

INTRODUCTION

In 1977, the Congress of the United States, recognizing the need for accurate, comprehensive, and comparable information on water use, directed the U.S. Geological Survey (USGS) to establish a National Water-Use Information Program to complement other USGS programs on the availability and quality of the Nation's water resources. The Water-Use Program is a cooperative project between USGS offices and various State agencies who are responsible for water-resources management. Currently (1994), a cooperative water-use program is in place in Connecticut and in the other five States of New England. These six individual programs are closely coordinated to promote development of uniform water-use data bases.

This report was prepared in cooperation with the Connecticut Department of Environmental Protection and is based on data for Connecticut that were compiled for a national report (Solley and others, 1993). National compilations of water-use information have been done every 5 years since 1950. A previous report was published for Connecticut based on the 1985 water-use compilation (Bigham and Bohr, 1988). The 1990 report is one of six reports being prepared for the New England States.

The purpose of this report is to provide information on water use in Connecticut to Federal and State agencies, water-resources professionals, and individuals interested in water-conservation issues. The report focuses on freshwater withdrawals and stream use for hydroelectric-power generation during 1990. Water withdrawals and use are reported in million gallons per day and are generally derived by dividing total annual withdrawals and use by 365 days. This procedure does not alter the values reported for water-use activities that are fairly constant throughout the year, such as domestic withdrawals; however, for water-use activities with significant seasonal variations (such as sand-and-gravel mining and irrigation), the average daily withdrawal rate is smaller than the actual daily withdrawal rate during the season of activity. Data are aggregated by river basin, which is the most common used water-resource planning unit in New England. In most cases, however, river-basin boundaries do not coincide with State boundaries, and the data reported here are only for the part of each river basin within Connecticut. The river basins are equivalent to hydrologic cataloging units that were delineated by the USGS in cooperation with the U.S. Water Resources Council. A complete description of the units can be found in Seaber and others (1987).

The Connecticut Department of Environmental Protection collects site-specific data on withdrawals for public supply and thermoelectric-power generation and on stream use for hydroelectric-power generation. These data have been supplemented by estimates derived in one of two ways. For mining and industrial withdrawals, site-specific information (such as production, data or number of employees) has been multiplied by a coefficient. For domestic, commercial, and agricultural withdrawals, aggregated data (such as census population data) have been multiplied by a coefficient (U.S. Department of Commerce, 1989, 1991).

REFERENCES CITED

- Bigham, D.K., and Bohr, J.R., 1988, Offstream freshwater use in Connecticut, 1985: U.S. Geological Survey Open-File Report 88-457, 1 sheet.
Seaber, P.R., Kapinos, F.P., and Knapp, G.L., 1987, Hydrologic unit maps: U.S. Geological Survey Water-Supply Paper 2294, 63 p.
Solley, W.B., Pierce, R.R., and Perlman, H.A., 1993, Estimated use of water in the United States in 1990: U.S. Geological Survey Circular 1081, 76 p.
U.S. Department of Commerce, 1989, 1987 census of agriculture, volume 1—geographic area series, part 7—Connecticut State and county data: Washington D.C., Bureau of the Census, publication AC87-A-7, 189 p.
—, 1991, 1990 census of population and housing, summary population and housing characteristics, Connecticut: Washington D.C., Bureau of the Census, publication 1990/CPH-1-S, 64 p.

CONVERSION FACTORS		
Multiply	by	To obtain
million gallons per day	0.04381	cubic meter per second
square mile	2.590	square kilometer

EXPLANATION	
—	River basin boundary
- - -	County boundary
3	River Basin, identified in Table 1



Index maps of Connecticut showing river basins (larger map) and total freshwater withdrawals by river basin (smaller map), 1990.

Table 1.—Area, population, and estimated withdrawals and hydroelectric instream use of water for river basins in Connecticut, 1990

