

INTRODUCTION

The Chowan-Roanoke subregion of North Carolina and Virginia consists of the Chowan and Roanoke River basins and drainage basins of other tributaries to the Albemarle Sound which include the Perquimans, Little, Pasquotank, North, Alligator, and Scuppernon Rivers. Included in this subregion also are the Northwest and North Landing River basins, which drain into the Currituck Sound in northeastern North Carolina. The subregion drains a total area of 18,300 mi² (square miles), of which 7,600 mi² are in North Carolina and 10,700 mi² are in Virginia. The Roanoke and Chowan River basins in northern North Carolina and southern Virginia comprise an area of about 17,500 mi² and account for about 95 percent of the subregion. The subregion includes parts of the Piedmont and the Coastal Plain physiographic provinces and all or parts of 28 counties in North Carolina and 28 counties or independent cities in Virginia.

Average precipitation in the subregion ranges between 44 and 52 inches per year; therefore, water appears to be plentiful for supplies. However, projected increases in water withdrawals, proposed interbasin diversions, and limited storage may reduce the amount of water available to meet the demand for water in the subregion. Currently, there are no major diversions or interstate transfers of water in the subregion; however, a proposal to construct a pipeline to divert water from a reservoir in North Carolina to Virginia Beach, Virginia, has become a major water issue in the two States. Agriculture is a major contributor to the area's economy, and the success of many agricultural operations is dependent upon a reliable supply of water to irrigate crops. Historically, tobacco has been the chief cash crop; however, due to the uncertain future of tobacco farming, some tobacco acreage has been converted to corn and soybeans in recent years.

National water-use estimates are published every 5 years (1950-85) in the U.S. Geological Survey Circular series, "Estimated use of water in the United States," (Mackichan, 1951, 1957; Mackichan and Kammerer, 1961; Murray, 1968; Murray and Reeves, 1972, 1977; and Solley and others, 1983, 1988). These circulars contain water-use data for states and water-resources regions. However, these publications do not provide detailed, site-specific water-withdrawal data that are needed to assess the water resources in the subregion.

This report summarizes ground- and surface-water withdrawals for 1983 by category of use and by county for the Chowan-Roanoke subregion and includes water withdrawal data for public water-supply systems, self-supplied industries, thermoelectric powerplants, and agricultural irrigation. Detailed information about water withdrawals in the study area in 1983 was collected because the demand for water during the dry 1983 growing season was among the highest on record. All water-withdrawal data were obtained by personal visits or telephone contacts with the facility managers, plant operators, irrigators, or others who maintained files or had knowledge about the water-use practices. The data were compiled in 1984 and represent annual average withdrawals for 1983.

DATA COLLECTION

This report was prepared in cooperation with the North Carolina Department of Environment, Health, and Natural Resources (EHNR), Division of Water Resources (DWR). The water-withdrawal data presented in this report were collected as part of the U.S. Geological Survey's National Water-Use Information Program (NWUIP). Through NWUIP, State and local agencies collect site-specific water-use data, which are compiled and aggregated by the U.S. Geological Survey (USGS) according to major categories of use.

The water-use survey for the Chowan-Roanoke subregion was a project of special interest for EHNR. Because it shared this interest, the USGS assisted with the collection of site-specific irrigation water-use data and in other aspects of the survey. This water-use survey involved the collection of water-use data for several categories of use: public supply, industrial, thermoelectric power generation, and irrigation. DWR collected the North Carolina water-use data and much of the Virginia data. The North Carolina irrigation data were collected through field interviews conducted by DWR and the USGS and with the assistance of the North Carolina Agricultural Extension Service. DWR also compiled the public supply and industrial water-use data for both States. Irrigation data for Virginia were collected through field interviews conducted by a private firm under contract to the State of North Carolina. The primary responsibility of the USGS involved compiling and processing the data and assisting EHNR with implementing quality-control procedures.

