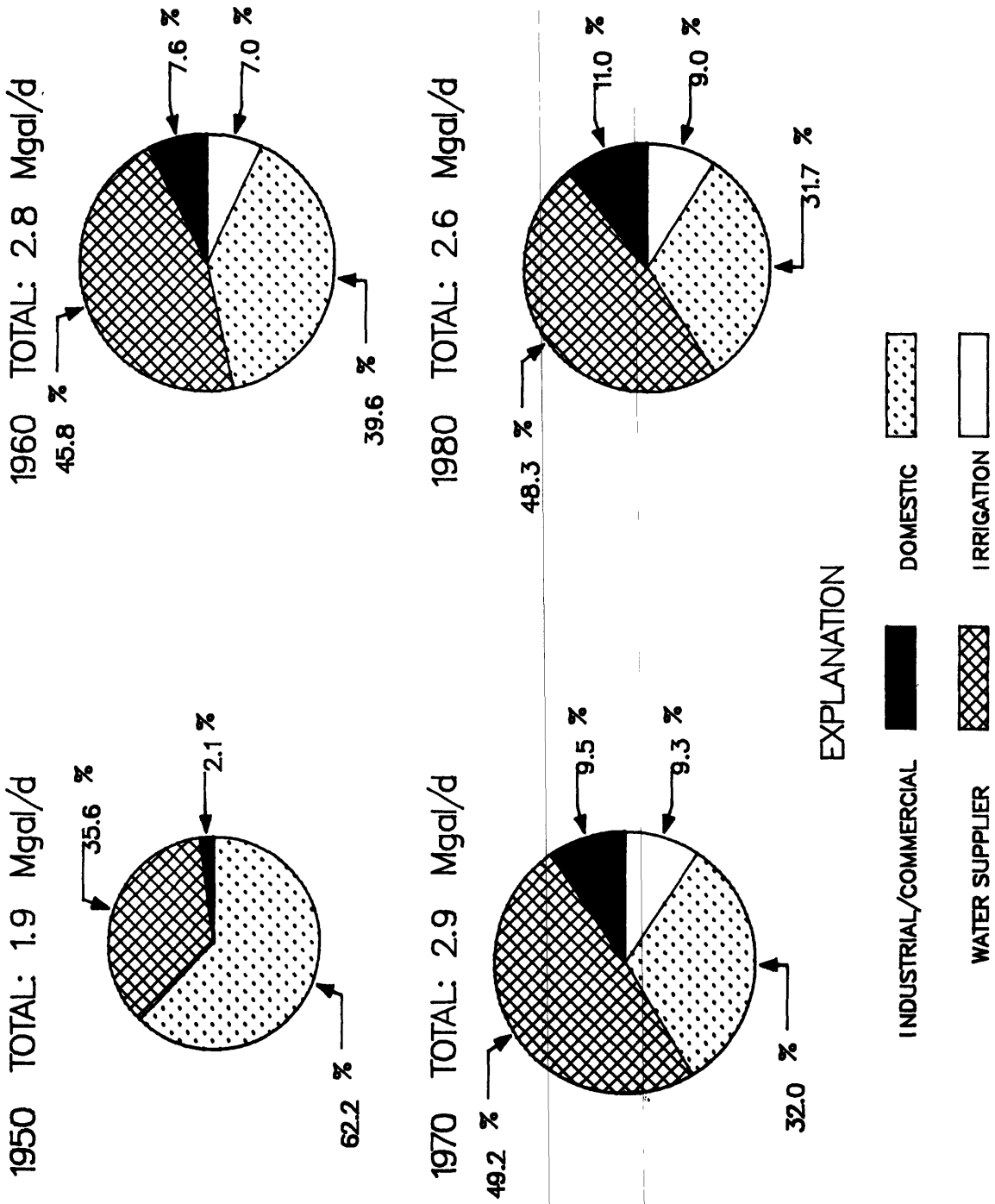


Figure 71.--Ground-water use in Somerset County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

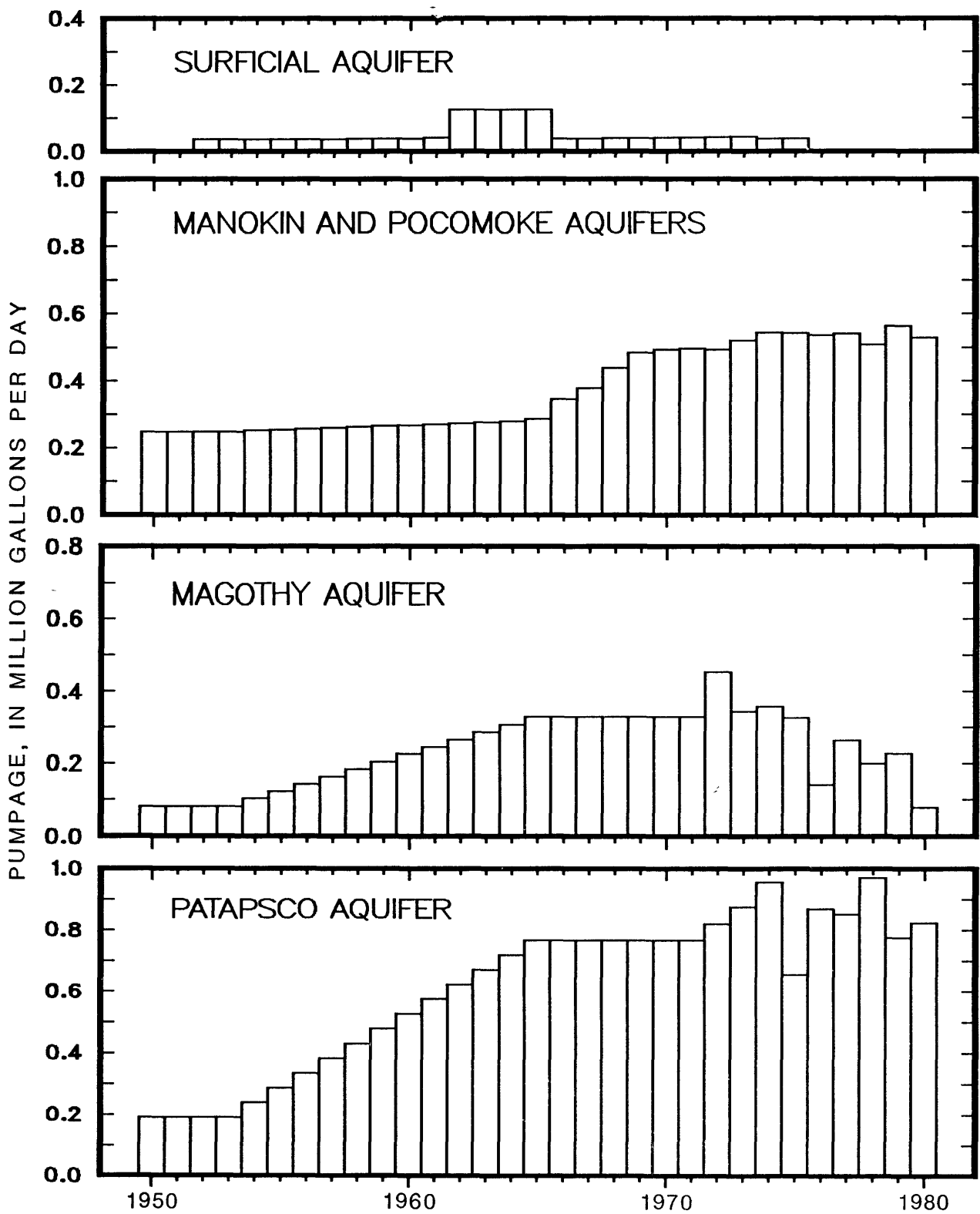


Figure 72.--Large ground-water withdrawals by aquifers in Somerset County from 1950 through 1980.

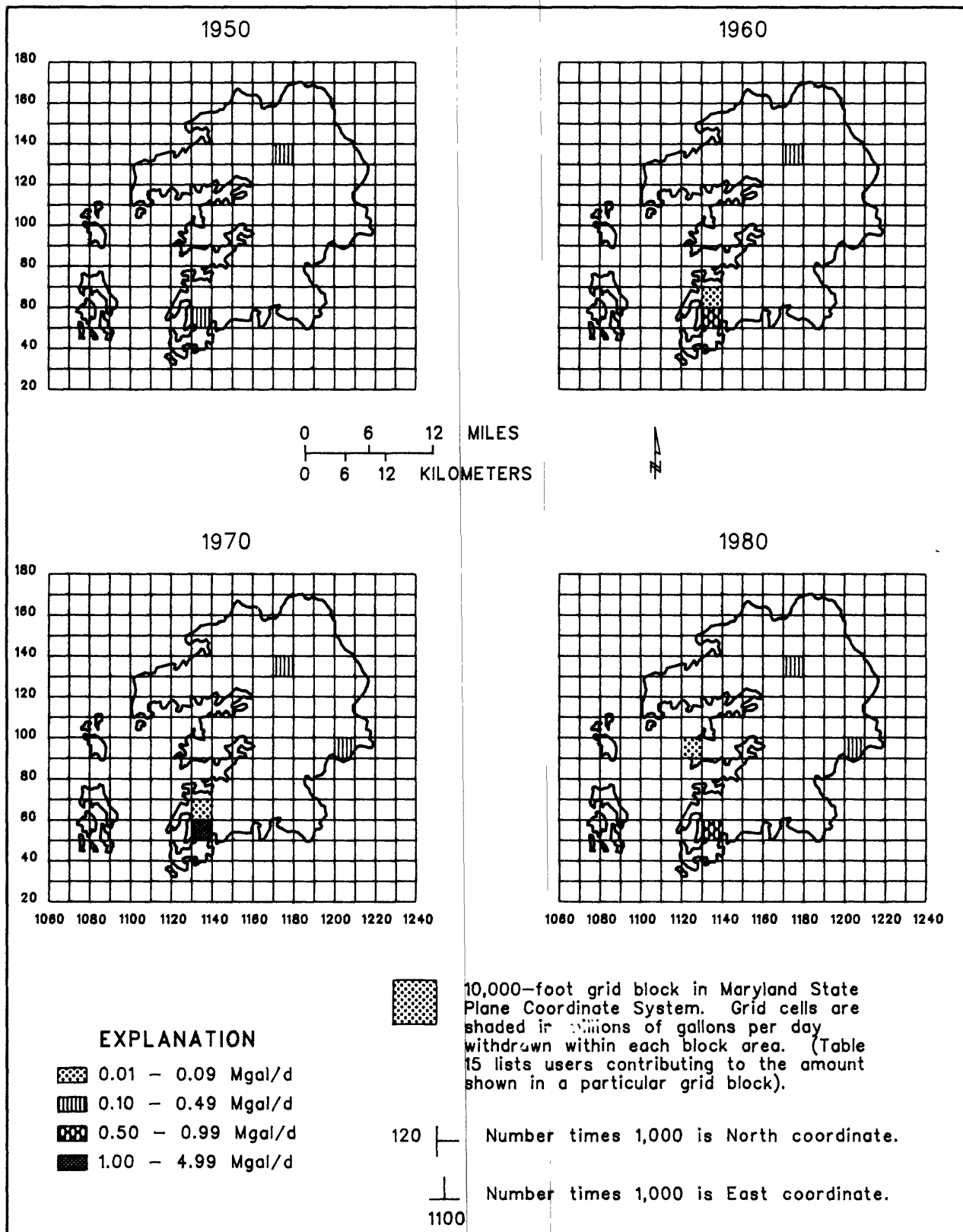


Figure 73.--Locations of large ground-water withdrawals in Somerset County for 1950, 1960, 1970, and 1980.

Table 15.--Large ground-water users in Somerset County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N050 E1130	Crisfield, City of	0.08	Patapsco
		do.	.19	Magothy
	N130 E1170	Princess Anne, Somerset County Sanitary District	.25	Manokin
1960	N050 E1130	Crisfield, City of	0.23	Patapsco
		do.	.53	Magothy
	N060 E1130	Carvel Hall Cutlery	.04	Quaternary
	N130 E1170	Princess Anne, Somerset County Sanitary District	.27	Manokin
1970	N050 E1130	Crisfield, City of	0.33	Patapsco
		do.	.77	Magothy
	N060 E1130	Carvel Hall Cutlery	.04	Quaternary
	N090 E1200	Chesapeake Bay Plywood Corporation	.18	Pocomoke
	N130 E1170	Princess Anne Wells, Somerset County Sanitary District	.32	Manokin
1980	N050 E1130	Crisfield, City of	0.08	Patapsco
		do.	.81	Magothy
	N090 E1120	Frenchtown, Somerset County Sanitary District	.01	Patapsco
	N090 E1200	Chesapeake Bay Plywood Corporation	.19	Pocomoke
	N130 E1170	Princess Anne Wells, Somerset County Sanitary District	.34	Manokin



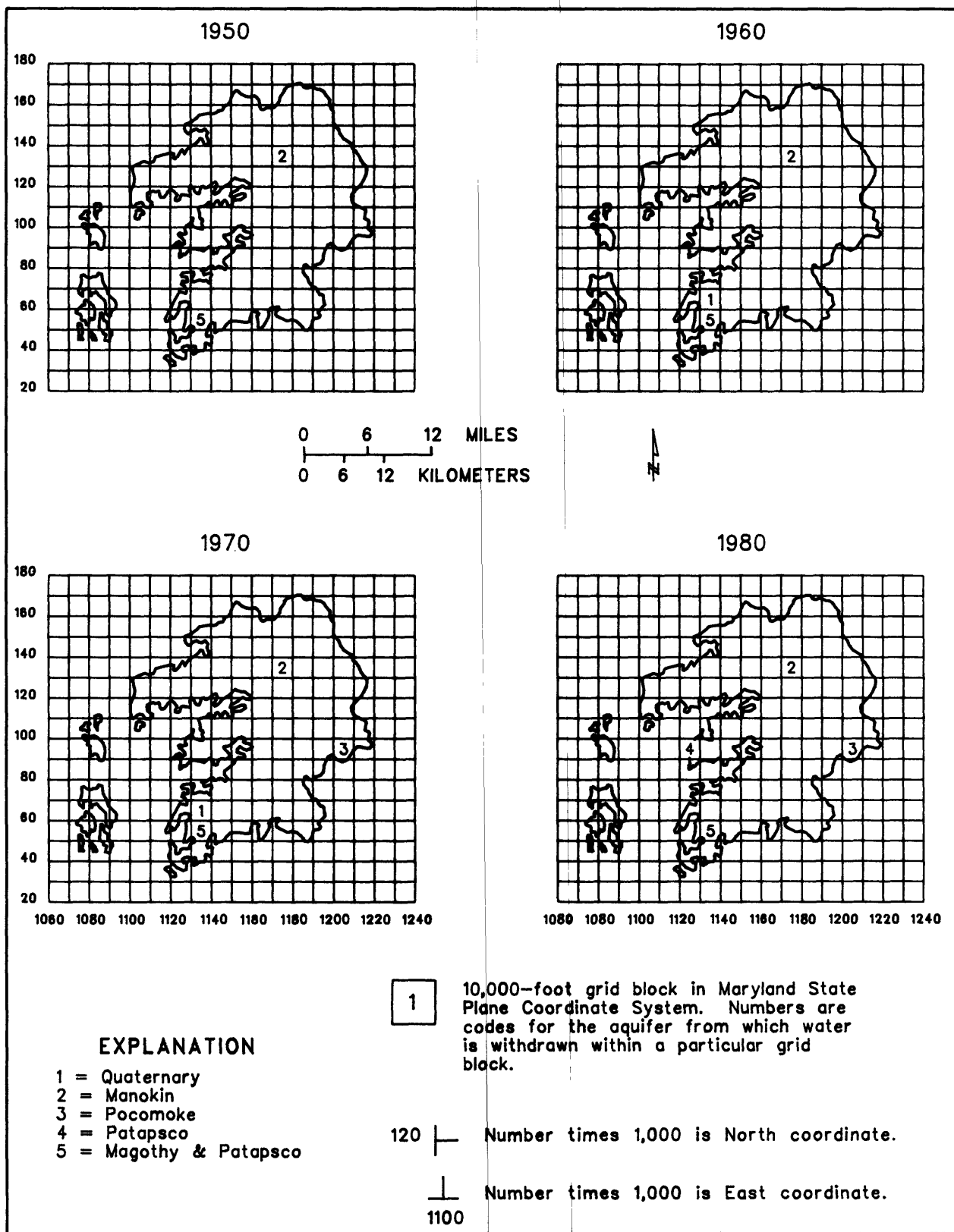


Figure 74.--Locations of large ground-water withdrawals by aquifers in Somerset County for 1950, 1960, 1970, and 1980.

## TALBOT COUNTY

Ground-water use in Talbot County from 1950 through 1980 is shown in figure 75. In 1950, the amount of ground water withdrawn was approximately 2.1 Mgal/d compared to withdrawals of nearly 3.7 Mgal/d in 1980. This represents an increase of 76 percent for the three decades.

Since 1950, water use in Talbot County increased in all categories, with one of the largest withdrawals being for domestic use. In 1950, domestic withdrawals were approximately 0.7 Mgal/d compared to about 1.0 Mgal/d in 1980. Withdrawals by water suppliers were about 0.8 Mgal/d in 1950. By 1980, this pumpage had increased to more than 1.6 Mgal/d. Industrial/commercial withdrawals were about 0.6 Mgal/d in 1950 and remained relatively the same until 1975, when they declined to about 0.4 Mgal/d. By 1980, however, withdrawals had increased again to 0.6 Mgal/d.

The use of ground water for irrigation by large users in the county began about 1960, with pumpage estimated to be about 0.1 Mgal/d. By 1980, withdrawals had increased to about 0.4 Mgal/d. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation uses are shown in figure 76. In 1950, 1960, and 1970, the percentages of total ground water for both domestic and water supplier uses were similar. In 1980, however, the percentage for water suppliers increased to 43 percent, whereas the percentage for domestic use declined to 29 percent. Irrigation comprised only 3.5 percent of the total water used in 1960, but, by 1980, it had increased to 11 percent.

### Major Aquifers

The earliest ground-water pumpage in Talbot County came from the surficial (Quaternary) aquifer. Although these shallow sands principally supplied much of the low-yield water needs, chiefly domestic use, there was some early use of the surficial aquifer by large users. As the demand for water increased, the use of deeper aquifers, particularly the Cheswold and Federsburg (in the lower Chesapeake Group), Piney

Point, Aquia, and Magothy, increased. Large user withdrawals by aquifer from 1950 through 1980 are shown in figure 77.

Withdrawals from the surficial aquifer remained about 0.2 Mgal/d until 1976, when they increased to about 0.37 Mgal/d. The highest pumpage during the 30-year period occurred in 1977 at approximately 0.43 Mgal/d, then declined to 0.35 Mgal/d in 1980. Withdrawals from the aquifers of the lower Chesapeake Group were about 0.18 Mgal/d in 1950. By 1973, pumpage had declined to less than 0.05 Mgal/d, but gradually increased again to 0.15 Mgal/d in 1980.

Use of the Piney Point aquifer by large users began in 1952 at approximately 0.2 Mgal/d, gradually increasing to 0.3 Mgal/d in 1963. Withdrawals remained at this level until 1975, when they declined to about 0.2 Mgal/d and continued to gradually decrease to about 0.18 Mgal/d by 1980. Withdrawals by large users of the Aquia aquifer were less than 0.05 Mgal/d in 1950, but increased to nearly 0.45 Mgal/d by 1980.

The Magothy aquifer supplied most of the ground water to large users during the 30-year period. In 1950, about 0.38 Mgal/d was withdrawn. Following a decline to just less than 0.3 Mgal/d in 1951, withdrawals increased over the next 25 years to a peak of about 0.98 Mgal/d in 1976. Pumpage then declined to nearly 0.86 Mgal/d in 1980.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Talbot County for 1950, 1960, 1970, and 1980 are shown in figure 78. Table 16 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. The areal distribution of use remained relatively the same for each of the years shown, although the number of sites of withdrawal increased from 1950 to 1980.

The locations of withdrawals from individual aquifers supplying the large users (described in table 16 and fig. 78) are shown in figure 79. Use of the Aquia aquifer was limited to the west-central part of the county, but its use increased from 1950 to 1980. From 1950 to 1980, use of the Magothy aquifer was limited to one location in central Talbot County.