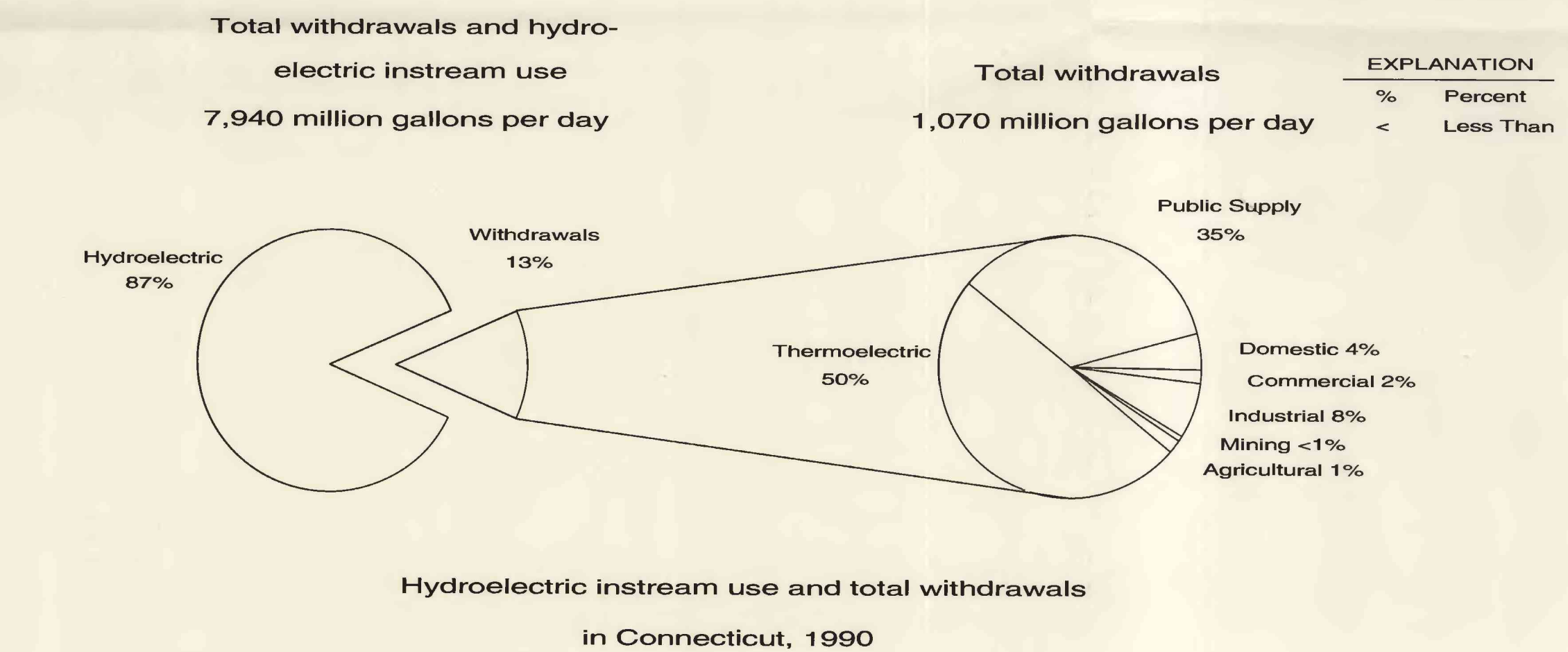
[Units are in million gallons per day (Mgal/d), except where noted; population numbers are rounded to the nearest hundred people; other numbers are rounded to the nearest 0.1 Mgal/d or to three significant figures; values may not add to totals because of independent rounding, m² square miles]

Map code		River basin	Hydrologic cataloging unit	Area (mi²)	Population (thousands)	Public supply	Estimated withdrawals							Hydroelectric instream use
							Self-supply							
						Domestic	Commercial	Industrial	Mining	Agriculture	Thermoelectric			
1	Lower Connecticut	01080205	959	819.6	40.3	9.1	3.2	29.4	0.4	5.5	530	618	96.7	
2	Westfield	01080206	13	1.1	0	0	0	0	0	0	0	5	0	
3	Farmington	01080207	441	201.0	77.4	1.7	1.1	9.5	3	2.8	0	92.8	682.3	
4	Pawcatuck-Wood	01090005	39	6.5	0	0	0	0	0	0	0	11	0	
5	Quinebaug	01100001	393	80.1	4.5	1.9	5.7	4.4	1	0	0	17.1	273	
6	Shetucket	01100002	550	116.0	6.2	3.6	5	4.8	2	1.1	0	16.4	1,790	
7	Thames	01100003	381	205.1	27.1	2.1	1.0	7.9	1	0	0	38.8	22.4	
8	Quinnipiac	01100004	516	625.5	75.1	7.6	1.1	11.0	4	1.8	0	97.0	0	
9	Housatonic	01100005	1,256	591.5	61.4	10.4	2.2	10.4	7	1.6	0	86.9	4,010	
10	Saugatuck	01100006	395	625.9	81.1	9.6	3.2	1.3	0	2.0	0	97.3	0	
11	Long Island Sound	01100007	568	0	0	0	0	0	0	0	0	0	0	
12	Lower Hudson	02050101	32	10.9	8	2	1	0	1	0	1.3	1.3	0	
TOTAL			5,543	3,287.2	374	46.3	18.1	80.1	2.2	16.2	530	1,070	6,870	