Total surface- and ground-water withdrawals in the Chowan-Roanoke subregion were about 3,660 Mgal/d (million gallons per day) in 1983. Of that amount, 3,460 Mgal/d, or 95 percent, was withdrawn in North Carolina. Four thermoelectric power generation plants in North Carolina withdrew 90 percent of the water used in the Chowan-Roanoke subregion. The largest use of water (excluding thermoelectric power generation) was in Martin and Halifax Counties, North Carolina, and in Henry and Southampton Counties, Virginia. Surface-water withdrawals totaled 3,370 Mgal/d and accounted for nearly 98 percent of the total withdrawals; thermoelectric power generation accounted for the largest use of surface water (92 percent). Ground-water withdrawals totaled 84 Mgal/d, or 2 percent of the total withdrawals in the Chowan-Roanoke subregion. The largest use of ground water was by self-supplied industries that withdrew about 48 Mgal/d, or 57 percent of the total ground-water withdrawals.

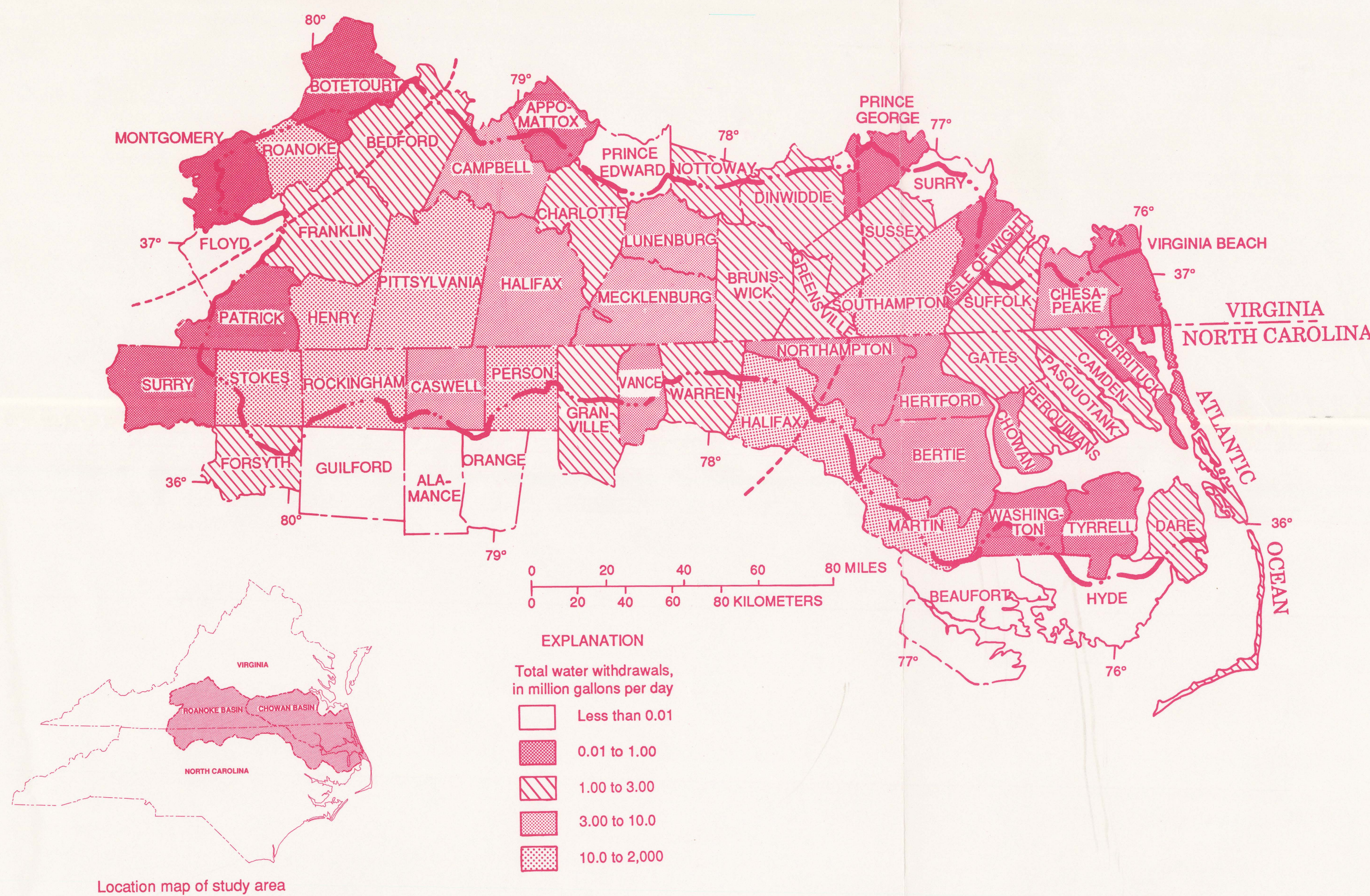
Water-use by self-supplied industries was the second largest category of water use and totaled 206 Mgal/d, which was 55 percent of the water withdrawals excluding those for thermoelectric power generation. Manufacturing of paper and wood products in Martin and Halifax Counties accounted for the majority of surface-water withdrawals for self-supplied industries in North Carolina. In Virginia, surface-water withdrawals for industrial use were highest in Henry County. In Southampton County, Virginia, ground-water withdrawals for industrial use totaled 39 Mgal/d, which accounted for 81 percent of industrial ground-water withdrawals in the entire subregion.