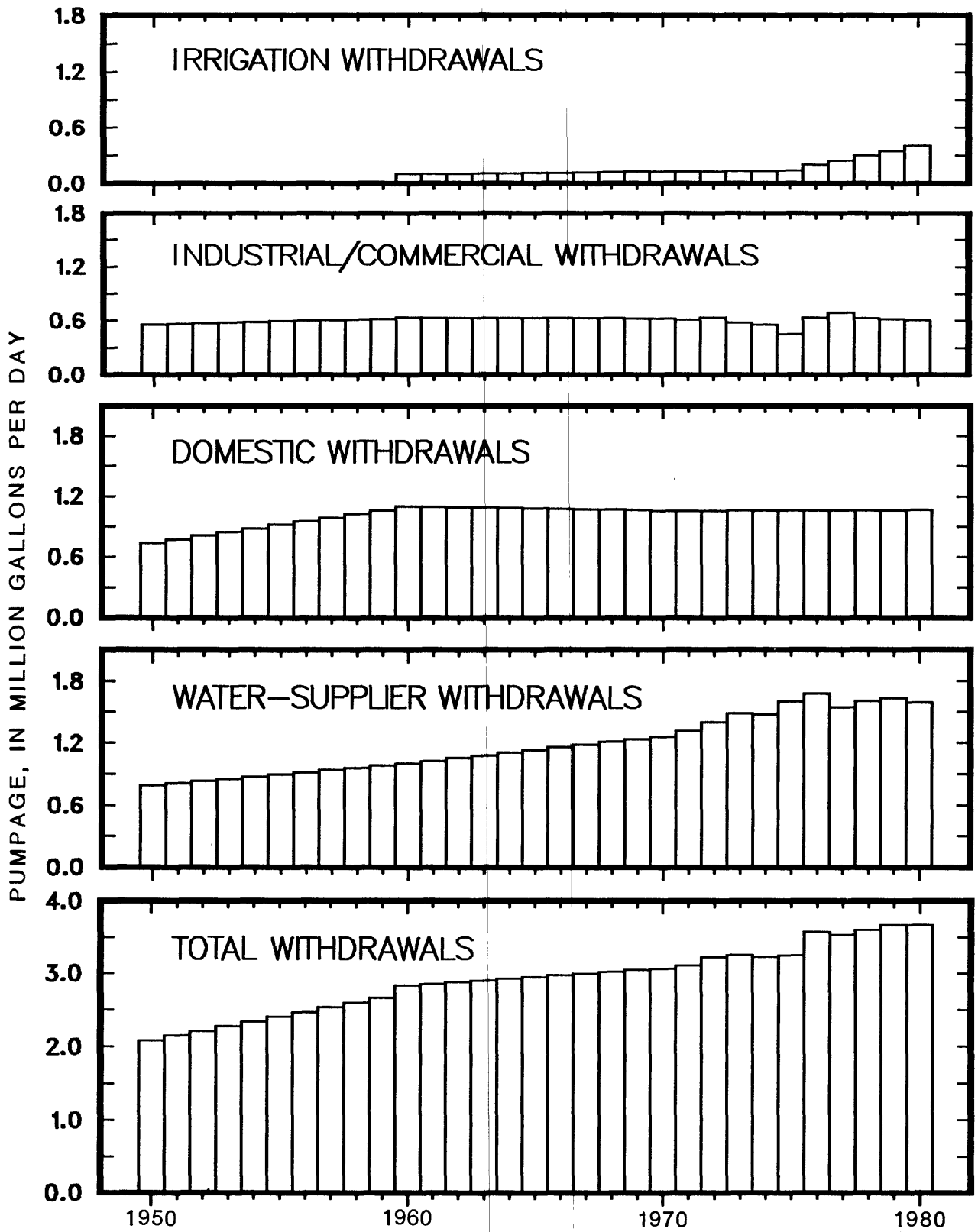
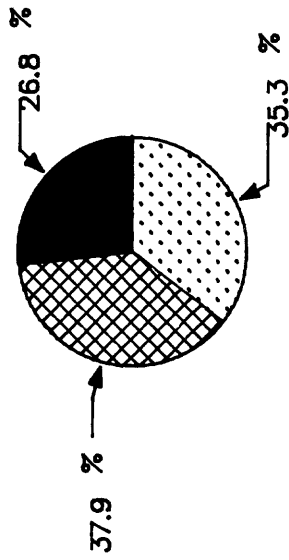
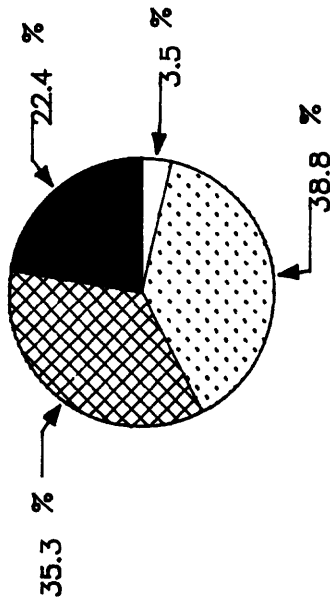


Figure 75.--Ground-water withdrawals by use in Talbot County from 1950 through 1980.

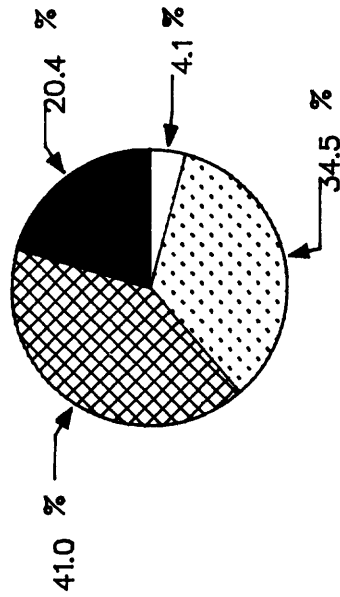
1950 TOTAL: 2.1 Mgal/d



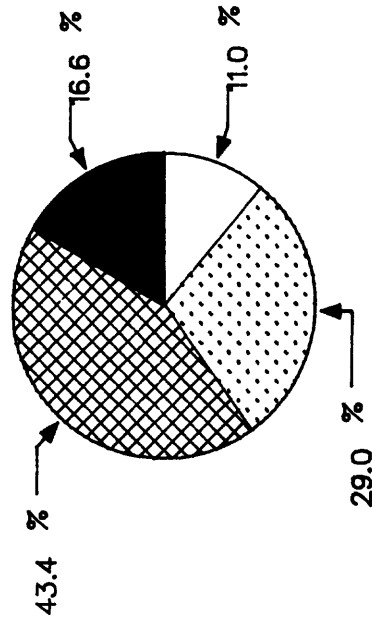
1960 TOTAL: 2.8 Mgal/d



1970 TOTAL: 3.0 Mgal/d



1980 TOTAL: 3.7 Mgal/d



EXPLANATION

- INDUSTRIAL/COMMERCIAL [Solid Black]
- DOMESTIC [Dotted]
- WATER SUPPLIER [Cross-hatched]
- IRRIGATION [White]

Figure 76.--Ground-water use in Talbot County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

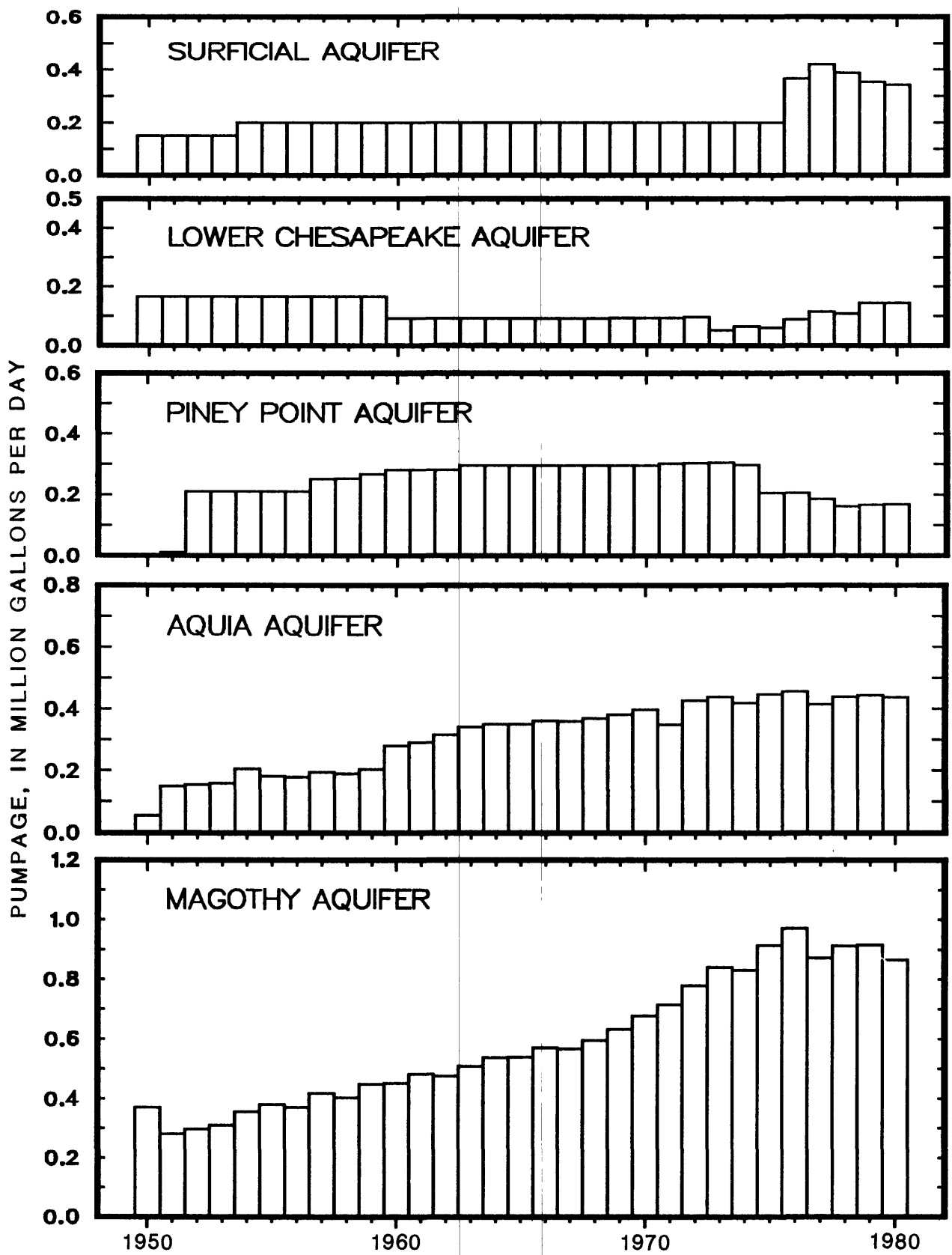


Figure 77.--Large ground-water withdrawals by aquifers in Talbot County from 1950 through 1980.

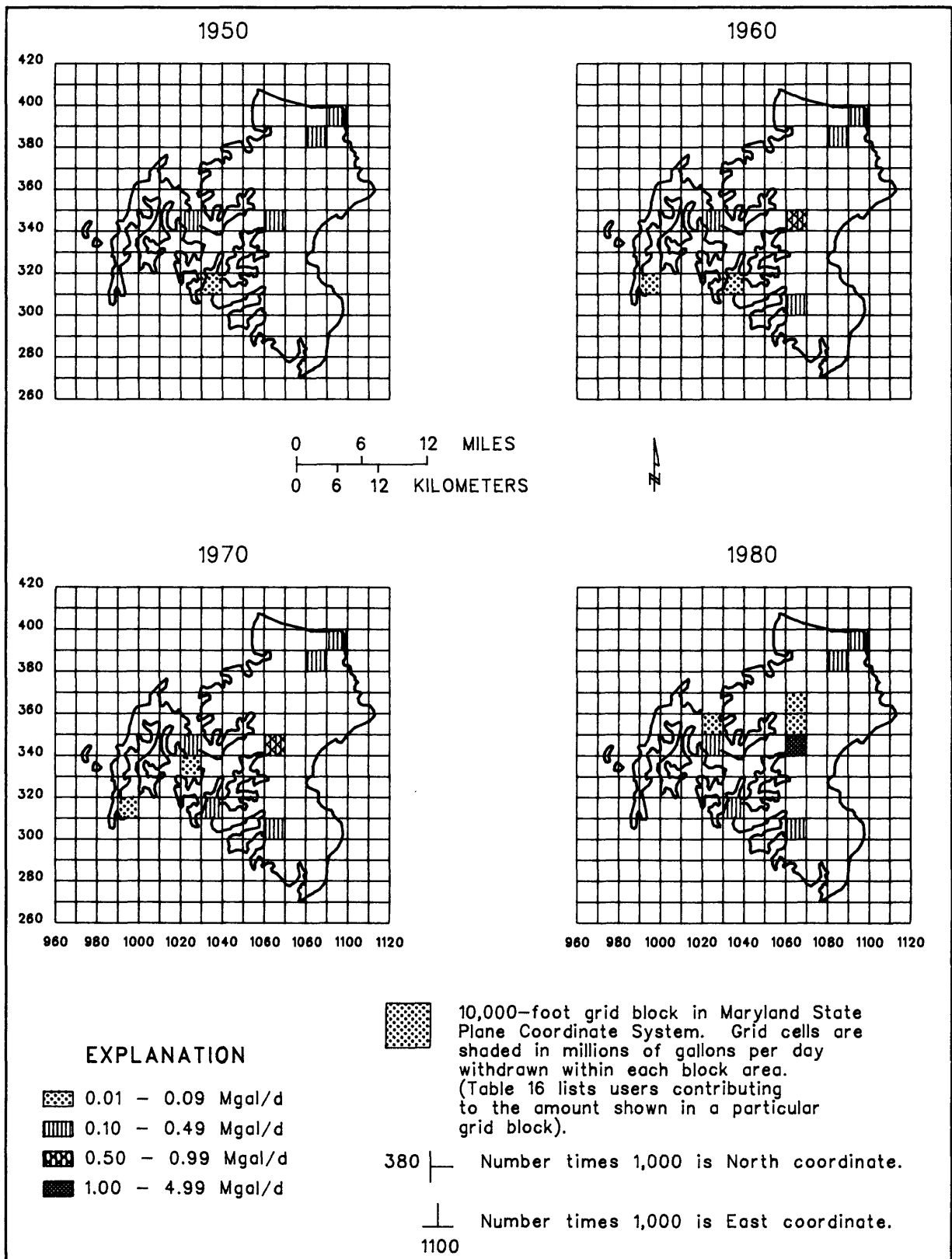


Figure 78.--Locations of large ground-water withdrawals in Talbot County for 1950, 1960, 1970, and 1980.

Table 16.--Large ground-water users in Talbot County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N310 E1030	Oxford, Town of	0.05	Aquia
	N340 E1020	St. Michaels, City of	.10	Aquia
	N340 E1060	Tidewater Inn	.02	Federalsburg
		Easton Utilities Commission	.37	Magothy
	N380 E1080	Allen Family Foods	.15	Quaternary
	N390 E1090	KMC Foods, Inc.	.15	Cheswold
1960	N300 E1060	Trappe Frozen Foods	0.23	Piney Point
		Trappe, Town of	.04	Piney Point
	N310 E 990	Tilghman Packing	.01	Piney Point
	N310 E1030	Oxford, Town of	.05	Aquia
	N340 E1020	St. Michaels, City of	.16	Aquia
	N340 E1060	Tidewater Inn	.02	Federalsburg
		Easton Utilities Commission	.15	Aquia
		do.	.45	Magothy
	N380 E1080	Allen Family Foods	.20	Quaternary
	N390 E1090	KMC Foods, Inc.	.08	Aquia
	do.	.08	Cheswold	
1970	N300 E1060	Trappe Frozen Foods	0.25	Piney Point
		Trappe, Town of	.04	Piney Point
	N310 E 990	Tilghman Packing	.01	Piney Point
	N310 E1030	Oxford, Town of	.10	Aquia
	N330 E1020	Country Pride Foods	.01	Aquia
	N340 E1020	St. Michaels, City of	.22	Aquia
	N340 E1060	Tidewater Inn	.02	Federalsburg
		Easton Utilities Commission	.22	Aquia
		do.	.68	Magothy
	N380 E1080	Allen Family Foods	.20	Quaternary
	N390 E1090	KMC Foods, Inc.	.06	Aquia
		do.	.08	Cheswold
	1980	N300 E1060	Trappe Frozen Foods	0.10
		Trappe, Town of	.07	Piney Point
N310 E1030		Oxford, Town of	.11	Aquia
N340 E1020		St. Michaels, City of	.23	Aquia
N340 E1060		Tidewater Inn	.02	Federalsburg
		Easton Utilities Commission	.29	Aquia
		do.	.87	Magothy
N350 E1020		Martingham Utility	.01	Aquia
N350 E1060		Talbot Trailer Park	.01	Cheswold
N360 E1060		Hogs Neck Golf Course	.01	Federalsburg
		do.	.07	Quaternary
N380 E1080		Allen Family Foods	.27	Quaternary
N390 E1090		KMC Foods, Inc.	.02	Aquia
	do.	.10	Cheswold	

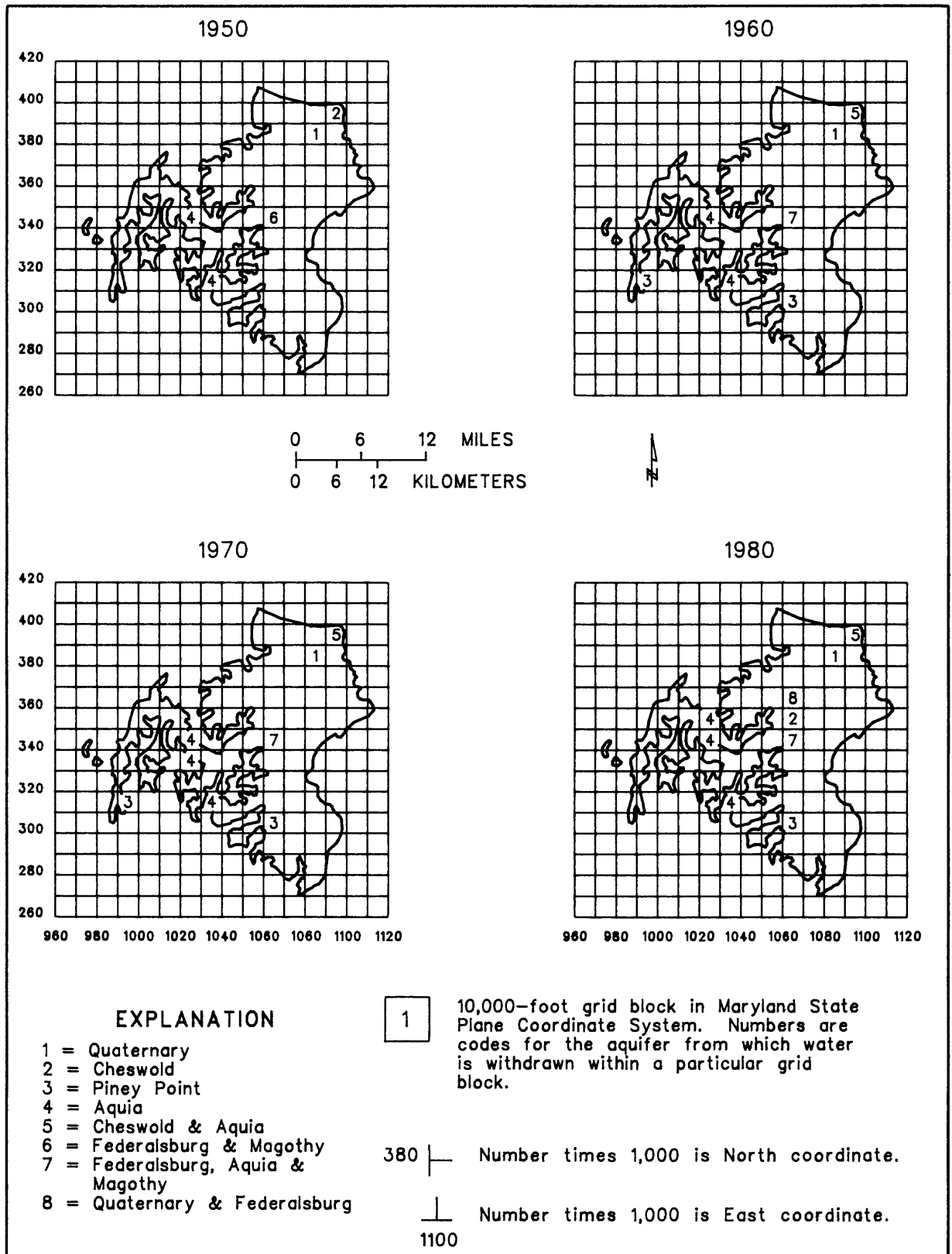


Figure 79.--Locations of large ground-water withdrawals by aquifers in Talbot County for 1950, 1960, 1970, and 1980.



## WICOMICO COUNTY

Ground-water use in Wicomico County from 1950 through 1980 is shown in figure 80. In 1950, the amount of ground water withdrawn was approximately 6.0 Mgal/d compared to withdrawals of nearly 12.0 Mgal/d in 1980. This represents an increase of 100 percent for the three decades.

Since 1950, water use increased in all categories at a rate of about 0.18 Mgal/yr for total withdrawals. In 1950, domestic withdrawals were about 1.0 Mgal/d compared to more than 2.5 Mgal/d in 1980. Withdrawals by water suppliers increased from about 2.5 Mgal/d in 1950 to 4.1 Mgal/d in 1980. Industrial/commercial use was about 2.5 Mgal/d in 1950 and increased to 3.5 Mgal/d in 1980. Large withdrawals of ground water for irrigation in the county began about 1960. Although there have been no precise measurements of amounts of water pumped by individual irrigators, methods of collecting and reporting these data have improved since the early 1960's. The most reliable data are from 1970 to 1980. It was estimated that withdrawals for irrigation were about 0.2 Mgal/d in 1960 and increased to approximately 1.6 Mgal/d by 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation uses are shown in figure 81. In 1950, the percentage for industrial/commercial use represented nearly half of the total water withdrawn in the county (about 44 percent). However, by 1980 the percentage for this use had dropped to about 30 percent. The percentage for irrigation was only about 3 percent in 1960, but by 1980 it had increased to 13 percent of the total ground water withdrawn.

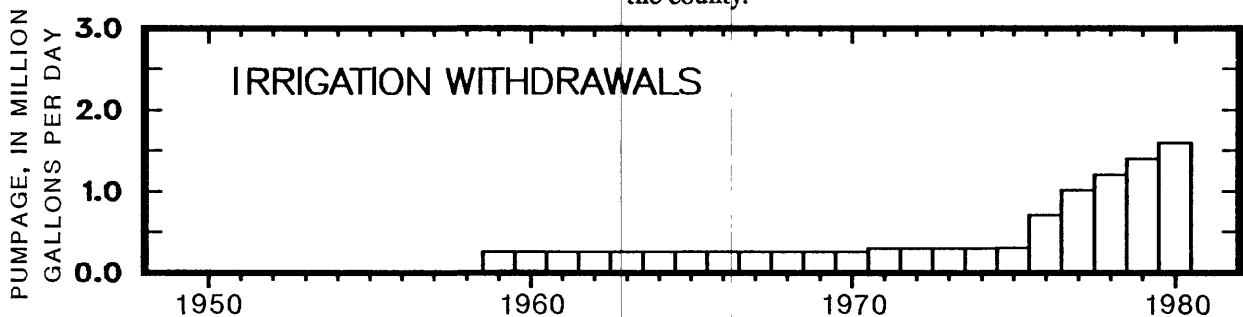


Figure 80.--Ground-water withdrawals by use in Wicomico County from 1950 through 1980.

## Major Aquifers

The earliest ground-water pumpage in Wicomico County came from the shallow surficial (Quaternary) aquifer. This aquifer continued to supply most of the water needs of large users, as well as for domestic use. However, the deeper Manokin aquifer also was used. Large user withdrawals by aquifer from 1950 through 1980 are shown in figure 82.

In 1950, the amount of water withdrawn from the surficial aquifer was about 3.3 Mgal/d compared to more than 7.5 Mgal/d by 1980. Withdrawals from the Manokin aquifer were about 0.35 Mgal/d in 1950 and increased to more than 0.5 Mgal/d during the 1970's, but declined to about 0.1 Mgal/d by 1980.

## Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Wicomico County for 1950, 1960, 1970, and 1980 are shown in figure 83. Table 17 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. The location of greatest withdrawals for all the years shown was the Salisbury area in the central part of the county. The maps also show an increase in the number of sites of large withdrawals throughout the county from 1950 to 1980.

The locations of withdrawals from individual aquifers supplying the large users in Wicomico County (described in table 17 and fig. 83) are shown in figure 84. In 1950, withdrawals from the surficial and Manokin aquifers were located in the central and southeastern part of the county. The maps for subsequent years show wider distribution of use for these aquifers. The Piney Point aquifer, shown on the 1960 and 1970 maps, was used in only one location in the southwestern corner of the county.