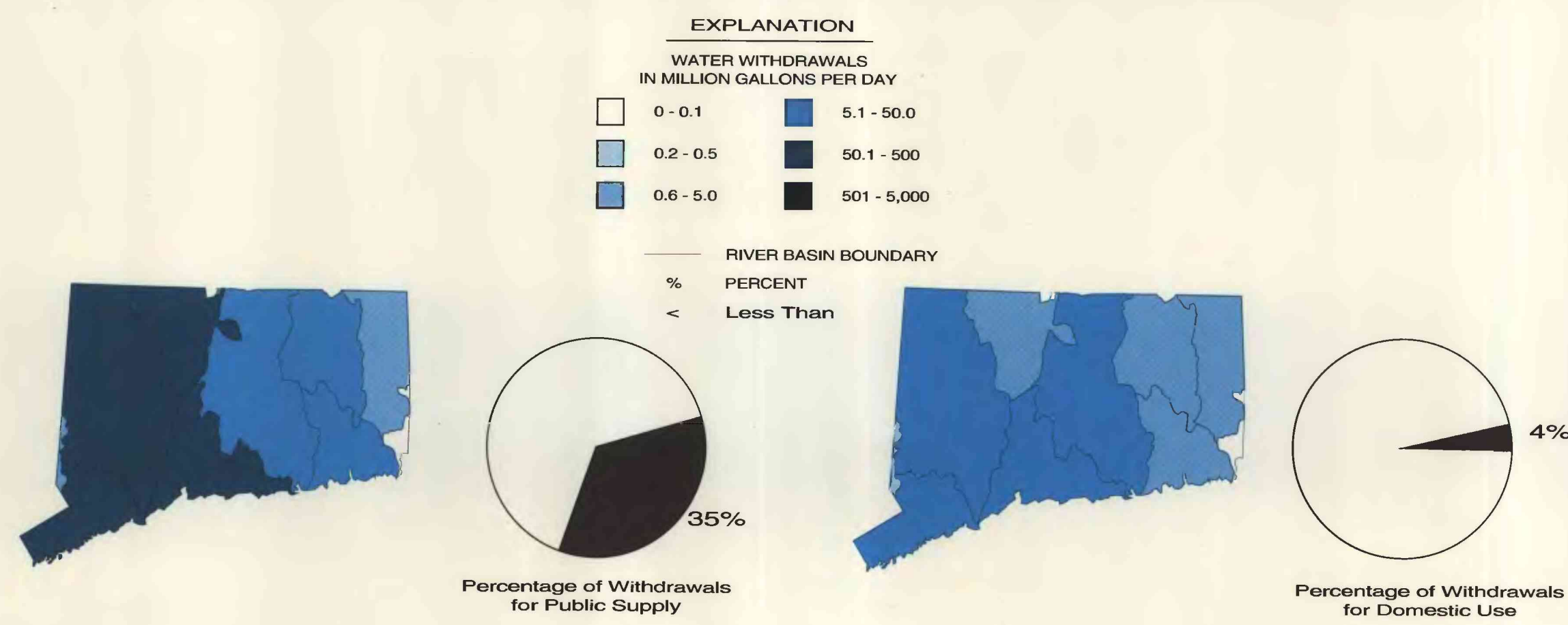
¹ Areas given for the Thames, Quinnipiac, and Long Island Sound basins are from Seaber and others (1987); areas for other basins are calculated because river-basin boundaries extend beyond state boundaries.

A water withdrawal generally refers to water removed for use from streams, reservoirs, or the ground. However, water can also be used without being moved from the stream channel—this is called instream use. The major instream use in Connecticut is hydroelectric-power generation. Hydroelectric instream use is discussed separately from withdrawals in this report for two reasons. First, unlike withdrawals, virtually no change in

the quantity of the water takes place during hydroelectric instream use. Second, the volume of water used for hydroelectric-power generation is so large that it overshadows the combined withdrawals for all other uses. In Connecticut, hydroelectric instream use is more than six times the total withdrawals. Other important instream uses include navigation, wastewater assimilation, recreation, and aquatic habitat.