Public supply was the next largest category of use and totaled 93 Mgal/d, or 25 percent of withdrawals excluding those for thermoelectric power generation. Withdrawals for irrigation accounted for the remainder of water use in the basin and totaled 74 Mgal/d, or 20 percent of the total excluding thermoelectric power generation.

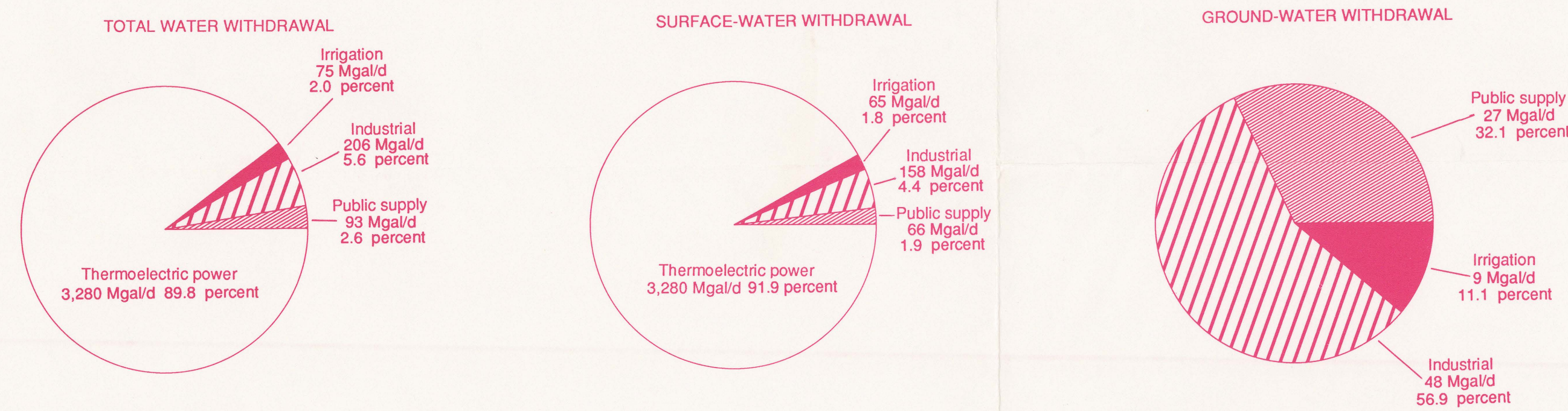
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TOTAL WITHDRAWALS BY COUNTY IN THE ROANOKE-CHOWAN SUBREGION IN NORTH CAROLINA AND VIRGINIA



WATER WITHDRAWALS BY SOURCE AND CATEGORY



WATER WITHDRAWALS BY CATEGORY

PUBLIC SUPPLY

- Public supply refers to water withdrawn by municipal water-supply systems and private water suppliers for delivery to domestic and commercial users, industries, powerplants, and non-metered public services such as fire fighting. Water withdrawals for public supply by county in the subregion are shown on the map below.
- Public-supply water systems withdrew about 93 Mgal/d in 1983, of which 71 percent was withdrawn from surface-water sources.
- Public suppliers served over 900,000 people in the subregion.
- Public supply per capita water use averaged 98 gallons per day.
- Municipalities in Roanoke and Pittsylvania Counties, Virginia, two of the most populated counties in the subregion, accounted for about one-third of the water withdrawn for public supply.
- Rockingham County, North Carolina, accounted for the largest use of ground water for public supply (6.2 Mgal/d).