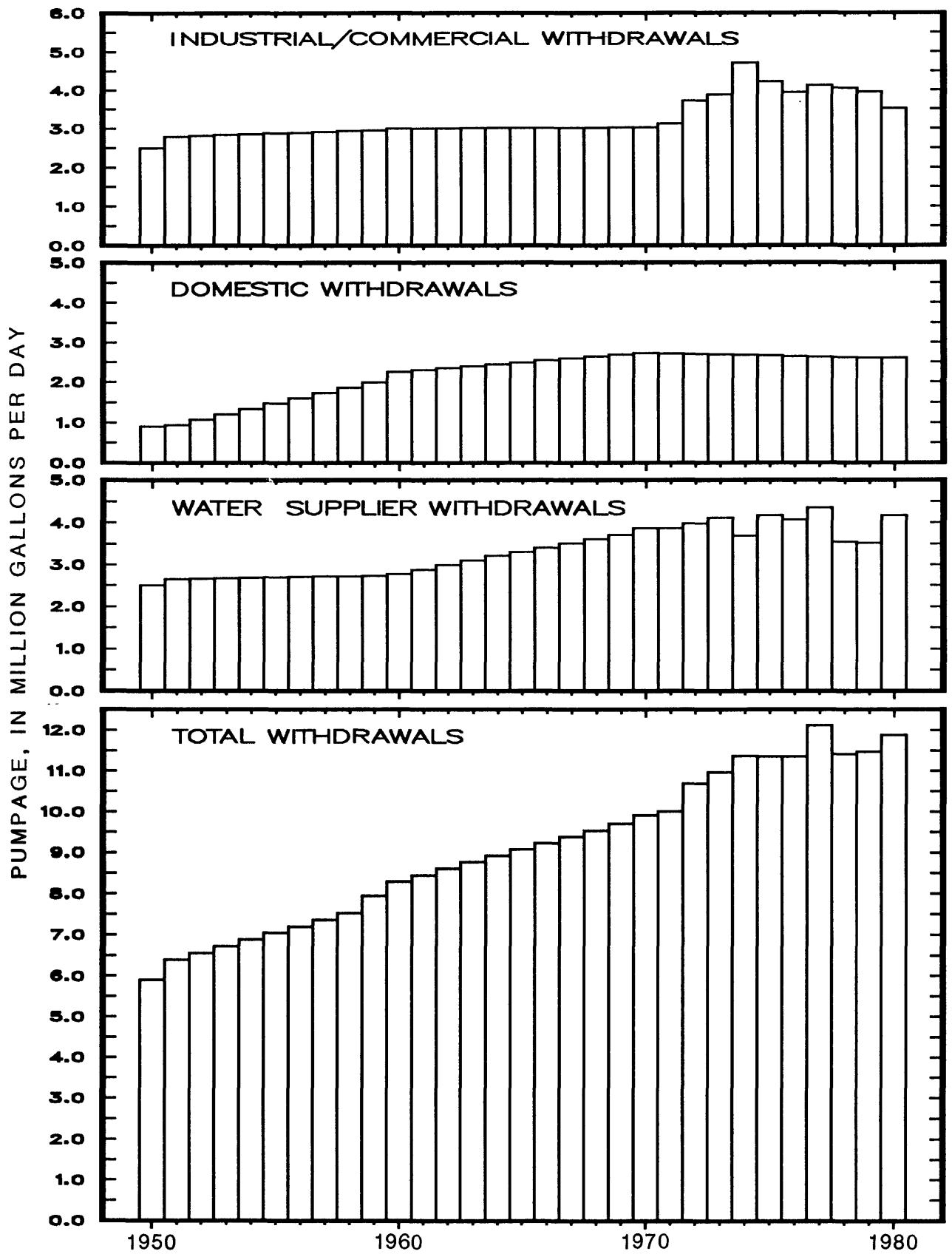
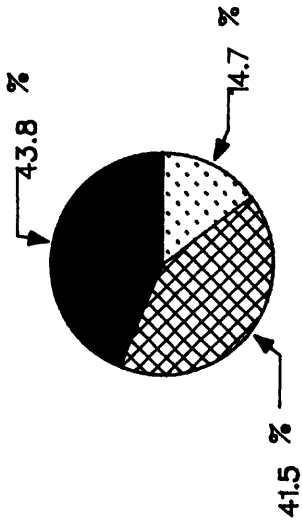
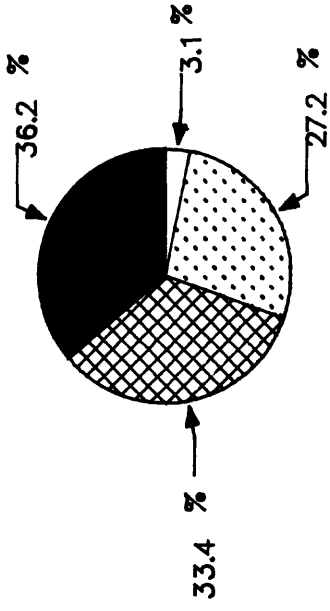


Figure 80.--Ground-water withdrawals by use in Wicomico County from 1950 through 1980--Continued.

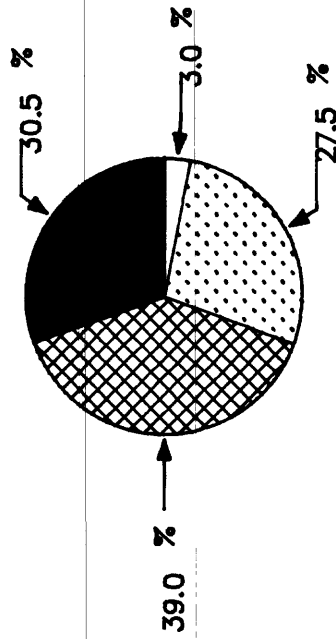
1950 TOTAL: 6.0 Mgal/d



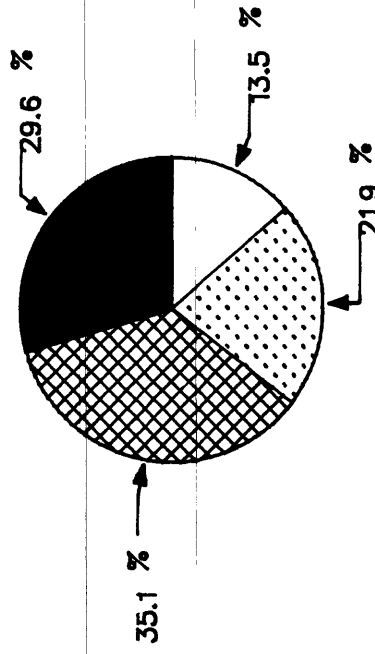
1960 TOTAL: 8.3 Mgal/d



1970 TOTAL: 9.9 Mgal/d



1980 TOTAL: 11.9 Mgal/d



EXPLANATION



Figure 81.--Ground-water use in Wicomico County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

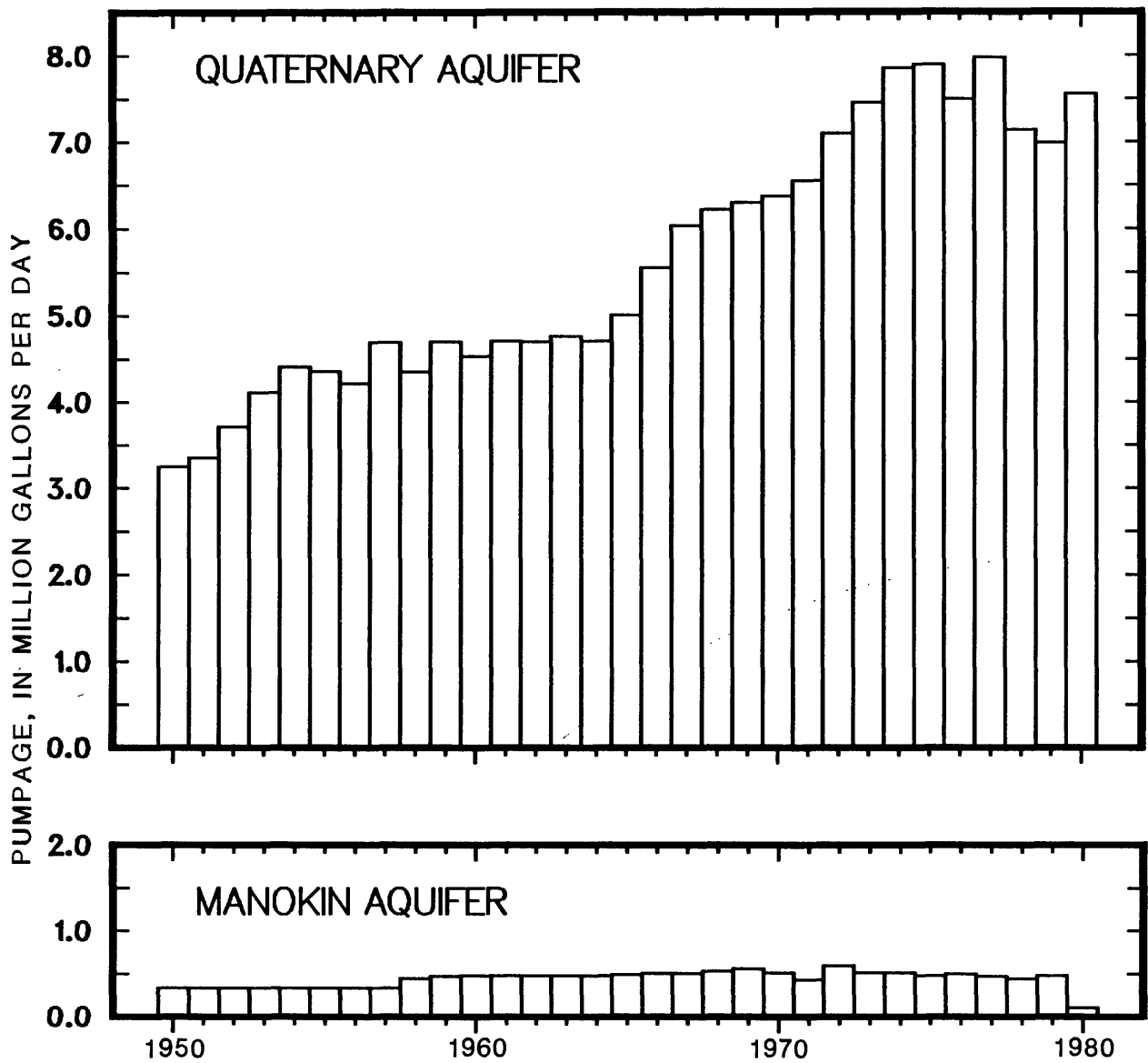


Figure 82.--Large ground-water withdrawals by aquifers in Wicomico County from 1950 through 1980.

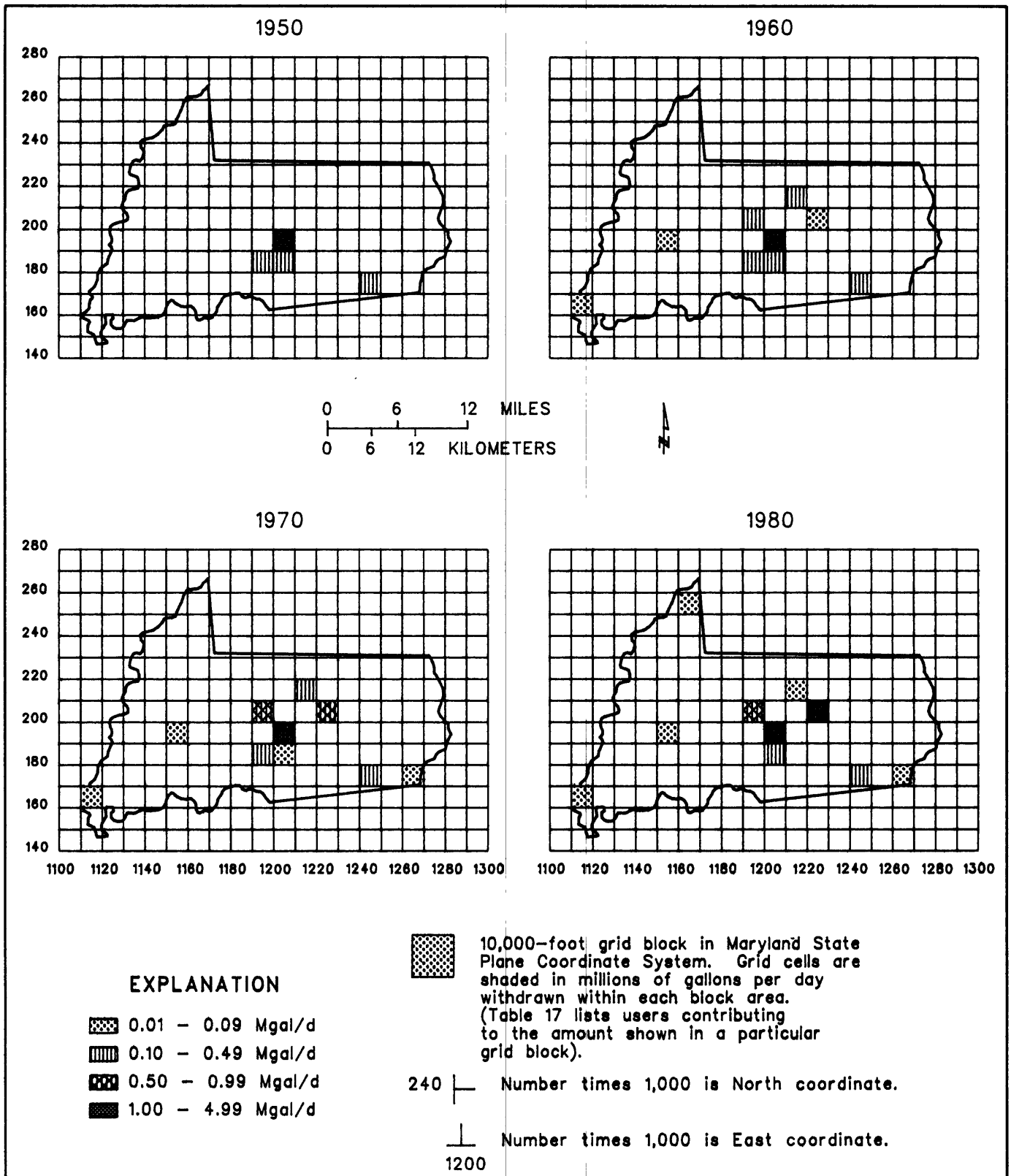


Figure 83.--Locations of large ground-water withdrawals in Wicomico County for 1950, 1960, 1970, and 1980.

Table 17.--Large ground-water users in Wicomico County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N170 E1240	Chesapeake Foods, Inc.	0.14	Quaternary
	N180 E1190	Green Giant Company	.02	Quaternary
		do.	.34	Manokin
	N180 E1200	Shoreland Freezers, Inc.	.22	Quaternary
	N190 E1200	Messick Ice Company	.61	Quaternary
		Salisbury, City of	2.30	Quaternary
1960	N160 E1110	Champion Chick Products Corp.	0.01	Manokin
	N170 E1240	Chesapeake Foods, Inc.	.25	Quaternary
	N180 E1190	Green Giant Company	.02	Quaternary
		do.	.34	Manokin
	N180 E1200	Shoreland Freezers, Inc.	.27	Quaternary
	N190 E1150	Poplar Hill Correction Camp	.02	Manokin
	N190 E1200	Messick Ice Company	.77	Quaternary
		Salisbury, City of	2.90	Quaternary
	N200 E1190	Campbell Soup, Inc.	.27	Quaternary
	N200 E1220	A. W. Perdue & Son, Inc.	.04	Quaternary
	N210 E1210	Delmarva Power & Light Company	.11	Manokin
1970	N160 E1110	Champion Chick Products Corp.	0.01	Manokin
	N170 E1240	Chesapeake Growers, Inc.	.02	Quaternary
		Chesapeake Foods, Inc.	.19	Quaternary
	N170 E1260	Shockley & Son, Inc.	.02	Manokin
	N180 E1190	Green Giant Company	.02	Quaternary
		do.	.34	Manokin
	N180 E1200	Shoreland Freezers, Inc.	.10	Quaternary
	N190 E1150	Poplar Hill Correction Camp	.02	Manokin
	N190 E1200	Messick Ice Company	.77	Quaternary
		Salisbury, City of	3.84	Quaternary
	N200 E1190	Campbell Soup, Inc.	.54	Quaternary
	N200 E1220	A. W. Perdue & Son, Inc.	.90	Quaternary
	N210 E1210	Salisbury Mobile Home Park	.01	Quaternary
	Delmarva Power & Light Company	.11	Manokin	
1980	N160 E1110	H. B. Kennerly & Sons, Inc.	0.02	Manokin
	N170 E1240	Chesapeake Growers, Inc.	.02	Quaternary
		Chesapeake Foods, Inc.	.30	Quaternary
	N170 E1260	Shockley & Son, Inc.	.03	Manokin
	N180 E1200	Shoreland Freezers, Inc.	.05	Quaternary
		Fruitland, City of	.17	Quaternary
	N190 E1150	Poplar Hill Correction Camp	.02	Manokin
	N190 E1200	Messick Ice Company	.61	Quaternary
		Salisbury, City of	3.87	Quaternary
	N200 E1190	Campbell Soup, Inc.	.86	Quaternary
	N200 E1220	A. W. Perdue & Son, Inc.	1.58	Quaternary
	N210 E1210	Salisbury Mobile Home Park	.02	Quaternary
		Delmarva Power & Light Company	.03	Manokin
	N250 E1160	Sharptown, City of	.07	Quaternary

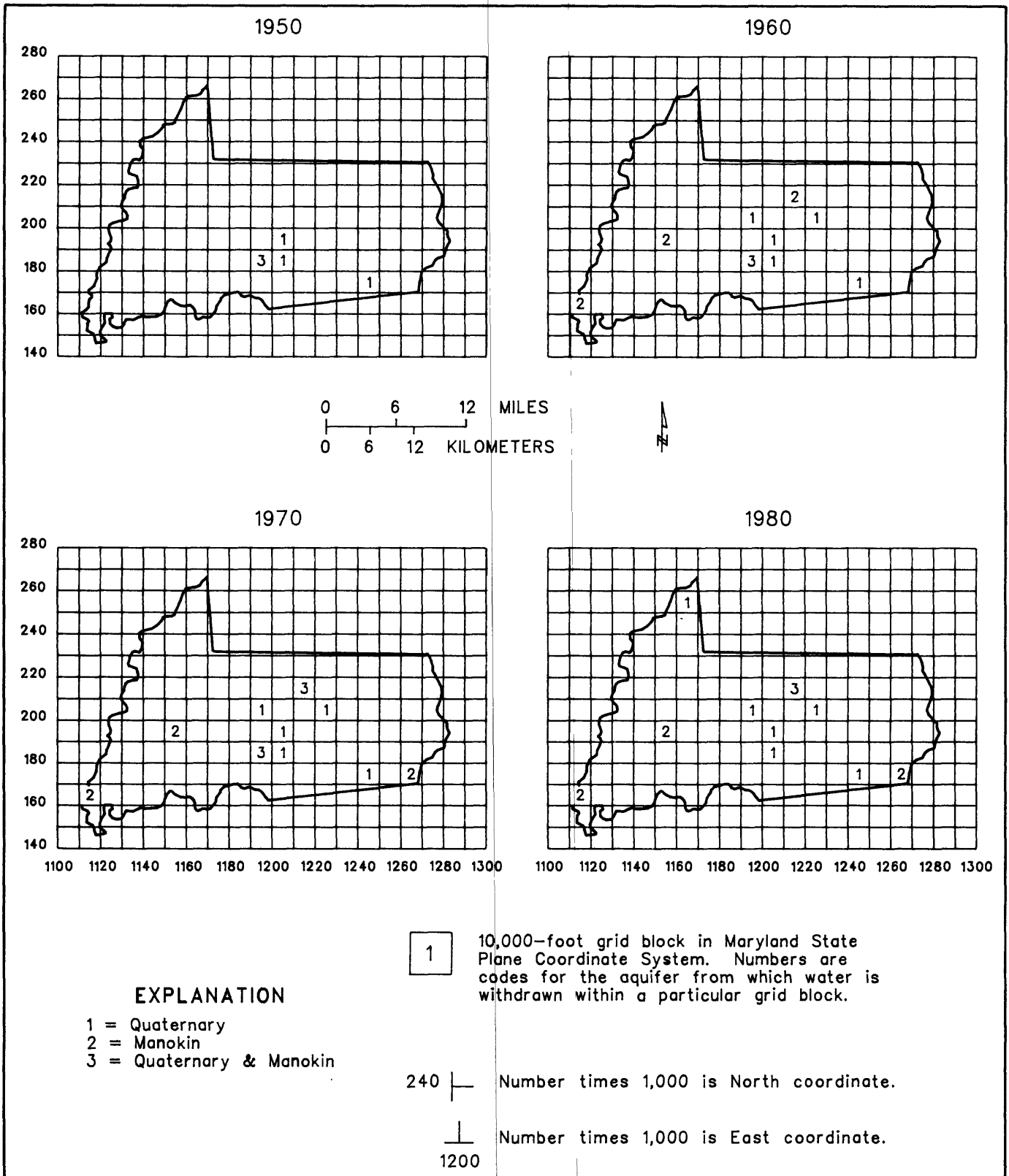


Figure 84.--Locations of large ground-water withdrawals by aquifers in Wicomico County for 1950, 1960, 1970, and 1980.

## WORCESTER COUNTY

Ground-water use in Worcester County from 1950 through 1980 is shown in figure 85. In 1950, the amount of ground water withdrawn was approximately 4.5 Mgal/d compared to withdrawals of nearly 11 Mgal/d in 1980. This represents an increase of 144 percent for the three decades.

Since 1950, ground-water use in Worcester County has increased in all categories. Domestic use was about 1.0 Mgal/d in 1950, and, by 1980, had increased to more than 2.0 Mgal/d. Withdrawals by water suppliers increased from approximately 1.4 Mgal/d in 1950 to about 5.0 Mgal/d in 1980. Industrial/commercial use increased from about 3.8 Mgal/d in 1970 to 5.8 Mgal/d in 1975, and dropped to about 3.0 Mgal/d in 1980. Withdrawals for agricultural irrigation were about 0.16 Mgal/d in 1960, but increased to 0.68 Mgal/d by 1980. See appendix for ground-water withdrawal data for each large user: User's name, appropriation permit number, source aquifer, location on the Maryland Grid Coordinate System, average daily pumpage, and year pumping began.