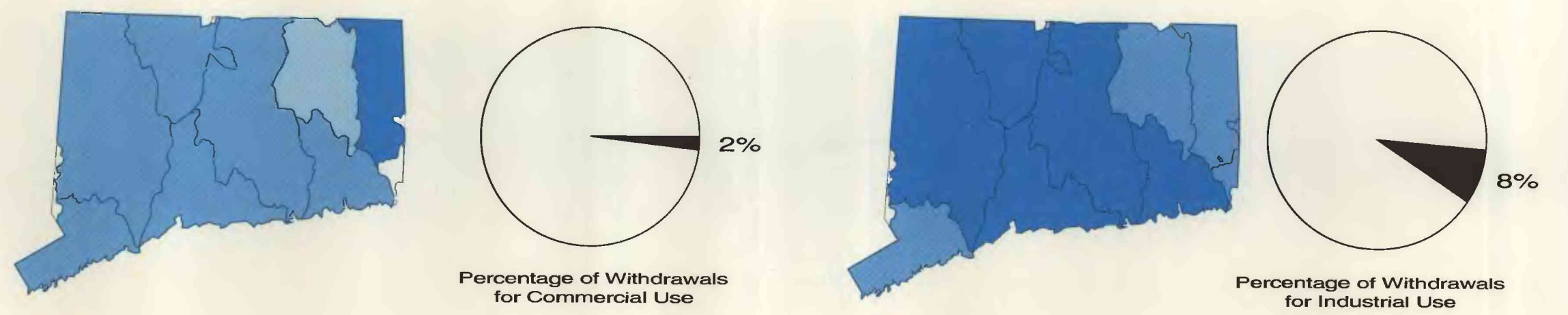


WITHDRAWALS BY WATER-USE CATEGORY AND RIVER BASIN



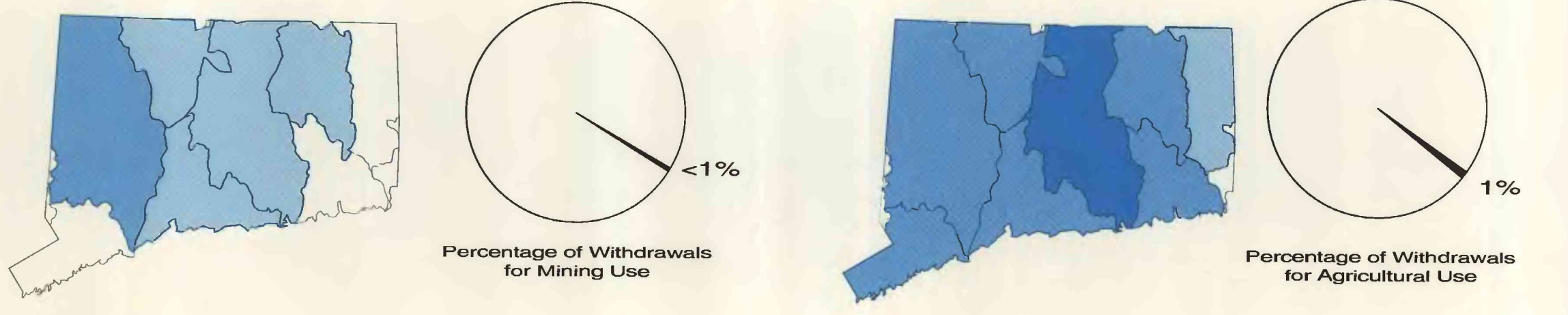
Public Supply Withdrawals

Public-supply withdrawals: Water withdrawn by public and private water suppliers who provide water to various users, such as domestic, commercial, and industrial users, and thermoelectric powerplants. Public supply also includes public use, losses, and transfers to other public suppliers or basins.
* Public-supply withdrawals, 374 million gallons per day, accounted for 35 percent of total withdrawals.
* Public suppliers served approximately 2,671,500 people or about 81 percent of the State's population.
* The largest withdrawals for public supply were in the Saugatuck, Farmington, and Quinnipiac River Basins, which include the cities of Stamford, Bridgeport, and New Haven, as well as the reservoirs that serve the Hartford metropolitan area.



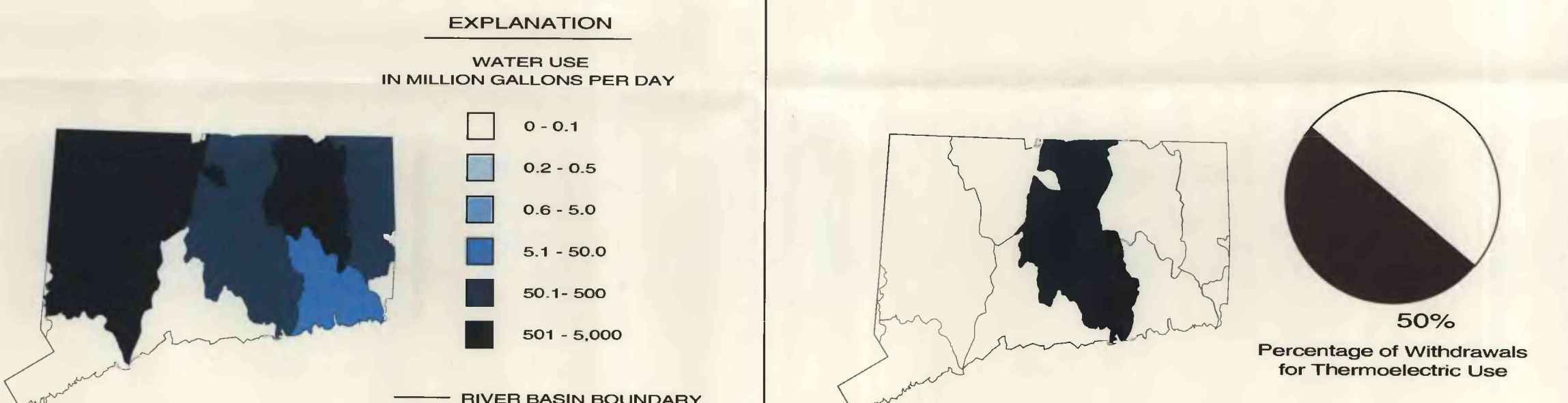
Commercial Withdrawals

Commercial withdrawals: Water withdrawn for use in motels, hotels, restaurants, office buildings, and other commercial facilities, plus institutions, such as hospitals or schools. Water withdrawn for air conditioning and fish hatcheries also is included.
* Commercial self-supply withdrawals, 18.1 million gallons per day, accounted for 2 percent of total withdrawals.
* The largest withdrawal for commercial self-supply was in the Quinebaug River Basin for a fish hatchery. The second largest withdrawals were in the Saugatuck and Lower Connecticut River Basins.



