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Delaware River Basin NAWQA Study

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Delaware River Basin Study Unit Description

The Delaware River drainage basin encompasses more than 12,700 mi² (square miles) and includes parts of Pennsylvania (6,465 mi²), New Jersey (2,969 mi²), New York (2,363 mi²), and Delaware (968 mi²). The [study-unit](#) area includes the entire drainage basin, except for 770 mi² of the Coastal Plain in the State of Delaware and the tidal portions of the Delaware Estuary. About 7.2 million people live within the study unit. An additional 7 million people in New York City and northern New Jersey rely on surface water diverted from the basin for their water supply.

The headwaters of the Delaware River are in the Catskill Mountains in the northern part of the basin. Upstream from Trenton, the river drains an area of 6,780 mi² and has an average yearly flow of 11,700 ft³/s (cubic feet per second) (Durlin and Schaffstall, 1997). Downstream from Trenton, the river is tidally influenced, but is not saline until south of Philadelphia. The two major tributaries to the Delaware River are the Lehigh and Schuylkill Rivers. The Schuylkill River drains an area of 1,893 mi², has an average yearly flow of about 2,720 ft³/s, and discharges into the Delaware Estuary at Philadelphia. The Lehigh River drains an area of 1,359 mi², has an average yearly flow of about 2,890 ft³/s, and discharges into the Delaware River at Easton, Pa.

Several large reservoirs on the headwaters of the Delaware and Lehigh Rivers are used for water supply, power generation, flood control, flow augmentation, and recreation. Three reservoirs in the upper Delaware River Basin operated by the City of New York divert up to 800 Mgal/d (million gallons per day) out of the basin (Parker and others, 1964). Reservoirs are also used to augment flow in order to maintain an average daily flow of 1,750 ft³/s at Montague, N.J., and to maintain sufficient flow at Trenton, N.J., to control salinity in the estuary. In the summer, reservoir releases can constitute more than 70 percent of the total flow in the upper Delaware River and 40 percent or more of the total flow at Trenton.

Physiography and Climate

Parts of five [physiographic provinces](#) lie within the Delaware River Basin. These are the Coastal Plain, Piedmont, New England, Valley and Ridge, and Appalachian Plateaus. [Topography](#) varies from the relatively flat Coastal Plain, which consists of unconsolidated sediments, to rolling lowlands and a series of broad uplands in the Piedmont. North of the Piedmont Province, the New England and the Valley and Ridge Provinces consist of rock layers that have been deformed into a series of steep ridges and parallel folds that trend northeast-southwest. The Appalachian Plateaus occupy the upper one-third of the basin and are characterized by rugged hills with intricately dissected plateaus and broad ridges. Altitude in the basin increases from sea level in the



south to more than 4,000 feet in the north. During the last major glacial advance, the Appalachian Plateaus and parts of the Valley and Ridge and the New England Provinces were glaciated. North of the line of glaciation, valleys typically are underlain by thick layers of stratified drift and till.

Average annual precipitation ranges from 42 inches in southern New Jersey to about 50 inches in the Catskill Mountains of southern New York; annual snowfall ranges from 13 inches in southern New Jersey to about 80 inches in the Catskill Mountains (Jenner and Lins, 1991). Generally, precipitation is evenly distributed throughout the year. Annual average temperatures range from 56 °F (degrees Fahrenheit) in southern New Jersey to 45 °F in southern New York.

Population and Land Use

On the basis of 1992 satellite-derived thematic mapper [land-use](#) data, it is estimated that about 60 percent of the Delaware River Basin is forested, 24 percent is agricultural, 9 percent is urban and residential, and 7 percent is surface-water bodies and miscellaneous land uses. Eighty percent of the [population](#) of the study unit lives in the Piedmont and Coastal Plain Provinces, which cover only about 40 percent of the total area. Agricultural land covers almost 30 percent of the Coastal Plain and 35 percent of the Piedmont. Both areas have almost 20 percent urban land use. Most of the population and urban land use is found along the estuary, which separates the two provinces. Although the population has not increased significantly over the past 20 years, large tracts of land have become suburbanized as people have moved out of the "core" city areas around Philadelphia into the surrounding agricultural and forested areas. The Valley and Ridge Province contains 14 percent of the population and about 24 percent of the total area of the basin. The population of this province in the study unit has increased 17 percent over the past 20 years. Land use in the province is more than 33 percent agricultural and 7 percent urban. Most of this development has occurred in the valleys, and especially in the Great Valley subprovince. Most of the forested areas are found along the ridges. The northwestern part of the province was mined extensively for anthracite coal in the past, and some mining continues today. The Appalachian Plateaus Physiographic Province covers more than one-third of the study-unit area, but contains less than 3 percent of its population. Land use in the Appalachian Plateaus is more than 85 percent forest, less than 10 percent agriculture, and about 1 percent urban.

Water Use

The [Delaware River Basin Commission](#) estimated that basinwide use of water for all purposes was about 7,337 Mgal/d in 1991. This is equivalent to the mean annual streamflow of the Delaware River at Trenton, N.J. Power generation accounts for the bulk of the water use (69 percent), followed by public-supply use and self-supplied-industrial use (15 percent each). Most of the water is returned to streams and aquifers within the basin, except for about 311 Mgal/d in consumptive uses within the basin and about 900 Mgal/d in diversions out of the basin to [New York City](#) and northeastern New Jersey. About 60 percent of consumptive water use within the basin is from surface-water sources and 40 percent is from groundwater sources.

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