The percentages of the total amount of ground water withdrawn for domestic, water supplier, industrial/commercial, and irrigation uses are shown in figure 86. The percentage for domestic use remained relatively the same for the 4 years shown. The percentage for water suppliers was about the same in 1950 (32 percent) and 1960 (about 30 percent), increasing a small amount in 1970 (35 percent). By 1980, it had increased to 46.6 percent of the total. Industrial/commercial use comprised a significant portion of the total pumpage (about 50 percent) for the years 1950 and 1960. By 1980, however, the representative percentage for this use had dropped to 27 percent.

### Major Aquifers

The earliest ground-water pumpage in Worcester County probably came from the surficial (Quaternary)

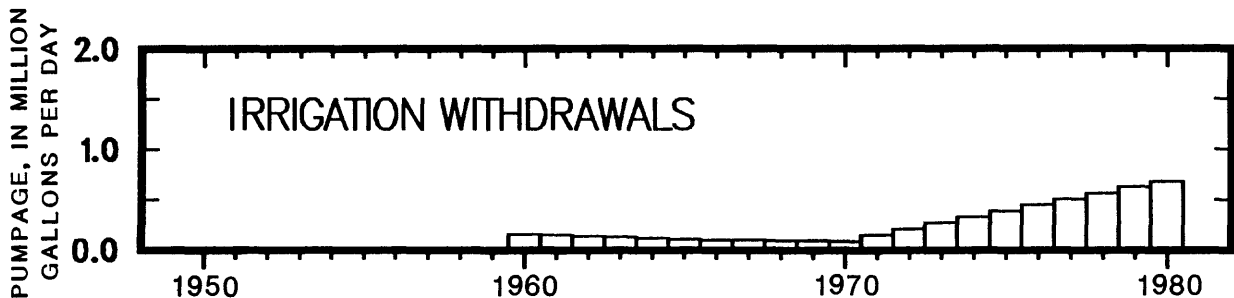


Figure 85.--Ground-water withdrawals by use in Worcester County from 1950 through 1980.

aquifer. These shallow sands continued to supply much of the low-yield water needs, chiefly for domestic use, although some large users also were able to withdraw sufficient quantities of water from the surficial aquifer. However, as the demand for water increased, use of the deeper Manokin and Pocomoke (in the upper Chesapeake Group) aquifers increased.

Large user withdrawals by aquifer in the county from 1950 through 1980 are shown in figure 87. In 1950 about 1.0 Mgal/d was withdrawn from the surficial aquifer. Pumpage gradually increased to about 4.3 Mgal/d in 1975 before declining to approximately 3.0 Mgal/d in 1980. The largest amount of water for the 30-year period was withdrawn from the Manokin and Pocomoke aquifers. In 1950, about 1.2 Mgal/d was withdrawn. By 1976, more than 5.6 Mgal/d was pumped from the Manokin and Pocomoke; withdrawals declined to about 4.9 Mgal/d in 1980.

### Locations of Large Ground-Water Withdrawals

The locations of withdrawals by large users in Worcester County for 1950, 1960, 1970, and 1980 are shown in figure 88. Table 18 presents water-use data for the large users located within particular grid blocks for the year indicated on the map. The maps indicate that the areal distribution of pumpage was similar for the years shown; however, the largest withdrawals were located mostly in the northeastern (Ocean City area) and southwestern sections of the county.

The locations of withdrawals from individual aquifers supplying the large users in Worcester County (described in table 18 and fig. 88) are shown in figure 89. From 1950 through 1980, large withdrawals from the surficial aquifer occurred primarily in the northern part of the county, although use of the Manokin and Pocomoke aquifers was more extensive.



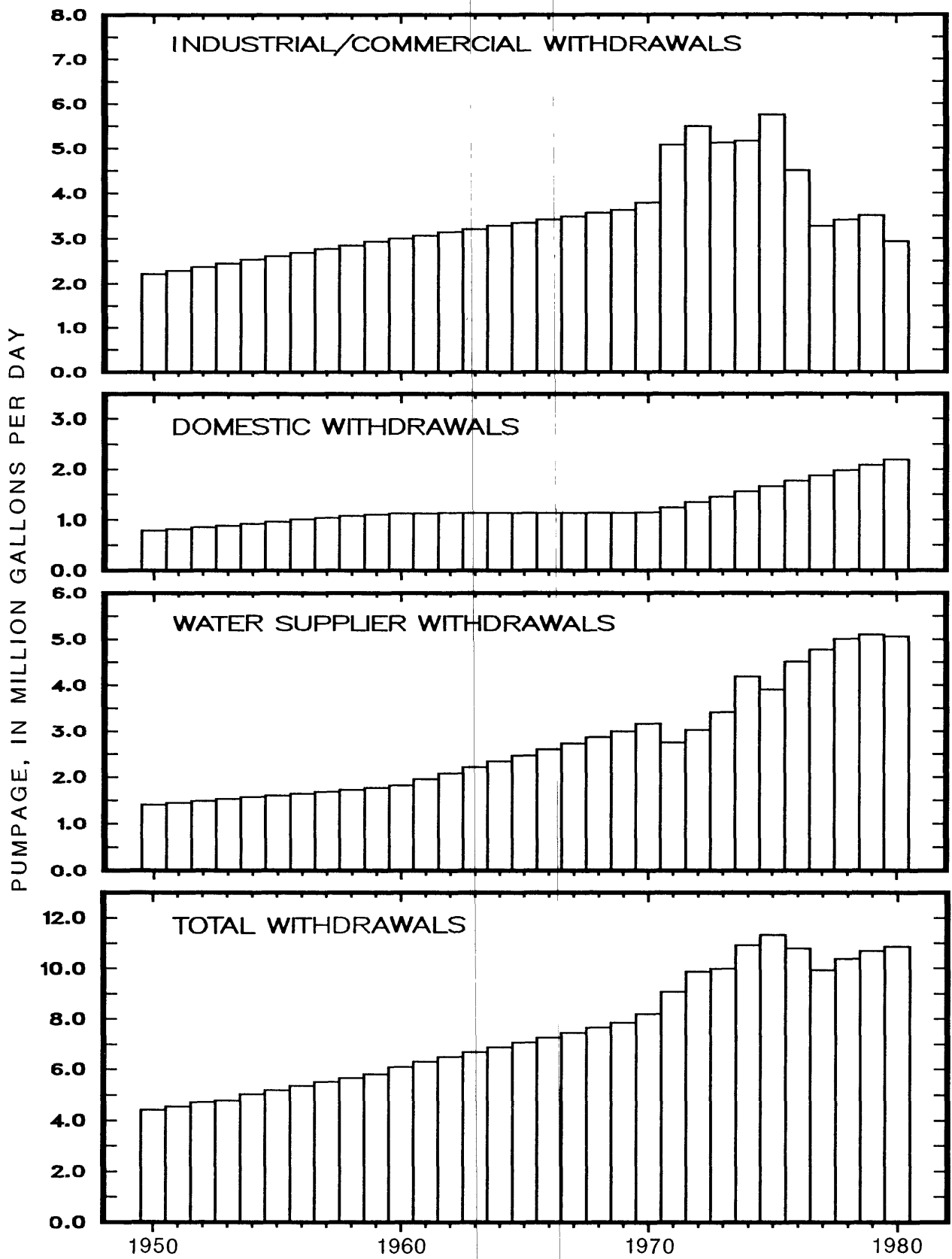
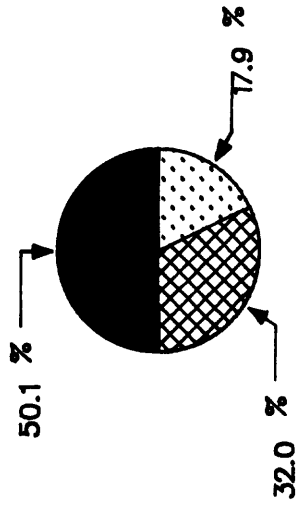
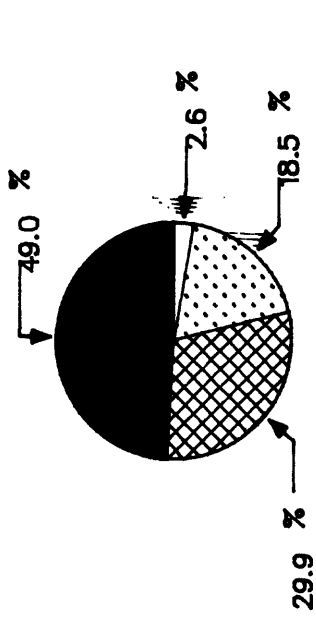


Figure 85.--Ground-water withdrawals by use in Worcester County from 1950 through 1980--Continued.

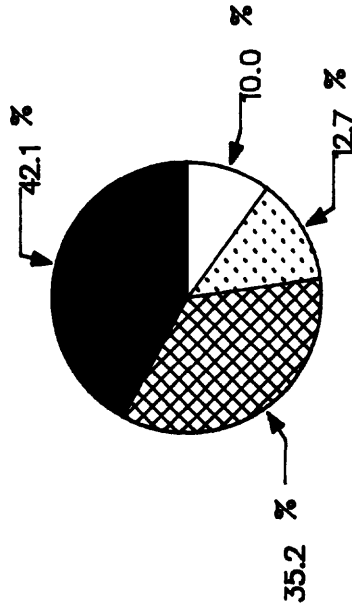
1950 TOTAL: 4.5 Mgal/d



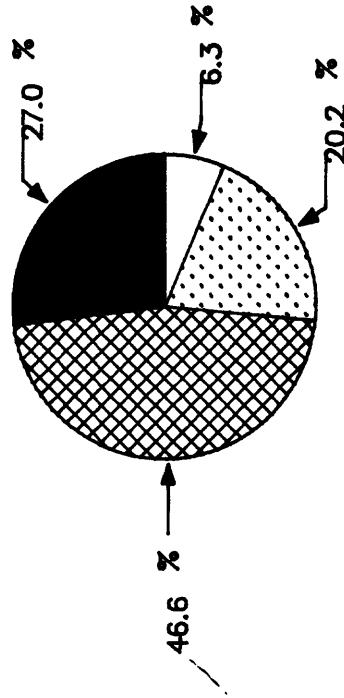
1960 TOTAL: 6.1 Mgal/d



1970 TOTAL: 8.2 Mgal/d



1980 TOTAL: 10.9 Mgal/d



EXPLANATION



Figure 86.--Ground-water use in Worcester County and percentage for each type of use, for 1950, 1960, 1970, and 1980.

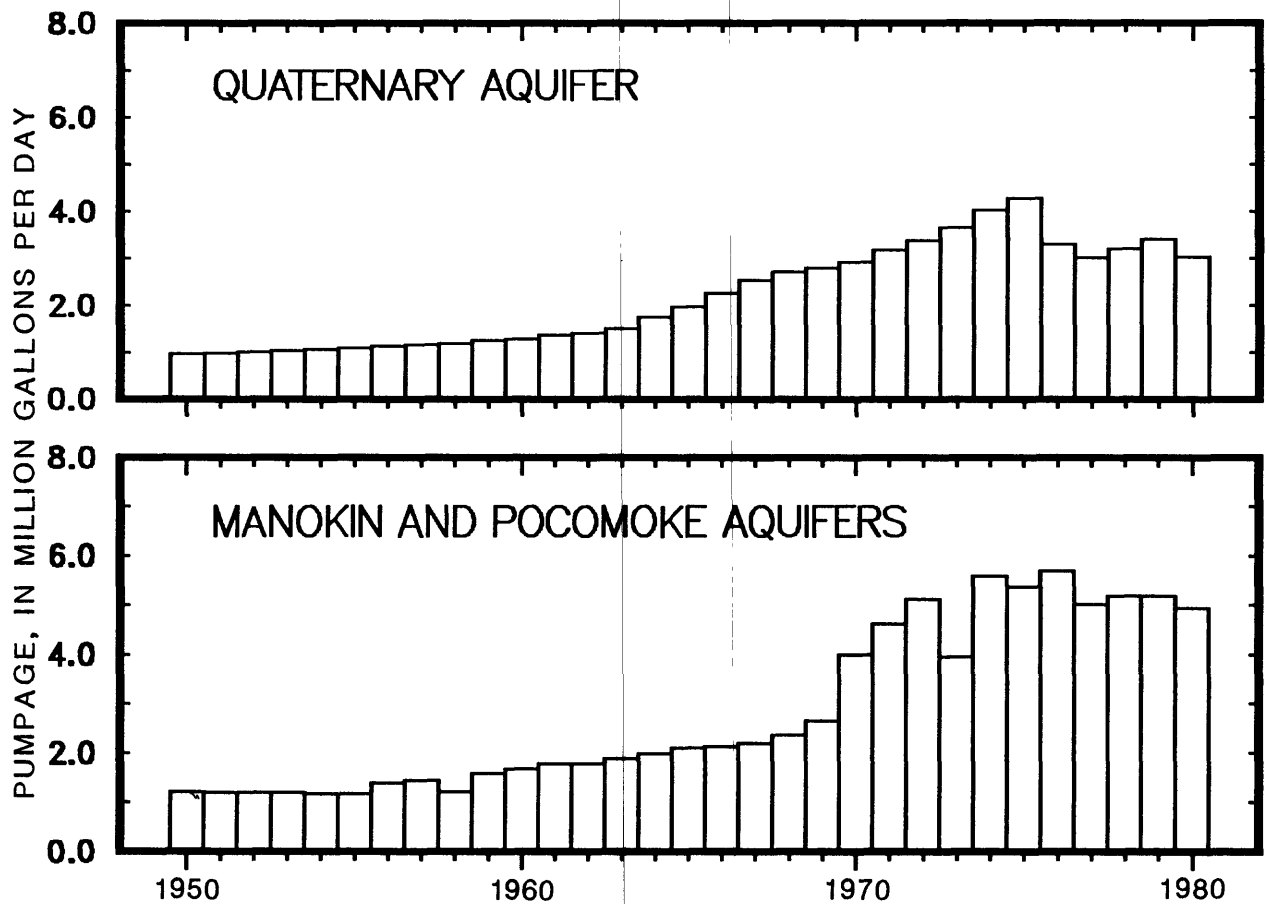


Figure 87.--Large ground-water withdrawals by aquifers in Worcester County from 1950 through 1980.

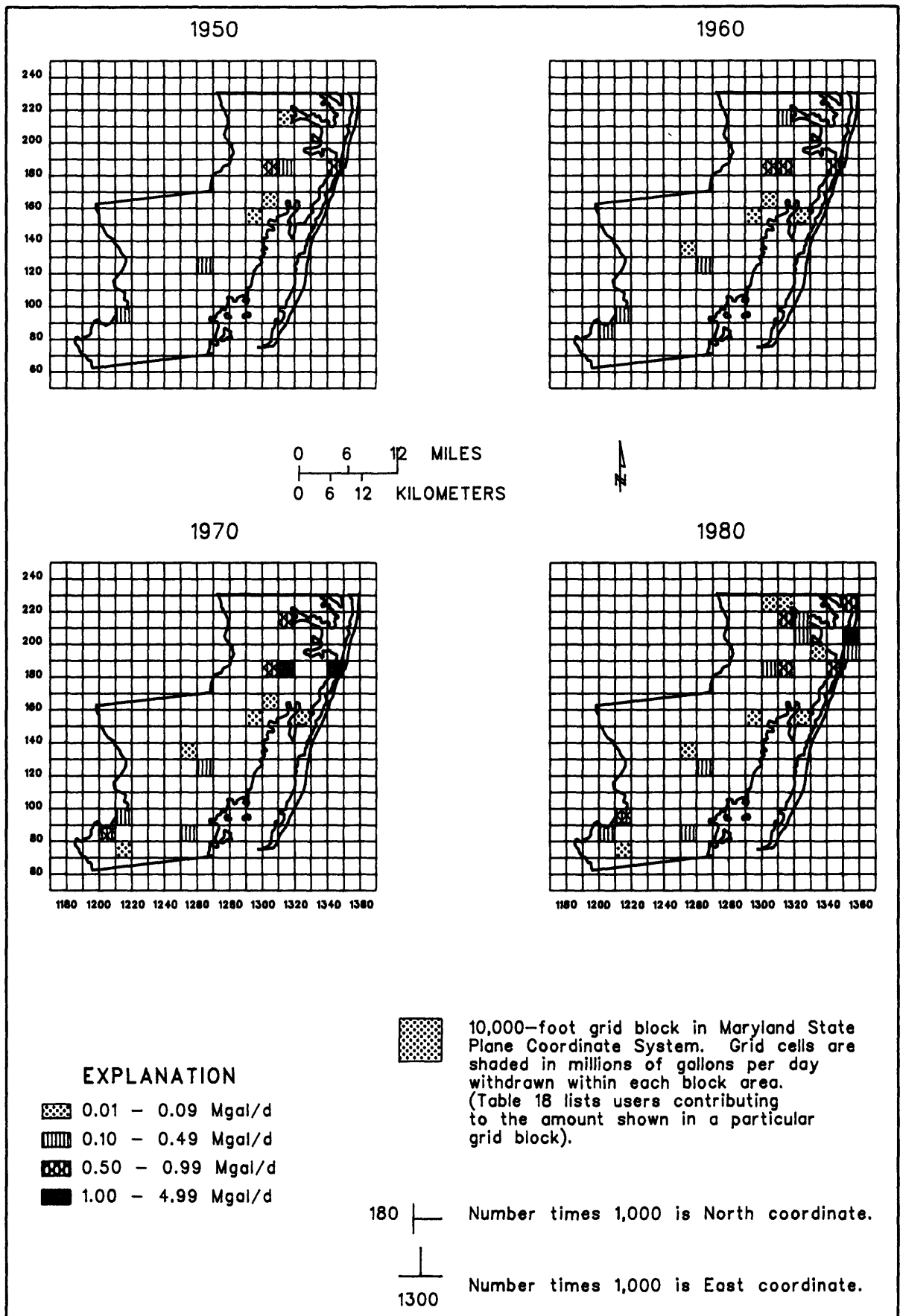


Figure 88.--Locations of large ground-water withdrawals in Worcester County for 1950, 1960, 1970, and 1980.

Table 18.--Large ground-water users in Worcester County in 1950, 1960, 1970, and 1980, summarized by the Maryland Grid Coordinate System

Year	Grid block	User	Pumpage (Mgal/d)	Aquifer
1950	N 90 E1210	Pocomoke City	0.45	Pocomoke
	N130 E1260	Snow Hill, Town of	.26	Manokin
	N150 E1290	Mason Canning Company	.01	Pocomoke
	N160 E1300	do.	.03	Quaternary
	N180 E1300	Davis Ice, Inc.	.63	Quaternary
	N180 E1310	Berlin, City of	.11	Quaternary
	N180 E1340	Savage Ice Company	.03	Quaternary
		Ocean City	.59	Manokin
	N210 E1310	Showell Farms, Inc.	.07	Quaternary
1960	N 80 E1200	Campbell Soup Company	0.16	Pocomoke
	N 90 E1210	Pocomoke, City of	.33	Pocomoke
	N130 E1260	Snow Hill, Town of	.26	Manokin
	N130 E1250	Holly Farms, Inc.	.01	Manokin
	N150 E1290	Mason Canning Company	.01	Pocomoke
	N150 E1320	Ocean City Golf & Yacht Club, Inc.	.01	Pocomoke
		do..	.01	Quaternary
	N160 E1300	Mason Canning Company	.03	Quaternary
	N180 E1300	Davis Ice, Inc.	.66	Quaternary
	N180 E1310	Berlin, City of	.19	Quaternary
		Chesapeake Foods	.36	Pocomoke
	N180 E1340	Savage Ice Company	.05	Quaternary
		Ocean City	.71	Manokin
	N210 E1310	Showell Farms, Inc.	.14	Quaternary
	1970	N 70 E1210	Quality Inn	0.02
N 80 E1200		Campbell Soup Company	.85	Pocomoke
N 80 E1250		Perdue, Inc.	.41	Quaternary
N 90 E1210		Pocomoke City	.30	Pocomoke
N130 E1260		Snow Hill, Town of	.26	Manokin
N130 E1250		Holly Farms, Inc.	.02	Manokin
N150 E1290		Mason Canning Company	.02	Pocomoke
N150 E1320		Ocean City Golf & Yacht Club, Inc.	.02	Pocomoke
		do.	.02	Quaternary
N160 E1300		Mason Canning Company	.03	Quaternary
N180 E1300		Davis Ice, Inc.	.68	Quaternary
N180 E1310		Ross Wells, Inc.	.02	Quaternary
		Berlin, City of	.41	Quaternary
		Chesapeake Foods	.71	Pocomoke
N180 E1340		Savage Ice Company	.06	Quaternary
	Ocean City	2.19	Manokin	
N210 E1310	Showell Farms, Inc.	.82	Quaternary	
1980	N 70 E1210	Quality Inn	0.01	Pocomoke
	N 80 E1200	Campbell Soup Company	.32	Pocomoke
	N 80 E1250	Perdue, Inc.	.46	Quaternary
	N 90 E1210	Pocomoke City	.57	Pocomoke
	N130 E1260	Snow Hill, Town of	.34	Manokin
	N130 E1250	Holly Farms, Inc.	.03	Manokin
	N150 E1290	Newark, Worcester Co. Sanitary Comm.	.01	Pocomoke
	N150 E1320	Ocean City Golf & Yacht Club, Inc.	.02	Pocomoke
		do.	.02	Quaternary
	N180 E1300	Davis Ice, Inc.	.29	Quaternary
	N180 E1310	Ross Wells, Inc.	.01	Quaternary
		Berlin, City of	.41	Quaternary
		Chesapeake Foods	.37	Pocomoke
	N180 E1340	Savage Ice Company	.04	Pocomoke
		Ocean City: south end wells	.90	Manokin
	N190 E1330	Ocean Downs Racing Assoc., Inc.	.05	Quaternary
	N190 E1350	Ocean City: 15th Street wells	.40	Manokin
		Ocean City Convention Hall	.02	Manokin
	N200 E1320	Pine Shore Golf, Inc.	.05	Quaternary
		Ocean Pines Assoc., Inc.	.11	Quaternary
	N200 E1350	Ocean City: 44th Street wells	1.34	Manokin
	N210 E1310	Showell Farms, Inc.	.88	Quaternary
N210 E1320	Maryland Marine Utilities, Inc.	.25	Quaternary	
N220 E1300	Showell Farms, Inc.	.01	Quaternary	
N220 E1310	do.	.08	Quaternary	
N220 E1350	Ocean City: Gorman Avenue wells	.97	Manokin	