SELF-SUPPLIED INDUSTRIAL

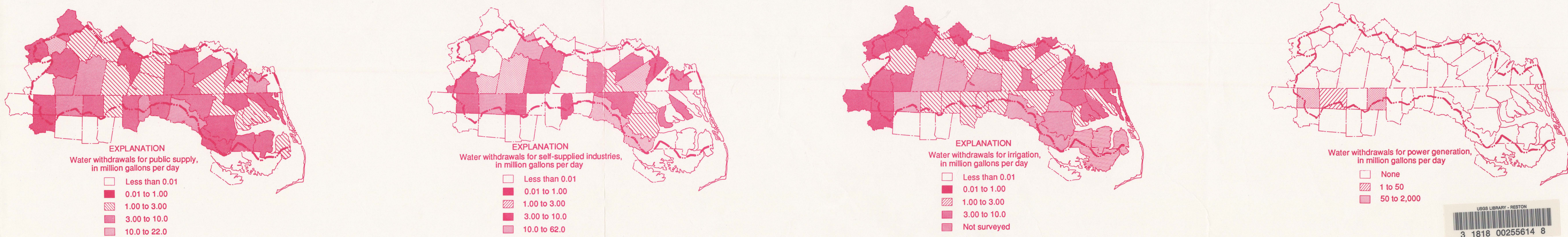
- Self-supplied industrial water use includes water withdrawals by industrial facilities in manufacturing of products such as steel, chemicals, paper and wood products, in mining, and in petroleum refining. About one-half of the counties in the subregion had self-supplied industrial withdrawals totaling less than 0.01 Mgal/d, and another 25 percent had withdrawals less than 1.0 Mgal/d.
- Total self-supplied industrial withdrawals for 1983 were estimated at 206 Mgal/d.
- Surface water was the source for 75 percent of the withdrawals.
- Manufacturing of paper and wood products (62 percent) and thermoelectric power (38 percent) accounted for the majority of water used by self-supplied industries.
- Martin and Halifax Counties, North Carolina, and Southampton and Henry Counties, Virginia, had the largest industrial withdrawals, accounting for 84 percent of the total use.
- Southampton County industries were the largest users of ground water (39 Mgal/d) in this category.

IRRIGATION

- Irrigation water use includes water applied to grow crops (including fertilization, chemigation, and frost-freeze protection) and maintain recreational lands, such as parks and golf courses. Note that Hays, Hyde, Tyrrell, and Washington Counties in North Carolina were not surveyed for this study.
- Irrigation withdrawals in 1983 were estimated at 74 Mgal/d or 83,000 acre-feet per year, of which 99 percent was withdrawn during the months of April through September.
- Surface water was the source for 87 percent of irrigation water.
- About 81,000 acres of farmland were irrigated--44,600 acres in North Carolina and 36,300 acres in Virginia.
- About 35 Mgal/d or almost one-half of the irrigation withdrawals was used to irrigate 36,000 acres of tobacco, which accounted for 44 percent of the total irrigated acreage.
- Irrigation application rates were about 1 foot of water per acre during the year.
- Hertford County, North Carolina, and Mecklenburg and Pittsylvania Counties, Virginia, accounted for about 25 percent of the total withdrawals for irrigation.
- The use of ground water for irrigation was greatest in Martin County, North Carolina, and Mecklenburg County, Virginia.

THERMOELECTRIC POWER

- This category of water use includes all water withdrawn by thermoelectric powerplants to generate electrical power. The four thermoelectric powerplants in the study area are located in North Carolina and use fossil-fuel to generate power.
- Thermoelectric powerplants withdrew about 3,280 Mgal/d of water in 1983, all of which was surface water.
- Thermoelectric power generation is the largest water-use category, accounting for 90 percent of the total water withdrawals for all categories.
- Two powerplants in Person and Stokes Counties use 87 percent of the total water withdrawn for thermoelectric power generation.
- Sixty percent of water withdrawn for thermoelectric power generation was used for cooling with off-stream cooling systems such as towers and ponds; the remainder of the water was used for once-through cooling purposes.



WATER WITHDRAWALS IN THE ROANOKE-CHOWAN SUBREGION OF NORTH CAROLINA AND VIRGINIA, 1983

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