Mining Withdrawals

Mining withdrawals: Water withdrawn for use in the extraction of minerals, which includes withdrawals associated with quarrying, devolving, milling (crushing, screening, washing, flotation), and other preparations customarily done at the mine site or as part of a mining activity.
* Mining withdrawals, 2.2 million gallons per day, accounted for less than 1 percent of total withdrawals. All mining operations in Connecticut were assumed to be self-supplied.
* Crushed stone, sand and gravel, and dimension stone were the major mineral commodities in Connecticut.
* The largest water withdrawals for mining were in the Housatonic, Lower Connecticut, and Quinnipiac River Basins. The central Connecticut valley is underlain by sand and gravel deposits, diabase, and basalt (locally known as trap rock), whereas the western and northwestern parts of the State are underlain by marble deposits.



Hydroelectric Instream Use

Hydroelectric instream use: Water used in the generation of electricity at plants where the turbine generates are driven by moving water.
* Hydroelectric instream use, approximately 6,870 million gallons per day, was primarily by powerplants along the Housatonic and Shetucket Rivers.
* Hydroelectric powerplants generated approximately 1.4 percent of all electric power in Connecticut in 1990.

Domestic Withdrawals

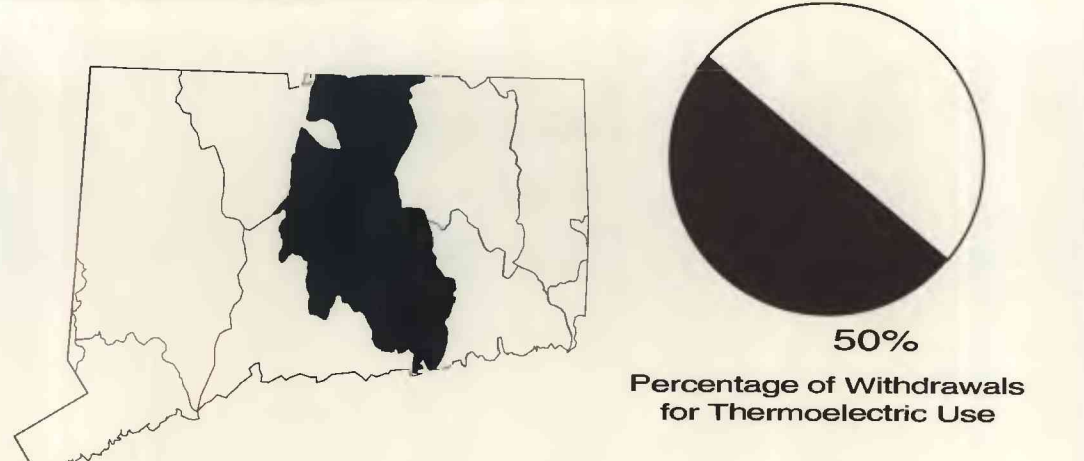
Domestic withdrawals: Water withdrawn for normal household purposes in homes, apartments, or in any place where people are included in a census survey. Domestic withdrawals include water used for drinking, preparing food, bathing, washing clothes or dishes, flushing toilets, and watering lawns and gardens.
* Domestic self-supply withdrawals, 46.3 million gallons per day, accounted for 4 percent of total withdrawals.
* Approximately 615,700 people or about 19 percent of the State's population were self-supplied.
* The largest withdrawals for domestic self-supply were in the Housatonic, Saugatuck, and Lower Connecticut River Basins—the areas with the largest suburban populations.

Industrial Withdrawals

Industrial withdrawals: Water withdrawn for use in fabricating, processing, washing, and cooling industrial materials.
* Industrial self-supply withdrawals, 80.1 million gallons per day, accounted for 8 percent of total withdrawals.
* The largest industrial withdrawals in Connecticut were for the transportation-equipment industry (the manufacture of aircraft, ships, and boats).
* The largest withdrawals by industries were in the Lower Connecticut, Quinnipiac, and Housatonic River Basins.

Agricultural Withdrawals

Agricultural withdrawals: Water withdrawn for use in irrigation and livestock watering.
* Agricultural withdrawals, 16.2 million gallons per day, accounted for 1 percent of total withdrawals. All agricultural use in Connecticut was assumed to be self-supplied.
* Irrigation (approximately 90 percent of agricultural withdrawals) was primarily for watering golf courses, field crops (corn and tobacco), and nursery stock (ornamental shrubs and plants). Dairy farming was an important nonirrigation agricultural use.
* The largest withdrawals for agriculture were in the Lower Connecticut, Farmington, and Saugatuck River Basins.