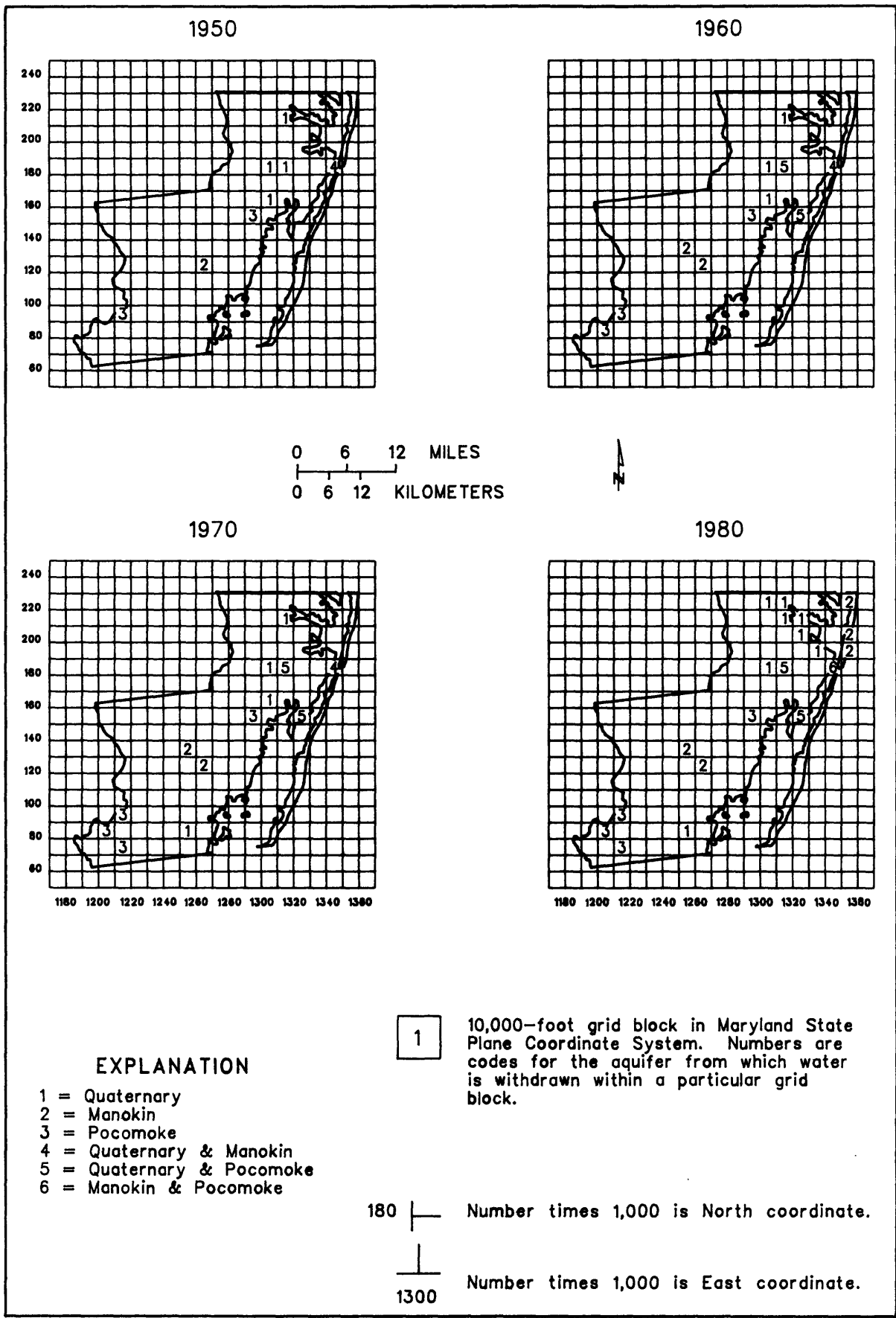


Figure 89.--Locations of large ground-water withdrawals by aquifers in Worcester County for 1950, 1960, 1970, and 1980.

## SUMMARY

Ground water was the major source of supply for most water users in the Coastal Plain of Maryland from 1900 through 1980. Withdrawals from Baltimore City and the 16 counties included in this report that lie either partially or totally within the Coastal Plain increased from approximately 25 Mgal/d in 1900 to nearly 136 Mgal/d in 1980. The jurisdictions with the greatest withdrawals (more than 5 Mgal/d for most of the 80-year period) were Anne Arundel and Baltimore Counties and Baltimore City.

The major uses of ground water were domestic, military, water suppliers, industrial/commercial, and irrigation. Domestic and industrial/commercial uses comprised the largest withdrawals from 1900 through

1965. For most of the next 15 years, water suppliers constituted the greatest use of ground water.

Large withdrawals for irrigation in the Coastal Plain began in the late 1950's and were primarily centered in Caroline, Dorchester, Queen Annes, and Wicomico Counties.

The surficial (Quaternary) aquifer was a primary source of water supply for many domestic withdrawals, and also provided adequate quantities to some large users (withdrawing 0.01 Mgal/d or more). However, the deeper Patapsco and Patuxent aquifers supplied the most water to large users during the 80 year period, mainly for industrial/commercial use.

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# **APPENDIX**

Ground-water withdrawals by large users in Anne Arundel County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates					
				1980	1979	1978	1977	1976
Annapolis, City of	72-009	Magothy	N421 E924	3.285	3.233	3.173	2.992	2.739
Annapolis, City of	72-009	Patapsco	N421 E924	1.396	1.315	.511	.795	.838
Annapolis Landing Water Treatment Plant	77-048	Magothy	N405 E918	.033	.007	.008	.007	.007
Annapolis Terrace Motel	56-011	Aquia	N432 E947	.010	.010	.010	.010	.010
Bodkin Elementary School	70-013	Patapsco	N465 E950	.012	.012	.012	.012	.004
Boones Mobile Estates	76-014	Magothy	N355 E890	.022	.024	.021	.019	.000
Broad Creek, Anne Arundel County Department of Utilities	68-006	Patapsco	N415 E925	.376	.266	.212	.198	.237
Broadwater Waste Treatment Plant	71-020	Aquia	N357 E936	.013	.019	.026	.057	.000
Cedarhurst Water Company	55-003	Patapsco	N468 E888	.000	.003	.003	.003	.003
Central Avenue School, Anne Arundel County Department of Utilities	71-026	Magothy	N398 E924	.029	.027	.016	.000	.000
Chartwell Golf and Country Club	61-009	Patapsco	N458 E914	.014	.014	.012	.011	.010
Chemetals, formerly Diamond Shamrock	62-030	Patuxent	N497 E923	.777	.580	.778	.808	.916
Chesapeake Mobile Court	57-007	Patapsco	N479 E880	.036	.036	.022	.035	.033
Colony Seven Motor Inn	60-024	Patuxent	N467 E864	.028	.029	.030	.026	.028
Crain Highway well, Anne Arundel County Department of Utilities	69-019	Patapsco	N475 E904	.410	.594	.595	.549	.686
Crofton, Anne Arundel County Department of Utilities	54-018	Patuxent	N430 E891	1.344	1.142	1.152	1.076	.933
Crownsville State Hospital	54-001	Magothy	N430 E915	.184	.165	.197	.202	.199
Dorsey wells, Anne Arundel County Department of Utilities	69-019	Patuxent	N486 E900	1.771	1.541	2.609	2.055	2.017
Dorsey wells, Anne Arundel County Department of Utilities	69-019	Patapsco	N486 E890	3.058	4.367	.622	2.530	2.055
Elvaton wells, Anne Arundel County Department of Utilities	89-019	Patapsco	N474 E907	.760	.672	.612	.541	.533
Epping Forest Water Works	66-026	Magothy	N431 E934	.032	.036	.038	.000	.039
Freestate Management Company, Lake Village	73-025	Patapsco	N474 E862	.139	.072	.038	.041	.025
Fort George Meade, U.S. Army	69-021	Patuxent	N459 E870	.363	.624	.051	.428	.222
Gibson Island, Anne Arundel County Department of Utilities	71-034	Patapsco	N455 E963	.099	.075	.054	.078	.081
Glendale, Anne Arundel County Department of Utilities	69-019	Patapsco	N483 E910	.462	.561	.000	.529	.383
Harundale, Anne Arundel County Department of Utilities	89-019	Patapsco	N478 E910	1.786	1.226	.713	.859	1.183
Herald Harbor, Anne Arundel County Department of Utilities	54-018	Patapsco	N430 E891	.073	.075	.021	.011	.027

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
3.063	2.795	2.775	3.348	3.014	2.822	2.582	2.684	2.046	0.000	0.000	0.000
										First pumpage:	?
.551	.783	.968	.853	.877	1.048	1.156	.000	.000	.000	.000	.000
										First pumpage:	1966
.006	.009	.008	.009	.008	.006	.003	.000	.000	.000	.000	.000
										First pumpage:	1979
.010	.010	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1974
.004	.003	.003	.001	.001	.001	.001	.003	.002	.000	.000	.000
										First pumpage:	1977
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1977
.194	.158	.137	.158	.112	.102	.123	.000	.000	.000	.000	.000
										First pumpage:	1968
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1977
.003	.003	.003	.003	.003	.022	.020	.008	.000	.000	.000	.000
										First pumpage:	?
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1978
.008	.005	.004	.004	.004	.004	.003	.000	.000	.000	.000	.000
										First pumpage:	1961
.725	.744	.685	.520	.483	.398	.305	.000	.000	.000	.000	.000
										First pumpage:	1962
.030	.029	.027	.026	.025	.025	.021	.010	.000	.000	.000	.000
										First pumpage:	1958
.026	.024	.028	.031	.027	.030	.030	.000	.000	.000	.000	.000
										First pumpage:	?
.356	.175	.086	.046	.010	.030	.001	.000	.000	.000	.000	.000
										First pumpage:	1969
.826	1.135	.521	.458	.373	.360	.114	.000	.000	.000	.000	.000
										First pumpage:	1960
.211	.235	.244	.573	.527	.520	.390	.358	.356	.329	.000	.000
										First pumpage:	?
2.105	1.657	1.626	1.670	1.138	.981	.889	.356	.000	.000	.000	.000
										First pumpage:	1957
1.115	1.402	1.491	1.510	1.456	1.485	1.156	.512	.000	.000	.000	.000
										First pumpage:	?
.442	.368	.525	.449	.496	.138	.000	.000	.000	.000	.000	.000
										First pumpage:	1970
.036	.034	.037	.036	.031	.027	.011	.005	.000	.000	.000	.000
										First pumpage:	1959
.019	.016	.014	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1973
.333	.385	.055	.455	.104	.039	.000	.000	.000	.000	.000	.000
										First pumpage:	1970
.069	.077	.077	.072	.064	.078	.085	.067	.068	.027	.014	.000
										First pumpage:	1928
.344	.360	.398	.569	.630	.411	.087	.000	.000	.000	.000	.000
										First pumpage:	1969
1.227	1.258	1.311	1.295	1.354	1.476	1.414	.795	.000	.000	.000	.000
										First pumpage:	?
.032	.310	.260	.229	.187	.123	.093	.000	.000	.000	.000	.000
										First pumpage:	1967

Ground-water withdrawals by large users in Anne Arundel County, 1900 through 1980--Continued

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Holiday Inn Laurel	69-009	Patuxent	N462 E853	0.000	0.005	0.008	0.010	0.010
Holiday Mobile Estates	63-008	Patuxent	N477 E871	.046	.044	.044	.043	.047
Homestead Gardens	None	Aquia	N397 E906	.010	.010	.010	.002	.002
Howard Johnson's Restaurant and Inn	55-004	Aquia	N434 E950	.041	.041	.041	.041	.041
Koppers Company	67-005	Patapsco	N481 E884	.000	.000	.000	.000	.000
Koppers Company	67-005	Patuxent	N481 E884	.000	.001	.003	.003	.004
Lake Shore Complex, including Lake Shore Elementary School	77-045	Magothy	N464 E943	.036	.028	.025	.022	.000
Laurel Race Course	47-003	Patuxent	N463 E853	.071	.087	.087	.087	.849
Lyons Creek Mobile Homes	66-055	Aquia	N349 E890	.037	.017	.040	.029	.013
Lyons Creek Mobile Homes	66-055	Magothy	N347 E892	.037	.009	.032	.021	.015
MacMillan Bloedel Packaging, Limited	62-003	Patapsco	N470 E887	.012	.014	.014	.015	.014
Maryland City-Fort Meade West, Anne Arundel County Department of Utilities	65-033	Patuxent	N461 E851	.563	.538	.512	.535	.540
Maryland Manor Homes	65-032	Magothy	N374 E892	.070	.045	.051	.051	.052
Meade Village, Anne Arundel County Department of Utilities	69-019	Patapsco	N474 E882	.112	.117	.107	.085	.098
Nevamar Corporation	70-012	Patapsco	N458 E886	1.665	2.665	2.410	2.632	2.797
Nevamar Corporation	70-012	Patuxent	N457 E886	.699	.139	.162	.200	.026
Parkway Industrial wells, Anne Arundel County Department of Utilities	69-019	Patuxent	N489 E886	.000	.000	.000	.000	.000
Parkway Manor/Econo Lodge	54-019	Patuxent	N476 E870	.010	.008	.008	.008	.005
Pasadena Water Company	62-028	Patapsco	N465 E921	.000	.000	.000	.047	.047
Phillips Drive well, Anne Arundel County Department of Utilities	69-019	Patapsco	N480 E907	.656	.425	.467	.364	.369
Pine Hills Corporation	74-002	Patapsco	N467 E892	.001	.015	.015	.015	.015
Pines on Severn, Anne Arundel County Department of Utilities	53-008	Magothy	N433 E939	.000	.000	.000	.010	.090
Provinces Water Company	70-046	Patuxent	N474 E876	.286	.243	.233	.230	.189
Quarterfield well, Anne Arundel County Department of Utilities	69-019	Patapsco	N475 E900	.732	.338	.262	.003	.022
Revell Square Water Corporation	76-001	Patapsco	N436 E960	.021	.007	.001	.000	.000
Riva Development	75-023	Magothy	N407 E919	.027	.025	.011	.000	.000
Robin Hood Dell Trailer Park	69-006	Patuxent	N486 E881	.011	.011	.010	.010	.010

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.010	0.010	0.010	0.009	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000
										0.000	0.000
										First pumpage:	1970
.045	.047	.044	.044	.041	.041	.040	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	?
.002	.002	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1974
.041	.041	.041	.041	.041	.041	.031	.027	.000	.000	.000	.000
										.000	.000
										First pumpage:	1955
.010	.010	.010	.010	.010	.010	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1970
.015	.019	.024	.026	.026	.023	.012	.002	.000	.000	.000	.000
										.000	.000
										First pumpage:	1966
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	?
.084	.074	.068	.066	.044	.060	.070	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1965
.008	.008	.008	.008	.003	.002	.002	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1966
.010	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1975
.011	.008	.005	.004	.004	.003	.002	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1964
.530	.548	.531	.521	.478	.511	.278	.178	.000	.000	.000	.000
										.000	.000
										First pumpage:	1951
.055	.055	.057	.054	.029	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1971
.099	.110	.066	.051	.018	.005	.005	.005	.000	.000	.000	.000
										.000	.000
										First pumpage:	1971
2.634	2.401	2.168	2.175	2.210	2.397	1.768	1.147	.685	.000	.000	.000
										.000	.000
										First pumpage:	1944
.080	.035	.307	.029	.296	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1971
.000	.001	.048	.038	.038	.038	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	?
.006	.006	.008	.008	.008	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	?
.046	.045	.045	.053	.053	.040	.040	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1964
.465	.519	.464	.482	.503	.429	.018	.001	.000	.000	.000	.000
										.000	.000
										First pumpage:	1969
.015	.014	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1974
.037	.174	.428	.409	.333	.204	.050	.024	.012	.006	.000	.000
										.000	.000
										First pumpage:	1934
.147	.129	.091	.042	.000	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1972
.093	.234	.464	.408	.331	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1971
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1978
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1978
.010	.010	.012	.011	.010	.010	.000	.000	.000	.000	.000	.000
										.000	.000
										First pumpage:	1970

Ground-water withdrawals by large users in Anne Arundel County, 1900 through 1980--Continued

User	Appropriation number	Aquifer	Maryland grid coordinates					
				1980	1979	1978	1977	1976
Rol-Park Trailer Park	58-005	Patapsco	N488 E904	0.017	0.015	0.013	0.012	0.010
Sandy Point State Park	49-004	Magothy	N434 E969	.011	.010	.010	.010	.010
Sands Road Joint Venture, Patuxent Mobile Estates	73-013	Aquia	N393 E890	.047	.000	.000	.000	.000
Sawmill Creek wells, Anne Arundel County Department of Utilities	69-019	Patapsco	N487 E905	1.844	1.679	.818	1.124	1.350
Severn Mobile Home Court	55-016	Patapsco	N458 E882	.015	.015	.016	.015	.015
Severna Park, Anne Arundel County Department of Utilities	53-008	Patapsco	N450 E929	4.181	3.167	2.724	2.011	2.355
Severn Water Company	69-016	Patapsco	N465 E880	.405	.388	.380	.332	.304
Sherwood Forest Water Service	63-029	Magothy	N433 E928	.059	.057	.058	.066	.055
Southern Senior High School	68-011	Magothy	N378 E908	.033	.032	.020	.014	.000
Southdown Shores Water Works	58-008	Aquia	N403 E921	.030	.041	.022	.022	.022
Summer Hill, Incorporated	60-021	Magothy	N428 E918	.012	.012	.015	.013	.013
Sylvan Shores	56-002	Magothy	N408 E919	.040	.042	.041	.044	.038
Sylvan Shorea	56-002	Quaternary	N408 E919	.000	.000	.000	.000	.000
Thelma Avenue, Anne Arundel County Department of Utilities	69-019	Patapsco	N481 E903	.207	.283	.339	.314	.341
Tracy's Landing School	61-027	Aquia	N346 E916	.003	.003	.003	.003	.003
Transit Truck Stop	62-026	Patapsco	N462 E905	.019	.019	.019	.020	.016
Two Guys Department Store	57-004	Patapsco	N487 E908	.000	.000	.000	.000	.200
USS Agricultural Chemical Company	67-042	Patuxent	N499 E918	.000	.007	.009	.007	.011
U.S. Air Force, Davidsonville housing	32-004	Magothy	N413 E890	.000	.000	.012	.000	.000
U.S. Naval Academy	32-003	Patapsco	N419 E946	1.605	1.413	1.461	1.400	1.259
U.S. Naval Academy Golf Course	70-041	Patapsco	N423 E953	.000	.000	.000	.011	.011
U.S. Naval Ship Research and Development Center	32-001	Patapsco	N421 E949	.311	.331	.341	.329	.390
U.S. Naval Ship Research and Development Center	32-001	Magothy	N421 E949	.140	.143	.161	.137	.168
Wayson's Mobile Court	60-008	Aquia	N356 E884	.047	.047	.055	.055	.053
Westinghouse Electric Corporation	66-027	Patapsco	N429 E968	.022	.023	.022	.019	.029
Whispering Woods	75-014	Patapsco	N436 E949	.036	.035	.060	.046	.050
Woodfield Fish and Oyster Company	54-003	Aquia	N370 E930	.044	.040	.035	.032	.043



Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1800-19
0.010	0.010	0.010	0.010	0.010	0.010	0.008	0.003	0.000	0.000	0.000	0.000
										0.000	0.000
										First pumpage:	1959
.010	.010	.010	.010	.010	.010	.007	.004	.000	.000	.000	.000
										First pumpage:	1950
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	?
.851	1.010	1.390	1.480	1.510	1.410	1.232	.519	.192	.089	.002	.000
										First pumpage:	1926
.013	.016	.024	.019	.018	.016	.012	.004	.000	.000	.000	.000
										First pumpage:	1956
2.136	1.997	1.557	1.291	1.189	.758	.551	.142	.042	.000	.000	.000
										First pumpage:	1947
.255	.225	.174	.132	.035	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1971
.048	.051	.055	.053	.047	.070	.060	.000	.000	.000	.000	.000
										First pumpage:	1965
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1977
.022	.022	.020	.024	.016	.016	.011	.002	.000	.000	.000	.000
										First pumpage:	1957
.010	.010	.010	.010	.009	.007	.003	.000	.000	.000	.000	.000
										First pumpage:	1960
.034	.043	.047	.052	.043	.041	.038	.035	.000	.000	.000	.000
										First pumpage:	1955
.000	.000	.000	.000	.000	.000	.000	.033	.027	.014	.000	.000
										First pumpage:	1934
.303	.256	.273	.293	.045	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1971
.003	.003	.003	.003	.033	.003	.003	.000	.000	.000	.000	.000
										First pumpage:	1962
.027	.029	.027	.020	.020	.020	.020	.000	.000	.000	.000	.000
										First pumpage:	1965
.200	.200	.178	.282	.178	.200	.200	.000	.000	.000	.000	.000
										First pumpage:	?
.008	.008	.011	.041	.041	.041	.037	.034	.019	.000	.000	.000
										First pumpage:	1949
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1978
1.388	1.370	1.257	1.350	1.315	1.275	.985	1.028	1.000	1.000	1.000	.925
										First pumpage:	199,
.011	.011	.011	.011	.011	.011	.002	.002	.001	.000	.000	.000
										First pumpage:	1940
.329	.298	.365	.290	.314	.315	.383	.384	.307	.000	.000	.000
										First pumpage:	1948
.164	.200	.200	.200	.200	.180	.190	.188	.150	.000	.000	.000
										First pumpage:	1948
.057	.051	.049	.049	.047	.041	.036	.000	.000	.000	.000	.000
										First pumpage:	1966
.035	.028	.033	.043	.090	.061	.027	.000	.000	.000	.000	.000
										First pumpage:	1967
.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1975
.055	.048	.046	.055	.055	.041	.039	.028	.025	.023	.022	.000
										First pumpage:	1920

**Ground-water withdrawals by large users in the Coastal Plain area of Baltimore City, 1900 through 1980**

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Canton District	None	Patuxent	N521 E924	0.000	0.000	0.000	0.000	0.000
Crown Cork & Seal	None	Patuxent	N532 E923	.000	.000	.000	.000	.000
Curtis Bay District	None	Patapsco	N509 E917	.000	.000	.000	.000	.000
Curtis Bay District	None	Patuxent	N509 E917	.000	.000	.000	.000	.000
Dundalk District	None	Patuxent	N517 E937	.000	.000	.000	.000	.000
F.M.C. Corporation, Industrial Chemical Division	60-002	Patuxent	N510 E919	.421	.593	.374	.533	.723
Fairfield District	None	Patuxent	N512 E923	.000	.000	.000	.000	.000
Federal Yeast Corporation	60-001	Patuxent	N522 E932	2.585	2.705	2.590	2.262	2.052
Harbor District	None	Patuxent	N521 E924	.000	.000	.000	.000	.000
Harbor District	None	Quaternary	N521 E924	.000	.000	.000	.000	.000
Highlandtown District	None	Patuxent	N532 E923	.000	.000	.000	.000	.000
Hood Vinegar Company	56-001	Patuxent	N535 E924	.079	.065	.047	.029	.043
Monarch Rubber Company	None	Patuxent	N532 E923	.000	.000	.000	.000	.000
Paul Jones Company	None	Patuxent	N532 E923	.000	.000	.000	.000	.000
Pennsylvania Water and Power	None	Patuxent	N532 E923	.000	.000	.000	.000	.000
Schluderberg-Kurdie Incorporated	58-001	Patuxent	N532 E923	.234	.261	.213	.186	.137

