

Spanning the Gap

A Drop to Drink



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Spanning the Gap
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by DeNise Cooke

The Delaware River Watershed

What's so special about the Delaware River?

The 330-mile Delaware River is the centerpiece of a 12,765-square-mile watershed located in the states of Delaware, New Jersey, Pennsylvania, and New York. Though a relatively small watershed compared to other river systems in the United States, it provides water to 20 million people--almost 10% of the nation's population, including both New York City and Philadelphia.

The watershed includes the streams, wetlands, lakes, ponds, and groundwater aquifers that flow to the river, its estuary and the Atlantic Ocean. Other water may not reach the ocean, but re-enters the water cycle through processes such as evaporation, precipitation, and uptake by plants.

The headwaters of the Delaware arise in the Catskill Mountains of New York State. North of Hancock, New York, the East Branch and the West Branch meet to form the Delaware River. These two branches of the Delaware supply the New York City metropolitan area with drinking water and with water recreation. Dams on the branches regulate mandated minimum flow in the mainstem. In addition to the two branches, the Delaware has major tributaries in the Neversink, which empties into the river at Port Jervis, New York, and the Lehigh, which joins the river at Easton,



The Delaware River looking downstream from McDade Trail's Riverview Trailhead PA.



Winter view of Silverthread Falls along the boardwalk at Dingmans Falls PA.

Pennsylvania.

The Delaware River is one of the last large free-flowing rivers left in America; that is, it is a river without dams or control structures on its mainstem. This is one reason why three segments of the Delaware River have been placed into the National Wild and Scenic Rivers System. The Upper Delaware Scenic and Recreational River flows 75 miles southward from Hancock to Port Jervis, New York. The Middle Delaware National Scenic River (within Delaware Water Gap National Recreation Area), flows 40 miles southward from Milford to Delaware Water Gap, Pennsylvania. And the most recent addition, the Lower Delaware Scenic and Recreational River, flows 65 miles southward from Delaware Water Gap to Washington Crossing, Pennsylvania (just upstream of Trenton, New Jersey.)



Blue Mountain Lakes NJ.

People and the River

The diversity of the Delaware River watershed, and the human settlement patterns with it, is largely due to geology and topography. Human use and settlement first occurred along the river and larger streams. Early nomadic inhabitants depended on good quality water for drinking, and water also supported food sources on which the people were dependent. Later, more sedentary European settlers increased uses of water to support agriculture, industry, and fire suppression. Several of the streams flowing through the recreation area were formerly sites for various types of mills. Settlement patterns began at the river and worked further up into the watershed. As technology increased, so did the ability to carry water farther away from its source.

Today, much of the land located near the headwaters of the streams which flow through the recreation area are protected by other public lands such as state forests and parks. Residential and commercial development occurs in areas in-between the public lands.



The recreated mill at Millbrook Village sits alongside Van Campens Brook near the site of Abram Garis' first mill in 1832. Garis' mill formed the nucleus of the village that became know as Millbrook.



Coppermine Inn

(Shoemaker's Union Hotel) was once the overnight stop of loggers using the Delaware as a floating highway to take rafts of felled trees to market in Philadelphia.

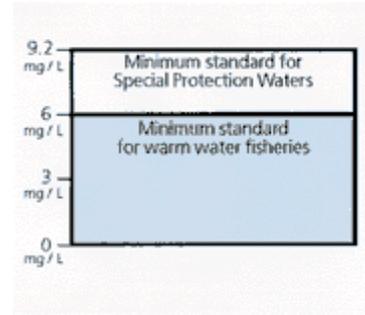
Water Quality

The 70,000 acres of Delaware Water Gap National Recreation Area include over two dozen streams that originate outside of park boundaries, but flow through the recreation area to the river. There are close to 700 lakes, ponds, and wetlands that are all to be protected from pollution for future generations.

Water quality management objectives for the park and river include requirements from the *Wild and Scenic Rivers Act* and from the park's enabling legislation--the congressional statement of why the park was formed. These documents provide the framework and justification for protecting water quality. The park then develops specific guidelines on how to protect water quality in cooperation with regulating agencies. Some of these agencies include the Delaware River Basin Commission, for activities directly relating to water quality and quantity; the U.S. Army Corps of Engineers for developments along floodplains; and state and local authorities for land uses that could affect water quality, such as farming and large-scale construction. Obtaining this information requires cooperating with universities and with agencies such as the U.S. Geological Survey and the U.S.D.A. Forest Service and Natural Resource Conservation Service, in addition to the Delaware River Basin Commission.