Thermoelectric Withdrawals

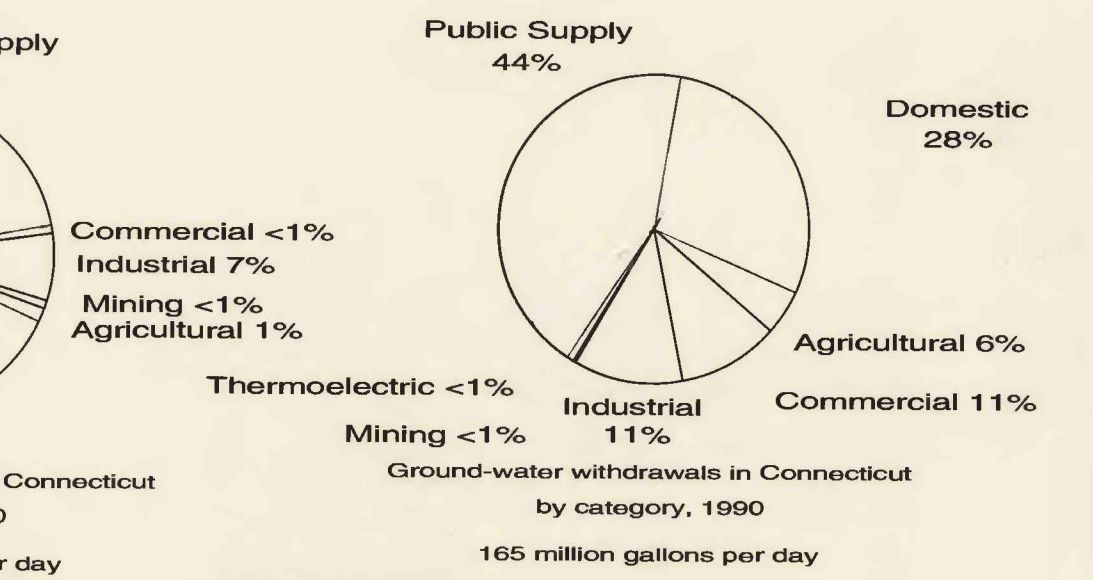
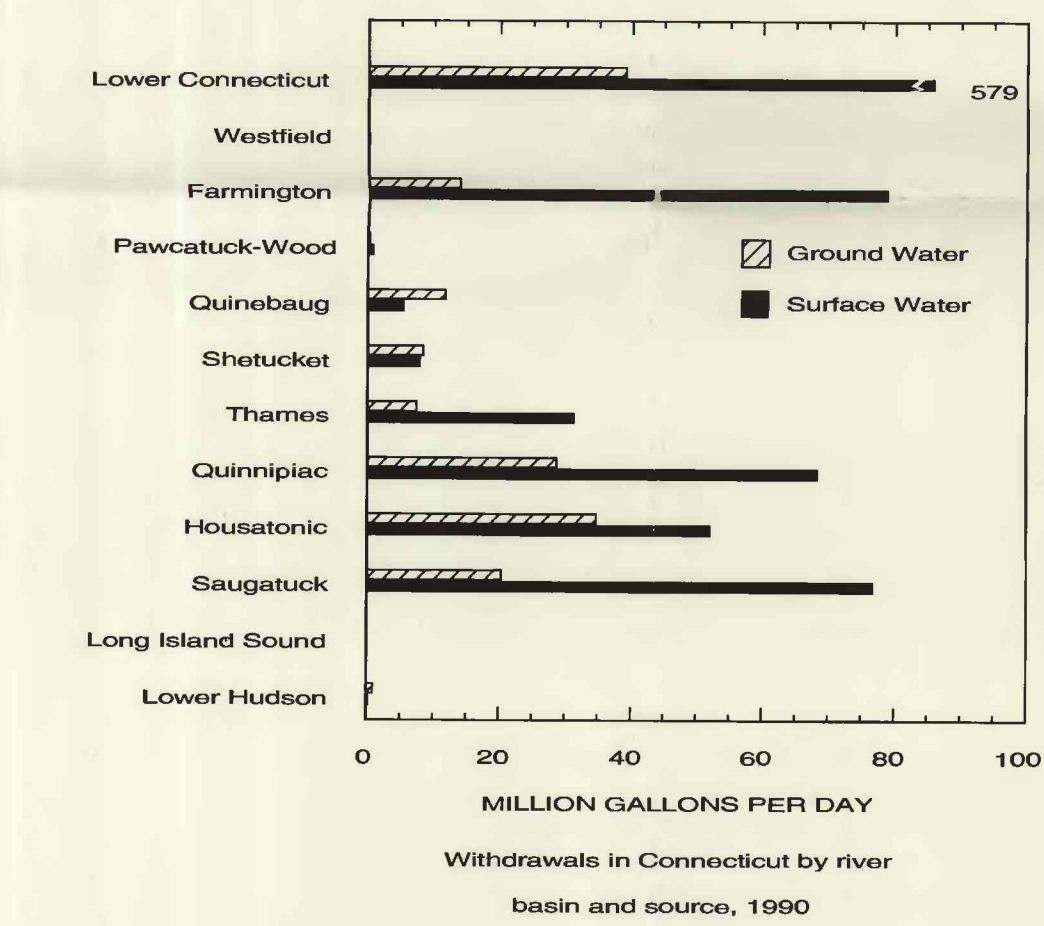
Thermoelectric withdrawals: Water withdrawn for use in the process of generating thermoelectric power. The water is primarily used for cooling.
* Self-supplied withdrawals for thermoelectric-power generation, 530 million gallons per day, accounted for 50 percent of total withdrawals.
* All freshwater withdrawals for thermoelectric-power generation were in the Lower Connecticut River Basin at Middletown Station and Connecticut Yankee power plants.
* Other fossil-fuel and nuclear power plants in Connecticut used saline water, so their use of water is not included in this report.