**Ground-water withdrawals by large users in the Coastal Plain area of Baltimore County, 1900 through 1980**

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Amercian Yeast Corporation	69-020	Patuxent	N524 E953	0.700	0.700	0.700	0.700	0.700
Bethlehem Steel Corporation	46-003	Patapsco	N504 E944	.000	.000	.000	.000	.000
Bethlehem Steel Corporation	46-003	Patuxent	N507 E945	3.606	4.929	5.422	5.151	5.553
Eastern Stainless Steel Corporation	56-006	Patuxent	N535 E940	.964	.822	.806	.877	.947
Joseph E. Seagram & Sons (Calvert Distillery)	78-017	Quaternary	N504 E886	.419	.545	.438	.358	.445
Joseph S. Merritt Incorporated	59-009	Patapsco	N519 E941	.017	.018	.017	.013	.021
Rocky Point Golf Course	70-006	Patuxent	N518 E966	.038	.015	.035	.056	.025

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.000	0.000	0.000	0.000	0.000	0.000	0.077	0.212	1.148	2.187	2.255	2.489
										First pumpage:	1918
.000	.000	.000	.000	.000	.000	.000	2.691	1.427	1.096	.000	.000
										First pumpage:	1939
.000	.000	.000	.000	.000	.000	.000	.186	.621	.821	.000	.000
										First pumpage:	1935
.000	.000	.000	.000	.000	.000	.000	.588	2.442	2.797	2.351	1.405
										First pumpage:	1915
.000	.000	.000	.000	.000	.000	.455	2.886	5.211	4.397	3.654	2.222
										First pumpage:	1900
.865	1.484	1.811	2.074	2.003	2.002	1.929	1.730	1.619	.000	.000	.000
										First pumpage:	?
.000	.000	.000	.000	.000	.000	1.781	2.561	4.725	4.068	3.388	1.756
										First pumpage:	1900
1.725	1.632	1.617	1.739	1.496	1.375	1.052	.840	1.000	.000	.000	.000
										First pumpage:	?
.000	.000	.000	.000	.000	.000	.000	.881	2.091	1.964	1.701	2.226
										First pumpage:	1918
.000	.000	.000	.000	.000	.000	.000	.047	.192	.274	.274	.274
										First pumpage:	1900
.000	.000	.000	.000	.000	.000	.000	.000	.000	1.676	1.129	.518
										First pumpage:	?
.087	.065	.050	.087	.078	.068	.065	.000	.000	.000	.000	.000
										First pumpage:	1969
.000	.000	.000	.000	.000	.000	.000	.053	.052	.016	.000	.000
										First pumpage:	1939
.000	.000	.000	.000	.000	.000	.000	.098	.117	.110	.000	.000
										First pumpage:	1939
.000	.000	.000	.000	.000	.000	.000	.007	.009	.005	.000	.000
										First pumpage:	1939
.219	.305	.174	.210	.151	.164	.256	.714	.870	.685	.000	.000
										First pumpage:	?

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.000	0.000	0.000	0.000	0.000
										First pumpage:	1969
.000	.000	.000	.000	.632	1.240	4.327	4.089	6.019	4.474	2.099	1.203
										First pumpage:	1915
4.975	5.414	5.578	5.025	6.589	7.778	5.608	5.695	6.905	4.474	2.099	1.203
										First pumpage:	1915
1.033	1.020	1.041	1.068	1.096	1.096	1.068	1.144	1.855	1.123	.333	.000
										First pumpage:	1923
.378	.565	.508	.633	.617	.529	.488	.480	.459	.000	.000	.000
										First pumpage:	1942
.015	.014	.016	.015	.019	.015	.013	.010	.005	.003	.003	.003
										First pumpage:	1913
.025	.026	.022	.029	.028	.015	.000	.000	.000	.000	.000	.000
										First pumpage:	1970

Ground-water withdrawals by large users in Calvert County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
A.I. Cassell Utility Corporation	59-002	Aquia	N268 E935	0.036	0.028	0.028	0.028	0.027
Baltimore Gas and Electric Company, Calvert Cliffs	69-010	Aquia	N219 E959	.121	.254	.252	.236	.205
Cavalier Country	70-004	Magothy	N333 E905	.048	.042	.038	.053	.049
Calvert Memorial Hospital	52-001	Aquia	N264 E915	.039	.032	.012	.012	.012
Calvert Middle School	73-008	Aquia	N260 E917	.004	.005	.006	.007	.010
Calvert Senior High School and Vocational Tech Center	70-005	Aquia	N263 E919	.009	.008	.012	.014	.011
Chesapeake Beach water system	72-003	Aquia	N310 E931	.047	.038	.038	.038	.029
Chesapeake Ranch Water Company	60-002	Piney Point	N193 E964	.028	.027	.023	.014	.023
Chesapeake Ranch Water Company	60-002	Aquia	N193 E975	.088	.092	.077	.046	.077
Columbia LNG Corporation	73-014	Aquia	N203 E969	.012	.012	.008	.006	.027
Dares Beach Water Company	74-002	Piney Point	N264 E937	.029	.022	.004	.000	.000
Kenwood Beach; Calvert water system	68-009	Piney Point	N241 E941	.017	.021	.016	.017	.016
Long Beach; Calvert water system	62-001	Piney Point	N227 E952	.062	.061	.054	.038	.038
Long Beach; Calvert water system	62-001	Aquia	N227 E952	.015	.015	.013	.027	.027
Northern Middle School	72-001	Magothy	N310 E898	.017	.016	.015	.015	.012
Northern High School	72-041	Magothy	N310 E899	.018	.018	.015	.015	.011
Prince Frederick water system	74-005	Aquia	N259 E916	.101	.086	.094	.096	.093
Scientist Cliffs Service Company	53-002	Aquia	N246 E939	.012	.013	.010	.019	.016
Scientist Cliffs Service Company	53-002	Piney Point	N246 E937	.028	.023	.030	.030	.030
Shores of Calvert	72-002	Magothy	N330 E891	.037	.032	.028	.025	.030
U.S. Navy, Randle Cliffs	32-002	Aquia	N301 E933	.038	.036	.030	.042	.058
U.S. Navy, Solomon Test Facility	32-001	Aquia	N184 E953	.090	.082	.071	.068	.062
White Sands Corporation	56-002	Piney Point	N215 E947	.008	.003	.002	.013	.013

Pumpage, in millions of gallons per day

1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.027	0.027	0.026	0.026	0.026	0.012	0.011	0.003	0.000	0.000	0.000	0.000 First pumpage: 1951
.213	.124	.145	.137	.137	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.047	.047	.044	.041	.038	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.011	.011	.011	.010	.005	.005	.005	.004	.000	.000	.000	.000 First pumpage: 1953
.011	.008	.006	.004	.005	.006	.006	.000	.000	.000	.000	.000 First pumpage: 1962
.008	.008	.010	.011	.010	.005	.000	.000	.000	.000	.000	.000 First pumpage: 1970
.023	.031	.030	.030	.030	.030	.028	.010	.005	.005	.005	.005 First pumpage: 1900
.018	.016	.014	.012	.012	.024	.022	.000	.000	.000	.000	.000 First pumpage: 1961
.058	.055	.046	.040	.040	.028	.027	.000	.000	.000	.000	.000 First pumpage: 1961
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1976
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1978
.016	.016	.017	.005	.005	.005	.004	.000	.000	.000	.000	.000 First pumpage: 1963
.038	.031	.033	.030	.030	.030	.026	.000	.000	.000	.000	.000 First pumpage: ?
.027	.027	.021	.019	.019	.019	.022	.027	.000	.000	.000	.000 First pumpage: 1951
.005	.004	.003	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1973
.006	.004	.003	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1972
.093	.090	.090	.090	.090	.090	.000	.000	.000	.000	.000	.000 First pumpage: 1970
.008	.011	.011	.008	.009	.008	.008	.000	.000	.000	.000	.000 First pumpage: 1965
.033	.027	.024	.021	.019	.021	.024	.020	.008	.000	.000	.000 First pumpage: 1947
.030	.004	.004	.004	.004	.004	.000	.000	.000	.000	.000	.000 First pumpage: 1975
.079	.044	.068	.068	.082	.096	.093	.063	.060	.000	.000	.000 First pumpage: 1941
.075	.075	.075	.075	.075	.075	.100	.519	.751	.000	.000	.000 First pumpage: 1941
.014	.012	.012	.012	.012	.012	.012	.002	.000	.000	.000	.000 First pumpage: 1950

Ground-water withdrawals by large users in Caroline County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Cooklyn Dairies	49-002	Choptank	N438 E1145	0.000	0.000	0.000	0.000	0.000
David M. King Canning Company	63-001	Quaternary	N438 E1144	.000	.000	.000	.000	.000
Denton, Town of	71-002	Piney Point	N383 E1133	.355	.268	.291	.273	.266
Electro-therm, Incorporated	70-002	Piney Point	N386 E1128	.008	.008	.014	.017	.015
Federalsburg, Town of	75-006	Columbia	N315 E1153	.498	.378	.384	.389	.448
Federalsburg, Town of	75-006	Federalsburg	N315 E1153	.166	.126	.128	.130	.149
Grasonville Fisheries, Incorporated	70-007	Frederica	N406 E1116	.130	.110	.175	.095	.110
Greensboro, Town of	70-009	Piney Point	N418 E1138	.171	.188	.182	.185	.200
John N. Wright Jr., Incorporated	50-003	Calvert	N313 E1148	.000	.000	.000	.000	.000
John N. Wright, Jr., Incorporated	46-001	Federalsburg	N319 E1125	.056	.056	.056	.059	.058
Maryland Plastics	50-002	Calvert	N315 E1153	.001	.001	.002	.001	.002
Northern Caroline High School and Denton Elementary School	78-004	Piney Point	N337 E1135	.017	.017	.017	.017	.017
Northern Caroline High School and Denton Elementary School	78-004	Cheswold	N337 E1135	.021	.021	.021	.022	.022
Nuttle Canning Company	68-006	Federalsburg	N368 E1163	.000	.000	.040	.040	.040
Preston, Town of	79-006	Pleistocene	N322 E1111	.070	.070	.070	.070	.070
Ridgely, Town of	79-005	Frederica	N407 E1116	.186	.186	.184	.181	.178
Saulsbury Brothers, Incorporated	46-002	Quaternary	N405 E1115	.237	.256	.272	.274	.236
T. Noble Jarrell Canning Company	65-001	Quaternary	N438 E1145	.000	.000	.144	.144	.144
The Benedictine School	49-003	Frederica	N428 E1117	.024	.024	.022	.025	.022
Wheatley Canning Company	46-004	Calvert	N315 E1153	.000	.000	.000	.000	.000
Wilson Laurel Farms, Incorporated	51-002	Choptank	N384 E1128	.000	.000	.000	.000	.000

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.000	0.000	0.000	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.000	0.000
										First pumpage:	1932
.000	.000	.000	.000	.000	.041	.041	.000	.000	.000	.000	.000
										First pumpage:	1963
.321	.291	.274	.274	.268	.262	.241	.200	.163	.143	.090	.036
										First pumpage:	?
.015	.015	.015	.015	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1972
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	?
.548	.548	.521	.521	.521	.521	.503	.484	.416	.144	.034	.030
										First pumpage:	?
.110	.110	.126	.101	.075	.113	.018	.000	.000	.000	.000	.000
										First pumpage:	1969
.172	.164	.164	.164	.164	.151	.118	.079	.063	.047	.021	.008
										First pumpage:	1916
.000	.000	.000	.000	.000	.000	.027	.027	.000	.000	.000	.000
										First pumpage:	?
.058	.074	.074	.074	.074	.084	.108	.110	.000	.000	.000	.000
										First pumpage:	?
.002	.002	.001	.002	.001	.090	.090	.090	.000	.000	.000	.000
										First pumpage:	1950
.017	.011	.011	.011	.011	.011	.011	.011	.000	.000	.000	.000
										First pumpage:	1959
.022	.022	.022	.015	.015	.015	.014	.000	.000	.000	.000	.000
										First pumpage:	1963
.040	.040	.040	.040	.040	.040	.040	.040	.040	.040	.000	.000
										First pumpage:	1933
.070	.070	.070	.070	.070	.070	.070	.070	.070	.070	.070	.000
										First pumpage:	1926
.178	.170	.164	.159	.151	.142	.112	.066	.031	.024	.022	.020
										First pumpage:	1918
.219	.170	.219	.219	.219	.219	.500	.500	.500	.500	.500	.000
										First pumpage:	1920
.144	.144	.144	.000	.144	.144	.144	.144	.144	.144	.144	.000
										First pumpage:	1920
.017	.006	.005	.005	.005	.005	.005	.005	.004	.030	.003	.000
										First pumpage:	1920
.000	.000	.000	.150	.150	.150	.150	.150	.150	.000	.000	.000
										First pumpage:	1946
.000	.000	.000	.000	.215	.115	.133	.119	.000	.000	.000	.000
										First pumpage:	?

Ground-water withdrawals by large users in the Coastal Plain area of Cecil County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Buttonwood Beach	74-017	Potomac Group	N592 E1091	0.029	0.009	0.014	0.027	0.014
Carpenters Point water system	67-023	Potomac Group	N627 E1079	.010	.012	.015	.014	.014
Cecilton, Town of	72-004	Magothy	N574 E1120	.025	.026	.030	.025	.022
Chesapeake City	79-018	Potomac Group	N619 E1134	.168	.164	.162	.159	.159
Crystal Beach	69-014	Potomac Group	N589 E1090	.018	.017	.000	.000	.000
Elk Neck State Park	60-013	Potomac Group	N606 E1086	.025	.024	.025	.027	.000
Elkton, Town of: Holly Hall water system	61-007	Potomac Group	N645 E1135	.213	.239	.238	.196	.164
Holly Hall Terrace Utility Corporation	54-007	Potomac Group	N646 E1134	.000	.000	.000	.000	.000
Hooker Plastics	71-002	Pleistocene	N633 E1078	.000	.000	.000	.000	.000
Meadowview Utilities Incorporated	58-005	Potomac Group	N664 E1139	.113	.110	.114	.000	.000
Morning Cheer, Sandy Cove	62-001	Potomac Group	N624 E1091	.006	.012	.015	.011	.010
Pinea Hills Subdivision	61-002	Potomac Group	N629 E1114	.021	.012	.012	.013	.013
Pirelli Cable Corporation	60-011	Potomac Group	N650 E1127	.038	.041	.043	.043	.042
Thickol Chemical Company	57-003	Potomac Group	N649 E1119	.024	.025	.023	.026	.021
Town and Country Mobile Park, Incorporated	66-025	Potomac Group	N650 E1103	.030	.016	.004	.004	.004



Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
											0.000
											First pumpage: 1975
.014	.016	.014	.000	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: 1973
.022	.020	.024	.026	.027	.027	.027	.000	.000	.000	.000	.000
											First pumpage: 1968
.156	.153	.153	.151	.148	.148	.139	.124	.091	.055	.000	.000
											First pumpage: 1937
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: ?
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: ?
.137	.110	.105	.111	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: 1972
.000	.000	.000	.000	.110	.110	.102	.026	.000	.000	.000	.000
											First pumpage: 1954
.000	.000	.004	.008	.012	.000	.000	.000	.000	.000	.000	.000
											First pumpage: 1971
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: ?
.010	.011	.012	.009	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: 1972
.013	.013	.014	.015	.015	.014	.000	.000	.000	.000	.000	.000
											First pumpage: ?
.043	.042	.043	.053	.038	.036	.038	.000	.000	.000	.000	.000
											First pumpage: 1961
.024	.028	.037	.037	.037	.036	.022	.018	.016	.000	.000	.000
											First pumpage: 1948
.004	.003	.003	.003	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: 1972

Ground-water withdrawals by large users in Charles County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Beantown Water Association	68-008	Magothy	N284 E841	0.014	0.013	0.012	0.012	0.011
Bel Alton Estates, Charles County Department of Public Works	74-010	Patapsco	N232 E807	.012	.010	.009	.009	.009
Berry Road well, Charles County Department of Public Works	70-009	Magothy	N297 E815	.625	.593	.610	.295	.244
Brookwood Utilities	67-009	Magothy	N282 E803	.041	.041	.040	.040	.039
Carmel Utilities Company	66-008	Patapsco	N267 E801	.015	.014	.021	.016	.015
Cedarville State Fish Hatchery	77-033	Magothy	N293 E847	.087	.006	.004	.000	.000
Charles County Community College	68-001	Patapsco	N264 E798	.011	.010	.010	.010	.010
Charles County Gardens Company	63-008	Magothy	N274 E838	.029	.024	.005	.005	.004
Charles Utilities Commission, Incorporated	55-003	Patuxent	N291 E781	.122	.112	.114	.110	.110
Cleveland Park, Charles County Department of Public Works	76-017	Magothy	N274 E821	.011	.010	.004	.000	.000
Clifton on the Potomac, Charles County Department of Public Works	69-001	Aquia	N195 E805	.038	.031	.040	.013	.008
Du-Mar Estates Water Company	68-002	Patuxent	N269 E753	.010	.012	.010	.010	.009
Ellenwood wells, Charles County Department of Public Works	75-002	Patapsco	N251 E816	.022	.022	.021	.019	.019
Indian Head, Town of	71-007	Patapsco	N280 E752	.100	.075	.074	.073	.092
Indian Head, Town of	71-007	Patuxent	N280 E758	.108	.138	.137	.136	.170
Inman Utilities Company	54-003	Patapsco	N291 E784	.010	.011	.011	.011	.011
J. Hanson School, Charles County Department of Public Works	70-009	Magothy	N287 E831	.646	.398	.316	.000	.000
Jenkins Lane Water Company	65-008	Patuxent	N288 E776	.009	.009	.010	.012	.010
La Plata, Town of	70-003	Patapsco	N250 E806	.281	.201	.308	.343	.226
La Plata, Town of	70-003	Aquia	N257 E803	.014	.005	.023	.022	.024
Lackey High School	68-009	Patapsco	N272 E762	.007	.008	.007	.009	.009
Mariellen Park Water Company	65-011	Aquia	N245 E814	.019	.018	.016	.016	.016
McDonough High School	75-001	Patapsco	N264 E790	.012	.010	.008	.003	.000
Newtown Estates Water Company, Incorporated	72-006	Aquia	N243 E818	.022	.028	.019	.016	.014
North well, Charles County Department of Public Works	70-009	Magothy	N298 E836	.194	.044	.195	.190	.341
Oak Hill Estates	69-003	Patapsco	N273 E802	.013	.011	.012	.012	.012
PEPCO, Morgantown	67-011	Patapsco	N192 E806	.762	.767	.702	.785	.820
Pine Hill Estates Water Company	71-004	Magothy	N271 E829	.011	.011	.011	.012	.012

Pumpage, in millions of gallons per day

1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.011	0.012	0.010	0.008	0.008	0.008	0.008	0.000	0.000	0.000	0.000	0.000
										0.000	0.000
										First pumpage:	1969
.008	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1975
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1976
.039	.039	.039	.038	.038	.027	.027	.000	.000	.000	.000	.000
										First pumpage:	1968
.014	.012	.010	.008	.008	.008	.008	.000	.000	.000	.000	.000
										First pumpage:	1966
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1978
.009	.009	.009	.009	.008	.008	.004	.000	.000	.000	.000	.000
										First pumpage:	1968
.004	.005	.005	.005	.004	.004	.002	.000	.000	.000	.000	.000
										First pumpage:	?
.110	.110	.110	.110	.110	.110	.077	.015	.000	.000	.000	.000
										First pumpage:	1956
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1978
.005	.003	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1973
.006	.007	.007	.007	.003	.002	.000	.000	.000	.000	.000	.000
										First pumpage:	1970
.016	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1975
.065	.074	.074	.190	.236	.192	.141	.091	.000	.000	.000	.000
										First pumpage:	1953
.121	.138	.138	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1973
.011	.011	.011	.010	.010	.010	.010	.000	.000	.000	.000	.000
										First pumpage:	1962
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1978
.010	.010	.010	.010	.010	.010	.008	.007	.000	.000	.000	.000
										First pumpage:	1956
.212	.150	.151	.140	.148	.170	.153	.118	.089	.000	.000	.000
										First pumpage:	1940
.019	.017	.020	.017	.018	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1971
.011	.012	.013	.012	.012	.012	.011	.000	.000	.000	.000	.000
										First pumpage:	1969
.016	.014	.011	.005	.002	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1973
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1977
.011	.010	.008	.002	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1972
.330	.336	.253	.223	.212	.210	.144	.000	.000	.000	.000	.000
										First pumpage:	1962
.012	.012	.013	.012	.012	.011	.000	.000	.000	.000	.000	.000
										First pumpage:	1970
.818	.842	.784	.859	.670	.274	.000	.000	.000	.000	.000	.000
										First pumpage:	1970
.012	.012	.013	.001	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1972

Ground-water withdrawals by large users in Charles County, 1900 through 1980--Continued

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Potomac Heights Home Owners Association	55-008	Patuxent	N280 E761	0.139	0.131	0.141	0.139	0.139
Potomac Utilities Corporation	66-005	Patuxent	N299 E779	.046	.047	.050	.041	.041
Potomac Utilities Corporation	66-005	Patapsco	N299 E779	.012	.012	.012	.010	.010
Quiet Acres and Billingsley Forest	71-003	Patuxent	N281 E791	.012	.010	.012	.012	.014
South well, Charles County Department of Public Works	70-009	Magothy	N279 E817	.266	.291	.080	.125	.272
Stardust Motel	58-003	Magothy	N293 E828	.000	.000	.000	.000	.000
St. Charles City, Charles County Department of Public Works	70-009	Magothy	N285 E825	.285	.365	.485	.497	.346
Trimac Water Company, Incorporated	55-001	Patapsco	N270 E630	.015	.014	.012	.000	.000
Turkey Hill Water Company	70-001	Patapsco	N271 E802	.010	.010	.010	.010	.010
U.S. Naval Ordnance Station, Indian Head	71-005	Patapsco	N279 E748	1.040	1.179	1.096	1.068	1.057
U.S. Naval Ordnance Station, Indian Head	71-005	Patuxent	N272 E750	.000	.000	.000	.000	.000
Woodland Village	57-003	Patuxent	N277 E757	.031	.022	.025	.025	.025
White Plains Park	74-007	Patapsco	N270 E822	.073	.016	.109	.055	.041
White Plains Water Company	85-007	Magothy	N274 E810	.022	.021	.020	.019	.017