In 1992, the Delaware River Basin Commission, in cooperation with the National Park Service, developed and adopted new regulations that would further protect park resources and also for growth in the areas outside the park. The Commission developed *Special Protection Waters Regulations* for the upper basin of the Delaware River. The cooperative monitoring program, which began in

Cleaner than it has to be:



DISSOLVED OXYGEN (DO)

Monitoring the concentration of dissolved oxygen (DO) is important in order to maintain good water quality. It is an essential component in maintaining the health of aquatic organisms and the diversity of water species.

Oxygen pervades water through absorption, from the atmosphere, or as a result of plant photosynthesis. Inadequate concentrations of dissolved oxygen can result from the decomposition of organic matter and from an overload of nutrients from non-point and point source pollution.

The explosive growth of aquatic flora that results from organic enrichment (nutrient loading) can consume the oxygen in the water, once the cycle for respiration to decomposition is complete. Thus, an adequate level of DO is an indicator of good

1984, found the water quality in this region to be significantly higher than what existing regulations actually required. Rather than allow water quality to degrade to the lower but still permissible levels, these Special Protection Waters Regulations, state that no measurable change, except toward even more natural conditions, is permissible. In support of these Special Protection Waters Regulations, monitoring is conducted to maintain high water quality as defined by the Regulations. Changes in land uses in the watershed are also reviewed and recorded by the recreation area.

Special Protection Waters Regulations have brought many benefits to the watershed. Besides the obvious environmental justification, economic benefits are protected as well. Direct benefits derived from river recreation in this reach of the Delaware River exceed \$70,000,000 per year, and are growing.

What is "high quality" water?

For almost a decade, the recreation area has been "proving" that in this region, the Delaware River has excellent water quality. The intense monitoring conducted in cooperation with the Delaware River Basin commission provides data to support this fact. Water quality is defined by several parameters, including water temperature, dissolved oxygen, fecal bacteria, conductivity and pH (acidity.) More intensive monitoring is sometimes used to measure organic enrichment, to analyze aquatic habitats, or for special studies or research associated with issue resolution. Water quality and testing for measurable change is calculated through statistical analysis.

Protecting the River

The recreation area continues to work to increase the understanding of this important ecological system. Additional data is collected to characterize the aquatic habitats, the hydrological system, and impacts from new or expanded discharges. More than two dozen sites are monitored and area

water quality.

Without the *Special Protection Waters Regulations*, the Middle Delaware would be classified as a *warm water fishery* and a permissible amount of dissolved oxygen (DO) for the Middle Delaware would be six milligrams of oxygen for one liter of water (6mg/L).

However, with the Special Protection Waters Regulations, the water quality definition for this DO is significantly higher. It is 9.2 milligrams per liter (9.2 mg/L.)

Measurements or dissolved oxygen are taken at specific sites along the river. Change is calculated by using statistical analysis in combination with other parameters.

NOTE: Even though park waters have excellent water quality, drinking untreated surface water is risky for humans, because diseases like *Giardia*, and harmful organisms spread by wildlife, may be present in the water.

sampled monthly in spring, summer, and fall. Data is entered into STORET, a national water quality database. Seasonal interns assist with sample collection and analysis.

Clear management objectives, good water quality data, dedicated partners, and professional natural resources staff are essential in conserving and protecting the Delaware River. Upper Delaware Scenic and Recreational River and Delaware and Delaware Water Gap Recreation Area include 120 miles of river, but manage only 70,000 acres of the 4,000 square-mile upper basin of the water shed.

Protecting water quality for plants, animals, and recreational opportunities, in one of the more important mission of Delaware Water Gap National Recreation Area. The recreation area heavily relies on voluntary efforts from adjacent communities and from visitors to this region to help accomplish this task. Practicing water conservation and increasing awareness of natural systems will help one serve this resource for the benefit of future generations. Information can be obtained from your local water supply, wastewater management, conservation agencies, or watershed organization. When you watch what happens in the watersheds that drain to the river, you protect the river itself.

DeNise Cooke is a Water Resources Specialist in the Division of Research and Resource management at Delaware Water Gap National Recreation Area. She is developing the Water Resources Management Plan for the recreation area, which will serve as the guide for conserving and protecting the Middle Delaware Scenic and Recreational River.



The *Creek Crawl* program uses macro-invertebrate counts from a park creek to demonstrate water quality standards.



Fishing at the Water Gap.



A traditional Pocono outing: checking on Dingmans Falls.