SURFACE-WATER AND GROUND-WATER WITHDRAWALS

Table 2.—Withdrawals of water by category and source in Connecticut, 1990
[Numbers are rounded to the nearest 0.1 Mgal/d or to three significant figures; values may not add to totals because of independent rounding; Mgal/d, million gallons per day]

Category	Source		
	Ground water (Mgal/d)	Surface water (Mgal/d)	Total (Mgal/d)
Public supply	72.5	302	374
Domestic	46.3	0	46.3
Commercial	17.5	0	16.1
Industrial	16.9	61.2	80.1
Mining	4	1.8	2.2
Agriculture	9.4	6.8	16.2
Thermoelectric	2	530	530
TOTAL	165	902	1,070

River Basin



EXPLANATION	
%	Percent
<	Less Than

SURFACE-WATER AND GROUND-WATER WITHDRAWALS

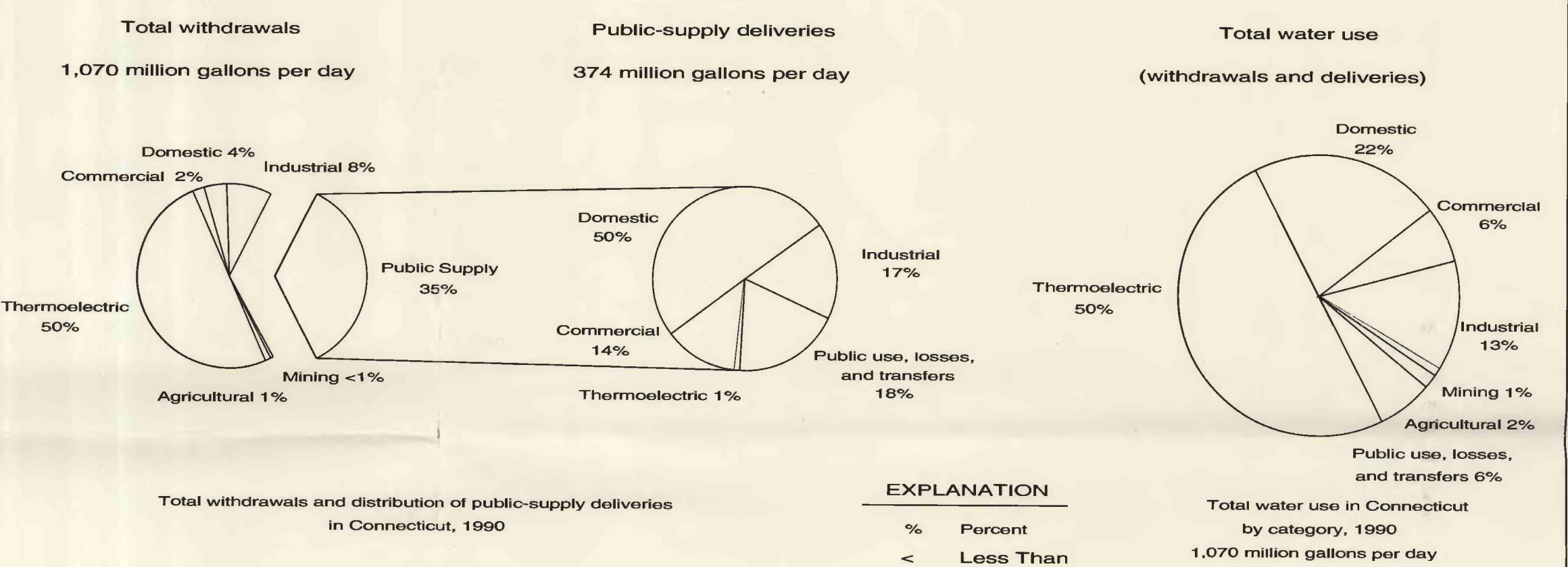
Surface water is water that is present at land surface, such as in streams, reservoirs, and lakes. The major fresh surface-water bodies in Connecticut are the Connecticut, Housatonic, and Thames Rivers.

During 1990, surface-water withdrawals were 902 million gallons per day and accounted for 84.5 percent of total withdrawals in Connecticut. The largest surface-water withdrawals were in the Lower Connecticut, Farmington, and Saugatuck river basins. Thermoelectric-power generation accounted for 59 percent of all surface-water withdrawals. Public supply accounted for 33 percent of all surface-water withdrawals.

Ground water is the subsurface water that is present beneath the water table in soils and geologic formations that are fully saturated. When geologic formations yield significant quantities of water, they can be referred to as "aquifers." Connecticut has four main types of aquifers—those in glacial deposits (such as stratified drift or till), in crystalline bedrock (such as schist or gneiss), in sedimentary bedrock, and in carbonate bedrock (marble).