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.129	0.141	0.133	0.128	0.123	0.123	0.120	0.120	0.100	0.094	0.000	0.000
										First pumpage:	1941
.039	.048	.039	.025	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1972
.009	.012	.010	.006	.032	.032	.030	.000	.000	.000	.000	.000
										First pumpage:	1966
.014	.014	.014	.014	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1972
.347	.326	.246	.223	.212	.210	.136	.000	.000	.000	.000	.000
										First pumpage:	1962
.000	.001	.001	.001	.002	.002	.009	.000	.000	.000	.000	.000
										First pumpage:	1960
.330	.289	.368	.360	.378	.370	.000	.000	.000	.000	.000	.000
										First pumpage:	1970
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	?
.010	.005	.003	.001	.001	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1971
1.301	1.617	1.438	1.438	1.440	1.524	1.149	.855	.522	.616	.787	.425
										First pumpage:	?
.000	.000	.000	.612	.710	.653	.492	.366	.224	.000	.000	.000
										First pumpage:	1945
.025	.025	.031	.031	.031	.022	.017	.015	.000	.000	.000	.000
										First pumpage:	1957
.027	.027	.027	.022	.019	.016	.014	.000	.000	.000	.000	.000
										First pumpage:	1969
.015	.015	.013	.011	.010	.008	.006	.000	.000	.000	.000	.000
										First pumpage:	1965

Ground-water withdrawals by large users in Dorchester County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
ACME Markets, Incorporated	59-004	Frederica	N292 E1126	0.265	0.342	0.335	0.250	0.429
Bloch and Guggenheimer, Incorporated	54-001	Quaternary	N292 E1128	.190	.190	.190	.190	.190
Bonnie Brook, Dorchester County Sanitary District	63-005	Piney Point	N265 E1081	.020	.019	.019	.019	.019
Bumble Bee Corporation	62-003	Piney Point	N263 E1067	.000	.000	.000	.000	.074
Cambridge, City of	71-005	Magothy	N264 E1065	.264	.270	.216	.314	.318
Cambridge, City of	71-005	Piney Point	N268 E1067	1.727	1.881	2.283	1.900	2.108
Cambridge, City of	71-005	Patapsco	N265 E1067	1.007	.860	.594	.769	.363
Country Pride Foods, Incorporated	71-003	Quaternary	N293 E1125	.460	.427	.430	.436	.457
Crystal Ice and Cold Storage	47-002	Magothy	N269 E1065	.000	.000	.000	.000	.000
Crystal Ice and Cold Storage	47-002	Piney Point	N269 E1065	.000	.000	.000	.000	.000
Dececco Corporation	66-005	Quaternary	N270 E1134	.030	.030	.030	.030	.030
Delmarva Power and Light Company	55-001	Federalsburg	N242 E1137	.008	.026	.022	.021	.025
Delmarva Power and Light Company	55-001	Quaternary	N242 E1138	.033	.066	.056	.054	.065
East Coast Cold Storage	62-007	Piney Point	N265 E1060	.048	.011	.004	.055	.111
East New Market, Town of	74-003	Calvert	N280 E1100	.032	.031	.035	.036	.035
Hanover Brands	62-002	Piney Point	N265 E1060	.004	.005	.004	.006	.098
Hurlock Pickling Company	61-002	Frederica	N292 E1120	.000	.000	.000	.000	.000
Hurlock, Town of	76-021	Frederica	N291 E1120	.287	.299	.248	.206	.192
Secretary, Town of	76-012	Piney Point	N284 E1100	.081	.076	.081	.041	.027
Vienna, Town of	79-004	Calvert	N239 E1130	.068	.061	.060	.058	.055
Walter T. Andrews and Son	53-002	Piney Point	N262 E1060	.000	.000	.009	.026	.018

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.426	0.490	0.404	0.306	0.276	0.247	0.238	0.160	0.000	0.000	0.000	0.000 First pumpage: 1954
.190	.190	.190	.190	.190	.190	.190	.190	.000	.000	.000	.000 First pumpage: 1950
.019	.019	.017	.017	.017	.015	.014	.000	.000	.000	.000	.000 First pumpage: 1961
.068	.087	.110	.110	.110	.145	.230	.439	.000	.000	.000	.000 First pumpage: 1952
.307	.343	.375	.262	.328	.467	.398	.434	.162	.000	.000	.000 First pumpage: 1945
2.227	2.587	2.467	2.519	2.570	3.164	2.634	2.849	2.266	1.305	.802	.644 First pumpage: ?
.465	.178	.175	.209	.217	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.438	.516	.496	.304	.256	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.000	.000	.000	.000	.000	.075	.075	.075	.075	.075	.075	.075 First pumpage: 1920
.000	.000	.000	.000	.000	.075	.075	.075	.075	.075	.075	.075 First pumpage: 1920
.027	.026	.026	.026	.025	.023	.022	.000	.000	.000	.000	.000 First pumpage: 1966
.018	.016	.015	.018	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1972
.046	.041	.039	.045	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1972
.077	.060	.083	.088	.140	.205	.218	.219	.219	.000	.000	.000 First pumpage: 1946
.035	.036	.035	.035	.035	.035	.031	.031	.033	.030	.027	.027 First pumpage: 1916
.128	.196	.235	.235	.235	.251	.276	.295	.001	.000	.000	.000 First pumpage: 1952
.000	.000	.000	.054	.054	.054	.054	.054	.000	.000	.000	.000 First pumpage: 1957
.178	.164	.151	.137	.137	.132	.131	.125	.106	.097	.094	.042 First pumpage: ?
.027	.065	.026	.026	.026	.030	.039	.039	.038	.038	.038	.025 First pumpage: ?
.052	.049	.048	.047	.045	.045	.048	.052	.046	.035	.029	.027 First pumpage: ?
.017	.024	.024	.004	.004	.004	.000	.000	.000	.000	.000	.000 First pumpage: 1970

**Ground-water withdrawals by large users in the Coastal Plain area of Harford County, 1900 through 1980**

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Aberdeen, Town of	77-022	Quaternary	N606 E1035	0.984	0.971	1.112	1.041	1.041
Aberdeen Proving Ground (Aberdeen wells)	78-058	Talbot	N568 E1013	.017	.016	.022	.028	.035
Aberdeen Proving Ground (Edgewood wells)	78-060	Talbot	N546 E1000	.016	.016	.023	.030	.037
Bata Shoe Company, Incorporated	52-002	Talbot	N596 E1015	.018	.027	.027	.026	.025
F.O. Mitchell and Brothers Canning Incorporated	47-003	Talbot	N597 E1024	.004	.007	.005	.010	.011
Interpace Corporation	56-007	Potomac Group	N595 E1025	.099	.120	.132	.101	.105
J.M. Huber Corporation	47-001	Talbot	N625 E1054	.178	.184	.176	.111	.113
Long Bar Harbor, Harford County Department of Public Works	66-012	Potomac Group	N594 E1011	.107	.134	.107	.000	.001
Joppatowne Utilities	63-013	Potomac Group	N575 E985	.259	.433	.296	.335	.318
Perryman wells, Harford County Department of Public Works	69-003	Potomac Group	N596 E1025	1.130	1.150	1.097	.981	2.321
Short Lane wells, Harford County Department of Public Works	69-025	Potomac Group	N595 E1027	1.778	1.826	1.504	2.181	1.096
Willoughby Beach Water Company	None	Potomac Group	N586 E1011	.038	.038	.038	.038	.038

**Ground-water withdrawals by large users in Kent County, 1900 through 1980**

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Betterton, Town of	79-002	Magothy	N560 E1065	0.016	0.015	0.015	0.015	0.015
C. H. Ashley & Son Oyster Company	55-001	Aquia	N467 E1028	.000	.000	.000	.000	.000
Camp Tockwogh	67-001	Patapsco	N556 E1048	.004	.004	.011	.004	.004
Campbell Soup Company	59-003	Aquia	N515 E1075	.580	.561	.649	.667	.644
Chestertown Utilities Commission	70-004	Aquia	N504 E1065	.505	.544	.473	.486	.479
Chestertown Utilities Commission	70-004	Patapsco	N504 E1065	.000	.000	.000	.000	.000
Fairlee District, Kent County Sanitary District	79-004	Magothy	N507 E1035	.038	.032	.029	.026	.023
Galena, Town of	71-003	Magothy	N551 E1118	.037	.040	.040	.043	.041
Ivens & Hudson Oyster Company	46-002	Magothy	N476 E1012	.000	.000	.000	.000	.000
Kennedyville, Kent Co. Sanitary District	67-008	Severn	N538 E1084	.012	.012	.012	.008	.008
Kent Packing Company	48-001	Magothy	N475 E1018	.000	.000	.000	.000	.000
Tenneco Chemicals Incorporated	59-002	Magothy	N521 E1058	.067	.076	.068	.088	.088
Rock Hall, Town of	71-004	Patapsco	N476 E1016	.153	.175	.163	.141	.136
Vita Food Products, Incorporated	54-001	Magothy	N504 E1062	.000	.000	.000	.000	.000



Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
1.014	1.000	1.200	1.200	1.200	1.200	0.968	0.294	0.152	0.105	0.075	0.038
										First pumpage:	1900
.041	.047	.053	.059	.065	.071	.104	.137	.137	.000	.000	.000
										First pumpage:	1940
.044	.051	.058	.064	.071	.078	.116	.163	.164	.000	.000	.000
										First pumpage:	1940
.041	.048	.049	.049	.049	.049	.044	.025	.018	.000	.000	.000
										First pumpage:	1940
.015	.023	.023	.023	.023	.023	.035	.035	.015	.015	.015	.015
										First pumpage:	1903
.067	.077	.139	.123	.123	.115	.113	.096	.000	.000	.000	.000
										First pumpage:	1956
.151	.204	.245	.181	.337	.326	.332	.091	.000	.000	.000	.000
										First pumpage:	1952
.001	.001	.002	.061	.054	.053	.050	.000	.000	.000	.000	.000
										First pumpage:	1967
.296	.261	.291	.508	.581	.538	.322	.000	.000	.000	.000	.000
										First pumpage:	?
.997	2.305	1.582	.735	.465	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1971
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1976
.038	.038	.038	.038	.038	.038	.038	.038	.000	.000	.000	.000
										First pumpage:	1854

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.000	0.000	0.000	0.000	0.000
										First pumpage:	1869
.000	.000	.000	.000	.000	.100	.108	.100	.000	.000	.000	.000
										First pumpage:	1855
.004	.004	.000	.002	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1872
.496	.628	.549	.522	.587	.591	.420	.000	.000	.000	.000	.000
										First pumpage:	1860
.421	.413	.492	.510	.315	.315	.315	.315	.275	.244	.000	.000
										First pumpage:	1935
.000	.000	.000	.000	.000	.000	.000	.000	.000	.227	.207	.200
										First pumpage:	?
.021	.017	.016	.015	.012	.001	.001	.000	.000	.000	.000	.000
										First pumpage:	1971
.038	.037	.029	.029	.029	.029	.027	.013	.013	.000	.000	.000
										First pumpage:	1942
.000	.000	.000	.000	.000	.024	.024	.024	.024	.000	.000	.000
										First pumpage:	1946
.008	.008	.008	.007	.006	.006	.006	.000	.000	.000	.000	.000
										First pumpage:	1967
.000	.000	.000	.000	.000	.150	.150	.150	.150	.000	.000	.000
										First pumpage:	1948
.066	.071	.075	.077	.063	.031	.000	.000	.000	.000	.000	.000
										First pumpage:	1970
.127	.129	.133	.133	.164	.140	.125	.110	.110	.081	.075	.000
										First pumpage:	1927
.000	.000	.000	.000	.096	.096	.096	.096	.096	.000	.000	.000
										First pumpage:	1844

Ground-water withdrawals by large users in the Coastal Plain area of Prince Georges County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
BFW Fabrication Company	65-005	Magothy	N309 E853	0.001	0.001	0.004	0.010	0.010
Bowie, City of	61-008	Magothy	N413 E876	.235	.121	.175	.152	.230
Bowie, City of	61-008	Patapsco	N413 E876	.164	.811	1.228	1.240	1.281
Bowie, City of	61-008	Patuxent	N413 E878	2.075	1.476	1.054	1.172	1.072
Boy's Village	56-007	Magothy	N329 E846	.112	.116	.090	.101	.082
Brandywine Country Club	71-002	Magothy	N333 E864	.000	.000	.000	.000	.000
Calvert Manor Corporation	55-011	Patapsco	N310 E798	.019	.016	.020	.019	.019
Cedar Ridge Company	51-003	Patapsco	N347 E800	.022	.021	.028	.027	.029
Cedarville Park, Incorporated	63-006	Magothy	N300 E850	.044	.045	.047	.049	.055
First Maryland Utilities, Incorporated	63-003	Magothy	N366 E879	.183	.187	.193	.115	.187
Forest Heights, Washington Suburban Sanitary Commission	74-017	Patuxent	N358 E799	.000	.000	.000	.000	.000
Fort Foote, Washington Suburban Sanitary Commission	74-018	Patapsco	N340 E795	.000	.000	.000	.000	.000
Fort Washington	None	Patapsco	N318 E794	.000	.000	.000	.000	.000
Fort Washington	None	Patuxent	N318 E794	.000	.000	.000	.000	.000
Greenbelt Consumer Service	47-002	Patuxent	N426 E836	.002	.002	.000	.000	.000
Lone Star Industries, Incorporated	59-001	Magothy	N356 E843	.000	.000	.000	.003	.008
Maryland National Capital Park and Planning Commission	70-006	Patapsco	N384 E858	.005	.010	.007	.005	.003
Mineral Pigments Corporation	None	Patuxent	N449 E829	.000	.000	.000	.000	.000
Morningside Village and Gwynn Subdivision	49-006	Patapsco	N364 E830	.000	.000	.000	.000	.000
Northeast Marlboro water system	47-003	Magothy	N361 E871	.002	.002	.002	.012	.014
Patuxent Wildlife Research Refuge	58-003	Patuxent	N443 E856	.164	.137	.141	.080	.000
Patuxent Wildlife Research Refuge	58-003	Patapsco	N443 E856	.000	.014	.027	.070	.070
PEPCO, Chalk Point	62-007	Magothy	N259 E892	.776	.671	.696	.685	.945
PEPCO, Chalk Point	62-007	Patapsco	N259 E892	.298	.304	.345	.189	.173
Potomac Vista Corporation	52-004	Patapsco	N347 E797	.015	.011	.011	.000	.000
Safeway Stores, Incorporated	55-005	Magothy	N347 E858	.000	.000	.000	.010	.010
Simpson Land Company, Incorporated	61-005	Magothy	N407 E879	.014	.015	.011	.012	.012

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.000	0.000	0.000	0.000	0.000 First pumpage: 1963
.254	.171	.195	.353	.478	.268	.184	.000	.000	.000	.000	.000 First pumpage: 1962
1.131	1.158	1.104	.874	1.409	.994	.710	.000	.000	.000	.000	.000 First pumpage: 1961
1.124	1.268	1.395	1.445	.852	1.420	1.049	.000	.000	.000	.000	.000 First pumpage: 1965
.082	.082	.082	.082	.096	.110	.149	.069	.027	.017	.011	.008 First pumpage: 1910
.000	.000	.000	.020	.019	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.018	.018	.017	.017	.014	.004	.004	.003	.000	.000	.000	.000 First pumpage: 1971
.030	.031	.032	.033	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1972
.058	.058	.058	.058	.058	.058	.058	.055	.000	.000	.000	.000 First pumpage: 1950
.175	.145	.127	.119	.096	.060	.034	.000	.000	.000	.000	.000 First pumpage: 1969
.000	.000	.000	.490	.479	.466	.423	.324	.158	.000	.000	.000 First pumpage: 1946
.000	.000	.233	.477	.467	.675	.620	.397	.000	.000	.000	.000 First pumpage: 1958
.000	.000	.000	.000	.000	.000	.022	.018	.010	.010	.010	.010 First pumpage: 1903
.000	.000	.000	.000	.000	.000	.033	.023	.007	.000	.000	.000 First pumpage: 1940
.000	.000	.000	.000	.000	.000	.000	.100	.100	.000	.000	.000 First pumpage: 1948
.017	.014	.015	.016	.013	.015	.017	.000	.000	.000	.000	.000 First pumpage: 1961
.002	.001	.002	.003	.002	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.000	.000	.000	.000	.000	.000	.068	.056	.034	.000	.000	.000 First pumpage: 1948
.000	.000	.000	.000	.000	.000	.000	.100	.044	.000	.000	.000 First pumpage: 1941
.013	.013	.012	.010	.018	.011	.012	.013	.000	.000	.000	.000 First pumpage: 1950
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: ?
.070	.070	.070	.070	.070	.070	.070	.000	.000	.000	.000	.000 First pumpage: ?
.749	.501	.440	.482	.487	.477	.317	.000	.000	.000	.000	.000 First pumpage: 1960
.158	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1975
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1978
.002	.002	.003	.012	.012	.012	.011	.001	.000	.000	.000	.000 First pumpage: 1855
.012	.012	.012	.012	.012	.012	.012	.000	.000	.000	.000	.000 First pumpage: 1961

Ground-water withdrawals by large users in the Coastal Plain area of Prince Georges County, 1900 through 1980--Continued

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
U.S. Department of Agriculture, Beltsville	66-012	Potuxent	N440 E836	0.607	0.573	0.625	0.705	0.715
U.S. Naval Research Laboratory, Brandywine	65-008	Petapsco	N308 E842	.014	.030	.030	.030	.030
Upper Marlboro, Washington Suburban Sanitary Commission	70-002	Magothy	N349 E878	.021	.017	.015	.041	.057
U.S. Air Force Country Club	32-001	Potomac Group	N319 E865	.000	.000	.000	.000	.000
U.S. Navy, Cheltenham	None	Magothy	N334 E841	.060	.060	.060	.060	.060
Washington Gas Light Company	57-014	Potomac Group	N320 E832	.000	.000	.000	.000	.000
Willie G. Sauerwein	53-006	Magothy	N355 E880	.007	.005	.008	.008	.010

Ground-water withdrawals by large users in Queen Annes County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Centreville, Town of	67-002	Aquia	N443 E1060	0.132	0.133	0.132	0.135	0.133
Centreville, Town of	67-002	Severn	N443 E1068	.329	.331	.329	.337	.333
Chesapeake Bay Model Shelter, U.S. Army Corps of Engineers	74-008	Magothy	N412 E985	.043	.071	.065	.060	.053
Country Pride Foods, Queenstown	69-003	Aquia	N420 E1052	.016	.013	.003	.003	.002
Jenkins Food Corporation	60-005	Aquia	N462 E1096	.000	.039	.024	.033	.050
Jenkins Food Corporation	60-005	Quaternary	N482 E1096	.000	.010	.006	.008	.013
Maryland Department of Correction, Eastern Pre-Release Unit	63-002	Aquia	N468 E1086	.019	.000	.000	.000	.000
Millington, Town of (sewage treatment plant)	66-013	Aquia	N521 E1128	.012	.012	.012	.011	.011
Princeton Turf Farms, Incorporated	71-010	Aquia	N423 E1054	.000	.000	.000	.029	.027
Prospect Plantation Golf Course	76-003	Aquia	N392 E1029	.022	.002	.000	.000	.000
Queenstown, Town of	79-010	Aquia	N423 E1040	.044	.000	.000	.000	.000
S.E.W. Friel Cannery, Queenstown	71-007	Cheswold	N421 E1041	.016	.012	.015	.009	.020
S.E.W. Friel Cannery, Queenstown	71-007	Aquia	N421 E1041	.032	.023	.028	.018	.039
S.E.W. Friel Cannery, Wye Mills	56-001	Aquia	N410 E1067	.105	.098	.128	.113	.093
Stevens Village Utility Company	70-002	Aquia	N417 E994	.032	.020	.018	.014	.011

Pumpage, in millions of gallons per day													
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19		
0.731	0.779	0.788	0.780	0.764	0.696	0.559	0.002	0.000	0.000	0.000	0.000	0.000	First pumpage: ?
.030	.030	.030	.030	.030	.030	.000	.000	.000	.000	.000	.000	.000	First pumpage: 1970
.073	.102	.054	.046	.048	.050	.051	.089	.125	.000	.000	.000	.000	First pumpage: 1949
.070	.070	.070	.070	.070	.070	.000	.000	.000	.000	.000	.000	.000	First pumpage: 1970
.056	.055	.065	.066	.068	.082	.144	.253	.330	.171	.000	.000	.000	First pumpage: 1938
.000	.000	.000	.000	.000	.000	.000	.026	.000	.000	.000	.000	.000	First pumpage: ?
.011	.011	.012	.011	.008	.011	.011	.011	.000	.000	.000	.000	.000	First pumpage: 1950

Pumpage, in millions of gallons per day													
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19		
0.116	0.118	0.117	0.117	0.119	0.119	0.105	0.082	0.000	0.000	0.000	0.000	0.000	First pumpage: 1955
.289	.294	.293	.200	.200	.200	.200	.161	.200	.200	.200	.200	.200	First pumpage: ?
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: 1976
.002	.002	.002	.002	.002	.002	.002	.000	.000	.000	.000	.000	.000	First pumpage: 1964
.035	.029	.030	.026	.000	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: 1972
.009	.007	.008	.007	.000	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: 1972
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: ?
.011	.010	.008	.007	.005	.004	.002	.000	.000	.000	.000	.000	.000	First pumpage: 1966
.000	.000	.001	.022	.006	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: ?
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: 1979
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: ?
.013	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: 1975
.025	.016	.027	.022	.025	.025	.023	.019	.019	.000	.000	.000	.000	First pumpage: 1945
.118	.120	.107	.104	.081	.077	.073	.041	.041	.000	.000	.000	.000	First pumpage: 1945
.008	.007	.007	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	First pumpage: 1973

Ground-water withdrawals by large users in St. Marys County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Birch Manor, St. Marys Metropolitan Commission	74-035	Aquia	N211 E880	0.024	0.023	0.019	0.017	0.011
Cedar Cove, St. Marys Metropolitan Commission	73-003	Aquia	N155 E967	.047	.039	.040	.060	.074
Chance Water Company	56-006	Piney Point	N158 E946	.010	.011	.011	.011	.011
Cherry Cove Water Company	69-017	Aquia	N158 E896	.065	.038	.037	.041	.049
Country Lakes, St. Marys Metropolitan Commission	76-003	Aquia	N208 E864	.028	.022	.017	.004	.003
Fenwick Manor, St. Marys Metropolitan Commission	74-043	Aquia	N188 E926	.020	.009	.005	.002	.008
Green Acres Drive-In, Incorporated	76-024	Aquia	N155 E902	.031	.038	.038	.029	.008
Greenview Knolls Water Company	67-001	Piney Point	N157 E945	.065	.048	.051	.045	.044
James Hill Trailer Park	52-002	Piney Point	N151 E946	.040	.039	.043	.044	.044
King and Kennedy wells, St. Marys Metropolitan Commission	71-004	Aquia	N203 E897	.021	.019	.018	.015	.011
Leonardtwn, Town of	67-003	Aquia	N169 E904	.310	.335	.287	.220	.205
Leonardtwn High School	67-009	Aquia	N158 E912	.013	.010	.008	.008	.008
Lexington Park, St. Marys Metropolitan Commission	46-001	Aquia	N156 E954	.694	.726	.730	.864	.680
Lundeburg School of Seamanship	70-010	Aquia	N111 E944	.085	.096	.096	.096	.096
Mayjack, Incorporated	56-008	Piney Point	N169 E942	.038	.026	.030	.025	.027
Mt. Pleasant Water Company	72-004	Aquia	N170 E874	.011	.008	.006	.005	.004
Patuxent Naval Air Station	74-018	Piney Point	N166 E960	.065	.056	.055	.062	.062
Patuxent Naval Air Station	74-018	Aquia	N160 E961	.765	.780	.761	.902	.870
Patuxent Naval Air Station	74-018	Aquia	N159 E971	.020	.020	.021	.019	.018
Patuxent Naval Air Station	74-018	Piney Point	N159 E971	.020	.020	.021	.019	.018
Point Lookout State Park	66-009	Upper Cretaceous	N084 E991	.012	.006	.007	.008	.010
Rolling Acres, St. Marys Metropolitan Commission	74-025	Aquia	N241 E881	.021	.015	.013	.012	.008
Southern Maryland Utilities Company	72-001	Patapsco	N200 E844	.010	.010	.010	.010	.012
St. Clements Shores Water Company	65-002	Aquia	N164 E887	.032	.024	.028	.028	.027
St. Marys College	69-001	Aquia	N130 E964	.055	.055	.052	.052	.051
Steuart Petroleum Company	50-002	Aquia	N116 E936	.019	.021	.020	.020	.019
Steuart Petroleum Company	50-002	Piney Point	N115 E935	.020	.003	.003	.003	.003
Town Creek Water Company	52-004	Piney Point	N172 E946	.152	.132	.128	.144	.156
Wildewood, St. Marys Metropolitan Commission	76-014	Aquia	N171 E933	.028	.015	.011	.013	.000

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000 First pumpage: 1976
.067	.052	.052	.049	.049	.049	.029	.000	.000	.000	.000	.000 First pumpage: 1968
.011	.011	.008	.008	.008	.008	.006	.005	.000	.000	.000	.000 First pumpage: 1953
.060	.066	.071	.052	.052	.052	.052	.000	.000	.000	.000	.000 First pumpage: 1961
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1976
.008	.008	.008	.008	.008	.007	.004	.003	.000	.000	.000	.000 First pumpage: 1977
.008	.008	.008	.008	.008	.008	.008	.000	.000	.000	.000	.000 First pumpage: 1977
.041	.038	.036	.036	.033	.033	.019	.007	.000	.000	.000	.000 First pumpage: 1959
.047	.037	.038	.038	.049	.049	.049	.049	.000	.000	.000	.000 First pumpage: 1953
.010	.008	.007	.005	.003	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.205	.205	.205	.192	.192	.164	.107	.035	.027	.000	.000	.000 First pumpage: 1945
.007	.006	.006	.005	.005	.005	.004	.000	.000	.000	.000	.000 First pumpage: 1967
.610	.959	.721	.686	.684	.685	.392	.262	.233	.000	.000	.000 First pumpage: ?
.096	.096	.096	.096	.096	.096	.070	.008	.000	.000	.000	.000 First pumpage: 1963
.027	.027	.026	.015	.015	.015	.015	.010	.005	.000	.000	.000 First pumpage: 1940
.003	.002	.002	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1973
.075	.069	.073	.073	.073	.082	.122	.154	.101	.000	.000	.000 First pumpage: 1941
.831	.839	.765	.841	.999	1.158	.936	1.291	1.489	.000	.000	.000 First pumpage: 1944
.022	.027	.026	.028	.041	.046	.032	.032	.031	.000	.000	.000 First pumpage: ?
.023	.027	.027	.028	.042	.046	.032	.032	.032	.000	.000	.000 First pumpage: 1944
.010	.010	.010	.010	.010	.003	.003	.000	.000	.000	.000	.000 First pumpage: 1961
.008	.008	.004	.004	.004	.004	.004	.000	.000	.000	.000	.000 First pumpage: 1974
.015	.014	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1974
.025	.026	.028	.024	.022	.022	.000	.000	.000	.000	.000	.000 First pumpage: 1970
.049	.049	.048	.047	.047	.046	.031	.016	.014	.011	.000	.000 First pumpage: 1930
.026	.029	.025	.021	.021	.023	.021	.021	.000	.000	.000	.000 First pumpage: 1951
.004	.005	.004	.004	.004	.002	.002	.002	.000	.000	.000	.000 First pumpage: 1951
.115	.118	.118	.118	.082	.082	.082	.082	.000	.000	.000	.000 First pumpage: 1953
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1977

Ground-water withdrawals by large users in Somerset County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Carvel Hall Cutlery	51-001	Quaternary	N062 E1137	0.000	0.000	0.000	0.000	0.000
Chesapeake Bay Plywood Corporation	66-004	Pocomoke	N091 E1207	.186	.220	.166	.197	.192
Chesapeake Egg Corporation	65-002	Pocomoke	N098 E1215	.000	.000	.000	.001	.003
Crisfield, City of	72-006	Magothy	N057 E1132	.812	.777	.972	.853	.870
Crisfield, City of	72-006	Patapsco	N058 E1132	.079	.228	.201	.265	.142
Princess Anne, Somerset County Sanitary District	79-005	Manokin	N137 E1173	.342	.342	.342	.342	.342
Frenchtown, Somerset County Sanitary District	80-007	Patapsco	N093 E1127	.013	.000	.000	.000	.000

Ground-water withdrawals by large users in Talbot County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Allen Family Foods	54-002	Quaternary	N382 E1087	0.272	0.293	0.321	0.233	0.201
Country Pride Foods	72-004	Aquia	N333 E1027	.001	.001	.009	.006	.006
Easton Utilities Commission	71-005	Magothy	N342 E1066	.866	.917	.913	.872	.972
Easton Utilities Commission	71-005	Aquia	N343 E1060	.288	.306	.304	.291	.324
Hogs Neck Golf Course	74-005	Quaternary	N364 E1069	.069	.059	.066	.188	.164
Hogs Neck Golf Course	74-005	Federalsburg	N364 E1069	.011	.010	.011	.031	.025
KMC Foods, Incorporated	57-004	Cheswold	N396 E1099	.098	.103	.070	.059	.044
KMC Foods, Incorporated	57-004	Aquia	N396 E1099	.025	.028	.021	.019	.023
Martingham Utility	71-002	Aquia	N356 E1021	.014	.012	.007	.003	.008
Oxford, Town of	70-002	Aquia	N314 E1037	.110	.098	.098	.086	.096
St. Michaels, City of	79-004	Aquia	N346 E1022	.233	.219	.219	.219	.219
Talbot Trailer Park	62-002	Cheswold	N357 E1069	.013	.016	.000	.001	.001
Tidewater Inn	46-005	Federalsburg	N344 E1064	.023	.017	.027	.025	.019
Tilghman Packing	46-003	Piney Point	N319 E990	.000	.000	.000	.000	.011
Trappe, Town of	79-006	Piney Point	N302 E1068	.067	.066	.063	.060	.058
Trappe Frozen Foods	46-001	Piney Point	N302 E1069	.101	.101	.099	.125	.137



Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.038	0.038	0.044	0.042	0.041	0.041	0.074	0.037	0.000	0.000	0.000	0.000 First pumpage: 1952
.192	.192	.174	.147	.178	.178	.113	.000	.000	.000	.000	.000 First pumpage: 1966
.014	.017	.018	.024	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: ?
.654	.957	.877	.822	.767	.767	.695	.292	.176	.132	.083	.045 First pumpage: ?
.327	.358	.345	.455	.329	.329	.298	.125	.075	.057	.036	.019 First pumpage: ?
.337	.334	.329	.323	.318	.315	.285	.255	.000	.000	.000	.000 First pumpage: ?
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1980

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.180	0.150	0.000	0.000	0.000 First pumpage: 1948
.010	.008	.017	.019	.013	.014	.014	.000	.000	.000	.000	.000 First pumpage: 1963
.915	.830	.842	.779	.714	.676	.537	.363	.284	.250	.250	.250 First pumpage: ?
.305	.277	.281	.260	.238	.225	.179	.125	.000	.000	.000	.000 First pumpage: 1951
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1976
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1976
.044	.051	.034	.076	.075	.075	.075	.150	.150	.000	.000	.000 First pumpage: 1940
.029	.033	.043	.049	.000	.060	.075	.000	.000	.000	.000	.000 First pumpage: 1960
.008	.005	.002	.002	.002	.002	.000	.000	.000	.000	.000	.000 First pumpage: 1970
.096	.096	.096	.096	.096	.096	.077	.055	.049	.046	.041	.000 First pumpage: ?
.219	.219	.219	.219	.219	.219	.193	.117	.077	.036	.024	.020 First pumpage: ?
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: ?
.016	.015	.018	.022	.019	.019	.017	.016	.000	.000	.000	.000 First pumpage: 1950
.011	.019	.024	.009	.011	.011	.011	.011	.000	.000	.000	.000 First pumpage: ?
.058	.049	.045	.045	.045	.038	.038	.036	.000	.000	.000	.000 First pumpage: ?
.137	.230	.236	.251	.247	.247	.242	.182	.000	.000	.000	.000 First pumpage: ?

Ground-water withdrawals by large users in Wicomico County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
A.W. Perdue and Son, Incorporated	55-001	Quaternary	N204 E1222	1.577	1.496	1.527	1.475	1.664
Campbell Soup, Incorporated	66-007	Quaternary	N200 E1198	.865	.979	1.134	1.228	.841
Champion Chick Products Corporation	46-001	Manokin	N160 E1113	.000	.000	.000	.013	.012
Chesapeake Foods, Incorporated	63-001	Quaternary	N173 E1247	.297	.315	.293	.288	.274
Chesapeake Growers, Incorporated	77-002	Quaternary	N172 E1245	.018	.016	.015	.015	.015
Delmarva Power and Light Company	56-002	Manokin	N213 E1210	.029	.044	.046	.085	.125
Fruitland, City of	77-041	Quaternary	N181 E1200	.173	.048	.000	.000	.000
Green Giant Company	67-012	Manokin	N182 E1197	.004	.369	.341	.326	.314
Green Giant Company	67-012	Quaternary	N182 E1197	.000	.019	.018	.017	.016
H.B.Kennerly and Sons, Incorporated	68-005	Manokin	N160 E1112	.015	.014	.008	.004	.004
Holiday Inn	62-002	Manokin	N215 E1211	.007	.003	.004	.005	.005
Holiday Inn	62-002	Quaternary	N214 E1212	.007	.003	.004	.005	.005
Mardella School	79-008	Frederica	N233 E1159	.010	.001	.001	.001	.001
Messick Ice Company	56-001	Quaternary	N196 E1203	.609	.595	.571	.576	.578
Poplar Hill Correction Camp	59-001	Manokin	N194 E1151	.024	.024	.024	.024	.024
Salisbury, City of	73-001	Quaternary	N197 E1208	3.874	3.375	3.438	4.312	4.038
Salisbury Mobile Home Park	66-001	Quaternary	N212 E1211	.015	.014	.014	.014	.014
Sharptown, City of	75-021	Quaternary	N259 E1169	.074	.061	.068	.000	.000
Shockley and Son, Incorporated	62-009	Manokin	N170 E1267	.032	.027	.025	.025	.025
Shoreland Freezers, Incorporated	63-003	Quaternary	N189 E1202	.053	.071	.063	.055	.055

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
1.848	2.207	1.157	1.159	1.123	0.903	0.751	0.041	0.000	0.000	0.000	0.000
											First pumpage: ?
.923	.979	1.058	.832	.486	.538	.526	.199	.000	.000	.000	.000
											First pumpage: 1952
.012	.011	.017	.014	.014	.014	.014	.000	.000	.000	.000	.000
											First pumpage: 1960
.274	.260	.247	.247	.192	.191	.248	.219	.000	.000	.000	.000
											First pumpage: 1950
.015	.015	.015	.015	.015	.015	.000	.000	.000	.000	.000	.000
											First pumpage: 1970
.104	.110	.156	.110	.110	.110	.110	.110	.000	.000	.000	.000
											First pumpage: ?
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: 1979
.313	.342	.292	.399	.260	.338	.346	.338	.000	.000	.000	.000
											First pumpage: ?
.016	.018	.015	.021	.014	.018	.018	.018	.000	.000	.000	.000
											First pumpage: ?
.004	.002	.002	.002	.001	.000	.001	.000	.000	.000	.000	.000
											First pumpage: 1958
.005	.005	.005	.005	.005	.005	.005	.000	.000	.000	.000	.000
											First pumpage: 1962
.005	.005	.005	.005	.005	.005	.005	.000	.000	.000	.000	.000
											First pumpage: 1962
.001	.001	.001	.001	.001	.001	.001	.001	.000	.001	.000	.000
											First pumpage: 1980
.573	.619	.778	.780	.778	.767	.767	.721	.614	.614	.614	.000
											First pumpage: 1920
.024	.023	.023	.023	.023	.023	.022	.022	.000	.000	.000	.000
											First pumpage: 1959
4.137	3.649	4.071	3.937	3.836	3.836	2.742	2.741	1.947	1.274	.600	.237
											First pumpage: ?
.014	.014	.020	.016	.012	.011	.006	.003	.000	.000	.000	.000
											First pumpage: 1955
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
											First pumpage: 1978
.025	.026	.021	.022	.024	.024	.021	.000	.000	.000	.000	.000
											First pumpage: 1965
.096	.098	.096	.096	.096	.096	.197	.240	.211	.000	.000	.000
											First pumpage: ?

Ground-water withdrawals by large users in Worcester County, 1900 through 1980

(Sources: Maryland Water Resources Administration files, Maryland Geological Survey reports, county water and sewerage plans, and miscellaneous county reports)

User	Appropriation number	Aquifer	Maryland grid coordinates	1960	1979	1978	1977	1976
Campbell Soup Company	67-006	Pocomoke	N088 E1209	0.317	0.330	0.377	0.383	0.647
Chesapeake Foods	56-005	Pocomoke	N188 E1311	.373	.531	.558	.672	.532
Berlin, City of	80-004	Quaternary	N185 E1311	.411	.411	.411	.411	.411
Davis Ice, Incorporated	55-003	Quaternary	N184 E1309	.289	.281	.281	.298	.248
General Motors Inns, Incorporated	66-009	Pocomoke	N083 E1217	.002	.002	.002	.003	.003
Holly Farms, Incorporated	70-005	Manokin	N134 E1256	.026	.028	.029	.024	.024
J.W. Shockley and Sons Fish Hatchery	63-003	Quaternary	N169 E1266	.000	.000	.000	.000	.000
Maryland Marine Utilities	68-010	Quaternary	N210 E1325	.252	.213	.174	.215	.185
Mason Canning Company	61-009	Pocomoke	N157 E1290	.000	.000	.000	.000	.000
Mason Canning Company	61-009	Quaternary	N161 E1302	.000	.000	.000	.000	.000
Newark, Worcester County Sanitary Commission	71-006	Pocomoke	N156 E1292	.014	.011	.013	.012	.009
Ocean City Convention Hall	68-008	Manokin	N199 E1353	.016	.002	.002	.002	.815
Ocean City Golf and Yacht Club, Incorporated	None	Quaternary	N156 E1324	.019	.004	.024	.024	.019
Ocean City Golf and Yacht Club, Incorporated	58-005	Pocomoke	N158 E1322	.019	.004	.024	.026	.019
Ocean City, 15th Street wells	71-005	Manokin	N192 E1350	.403	.454	.722	.800	.676
Ocean City, 44th Street wells	71-005	Manokin	N200 E1352	1.339	1.504	1.575	1.173	1.289
Ocean City, Gorman Avenue wells	71-005	Manokin	N227 E1356	.970	1.091	.871	.976	.799
Ocean City, south end wells	71-005	Manokin	N186 E1346	.899	.993	.767	.761	.891
Ocean City	71-005	Manokin	N185 E1345	.000	.000	.000	.000	.000
Ocean Downs Racing Association, Incorporated	67-005	Quaternary	N194 E1331	.051	.067	.049	.045	.045
Ocean Pines Association, Incorporated	78-002	Quaternary	N207 E1328	.113	.070	.086	.082	.082
Perdue, Incorporated	69-002	Quaternary	N084 E1258	.465	.822	.807	.733	.812
Pine Shore Golf, Incorporated	79-004	Quaternary	N207 E1320	.047	.000	.000	.000	.000
Pocomoke City	79-010	Pocomoke	N090 E1214	.574	.303	.303	.303	.303
Pocomoke State Park	63-004	Manokin	N115 E1248	.008	.008	.009	.010	.010
Quality Inn	65-004	Pocomoke	N078 E1219	.011	.019	.022	.021	.021

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.949	0.696	0.678	0.954	0.913	0.852	0.269	0.144	0.000	0.000	0.000	0.000 First pumpage: 1956
.507	.704	.773	1.141	.959	.712	.462	.196	.000	.000	.000	.000 First pumpage: 1956
.411	.411	.411	.411	.411	.411	.282	.145	.097	.077	.061	.050 First pumpage: ?
1.053	.889	.677	.685	.685	.685	.670	.633	.589	.479	.479	.479 First pumpage: 1913
.007	.010	.004	.003	.000	.003	.002	.000	.000	.000	.000	.000 First pumpage: 1969
.024	.022	.021	.019	.019	.019	.015	.012	.000	.000	.000	.000 First pumpage: 1954
.000	.000	.014	.008	.009	.008	.007	.004	.000	.000	.000	.000 First pumpage: 1957
.168	.135	.096	.065	.052	.036	.021	.000	.000	.000	.000	.000 First pumpage: 1969
.000	.000	.000	.000	.007	.019	.011	.011	.000	.000	.000	.000 First pumpage: 1950
.000	.000	.000	.000	.021	.030	.034	.033	.040	.000	.000	.000 First pumpage: 1941
.010	.011	.010	.003	.004	.004	.003	.000	.000	.000	.000	.000 First pumpage: 1972
.815	.815	.815	.815	.815	.002	.050	.000	.000	.000	.000	.000 First pumpage: 1969
.016	.021	.012	.014	.016	.016	.014	.000	.000	.000	.000	.000 First pumpage: 1960
.016	.021	.012	.014	.016	.016	.014	.000	.000	.000	.000	.000 First pumpage: 1960
.570	.891	.682	.363	.665	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
1.099	1.130	.011	.749	.635	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1973
.482	.322	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1974
.690	.785	.758	.865	.405	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.000	.000	.000	.000	.000	2.192	.980	.616	.522	.363	.226	.150 First pumpage: ?
.044	.044	.041	.012	.011	.010	.007	.005	.004	.000	.000	.000 First pumpage: 1949
.082	.082	.082	.082	.082	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1971
.786	.859	.769	.685	.548	.411	.239	.000	.000	.000	.000	.000 First pumpage: ?
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000 First pumpage: 1980
.303	.301	.301	.301	.301	.301	.310	.410	.423	.308	.171	.090 First pumpage: 1918
.010	.010	.010	.010	.010	.010	.011	.000	.000	.000	.000	.000 First pumpage: 1969
.022	.021	.022	.021	.021	.020	.022	.000	.000	.000	.000	.000 First pumpage: 1968

Ground-water withdrawals by large users in Worcester County, 1900 through 1980--Continued

User	Appropriation number	Aquifer	Maryland grid coordinates	1980	1979	1978	1977	1976
Ralph L. Mason, Incorporated	78-004	Pocomoke	N156 E1290	0.007	0.008	0.013	0.010	0.010
Ralph L. Mason, Incorporated	78-004	Quaternary	N156 E1290	.000	.000	.000	.000	.000
Ross Wells, Incorporated	69-004	Quaternary	N189 E1314	.010	.015	.013	.023	.032
Savage Ice Company	51-005	Quaternary	N186 E1348	.000	.000	.000	.055	.106
Savage Ice Company	51-005	Pocomoke	N186 E1348	.041	.055	.055	.003	.004
Showell Farms, Incorporated	51-003	Quaternary	N211 E1312	.883	1.071	.927	.681	.841
Showell Farms, Incorporated	71-001	Quaternary	N221 E1309	.011	.007	.004	.004	.003
Showell Farms, Incorporated	78-007	Quaternary	N229 E1317	.075	.037	.027	.027	.011
Snow Hill, Town of	78-013	Manokin	N130 E1262	.335	.260	.260	.260	.260

Pumpage, in millions of gallons per day											
1975	1974	1973	1972	1971	1970	1960-69	1950-59	1940-49	1930-39	1920-29	1900-19
0.010	0.010	0.010	0.010	0.010	0.010	0.009	0.008	0.000	0.000	0.000	0.000
										0.000	0.000
										First pumpage:	1952
.000	.000	.000	.000	.000	.000	.000	.007	.005	.004	.004	.000
										First pumpage:	?
.028	.026	.027	.025	.025	.025	.002	.000	.000	.000	.000	.000
										First pumpage:	1969
.094	.096	.100	.103	.082	.055	.055	.042	.020	.000	.000	.000
										First pumpage:	1940
.011	.004	.004	.003	.003	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1971
1.154	1.046	1.003	.876	.822	.822	.458	.088	.000	.000	.000	.000
										First pumpage:	1950
.003	.003	.003	.000	.000	.000	.000	.000	.000	.000	.000	.000
										First pumpage:	1973
.011	.011	.011	.011	.011	.011	.011	.009	.000	.000	.000	.000
										First pumpage:	1952
.260	.260	.260	.260	.260	.260	.260	.260	.216	.134	.066	.023
										First pumpage:	?