During 1990, ground-water withdrawals were 165 million gallons per day and accounted for 15.5 percent of total withdrawals in Connecticut. The largest ground-water withdrawals were from the glacial-deposit and crystalline bedrock aquifers in the Lower Connecticut and Housatonic river basins. Public supply accounted for 44 percent of all ground-water withdrawals. Domestic self-supply accounted for 28 percent of all ground-water withdrawals.

SELF-SUPPLY WITHDRAWALS AND PUBLIC-SUPPLY DELIVERIES



EXPLANATION	
%	Percent
<	Less Than

PUBLIC-SUPPLY AND SELF-SUPPLY USE

Public supply is water withdrawn by public and private water suppliers who provide water to various users, such as domestic, commercial, and industrial users, and thermoelectric powerplants. It also includes public use (water used for fire fighting, hydrant flushing, sanitation, and parks), losses that result from leaks in the distribution system, transfers to or from other river basins, and meter errors that may over-register or under-register the actual volume of water flowing through the meter. In the table below, large positive values in the column headed "Public use, losses, and transfers" reflect large values of public supply water to other river basins, whereas large negative values reflect large imports.

During 1990, withdrawals for public supply were 374 million gallons per day, about 35 percent of the water withdrawn in Connecticut. (Public use, losses, and transfers were included in this amount.) The largest public-supply deliveries were in the Housatonic, Saugatuck, and Lower Connecticut river basins, where public-supply systems in the cities of Danbury, Waterbury, Bridgeport, Hartford, and Middletown served residents and local commercial and industrial users. Domestic deliveries, 188 million gallons per day (50 percent) was the largest category of public supply. Industrial deliveries (17 percent) and commercial deliveries (14 percent) accounted for the second and third uses of public supply.

Self-supply water is water that is withdrawn from a surface-water or ground-water source by a user rather than obtained from a public supplier. During 1990, self-supply withdrawals were 693 million gallons per day, almost 65 percent of the water withdrawn in Connecticut. The largest self-supply withdrawals were in the Lower Connecticut, Housatonic, and Quinnipiac River basins. Cooling water for thermoelectric powerplants, 530 million gallons per day, accounted for the largest use of self-supply water. Industrial and domestic uses accounted for the second and third largest withdrawals of self-supply water.

Total water use is the quantity of water use for a specific category and is the combination of self-supply withdrawals and public-supply deliveries. The domestic-use category, which only accounts for 4 percent of total withdrawals, is the second largest total water-use category (22 percent) in Connecticut.

Table 3.—Use of water by category and supply type in Connecticut, 1990
[Numbers exclude hydroelectric instream use; values are rounded to nearest 0.1 Mgal/d or to three significant figures; values may not add to totals because of independent rounding; Mgal/d, million gallons per day]

River Basin	Population (thousands)	Public supply (Mgal/d)	Self-supply (Mgal/d)	Public-supply deliveries				Thermoelectric (Mgal/d)	Total (Mgal/d)
				Domestic	Commercial	Industrial	Thermoelectric		
Lower Connecticut	696.6	121.0	20.2	36.7	11.1	10.7	0.0	40.3	234
Westfield	1.0	1	0	0	0	0	0	0	0
Farmington	178.9	22.1	41.2	22.8	6.6	6.7	0	77.4	0
Pawcatuck-Wood	5.6	9	14	0	0	0	0	0	0
Quinebaug	85.0	25.1	3.1	5.1	1.1	1.4	0	4.5	0
Shetucket	65.0	47.5	2.2	6.5	9	1.0	0	6.2	0
Thames	177.4	27.7	14.5	5.4	3.2	3.5	4	27.1	0
Quinnipiac	527.6	101.9	19.8	37.5	6.3	11.3	2	75.1	0
Housatonic	452.4	139.1	9	37.2	9.6	12.9	5	61.4	0
Saugatuck	497.9	128.0	20.2	33.4	11.7	14.4	1.5	81.1	0
Long Island Sound	0	0	0	0	0	0	0	0	0
Lower Hudson	8.5	2.3	1.1	0	0	0	0	0	0
TOTAL	2,871.5	615.7	68.9	188.1	51.0	63.8	2.6	374.0	

Table 4.—Population with public- and self-supply water, and public-supply deliveries of water in Connecticut, 1990
[Units are in million gallons per day (Mgal/d), except where noted; population numbers are rounded to the nearest hundred people; other numbers are rounded to the nearest 0.1 Mgal/d or to three significant figures; values may not add to totals because of independent rounding]

Category	Population (thousands)	Public supply (Mgal/d)	Self-supply (Mgal/d)	Total (Mgal/d)
Domestic	186	46.3	0	46.3
Commercial	51.0	16.1	0	16.1
Industrial	63.8	80.1	0	144
Mining	0	2.2	0	2.2
Agriculture	0	16.2	0	16.2
Thermoelectric	2.6	530	0	533
Public use, losses, and transfers	66.6	0	0	66.6
TOTAL	374	693	0	1,070

For additional information write to:

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ESTIMATED WITHDRAWALS AND USE OF FRESHWATER IN CONNECTICUT, 1990